Final Environmental Impact Statement

Phase 3–Reclamation District 17 Levee Seepage Repair Project

Prepared for:

U.S. Army Corps of Engineers

April 2021

Prepared by:

ASCENT ENVIRONMENTAL

and

GEI Consultants

in association with

AECOM

Final Environmental Impact Statement

Phase 3–Reclamation District 17 Levee Seepage Repair Project

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Final Environmental Impact Statement on Phase 3–Reclamation District 17 Levee Seepage Repair Project

Federal Lead Agency	Project Location
Department of the Army U.S. Army Corps of Engineers Sacramento District	San Joaquin County, California
Responsible Official for Lead Agency	**For Information, Contact**
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Abstract

This Final Environmental Impact Statement (FEIS) has been prepared by the Sacramento District of the U.S. Army Corps of Engineers (USACE) in accordance with the requirements of the National Environmental Policy Act (NEPA); the Council on Environmental Quality's Implementing Regulations for NEPA; the USACE Civil Works Program "Procedures for Implementing NEPA"; and the USACE Regulatory Program Appendix B, "NEPA Implementation Procedures for the Regulatory Program," to 33 Code of Federal Regulations Part 325. It evaluates the environmental effects of implementing Phase 3 of the proposed Reclamation District 17 (RD 17) Levee Seepage Repair Project (LSRP) (Phase 3 Repair Project). The Phase 3 Repair Project area encompasses 19 LSRP elements, affecting 7 miles of the approximately 19-mile RD 17 levee system. This area includes portions of the San Joaquin River east levee and portions of the levee along the north bank of Walthall Slough. The Phase 3 Repair Project includes modifying the levee slope and crown width to meet levee geometry requirements, constructing seepage berms and a setback levee with a cutoff wall and seepage berm, and installing slurry cutoff walls and chimney drains to reduce under seepage and through seepage gradients. This work is necessary to comply with applicable Federal and state design standards for levees protecting urban areas. To implement the Phase 3 Repair Project, RD 17 is requesting permission from USACE under Section 14 of the Rivers and Harbors Act of 1899 for alteration of Federal project levees and Section 404 of the Clean Water Act for the placement of fill in jurisdictional waters of the United States. RD 17 initiated this effort in cooperation with the California Department of Water Resources, the California Central Valley Flood Protection Board (CVFPB), and USACE. This FEIS summarizes prior environmental analyses for the previously approved phases of the LSRP and evaluates the environmental effects of the Phase 3 Repair Project, including alternatives representing the minimum and maximum disturbance scenarios and the Requester's Preferred Alternative, which was selected after public review of the Draft Environmental Impact Statement/Environmental Impact Report (DEIS/DEIR). Implementing the Phase 3 Repair Project would result in significant and unavoidable adverse effects on agricultural resources, special-status terrestrial species, cultural resources, noise, and visual resources.

Public Review and Comment:

A DEIS/DEIR was prepared in compliance with NEPA and the California Environmental Quality Act (CEQA) to describe the environmental effects associated with the minimum and maximum footprint alternatives. After USACE and RD 17 issued public notices, the document was circulated for public review on September 9, 2011. Two public meetings were held on October 13, 2011, in Lathrop, California. The public review period ended on October 24, 2011. RD 17 prepared a Final EIR (FEIR) to respond to comments received on the DEIS/DEIR in compliance with CEQA, and the FEIR was certified on July 12, 2016. This FEIS has been prepared to respond to comments received on the DEIS/DEIR in compliance with NEPA. The DEIS/DEIR analysis and revisions provided in response to public comments are presented in this FEIS. USACE is circulating this FEIS for public review before determining whether to grant permissions for 11 Phase 3 Repair Project elements; the other eight project elements were constructed under an emergency declaration in 2017 and a categorical permission from USACE and CVFPB approval in 2019.

Review Dates:

The FEIS is available for public review and comment for 30 days from the date of publication of the Notice of Availability in the Federal Register, which was April 30, 2021. An electronic version of the FEIS can be found on the Internet at: https://www.spk.usace.army.mil/Media/USACE-Project-Public-Notices/. Written comments must be received by Ms. Tanis J. Toland at the address listed above under "For Information, Contact" by June 01, 2021.

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Abbreviations and Acronyms

*	no data available
°C	Celsius
°F	degrees Fahrenheit
$\mu g/m^3$	micrograms per cubic meter
A	attainment
A1	Alternative 1
A2	Alternative 2
AB	Assembly Bill
AEP	annual exceedance probability
ALUCP	Airport Land Use Compatibility Plan
AQAp	Air Quality Attainment Plan
APE	Area of Potential Effects
ARPA	Archaeological Resources Protection Act
B	Beneficial
B.P.	Before Present
BA	Biological Assessment
Bay-Delta	San Francisco Bay/Sacramento–San Joaquin Delta Estuary
Blueprint	San Joaquin County Regional Blueprint
BMP	Best Management Practice
BPS	best performance standards
C	carbon
C	Candidate species
CAA	Clean Air Act
CAAQS	California ambient air quality standards
CAFE	corporate average fuel economy
Cal/OSHA	California Occupational Health and Safety Administration
CalEPA	California Environmental Protection Agency
Caltrans	California Department of Transportation
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CCIC	Central California Information Center
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
CP	Categorical Permission
CRHR	California Register of Historical Resources
CRPR	California Rare Plant Ranks / Ranking
cu. yd.	cubic yard
CVFPB	Central Valley Flood Protection Board
CVFPP	Central Valley Flood Protection Plan
CWA	Clean Water Act
cy	cubic yard
dB	decibels
dBA	A-weighted decibels
dbh	diameter at breast height
DDT	dichlorodiphenyltrichloroethane
DEIR	draft environmental impact report
DEIS/DEIR	draft environmental impact statement/environmental impact report
Delta	Sacramento–San Joaquin Delta
DHA	disproportionately high and adverse without mitigation
DHAm	disproportionately high and adverse with mitigation
DNL	Day-Night Noise Level
DOC	California Department of Conservation
DPM	diesel particulate matter
DPS	distinct population segment
DSM	deep soil mixing method
DT	Delisted (species) from Threatened status
DTSC	California Department of Toxic Substances Control
du/acre	dwelling units per acre
DWQ	California Division of Water Quality
DWR	California Department of Water Resources
E	Endangered species
EBMUD	East Bay Municipal Utility District

EFH	Essential Fish Habitat
EIP	Early Implementation Program
EIS	environmental impact statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ER	Engineer Regulation
ESA	Federal Endangered Species Act
ESU	evolutionarily significant unit
ETL	Engineering Technical Letter
FEIR	final environmental impact report
FEIS	final environmental impact statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FMMP	Farmland Mapping and Monitoring Program
FP	Fully Protected species
FPMP	floodplain management plan
FPPA	Farmland Protection Policy Act
FR	Federal Register
FSP	Flood Safety Plan
FTA	Federal Transit Administration
GBA	Groundwater Banking Authority
GHG	greenhouse gas
GPA	General Plan Amendment
Growth Program	City of Manteca's Revised Growth Management Program
GSP	groundwater sustainability plan
GWP	global warming potential
HCP	Habitat Conservation Plan
HI	hazard index
I-5	Interstate 5
in/sec	inches per second
IRWMP	Integrated Regional Water Management Plan
ITE	Institute of Transportation Engineers
LAFCo	Local Agency Formation Commission
LCTF	Lathrop Consolidated Treatment Facility
L_{eq}	Equivalent Noise Level
LOS	level of service
LSm	less than significant with mitigation
LSRP	Levee Seepage Repair Project
LSRTP	Lower San Joaquin River and Tributaries Project

LS *or* LTS	less than significant
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MBTA	Migratory Bird Treaty Act
mg/m^3	milligrams per cubic meter
MLD	most likely descendant
MMP	Mitigation and Monitoring Plan
mm/year	millimeters per year
MRZ	Mineral Resource Zone
MSA	Metropolitation Statistical Data
MT	metric tons
$MTCO_2$/yr	metric tons of carbon dioxide per year
N	nonattainment
N_2O	nitrous oxide
NA	Not applicable
NAAQS	national ambient air quality standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NDHA	No Disproportionately High and Adverse Effects *or* not disproportionately high and adverse
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NHTSA	National Highway Traffic Safety Administration
NI	No Impact
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOI	Notice of Intent
NOP	Notice of Preparation
NO_X	oxides of nitrogen
NPA	No-Project Alternative
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWP	Nationwide Permit
O&M	operations and maintenance
OPR	Office of Planning and Research
PA	Preferred Alternative
PAL	provisional accredited levee

PCBs	polychlorinated biphenyls
PG&E	Pacific Gas and Electric Company
PL	Public Law
$PM_{2.5}$	fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less
PM_{10}	particulate matter 10 micrometers or less in size
$PM_{2.5}$	particulate matter 2.5 micrometers or less in size
ppb	parts per billion
ppm	parts per million
PPMP	Pollution Prevention and Monitoring Plan
ppt	parts per thousand
PPV	peak particle velocity
PRC	Public Resources Code
PS	potentially significant
PSU	potentially significant and unavoidable
PT	Proposed Threatened species
R	Rare species
RCRA	Resource Conservation and Recovery Act
RD 17	Reclamation District No. 17
RECs	Recognized Environmental Conditions
REL	Reference exposure level
RGP	Regional General Permit
RHA	Rivers and Harbors Act of 1899
RMS	root mean square
ROD	record of decision
ROG	reactive organic gases
RTIP	Regional Transportation Improvement Program
RTP/SCS	Regional Transportation Plan and Sustainable Communities Strategy
RTPA	Regional Transportation Planning Agency
RWQCB	Regional Water Quality Control Board
S	Significant
SAFE	Safer Affordable Fuel Efficient
SB	Senate Bill
SC	Species of Concern
Section 408	Rivers and Harbors Act of 1899, Section 14 (33 U.S. Code 408)
SGMA	Sustainable Groundwater Management Act
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan

SJAFCA	San Joaquin Area Flood Control Agency
SJCOG	San Joaquin Council of Governments
SJMSCP	San Joaquin County Multi-Species Habitat Conservation and Open Space Plan
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO_2	sulfur dioxide
SOI	sphere of influence
SP	Specific Plan
sq. ft.	square feet
SR	State Route
SRA	shaded riverine aquatic
SSC	California Species of Special Concern
Statistical Descriptor	Statistical Descriptor
SU	significant and unavoidable
SWPPP	stormwater pollution prevention plan
SWRCB	State Water Resources Control Board
T	Threatened species
TACs	toxic air contaminants
TDS	total dissolved solids
TMDL	total maximum daily load
TPY	tons per year
U	unclassifiable
UCMP	University of California Museum of Paleontology
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VdB	vibration decibels
VdB re 1 micro-inch/second	vibration decibels referenced to 1 μ inch/second
VMT	vehicle miles traveled
volume/capacity	volume to capacity ratio
WDR	waste discharge requirement
WRDA	Water Resources Development Act of 1996
yr	year

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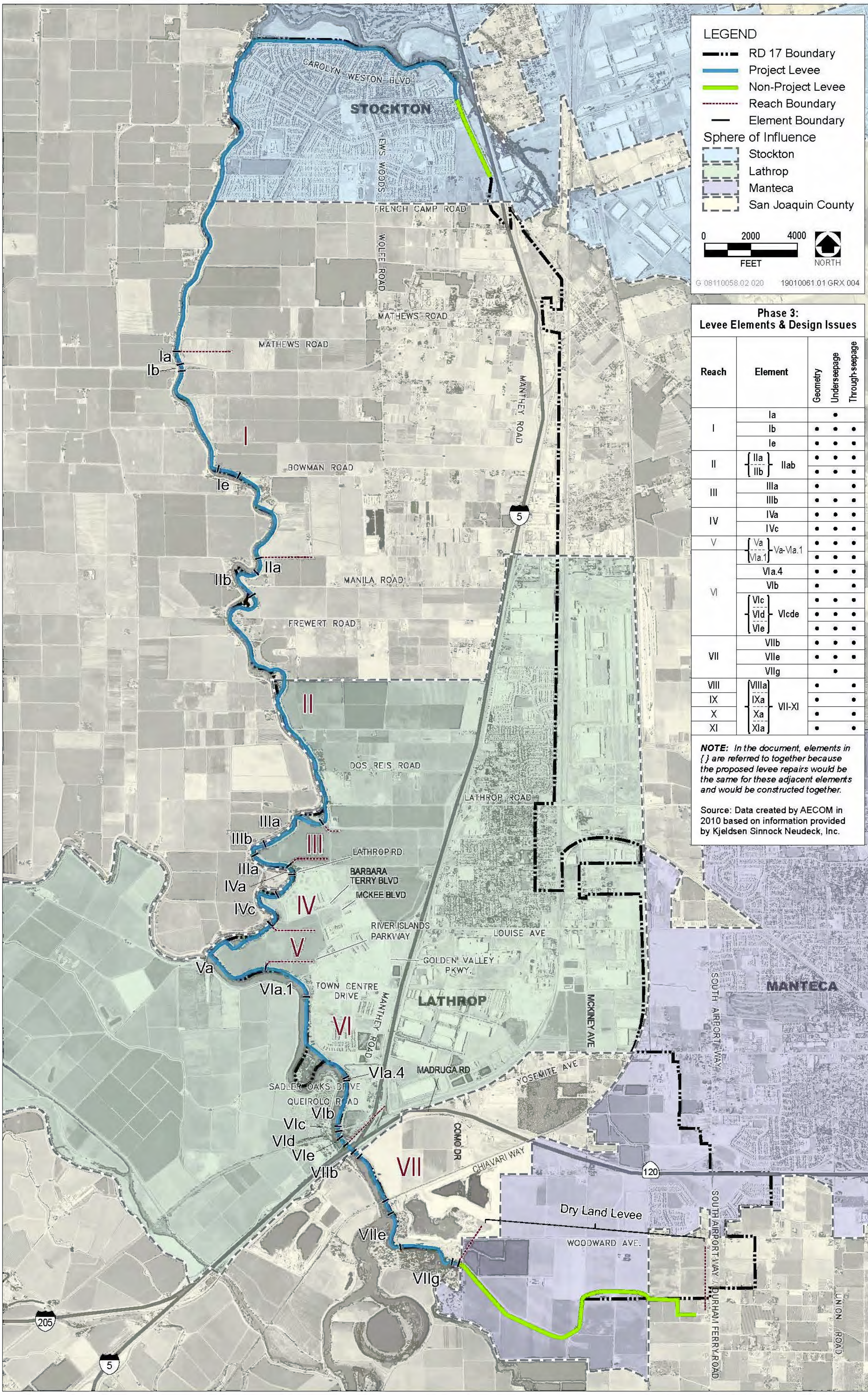

Phase 3: Levee Elements & Design Issues

Reach	Element		Geometry	Underseepage	Through-seepage
I	Ia			•	
	Ib		•	•	•
	Ie		•	•	•
II	IIa	IIab	•	•	•
	IIb		•	•	•
III	IIIa		•		•
	IIIb		•	•	•
IV	IVa		•	•	•
	IVc		•	•	•
V	Va	Va-VIa.1	•	•	•
VI	VIa.1		•	•	•
	VIa.4		•	•	•
	VIb		•		•
	VIc	VIcde	•	•	•
	VId		•	•	•
	VIe		•	•	•
VII	VIIb		•	•	•
	VIIe		•	•	•
	VIIg			•	
VIII	VIIIa	VII-XI	•		•
IX	IXa		•		•
X	Xa		•		•
XI	XIa		•		•

***NOTE:** In the document, elements in { } are referred to together because the proposed levee repairs would be the same for these adjacent elements and would be constructed together.*

Source: Data created by AECOM in 2010 based on information provided by Kjeldsen Sinnock Neudeck, Inc.

Source: KSN 2007, Adapted by AECOM 2010

Phase 3 Reference Exhibit

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Executive Summary

ES.1. Introduction

Reclamation District 17 (RD 17) is proposing the Phase 3–Levee Seepage Repair Project (LSRP), hereinafter referred to as the Phase 3 Repair Project, which would implement repairs to the levees along the San Joaquin River East Levee in the vicinity of the cities of Stockton, Lathrop, and Manteca to provide continued flood risk reduction in the RD 17 service area. RD 17 is requesting permission from the U.S. Army Corps of Engineers (USACE) pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 U.S. Code [USC] 408, hereinafter referred to as "Section 408") for alteration of Federal project levees[1] and pursuant to Section 404 of the Clean Water Act (CWA) (33 USC 1344, hereinafter referred to as "Section 404") for the placement of fill in jurisdictional waters of the United States.

The draft environmental impact statement/environmental impact report (DEIS/DEIR) was prepared jointly by USACE, the NEPA lead agency, and RD 17, the Requester and lead agency under the California Environmental Quality Act (CEQA), in compliance with both NEPA and CEQA (USACE and RD 17 2011). The DEIS/DEIR was written with joint NEPA and CEQA language to improve efficiency and assure consistency in compliance with the two statutes, where appropriate. Since the release of the DEIS/DEIR in September 2011, the NEPA and CEQA processes have been separated and are now represented by a stand-alone FEIS and a stand-alone final environmental impact report (FEIR), respectively. The FEIR was certified in July 2016.

Following public and agency review of the DEIS/DEIR, RD 17 (Requester) selected its preferred alternative, a combination of the two alternatives evaluated in the DEIS/DEIR as summarized in Section 1.4.3, "Phase 3 Repair Project" of the FEIS and described in detail in Section 2.4, "Alternatives Evaluated in this FEIS." The Council on Environmental Quality (CEQ) regulations (40 CFR Part 1508.9(c)(1 and 2)) specify the circumstances which would require that a NEPA document be supplemented. "Agencies [s]hall prepare supplements to either draft or final environmental impact statements if: (i) [t]he agency makes substantial changes in the proposed action that are relevant to environmental concerns; or (ii) [t]here are significant new circumstances or information relevant to [the] environmental concerns and bearing on the proposed actions or its impacts. [Agencies m]ay also prepare supplements when the agency determines that the purposes of [NEPA] will be furthered by doing so." USACE has determined that while the Requester's Preferred Alternative is not the same as either of the action alternatives disclosed in the DEIS/DEIR, the Requester's Preferred Alternative is within the footprint/limits and features of the alternatives disclosed in the DEIS/DEIR, and because the environmental effects for the preferred alternative remain the same in type and the magnitude of the impacts are either the same or reduced, a Supplemental DEIS is not required, and an FEIS has been prepared to complete NEPA compliance.

1 A "Federal project levee," also referred to as a "Federal levee" or a "project levee," is a levee built by a Federal agency and/or authorized by Congress. All other levees are referred to as "non-Federal" or "non-project levees."

It should be noted that the FEIS uses only NEPA language, where reasonable to do so. Because of its initial preparation and public circulation as a joint document, the FEIS responds to all public comments submitted in response to the DEIS/DEIR. However, the FEIS reflects compliance with NEPA only.

ES.2. Document Organization and Format

The FEIS has been prepared by RD 17, and its environmental consultants, Ascent Environmental and GEI Consultants in cooperation with AECOM, and has been reviewed by the USACE Sacramento District, as Federal lead agency under NEPA (see 42 U.S. Code [USC] 4321 et seq.), the Council on Environmental Quality's Implementing Regulations for NEPA (see 40 CFR Parts 1500–1508), and USACE NEPA regulations (see 33 Code of Federal Regulations [CFR] Part 230, Engineer Regulations 200-2-2 ["Procedures for Implementing NEPA for the Civil Works Program", and 33 CFR Part 325, Appendix B ["NEPA Implementation Procedures for the Regulatory Program"]).

The FEIS evaluates a reasonable range of alternatives and identifies mitigation to avoid, minimize, reduce, or compensate for any significant adverse effects. While its contents are consistent with the data and analysis presented in the DEIS/DEIR that was circulated for public comment and review in September 2011, modifications have been made to reflect new or changed information or changes in response to public comment. Figures from the DEIS/DEIR that have been revised for the FEIS have been noted as such in the text. The content of the FEIS replaces that of the DEIS/DEIR in its entirety.

The FEIS reflects minor modifications to the Phase 3 Repair Project as a result of engineering and design refinements; identifies RD 17's preferred seepage remediation methods for each of the 19 elements of the Phase 3 Repair Project, which were selected after public review of the DEIS/DEIR; describes repairs that were completed as part of the emergency flood response in 2017 and under USACE's new categorical permissions process in 2019; and evaluates the Minimum and Maximum Footprint alternatives and the Requester's Preferred Alternative, which comprises the identified preferred repairs that remain to be completed. The comment letters received on the DEIS/DEIR and the responses to those comments are provided in Appendix B of the FEIS. Specifically, each comment received has been considered and responded to individually. References in Appendix B to a "Chapter" or a "Section" should be assumed to refer to the FEIS. If a comment resulted in a change to the text of the FEIS, it is noted within the comment's response.

The Phase 3 Repair Project includes modifying the levee slope and crown width to meet levee geometry requirements, constructing seepage berms and setback levees with seepage berms, and installing slurry cutoff walls and chimney drains to reduce the potential negative effects of under and through seepage. Proposed levee work would occur along various sections of the RD 17 levee system, starting near the southern boundary of the city of Stockton, extending through the city of Lathrop, and ending at the western boundary of the city of Manteca. RD 17 has initiated this effort in cooperation with the California Department of Water Resources (DWR), the California Central Valley Flood Protection Board (CVFPB), and USACE with the aim of improving the existing levee integrity based on the USACE standards for seepage and continuing to provide flood risk reduction during a 100-year flood event (a flood with a 1 percent chance of occurring in any given year, or having a 0.01 annual exceedance probability).

NEPA evaluation is required when a major Federal action, including a permit or approval, is under consideration and may have significant effects on the quality of the human environment. The Phase 3 Repair Project has the potential to significantly affect the human environment; therefore, an EIS has been prepared. USACE will rely on the FEIS, which evaluates the potential environmental effects of implementing the Phase 3 Repair Project, to assist the agency in deciding whether to grant permission for the remaining actions under the Phase 3 Repair Project pursuant to Section 408 and CWA Section 404.

The Phase 3 Repair Project also is subject to compliance with CEQA, and RD 17 will need to obtain several state approvals or permits, including a CVFPB encroachment permit, CWA Section 401 water quality certification, a CWA Section 402 National Pollutant Discharge Elimination System permit, a California Fish and Game Code Section 1602 Streambed Alteration Agreement, and permits from the San Joaquin Valley Air Pollution Control District. RD 17 certified the FEIR for the Phase 3 Repair Project on July 12, 2016.

In some cases in this document, both NEPA and CEQA terminology are used, as in Chapter 1, where the project purpose and need, and project objectives are discussed. The terms "environmental consequences," "environmental impacts," and "environmental effects" are considered synonymous in the analysis. Technical terms used in the FEIS generally are defined in their first instance of use in the text. A list of acronyms and other abbreviations is included at the end of the table of contents. A glossary is provided in Chapter 11.

ES.3. Project Purpose and Need

Overall Project Purpose

The overall purpose of the Phase 3 Repair Project is to implement landside and isolated waterside levee improvements along portions of the approximately 19-mile RD 17 levee system to reduce the risk of flooding in the RD 17 service area during a 100-year flood event. USACE and RD 17 each view the project purpose from the purview of their respective responsibilities, as defined below. NEPA requires the lead agency to explain the purpose to which it is responding.

Reclamation District 17 Objectives

RD 17's objectives for the Phase 3 Repair Project are to repair seepage deficiencies where needed to meet USACE seepage criteria, thereby increasing the levee's resistance to under seepage and/or through seepage by providing under seepage exit gradients equal to or less than 0.5 at the landside levee toe and equal to or less than 0.8 at the landside drained seepage berm toe at the water surface elevation associated with the design water surface and to meet geometry requirements of the permitting agencies in the specific areas of repair work. Levee improvements under consideration include constructing drained seepage berms designed to address under seepage, installing chimney drains in existing and new seepage berms designed to address through seepage, installing deep cutoff walls designed to address both under and through seepage, and modifying levee slopes and crown widths where needed to achieve levee geometry requirements. RD 17 also is considering construction of setback levees to meet funding requirements for the project from DWR's Proposition 1E Early Implementation Program (EIP). Proposition 1E—the Disaster Preparedness and Flood Protection Bond Act of 2006—authorized $4.09 billion in general obligation bonds to rebuild and repair California's most vulnerable structures for reducing flood damage. The EIP prioritizes projects to more rapidly receive funding from the overall Proposition 1E funding pool. EIP funding requires that project proponents at least consider setback levees as an option for repairing/enhancing flood control systems where setback levees can serve the combined purposes of improving flood risk reduction infrastructure, reducing water surface elevations through expansion of the floodway, and providing habitat restoration/enhancement opportunities without causing adverse hydraulic impacts.

U.S. Army Corps of Engineers Decisions

USACE must decide whether or not to grant permission for RD 17's Phase 3 Repair Project to alter the Federal project levees within its levee system under Section 408 and issue permits under CWA Section 404. USACE decisions contemplated by the FEIS pertain only to the Phase 3 Repair Project, which is the subject of the document. No USACE regulatory decisions were required for the Phase 1 and Phase 2 Repair Projects.

Need for Action

Overview

The flood risk to areas protected by the RD 17 levee system needs to be reduced because failure of this levee system and subsequent flooding would pose a significant threat to public health and safety and would cause substantial economic losses. The RD 17 levee system protects approximately 19,600 acres of mixed-use lands with a population estimated at approximately 43,000 people and an estimated $5 billion in damageable property. Examples of some large commercial facilities within RD 17 include Del Monte Foods Distribution Center, In-N-Out Burger Distribution Center, Ghirardelli Chocolate manufacturing facility, and Daimler Chrysler parts center. Main transportation arteries within RD 17 include Interstate 5 and State Route 120, and two Union Pacific Railroad lines. Other critical infrastructure protected by RD 17 levees include 18 schools, 33 long-term care facilities, a minimum-security facility, juvenile detention center, a children's shelter, fire and police stations, the county jail, Sharpe Army Depot, and a hospital. Approximately 13,000 acres in RD 17 are used for agricultural purposes. Crops produced on this land include tomatoes, alfalfa, and corn (RD 17 2009:12–15).

Flood Problems and Needs

Seepage

Seepage remediation to be performed by RD 17 is intended to provide seepage exit gradients equal to or less than 0.5 at the landside levee toe and equal to or less than 0.8 at the landside seepage berm toe at the water surface elevation associated with the design water surface.

Under seepage occurs below the aboveground levee prism and is caused by the buildup of water pressure in the subsurface foundation soils when high river stages are present on the waterside of the levees. This pressure head causes water to flow through the earthen foundation layers under the levee and exit onto the ground surface on the landside of the levee prism. Such seepage is not uncommon and does not inherently imply the levee is failing; however, excessive and uncontrolled under seepage can carry fine-grained material with the water flow that can undermine the levee and can lead to levee failure.

In addition to addressing under seepage issues, the Phase 3 Repair Project would address through seepage at the Phase 3 Repair Project levee elements. Through seepage is the movement of water through the levee prism when high river stage conditions exist on the waterside of the levee. Depending on the duration of high water and the permeability of the levee embankment soil, seepage may exit onto the landside slope of the levee, thereby adversely affecting the stability of the landside levee slope.

Management of Vegetation Encroachments

With issuance of Engineering Technical Letter (ETL) 1110-2-571 in 2009,[2] USACE updated its vegetation management standards for levees requiring the removal of all vegetation, with the exception of perennial grasses, on levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2009). In September 2011, USACE issued a DEIS/DEIR for the Phase 3 Repair Project. The September 2011 DEIS/DEIR considered two options for complying with ETL 1110-2-571, as follows:

- Full Implementation of USACE ETL 1110-2-571: All vegetation, other than perennial grasses, would be removed from the levee slopes and out 15 feet from the waterside and landside levee toes, or

- Acquisition of a Variance from Full Compliance with USACE ETL 1110-2-571: Permission would be obtained from USACE to retain all vegetation on the lower two-thirds of the waterside levee slope and out 15 feet from the waterside levee toe; all other levee vegetation still would be removed in accordance with existing USACE policy.

These two options were designed to meet Public Law (PL) 84-99, which authorizes USACE to provide rehabilitation assistance for levees as long as the system is operated and maintained to acceptable or minimally acceptable standards. However, on March 21, 2014, USACE issued a memorandum, "Interim Policy for Determining Eligibility Status of Flood Risk Management Projects for the Rehabilitation Program Pursuant to Public Law 84-99," to provide interim criteria for determining eligibility for PL 84-99 assistance. Under this interim policy, vegetation management will not be considered in making a PL 84-99 eligibility determination.

Therefore, RD 17 will continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which includes trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground to 5 feet above the ground (or 12 feet above the crown road). However, within the Phase 3 Repair Project area under the action alternatives evaluated in the FEIS, landside vegetation would be removed as previously evaluated in the September 2011 DEIS/DEIR; only waterside vegetation would be managed in accordance with RD 17 existing practices.

ES.4. Project Location and Existing System to Reduce Flood Damage Risk

RD 17 is located in south-central San Joaquin County, California, in the center of the California Central Valley, at the north end of the San Joaquin River Basin, and within the far southeast limit of the Sacramento–San Joaquin Delta. In general, the boundaries of RD 17 are marked by French Camp Slough on the north, approximately 3 miles southwest of the central business district of the city of Stockton; the San Joaquin River on the west; Walthall Slough on the south (just below State Route 120); and Airport Way/McKinley Avenue on the east, just outside the city of Manteca. RD 17 is responsible for maintaining the levees along Walthall Slough, the San Joaquin River, and French Camp Slough, as well as a dryland levee along the southern boundary of Manteca (Refer to **Phase 3 Reference Exhibit** [pullout map in sleeve of cover]). The dryland levee is an overland earthen berm, north and east of the San Joaquin River. Under almost all conditions, water does not come in contact with the dryland levee. It functions as a flood control feature only if water from the San Joaquin River or Walthall Slough

2 USACE ETL 1110-2-571 subsequently was replaced by ETL 1110-2-583 on April 30, 2014 (USACE 2014).

leaves the banks of these waterways and inundates land to the north and east toward Manteca. The dryland levee then acts as an elevated earthen feature that prevents floodwaters from moving farther north.

ES.5. Project History and Planning Context

The RD 17 levee system, like other flood risk reduction systems in the San Joaquin Valley, was initially designed to reduce the risk of flooding for the purposes of facilitating agricultural development of the extensive floodplains encompassed by the San Joaquin Valley and supporting river navigation. The RD 17 area, like much of the Sacramento–San Joaquin Delta, originally was designated swamp and overflowed lands because during times of high flows, water overflowed the riverbanks, inundating adjacent lands. In 1850, Congress adopted the Arkansas Act of 1850, sometimes referred to as the Swamp Land Act of 1850, to aid states in reclaiming swamp and overflowed lands. By this act, such lands were conveyed to the State of California in consideration of its duty to make and maintain the necessary improvements for such reclamation. The object of the Federal government in making this munificent donation to several states was to promote the speedy reclamation of the lands, and thus to invite population and settlement to them, thereby opening new fields for industry and increasing the general prosperity. The banks of the channels were the natural high ground resulting from sedimentation of the materials carried by the high flows. Settlers, using the high ground of the riverbanks as a foundation, constructed levees using horses, hand labor, and material adjacent to the riverbank. After the levees were in place, the protected lands were drained and were used for agriculture, residential, commercial, and industrial purposes. From about 1863, RD 17 undertook the maintenance and reconstruction of the levee system.

Several decades later, Congress authorized the Lower San Joaquin River and Tributaries Project (LSRTP) in the Flood Control Act of 1944, and USACE subsequently began this work. Included in the LSRTP were the RD 17 levees along the left bank of French Camp Slough, those along the right bank of the San Joaquin River, and those along the right bank of Walthall Slough. In 1950, the levee along the San Joaquin River failed and RD 17 was flooded. The levee was repaired, and in May 1963, the LSRTP was completed.

In 1988 and 1989, the RD 17 levees, including those authorized as part of the LSRTP, were substantially improved as a part of the development of Weston Ranch in the city of Stockton. The purpose of the improvement project was to meet Federal Emergency Management Agency (FEMA) 100-year flood event requirements to allow urban development. In February 1990, FEMA accredited the levee as meeting the requirements for flood protection for urban development during a 100-year flood event.

During a high-water event on the San Joaquin River in January 1997, seepage and boils occurred at a number of locations along the RD 17 levees. USACE, DWR, CVFPB, and RD 17 actively and successfully contained the seepage and boils, and the levees did not breach. After the 1997 event, USACE, CVFPB, and RD 17 funded a project to repair the seepage and boil areas under PL 84-99 (Rehabilitation Assistance Program). The project, referred to as “Reconstruction of the California Central Valley Levees San Joaquin Basin #4, Reclamation District #17,” consisted of the installation of landside drainage stability berms. Design and construction was conducted by USACE. In October 2004, USACE provided an addendum to the Standard Operation and Maintenance Manual for work completed as of October 2001.

In 2006, FEMA began a comprehensive update to the Flood Insurance Rate Map. The update is referred to as the Map Modernization Program. FEMA described the Map Modernization Program as a digitizing effort rather than a reevaluation process, with simple recognition of "fatal flaws." After review of the data supporting the 1990 accreditation and subsequent information, FEMA stated its intention to RD 17 to confirm full accreditation of the RD 17 levees as meeting the 100-year flood event requirements. On June 19, 2007, DWR wrote a letter to the City of Lathrop with a copy to FEMA, stating that it could not support recertification of the RD 17 levees or the granting of provisional accreditation because of concerns regarding seepage exit gradients. "Seepage exit gradient" is an expression in numeric form of the potential for under seepage to exit on the landside of a levee as seepage or a boil. The lower the number used to express the seepage exit gradient, the more resistant the system is to seepage or boils; the higher the number, the more likely seepage or boils may occur during a high-water event. In fall 2007, in response to the DWR concerns, RD 17 initiated the LSRP and requested state funding through DWR's EIP. Because of DWR's concern, FEMA granted provisional accredited levee (PAL) status to the RD 17 levees. A PAL is a levee that FEMA has previously credited with providing a 100-year flood event level of flood risk reduction (0.01 annual exceedance probability).

Since 2008, RD 17 has been undertaking the LSRP at various locations along the landside of the levees to increase the levee system's resistance to under seepage and through seepage and bring RD 17's approximately 19-mile levee system into compliance with USACE seepage criteria. To facilitate design and implementation of the LSRP repairs, the RD 17 levees along the east bank of the San Joaquin River from just south of Mathews Road to Walthall Slough and the levees along the north bank of Walthall Slough have been divided into seven distinct "reaches," identified by Roman numerals (i.e., I, II, III,…, VII), and have been subdivided further into a total of 19 "elements," identified by the reach number followed by a lowercase letter and, where needed to further distinguish elements, an Arabic numeral (e.g., Ia, IIa, IIb,…, Va, VIa.1, VIa.4,…, VIe, VIIa, VIIb,…, VIIg).

Implementation of the LSRP is divided into three phases. The Phase 1 Repair Project was completed in 2009. The Phase 2 Repair Project has been analyzed in previous environmental documents (see Section 1.4.2 of the FEIS) and was completed in summer 2010. Following completion of Phase 1 and 2 levee repairs, RD 17 submitted a recertification application to FEMA and received a letter in response (September 2010) declaring that FEMA had accredited the area protected by the RD 17 levee system, including the dryland levee, thereby removing the PAL status.

The Phase 3 Repair Project is the last of the currently planned LSRP phases and the focus of the EIS. Phase 3, as originally defined and evaluated in the September 2011 DEIS/DEIR, involved improvements to all 19 LSRP elements and the dryland levee. Following completion of the September 2011 DEIS/DEIR, the dryland levee was removed from the Phase 3 Repair Project and the preferred seepage remediation methods were identified for each of the 19 elements comprising the LSRP. The "Applicant's Preferred Alternative" evaluated in the FEIR included the preferred repairs for all 19 elements. However, in February 2017, prior to preparation of the FEIS, the RD 17 Board of Trustees issued a Declaration of Emergency in response to a severe flood threat due to a historical snowpack, significant encroachment in upstream reservoir flood reservation space, king tides, ongoing forecasts of atmospheric-river-fed storm systems, and elevated San Joaquin River stages. Under the declaration, RD 17 constructed some components of the preferred repairs, including seepage berms at 11 Phase 3 Repair Project elements (Ia, Ib, Ie, IIIb, IVa, Va–VIa.1, VIcde, and VIIb), parking lot improvements at element VId, and haul road improvements in element VIIb. None of these emergency actions were subject to authorization under Section 408. Then, in 2019, RD 17 obtained Section 408 authorization through USACE's new categorical permissions process for additional components of the preferred repairs, including construction of a seepage berm and chimney drain at element VIIg and installation of chimney drains in the existing seepage berm at element IIIa and in seven of the seepage berms constructed in

2017 (Ia, Ib, Ie, IIIb, IVa, and VIcde). These actions effectively completed the preferred repairs at eight of the 19 Phase 3 Repair Project elements (Ib, Ie, IIIa, IIIb, IVa, VIde, VIIb, and VIIg).

ES.6. Community Outreach, Agency Coordination, and Issues of Known Controversy

Community Outreach

On April 23, 2010, USACE issued a Notice of Intent to prepare a joint EIS/EIR. The Notice of Intent is provided in **Appendix A1** of the FEIS.

A joint public scoping meeting with RD 17 to satisfy both the NEPA and CEQA processes was held on May 11, 2010, from 2 p.m. to 5 p.m. at the City Council Chambers, Lathrop City Hall in Lathrop, California, to brief interested parties on the Phase 3 Repair Project and obtain the views of agency representatives and the public on the scope and content of the DEIS/DEIR. **Appendix A2** of the FEIS contains the public outreach materials for the May 11, 2010, scoping meeting. No oral or written comments were received during the scoping meeting. Two individuals attended the scoping meeting and informally discussed their individual properties with the engineers while there. However, when asked, neither wished to enter comments into the record. Written comments from agencies and individuals were received throughout the scoping period. Chapter 6, "Consultation and Coordination," of the FEIS includes a summary listing of the substantive comments during the scoping period. Copies of the comment letters received are included in **Appendix A3** of the FEIS.

The joint DEIS/DEIR was completed in September 2011, and two public meetings were held from 2 p.m. to 4 p.m. and 5 p.m. to 7 p.m. on Thursday, October 13, 2011, in the Lathrop City Council Chambers. The public comment period for the joint DEIS/DEIR ended on Monday, October 24, 2011. Responses to comments are provided in **Appendix B** of the FEIS.

Agency Consultation and Coordination

Under NEPA, any agency other than the Federal lead agency that has jurisdiction by law or special expertise regarding any environmental effect involved in an action requiring an environmental impact statement is eligible to be a cooperating agency (40 CFR 1501.6). Cooperating agencies are encouraged to actively participate in the NEPA process of the Federal lead agency, review the NEPA documents of the Federal lead agency, and use the documents when making their own decisions on the action. No Federal agencies are acting as NEPA cooperating agencies for the Phase 3 Repair Project.

In Chapter 3 of the FEIS, the regulatory setting for each respective resource describes the Federal, state, regional, and local laws and regulations that apply to the Phase 3 Repair Project. Chapter 5, "Compliance with Federal Environmental Laws and Regulations," describes the project's compliance with the Federal laws and regulations, and Chapter 6, "Consultation and Coordination," summarizes public and agency involvement activities, including agency consultation and coordination, and Native American consultation to date.

Issues of Known or Expected Controversy

NEPA requires that project proponents identify issues of known controversy that have been raised in the scoping process and throughout the development of the project. The following are potentially controversial issues:

- construction-related effects on special-status species and their habitat;
- levee encroachments and vegetation removal;
- cumulative effects on fish, plants, wildlife, and water quality;
- farmland protection;
- effects on current and planned land uses; and
- consideration of setback levees.

ES.7. Alternatives Development

USACE, as the NEPA lead agency, in close coordination with RD 17, the Requester and CEQA lead agency, formulated a reasonable range of alternatives that would achieve the project purpose under NEPA and the project objectives under CEQA through the following steps:

- identification of the deficiencies in the RD 17 levee system that must be addressed to meet state and Federal under seepage and through seepage criteria as quickly as possible,
- identification of feasible remedial measures to address the deficiencies,
- determination of the likely environmental effects of the remedial measures, and
- development of a reasonable range of alternatives for implementing the remedial measures to reduce flood damage risk.

For several levee elements, this screening process resulted in a single remediation approach being identified as best suited to the conditions of the particular element because of issues such as access, proximity to housing or other development, cost, feasibility, environmental constraints, and ability to meet project objectives. For other elements, two or more remediation options remained as approaches warranting further consideration. The Phase 3 Repair Project levee elements where two or more remediation options were identified provided the basis for the alternatives analyzed in the FEIS.

Seepage remediation to be performed by RD 17 is proposed to address under seepage and/or through seepage concerns. The types of seepage remediation considered include the following:

- seepage berm,
- seepage berm with toe drain,
- seepage berm with chimney drain,
- cutoff wall, and
- setback levee with seepage berm or cutoff wall.

ES.8. Alternatives Evaluated in the FEIS

The September 2011 DEIS/DEIR evaluated the No-Action Alternative and two action alternatives: Alternative 1 – Minimum Footprint Alternative and Alternative 2 – Maximum Footprint Alternative. Following completion of the public review process for the September 2011 DEIS/DEIR, the dryland levee was removed from the Phase 3 Repair Project, and a preferred seepage remediation method (preferred repair) was identified for each of the 19 elements of the Phase 3 Repair Project from among the seepage remediation methods evaluated as part of Alternatives 1 and 2. With completion of the 2017 Emergency Flood Response and 2019 CP Construction Projects, eight of the 19 elements of the Phase 3 Repair Project were fully implemented. The remaining 11 elements comprise the Requester’s Preferred

Alternative evaluated in the FEIS. The alternatives evaluated in the FEIS are summarized below and are shown in **Table ES-1**. Detailed descriptions are presented in Chapter 2, "Alternatives," of the FEIS.

No-Action Alternative

The No-Action Alternative serves as the baseline against which the effects and benefits of the action alternatives are evaluated under NEPA. The No-Action Alternative consists of the conditions that would be reasonably expected to occur in the foreseeable future if no additional permissions and permits are granted to RD 17 by USACE or by the state to alter the existing levees or discharge dredged or fill material into waters of the United States.

Under the No-Action Alternative, USACE would not grant permission or permits to undertake the Phase 3 Repair Project under Section 408 or CWA Section 404. Operation and maintenance activities, including all-weather road maintenance, vegetation control and eradication, repair of minor slip-outs and erosion, rodent control, abatement, and hole grouting, and regrading of levee slopes would continue; and levee vegetation management would be undertaken in accordance with RD 17's existing practices (see the "Management of Vegetation Encroachments" section in Section 1.6.2).

Under the No-Action Alternative, key segments of the RD 17 levee system would continue to exhibit undesirable seepage conditions during periods of sustained high river stage. Because of the deficiencies remaining in the RD 17 levee system after implementation of Phases 1 and Phase 2 of the RD 17 LSRP, and the 2017 Emergency Flood Response and 2019 Categorical Permissions Construction Project, the risk of levee failure would remain at current levels for portions of the RD 17 levee system, potentially triggering widespread flooding and extensive damage to existing residential, commercial, agricultural, and industrial structures protected by these levees. Flooding also would be likely to cause extensive damage to utilities, roadways, and other infrastructure. The magnitude of the flood damage and flood-fighting requirements would depend on the location of the levee breach, severity of the storm, and river flows at the time of a potential levee failure.

Action Alternatives

The three action alternatives summarized below address under seepage and through seepage along the RD 17 levee system, including portions of the San Joaquin River east levee and portions of the levee along the north bank of Walthall Slough. Alternatives 1 and 2 propose repairs to all 19 levee elements comprising the Phase 3 Repair Project which encompasses approximately 7 miles of the 19-mile RD 17 levee system. The Requester's Preferred Alternative proposes repairs to 11 of the 19 Phase 3 Repair Project elements affecting approximately 5 miles of the 19-mile RD 17 levee system.

Alternative 1: Minimum Footprint Alternative

Alternative 1, the Minimum Footprint Alternative, would encompass the proposed method(s) for reducing flood risk at each levee element that would result in the least area of disturbance relative to other options being evaluated for the same element (e.g., cutoff wall for any elements where a cutoff wall and either a seepage berm or a setback levee are under consideration, because the disturbance area would be less than that of these other two seepage remediation methods; seepage berm for any elements where the options under consideration are a seepage berm or a setback levee, because a setback levee by itself would not address seepage issues and would also require a seepage berm, and therefore would result in a greater area of disturbance relative to the area that would be disturbed by construction of a seepage berm along an existing levee).

Table ES-1. Phase 3 Repair Project FEIS Action Alternatives

Levee Reach	Levee Element	Minimum Footprint Alternative (Alternative 1)	Maximum Footprint Alternative (Alternative 2)	Requester's Preferred Alternative
I	Ia	Seepage berm	Seepage berm	Seepage berm with chimney drain
	Ib	Seepage berm with chimney drain	Seepage berm with chimney drain	Seepage berm with chimney drain
	Ie	Seepage berm with chimney drain	Seepage berm with chimney drain	Seepage berm with chimney drain
II	IIa	Cutoff wall[1]	Setback levee	Cutoff wall[1]
	IIb	Cutoff wall[2]	Setback levee	Cutoff wall[1]
III	IIIa	Chimney drain in existing seepage berm	Chimney drain in existing seepage berm	Chimney drain in existing seepage berm
	IIIb	Seepage berm with chimney drain	Seepage berm with chimney drain	Seepage berm with chimney drain
IV	IVa	Seepage berm with chimney drain	Seepage berm with chimney drain	Seepage berm with chimney drain
	IVc	Cutoff wall[2]	Seepage berm with chimney drain/toe drain or setback levee with seepage berm	Setback levee with cutoff wall and section of seepage berm
V	Va	Cutoff wall[2]	Seepage berm with toe drain	Cutoff wall[1]
VI	VIa.1	Cutoff wall[2]	Seepage berm with toe drain	Cutoff wall[1]
	VIa.4	Seepage berm with toe drain	Seepage berm with toe drain	Cutoff wall[3]
	VIb	Chimney drain in existing seepage berm	Chimney drain in existing seepage berm	Cutoff wall[3]
	VIc	Seepage berm and fill	Setback levee	Cutoff wall[3]
	VId	Seepage berm and fill	Setback levee	Seepage berm with chimney drain
	VIe	Seepage berm and fill	Setback levee	Seepage berm with chimney drain
VII	VIIb	Seepage berm with chimney drain	Seepage berm with chimney drain	Seepage berm with chimney drain
	VIIe	Slurry cutoff wall[1] or sheet pile cutoff wall[4]	Slurry cutoff wall[1] or sheet pile cutoffwall[4]	Slurry cutoff wall[2]
	VIIg	Seepage berm with toe drain and fill	Seepage berm with toe drain and fill	Seepage berm with chimney drain/toe drain and fill

Notes: Grayed-out text indicates Phase 3 Repair Project preferred repairs implemented during 2017 Emergency Flood Response Construction Project and/or 2019 Categorical Permissions Construction Project.
[1] Slurry cutoff wall to be constructed with open-trench method.
[2] Slurry cutoff wall to be constructed with deep soil mixing method.
[3] Slurry cutoff wall to be constructed with a combination of open-trench and deep soil mixing methods.
[4] Sheet piles to be installed using pile-driving technology.
Source: Data created by AECOM in 2011 and 2014 based on information provided by Kjeldsen, Sinnock & Neudeck

Under Alternative 1, cutoff walls are proposed to address levee seepage in six elements: IIa and IIb (hereafter referred to as IIab), IVc, Va and VIa.1 (hereafter referred to as Va–VIa.1), and VIIe. In the remaining 13 elements, seepage berms with or without chimney drains are proposed for seepage remediation: Ia; Ib; Ie; IIIa; IIIb; IVa; VIa.4; VIb; VIc, VId, and VIe (hereafter referred to as VIcde); VIIb; and VIIg.

As stated in the "Management of Vegetation Encroachments" section in Section 1.6.2, the September 2011 DEIS/DEIR evaluated two vegetation management options: (1) removing all waterside and landside vegetation in compliance with USACE ETL 1110-2-571; and (2) removing vegetation, except perennial grasses, on the landside levee slope and within 15 feet of the landside levee toe, and retaining vegetation on the waterside slope. The FEIS evaluates retaining vegetation on the waterside slope and managing this vegetation in compliance with existing RD 17 vegetation management practices (i.e., trees within the levee prism on the waterside slope, and within 15 feet of the waterside toe are trimmed from the ground up to 5 feet above the ground [or 12 feet above the crown road]); and removal of all landside levee vegetation, except perennial grasses, as previously evaluated in the September 2011 DEIS/DEIR.

Alternative 2: Maximum Footprint Alternative

Alternative 2, the Maximum Footprint Alternative, would encompass the proposed method(s) for reducing flood risk for each levee element that would result in the greatest area of disturbance relative to other options under consideration for the same element. Under this alternative, levee seepage would be addressed by seepage berms with or without chimney drains or toe drains at 12 elements (Ia, Ib, Ie, IIIa, IIIb, IVa, Va–VIa.1, VIa.4, VIb, VIIb, VIIg), by a seepage berm with a chimney drain or toe drain or by a setback levee with a seepage berm at one element (IVc), by setback levees at five elements (IIab and VIcde), and by a cutoff wall at the remaining element (VIIe).

The September 2011 DEIS/DEIR also evaluated the two previously described vegetation management options for Alternative 2. However, as with Alternative 1 above, the FEIS evaluates only retaining vegetation on the waterside slope and managing this vegetation in compliance with the existing RD 17 vegetation management strategy (i.e., trees within the levee prism on the landside slope and waterside slope, and within 15 feet of the landside toe are trimmed from the ground up to 5 feet above the ground [or 12 feet above the crown road]); and removing all landside levee vegetation, except perennial grasses, as previously evaluated in the September 2011 DEIS/DEIR.

Requester's Preferred Alternative

Following receipt of comments on the September 2011 DEIS/DEIR, RD 17 identified the preferred repairs for each of the 19 elements of the Phase 3 Repair Project. However, with completion of the 2017 Emergency Flood Response Construction Project and the 2019 Categorical Permission (CP) Construction Project, construction of the preferred repairs was completed at nine of the 19 Phase 3 Repair Project elements. The Requester's Preferred Alternative would include the preferred repairs at the remaining 10 elements of the Phase 3 Repair Project not previously constructed as part of the 2017 Emergency Flood Response Construction Project and the 2019 CP Construction Project.

Under the Requester's Preferred Alternative, cutoff walls would be installed to address levee seepage in eight of the 10 elements: IIab, Va–VIa.1, VIa.4, VIb, VIc, and VIIe. A drained seepage berm with a chimney drain would be installed to address levee seepage in one element: Ia. The remaining element (IVc) would include a setback levee with a seepage berm and cutoff wall. The Requester's Preferred

Alternative also would include retaining vegetation on the waterside slope, managing this vegetation in compliance with the existing RD 17 vegetation management strategy, and removing landside levee vegetation, except perennial grasses, as previously evaluated in the September 2011 DEIS/DEIR.

ES.9. Phase 3 Repair Project Effects and Mitigation Measures

Table ES-2 summarizes the potential effects of the Phase 3 Repair Project and the identified feasible mitigation measures for each of the alternatives that are evaluated in the FEIS. To avoid and minimize construction-related effects, RD 17 would implement the mitigation measures identified in **Table ES-2** to reduce or offset these effects.

The effects that would remain significant and unavoidable or potentially significant and unavoidable after mitigation under the Requester's Preferred Alternative are as follows:

- Effect 3.2-a: Conversion of Important Farmland to Nonagricultural Uses and Other Changes in the Existing Environment That Could Result in Conversion of Important Farmland to Nonagricultural Uses.
- Effect 3.2-b: Conflict with Land under Williamson Act Contracts.
- Effect 3.6-j: Potential Loss of or Disturbance to Riparian Brush Rabbit and Their Habitats.
- Effect 3.7-b: Potential Damage to or Destruction of Previously Undiscovered Cultural Resources from Ground Disturbance or Other Construction-Related Activities.
- Effect 3.7-c: Effects on Previously Unidentified Human Remains.
- Effect 3.11-a: Generation of Temporary and Short-Term Construction Noise.
- Effect 3.11-b: Temporary and Short-Term Exposure of Sensitive Receptors to, or Temporary and Short-Term Generation of, Excessive Groundborne Vibration.
- Effect 3.13-b: Temporary, Short-Term Degradation of Visual Character during Construction.

Table ES-2. Summary of Effects and Mitigation Measures

Effects	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
3.2 Agricultural Resources			
3.2-a: Conversion of Important Farmland to Nonagricultural Uses and Other Changes in the Existing Environment that Could Result in Conversion of Important Farmland to Nonagricultural Uses.	NPA-PS A1-S A2-S PA-S	3.2-a: Minimize Important Farmland Conversion to the Extent Practicable and Feasible.	NPA-NA A1-SU A2-SU PA-SU
3.2-b: Conflict with Land~~s~~ under Williamson Act Contracts.	NPA-NI A1-S A2-S PA-S	3.2-b: Minimize Impacts on Agricultural Preserve Land and Land under Williamson Act Contracts, Comply with California Government Code Sections 51290–51293, and Coordinate with Landowners and Agricultural Operators.	NPA-NA A1-SU A2-SU PA-SU
3.3 Land Use, Socioeconomics, Population and Housing			
3.3-a: Physically Divide an Established Community.	NPA-PS A1-NI A2-NI PA-NI	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.3-b: Conflict with Any Adopted Applicable Land Use Plan, Policy, or Regulation (e.g., General Plan, Specific Plan, Local Coastal Program, or Zoning Ordinance) of an Agency with Jurisdiction over the Project and Adopted to Avoid or Mitigate an Environmental Effect.	NPA-PS A1-NI A2-NI PA-NI	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.3-c: Conflict with Implementation of the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan.	NPA-LTS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.3-d: Displace Substantial Numbers of Existing Housing, Necessitating the Construction of Replacement Housing Elsewhere; or Displace Substantial Numbers of People, Necessitating the Construction of Replacement Housing Elsewhere.	NPA-S A1-NI A2-LTS PA-NI	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.4 Geology, Soils, Minerals, and Paleontological Resources			
3.4-a: Potential Temporary Localized Soil Erosion during Construction.	NPA-PS A1-PS A2-PS PA-PS	3.4-a: Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions.	NPA-NA A1-LTS A2-LTS PA-LTS

A1 = Alternative 1; A2 = Alternative 2; B = Beneficial; LTS = Less than significant; NA = Not applicable; NDHA = No Disproportionately High and Adverse Effects; NI = No impact; NPA = No-Project Alternative; PA = Preferred Alternative; PS = Potentially significant; PSU = Potentially significant and unavoidable; S = Significant; SU = Significant and unavoidable

Table ES-2. Summary of Effects and Mitigation Measures

Effects	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
3.4-b: Potential Soil Erosion during Project Operations.	NPA-PS A1-B, LTS A2-B, LTS PA-B, LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.4-c: Possible Loss of Access to Aggregate Resources.	NPA-NI A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.4-d: Possible Damage or Destruction of Previously Unknown Unique Paleontological Resources during Construction-Related Activities.	NPA-NI A1-PS A2-PS PA-PS	3.4-d: Conduct Construction Personnel Education, Stop Work if Paleontological Resources are Discovered, Assess the Significance of the Find, and Prepare and Implement a Recovery Plan as Required.	NPA-NA A1-LTS A2-LTS PA-LTS
3.5 Hydrology and Water Quality			
3.5-a: Temporary Impacts on Water Quality from Stormwater Runoff, Erosion, or Spills.	NPA-PS A1-PS A2-PS PA-PS	3.5-a: Implement Mitigation Measure 3.4-a, “Implement Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions.”	NPA-NA A1-LTS A2-LTS PA-LTS
3.5-b: Impacts on San Joaquin River Water Quality from Stormwater Runoff.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.5-c: Place Housing within a 100-Year Flood Hazard Area or Place within a 100-Year Flood Hazard Area Structures that Would Impede or Redirect Flood Flows.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.5-d: Alteration of Local Drainages or Exceedance of the Capacity of Stormwater Drainage Infrastructure.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.5-e: Effects on Groundwater.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA

A1 = Alternative 1; A2 = Alternative 2; B = Beneficial; LTS = Less than significant; NA = Not applicable; NDHA = No Disproportionately High and Adverse Effects; NI = No impact; NPA = No-Project Alternative; PA = Preferred Alternative; PS = Potentially significant; PSU = Potentially significant and unavoidable; S = Significant; SU = Significant and unavoidable

Table ES-2. Summary of Effects and Mitigation Measures

Effects	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
3.6 Biological Resources			
3.6-a: Loss or Degradation of Fish and Other Aquatic Habitats during Construction.	NPA-PS A1-PS A2-PS PA-PS	3.6-a: Implement Mitigation Measure 3.4-a, “Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions.”	NPA-NA A1-LTS A2-LTS PA-LTS
3.6-b: Loss of Woodlands and Shaded Riverine Aquatic Habitats.	NPA-PS A1-S A2-S PA-S	3.6-b: Reduce Loss of Woodlands and Shaded Riverine Aquatic Habitat by Implementing Minimization Measures.	NPA-NA A1-LTS A2-LTS PA-LTS
3.6-c: Impacts on Wetlands and Other Jurisdictional Waters of the United States and Waters of the State.	NPA-PS A1-S A2-S PA-S	3.6-c: Potential Impacts on Wetlands and Other Jurisdictional Waters of the United States and Waters of the State.	NPA-NA A1-LTS A2-LTS PA-LTS
3.6-d: Potential Loss of or Disturbance to Special-Status Plants and Their Habitats.	NPA-PS A1-PS A2-PS PA-PS	3.6-d: Reduce Potential Loss of or Disturbance to Special-Status Plants and Their Habitats by Implementing Avoidance and Minimization Measures.	NPA-NA A1-LTS A2-LTS PA-LTS
3.6-e: Potential Loss of or Disturbance to Valley Elderberry Longhorn Beetle and Their Habitats.	NPA-PS A1-PS A2-S PA-S	3.6-e: Reduce Potential Loss of or Disturbance to Valley Elderberry Longhorn Beetle by Implementing Avoidance and Minimization Measures.	NPA-NA A1-LTS A2-LTS PA-LTS
3.6-f: Potential Loss of or Disturbance to Northwestern Pond Turtle and Their Habitats.	NPA-PS A1-PS A2-PS PA-PS	3.6-f: Reduce Potential Loss of or Disturbance to Northwestern Pond Turtle and Their Habitats and Implement Avoidance and Minimization Measures.	NPA-NA A1-LTS A2-LTS PA-LTS
3.6-g: Potential Loss of or Disturbance to Burrowing Owl and Their Habitats.	NPA-PS A1-PS A2-PS PA-PS	3.6-g: Reduce Loss of or Disturbance to Burrowing Owl and Their Habitats by Implementing Avoidance and Minimization Measures.	NPA-NA A1-LTS A2-LTS PA-LTS
3.6-h: Impacts on Swainson’s Hawk and White-Tailed Kite.	NPA-PS A1-PS A2-PS PA-PS	3.6-h: Reduce Potential Impacts on Swainson’s Hawk and White-Tailed Kite by Implementing Avoidance and Minimization Measures.	NPA-NA A1-LTS A2-LTS PA-LTS

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Table ES-2. Summary of Effects and Mitigation Measures

Effects	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
3.6-i: Impacts on Northern Harrier and Their Habitat.	NPA-PS A1-PS A2-PS PA-PS	3.6-i: Reduce Potential Impacts on Northern Harrier and Their Habitat by Implementing Avoidance and Minimization Measures.	NPA-NA A1-LTS A2-LTS PA-LTS
3.6-j: Potential Loss of or Disturbance to Riparian Brush Rabbit and Their Habitats.	NPA-PS A1-PS A2-PS PA-PS	3.6-j: Reduce Potential Loss of or Disturbance to Riparian Brush Rabbit and Their Habitats by Implementing Avoidance and Minimization Measures.	NPA-NA A1-PSU A2-PSU PA-PSU
3.6-k: Potential Loss of and/or Direct Impacts on Bat Species and Their Habitats.	NPA-PS A1-PS A2-PS PA-PS	3.6-k: Reduce Potential Loss and/or Direct Impact of Bat Species and Their Habitats by Implementing Avoidance and Minimization Measures.	NPA-NA A1-LTS A2-LTS PA-LTS
3.6-l: Disruption to and Loss of Existing Wildlife Corridors or Nursery Sites.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.6-m: Impacts on Local Plans and Policies, Including Successful Implementation of the SJMSCP.	NPA-PS A1-PS A2-PS PA-PS	3.6-m: Reduce Potential Impacts on Local Plans and Policies, Including Successful Implementation of the SJMSCP by Implementing Avoidance and Minimization Measures for Sensitive Biological Resources and Habitats.	NPA-NA A1-LTS A2-LTS PA-LTS
3.7 Cultural Resources			
3.7-a: Potential Damage or Disturbance to Identified Cultural Resources from Ground-Disturbance or Other Construction-Related Activities.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.7-b: Potential Damage to or Destruction of Previously Undiscovered Cultural Resources from Ground-Disturbance or Other Construction-Related Activities.	NPA-PS A1-PS A2-PS PA-PS	3.7-b: Complete Surveys, Train Construction Workers before Construction Begins, Monitor Construction Activities, Stop Potentially Damaging Activities, Evaluate Discovery(ies), and Resolve Adverse Effects on Significant Resources.	NPA-NA A1-PSU A2-PSU PA-PSU
3.7-c: Impacts on Previously Unidentified Human Remains.	NPA-PS A1-PS A2-PS PA-PS	3.7-c: Stop Work in the Event of a Discovery of Human Remains, Notify the Applicable County Coroner and Most Likely Descendant (MLD), and Treat Remains in Accordance with State Law and Measures Developed in Consultation between USACE, the SHPO, RD 17, and the MLD.	NPA-NA A1-PSU A2-PSU PA-PSU

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Table ES-2. Summary of Effects and Mitigation Measures

Effects	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
3.8 Transportation and Circulation			
3.8-a: Potential Conflicts with an Applicable Plan, Ordinance, or Policy Establishing Measures of Effectiveness for the Performance of the Circulation System.	NPA-LTS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.8-b: Potential Conflict with an Applicable Congestion Management Program.	NPA-PS A1-NI A2-NI PA-NE	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.8-c: Potential Change in Air Traffic Patterns, including Either an Increase in Traffic Levels or a Change in Location that Results in Substantial Safety Risks.	NPA-PS A1-NI A2-NI PA-NI	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.8-d: Potential Increase in Hazards Caused by a Design Feature.	NPA-LTS A1-NI A2-NI PA-NI	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.8-e: Potential Reduction in Adequate Emergency Access.	NPA-PS A1-PS A2-PS PA-PS	3.8-e: Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips.	NPA-NA A1-LTS A2-LTS PA-LTS
3.9 Air Quality			
3.9-a: Temporary and Short-Term Emissions of ROG, NO_X, PM_{10} and $PM_{2.5}$ during Construction.	NPA-PS A1-S A2-S PA-S	3.9-a(1): Prepare and Implement a Dust Control Plan in Accordance with SJVAPCD Regulation VIII to Control Fugitive Dust Emissions. 3.9-a(2): Implement Fleetwide Exhaust Emissions Reduction Measures.	NPA-NA A1-LTS A2-LTS PA-LTS
3.9-b: Operational Emissions of ROG, NO_X, PM_{10}, and $PM_{2.5}$ Associated with Project Implementation.	NPA-NI A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.9-c: General Conformity Applicability Analysis.	NPA-PS A1-LTS A2-S PA-LTS	3.9-a(2): Implement Fleetwide Exhaust Emissions Reduction Measures.	NPA-NA A1-NA A2-LTS PA-NA

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Table ES-2. Summary of Effects and Mitigation Measures

Effects	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
3.9-d: Exposure of Sensitive Receptors to Substantial Pollutant or Toxic Concentrations.	NPA-LTS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.10 Climate Change			
3.10-a: Generation of GHG Emissions, Either Directly or Indirectly, That May Have a Significant Effect on the Environment.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.10-b: Conflict with an Applicable Plan, Policy or Regulation Adopted for the Purpose of Reducing GHG Emissions.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.10-c: Contribution to a Lower Carbon Future and Energy Efficiency.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.11 Noise			
3.11-a: Generation of Temporary and Short-Term Construction Noise.	NPA-PS A1-S A2-S PA-S	3.11-a: Implement Noise-Reducing Measures Near Sensitive Receptors during Project Construction.	NPA-NA A1-SU A2-SU PA-SU
3.11-b: Temporary and Short-Term Exposure of Sensitive Receptors to, or Temporary and Short-Term Generation of, Excessive Groundborne Vibration.	NPA-PS A1-S A2-S PA-S	3.11-b: Implement Vibration-Reducing Measures Near Sensitive Receptors during Project Construction.	NPA-NA A1-SU A2-SU PA-SU
3.11-c: Long-Term Increases in Project-Generated Noise.	NPA-LTS A1-NI A2-NI PA-NI	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA

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Table ES-2. Summary of Effects and Mitigation Measures

Effects	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
3.12 Recreation			
3.12-a: Temporary Disruption of Recreational Activities and Facilities.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.13 Visual Resources			
3.13-a: Substantial Degradation of the Existing Visual Character or Quality of the Phase 3 Repair Project Area and Its Surroundings.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.13-b: Temporary, Short-Term Degradation of Visual Character during Construction.	NPA-PS A1-S A2-S PA-S	No feasible mitigation is available.	NPA-NA A1-SU A2-SU PA-SU
3.14 Utilities and Service Systems			
3.14-a: Potential Temporary Disruption of Irrigation Water Supply.	NPA-PS A1-PS A2-PS PA-PS	3.14-a: Coordinate with Irrigation Water Supply Users before and during All Irrigation Infrastructure Modifications and Minimize Interruptions of Supply.	NPA-NA A1-LTS A2-LTS PA-LTS
3.14-b: Potential Disruption of Utility Service.	NPA-PS A1-PS A2-PS PA-PS	3.14-b: Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training with Respect to Accidental Utility Damage.	NPA-NA A1-LTS A2-LTS PA-LTS
3.15 Hazards and Hazardous Materials			
3.15-a: Accidental Spills of Hazardous Materials in the Phase 3 Repair Project Area.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.15-b: Potential Exposure of Construction Workers and the General Public to Unknown Hazardous Materials Encountered in the Phase 3 Repair Project Area.	NPA-PS A1-PS A2-PS PA-PS	3.15-b: Conduct Phase I and II Environmental Site Assessments and Implement Required Measures.	NPA-NA A1-LTS A2-LTS PA-LTS

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Table ES-2. Summary of Effects and Mitigation Measures

Effects	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
3.15-c: Hazardous Emissions or Handling of Hazardous or Acutely Hazardous Materials, Substances, or Waste within One-Quarter Mile of an Existing or Proposed School.	NPA-PS A1-LTS A2-LTS PA-LTS	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA
3.16 Environmental Justice			
Effect 3.16-a: Potential to Result in a Disproportionately High and Adverse Environmental Effect on Minority or Low-Income Populations.	NPA-NDHA A1-NDHA A2-NDHA PA-NDHA	No mitigation is required.	NPA-NA A1-NA A2-NA PA-NA

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Chapter 1. Introduction and Project Purpose, Need, and Objectives

1.1 Introduction

To implement the Phase 3–Reclamation District (RD) 17 Levee Seepage Repair Project (LSRP), hereinafter referred to as the Phase 3 Repair Project, permission from the U.S. Army Corps of Engineers (USACE) pursuant to Section 14 of the Rivers and Harbors Act of 1899 (RHA) (33 U.S. Code [USC] 408, hereinafter referred to as "Section 408") for alteration of Federal project levees[1] and pursuant to Section 404 of the Clean Water Act (CWA) (33 USC 1344, hereinafter referred to as Section 404) for the placement of fill in jurisdictional waters of the United States is required.

This document is the final environmental impact statement (FEIS) prepared for the Phase 3 Repair Project. The draft environmental impact statement/environmental impact report (DEIS/DEIR), circulated to the public in September 2011, was prepared jointly by USACE, the National Environmental Policy Act (NEPA) lead agency, and RD 17, the project applicant and lead agency under the California Environmental Quality Act (CEQA) in compliance with both NEPA and CEQA (USACE and RD 17 2011). The DEIS/DEIR was written with joint NEPA and CEQA language to improve efficiency and assure consistency in compliance with the two statutes, where appropriate. Since the release of the DEIS/DEIR in September 2011, the NEPA and CEQA processes have been separated and are now represented by a stand-alone FEIS and a stand-alone final environmental impact report (FEIR), respectively.

Following public and agency review of the DEIS/DEIR, RD 17 (Requester) selected its preferred alternative, a combination of the two alternatives evaluated in the DEIS/DEIR as summarized in Section 1.4.3, "Phase 3 Repair Project," of this FEIS and described in detail in Chapter 2.4, "Alternatives Evaluated in this FEIS." The Council on Environmental Quality (CEQ) regulations (40 CFR Part 1508.9(c)(1 and 2)) specify the circumstances which would require that a NEPA document be supplemented. "Agencies [s]hall prepare supplements to either draft or final environmental impact statements if: (i) [t]he agency makes substantial changes in the proposed action that are relevant to environmental concerns; or (ii) [t]here are significant new circumstances or information relevant to [the] environmental concerns and bearing on the proposed actions or its impacts. [Agencies m]ay also prepare supplements when the agency determines that the purposes of [NEPA] will be furthered by doing so." USACE has determined while the Requester's Preferred Alternative is not the same as either of the action alternatives disclosed in the DEIS/DEIR, the Requester's Preferred Alternative is within the footprint/limits and features of the alternatives disclosed in the DEIS/DEIR, and because the environmental effects for the preferred alternative remain the same in type and the magnitude of the impacts are either the same or reduced, a Supplemental DEIS is not required, and this FEIS has been prepared to complete compliance with NEPA.

[1] A "Federal project levee," also referred to as a "Federal levee" or a "project levee," is a levee built by a Federal agency and/or authorized by Congress. All other levees are referred to as "non-Federal" or "non-project levees."

It should be noted that this FEIS uses only NEPA language, where reasonable to do so. Because of its initial preparation and public circulation as a joint document, this FEIS responds to all public comments submitted in response to the DEIS/DEIR. However, this FEIS reflects compliance with NEPA only; the FEIR has been completed, and was certified by RD 17 on July 12, 2016, which concluded the CEQA review process.

1.2 Document Content

This FEIS has been prepared by RD 17 and its environmental consultants, GEI Consultants in cooperation with Ascent Environmental, in close coordination with USACE Sacramento District staff, and has been reviewed by the USACE Sacramento District, as Federal lead agency under NEPA (see 42 U.S. Code [USC] 4321 et seq.), the Council on Environmental Quality's Implementing Regulations for NEPA (see 40 CFR Parts 1500–1508), and USACE NEPA regulations (see 33 Code of Federal Regulations [CFR] Part 230, Engineer Regulations 200-2-2 ["Procedures for Implementing NEPA for the Civil Works Program", and 33 CFR Part 325, Appendix B ["NEPA Implementation Procedures for the Regulatory Program"]). It evaluates a reasonable range of alternatives. In addition, this FEIS identifies mitigation to avoid, minimize, reduce, or compensate for any significant adverse effects. Although its contents are consistent with the data and analysis presented in the DEIS/DEIR, which was circulated for public comment and review in September 2011, updates have been made to reflect new or changed information since publication of the DEIS/DEIR. Changes have also been made to respond to public comment on the DEIS/DEIR.

This FEIS reflects minor modifications to the Phase 3 Repair Project as a result of engineering and design refinements; identifies RD 17's preferred seepage remediation methods for each of the 19 elements of the Phase 3 Repair Project, which were selected after public review of the DEIS/DEIR; describes repairs that were completed as part of the emergency flood response in 2017 and under USACE's new categorical permissions process in 2019; and evaluates the Minimum and Maximum Footprint alternatives and the Requester's Preferred Alternative, which comprises the identified preferred repairs that remain to be completed.

A variety of levee repairs have been considered for the Phase 3 Repair Project, including modifying the levee slope and crown width modifications to meet levee geometry requirements, construction of seepage berms and setback levees with seepage berms, and installation of slurry cutoff walls and chimney drains to reduce the potential impacts of under and through seepage. Proposed levee repairs would occur along various sections of the RD 17 levee system along the right bank of the San Joaquin River between Stockton and Manteca. RD 17 is conducting this effort in cooperation with the California Department of Water Resources (DWR), the Central Valley Flood Protection Board (CVFPB), and USACE with the aim of reducing the risk of flooding during a 100-year flood event (flood with a 1-percent chance of occurring in any given year, or 0.01 annual exceedance probability [AEP]).

NEPA evaluation is required when a major Federal action, including a permit or approval, is under consideration and may have significant effects on the quality of the human environment. The Phase 3 Repair Project has the potential to significantly affect the human environment; therefore, an environmental impact statement (EIS) has been prepared. USACE will rely on this FEIS, which evaluates the potential environmental effects of implementing the Phase 3 Repair Project, to assist the agency in deciding whether to grant permission for the remaining elements actions under the Phase 3 Repair Project pursuant to Section 408 and CWA Section 404.

Because the Phase 3 Repair Project would also require several approvals or permits from state or regional agencies, it was also subject to compliance with CEQA. In some cases in this document, both

NEPA and CEQA terminology are used, as in this chapter, where the project purpose and need and project objectives are discussed. The terms “environmental consequences,” “environmental impacts,” and “environmental effects” are considered synonymous in this analysis. Technical terms used in this FEIS generally are defined in their first instance of use in the text. A list of acronyms and other abbreviations is included at the end of the table of contents. A glossary is provided in Chapter 11.

1.3 Project Location and Existing System to Reduce Flood Damage

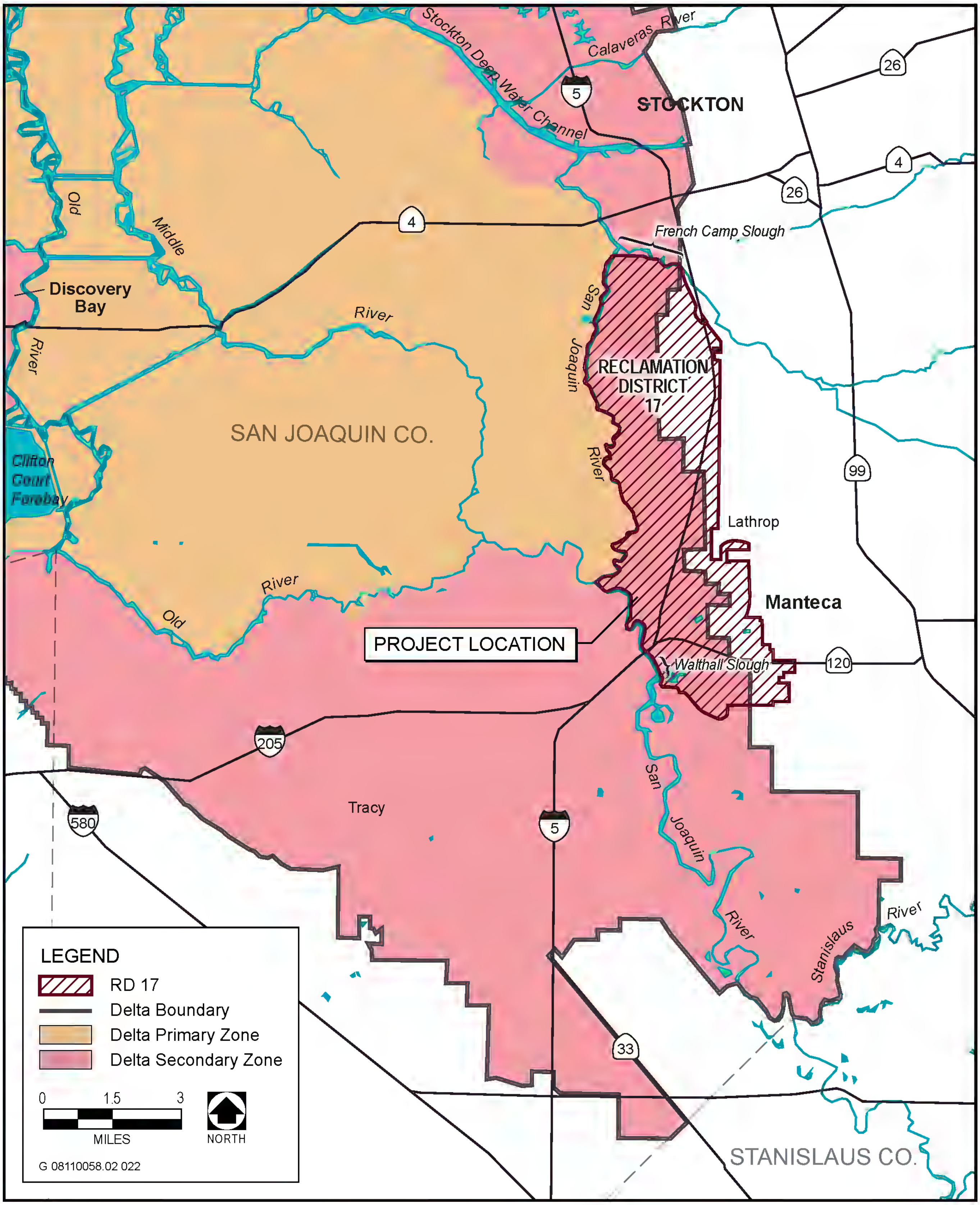
RD 17 is located in south-central San Joaquin County, California, in the center of the California Central Valley, at the north end of the San Joaquin River Basin, and within the far southeast limit of the Sacramento–San Joaquin Delta (Delta) (**Figure 1-1**). In general, the boundaries of RD 17 are marked by French Camp Slough on the north, approximately 3 miles southwest of the central business district of the city of Stockton; the San Joaquin River on the west; Walthall Slough on the south (just below State Route 120); and Airport Way/McKinley Avenue on the east, just outside the city of Manteca. RD 17 is responsible for maintaining the levees along Walthall Slough, the San Joaquin River, and French Camp Slough, as well as a dryland levee along the southern boundary of Manteca (**Figure 1-2**). The dryland levee is an overland earthen berm north and east of the San Joaquin River. Under almost all conditions, water does not come in contact with the dryland levee. It functions as a flood control feature only if water from the San Joaquin River or Walthall Slough leaves the banks of these waterways and inundates lands to the north and east toward Manteca. The dryland levee then acts as an elevated earthen feature that prevents floodwaters from moving farther north.

1.4 Project History and Planning Context

The RD 17 levee system, like other flood risk reduction systems in the San Joaquin Valley, was initially designed to reduce the risk of flooding for the purposes of facilitating agricultural development of the extensive floodplains encompassed by the San Joaquin Valley and supporting river navigation. The RD 17 area, like much of the Delta, originally was designated swamp and overflowed lands because during times of high flows, water overflowed the riverbanks, inundating adjacent lands. In 1850, Congress adopted the Arkansas Act of 1850, occasionally referred to as the Swamp Land Act of 1850, to aid states in reclaiming swamp and overflowed lands. By this act, such lands were conveyed to the State of California in consideration of its duty to make and maintain the necessary improvements for such reclamation. The object of the Federal government in making this munificent donation to several states was to promote the speedy reclamation of the lands, and thus to invite population and settlement to them, thereby opening new fields for industry and increasing the general prosperity. The banks of the channels were the natural high ground resulting from sedimentation of the materials carried by the high flows. Settlers, using the high ground of the riverbanks as a foundation, constructed levees using horses, hand labor, and material adjacent to the riverbank. After the levees were in place, the protected lands were drained and were used for agriculture, residential, commercial, and industrial purposes. From about 1863, RD 17 undertook maintenance and reconstruction of the levee system.

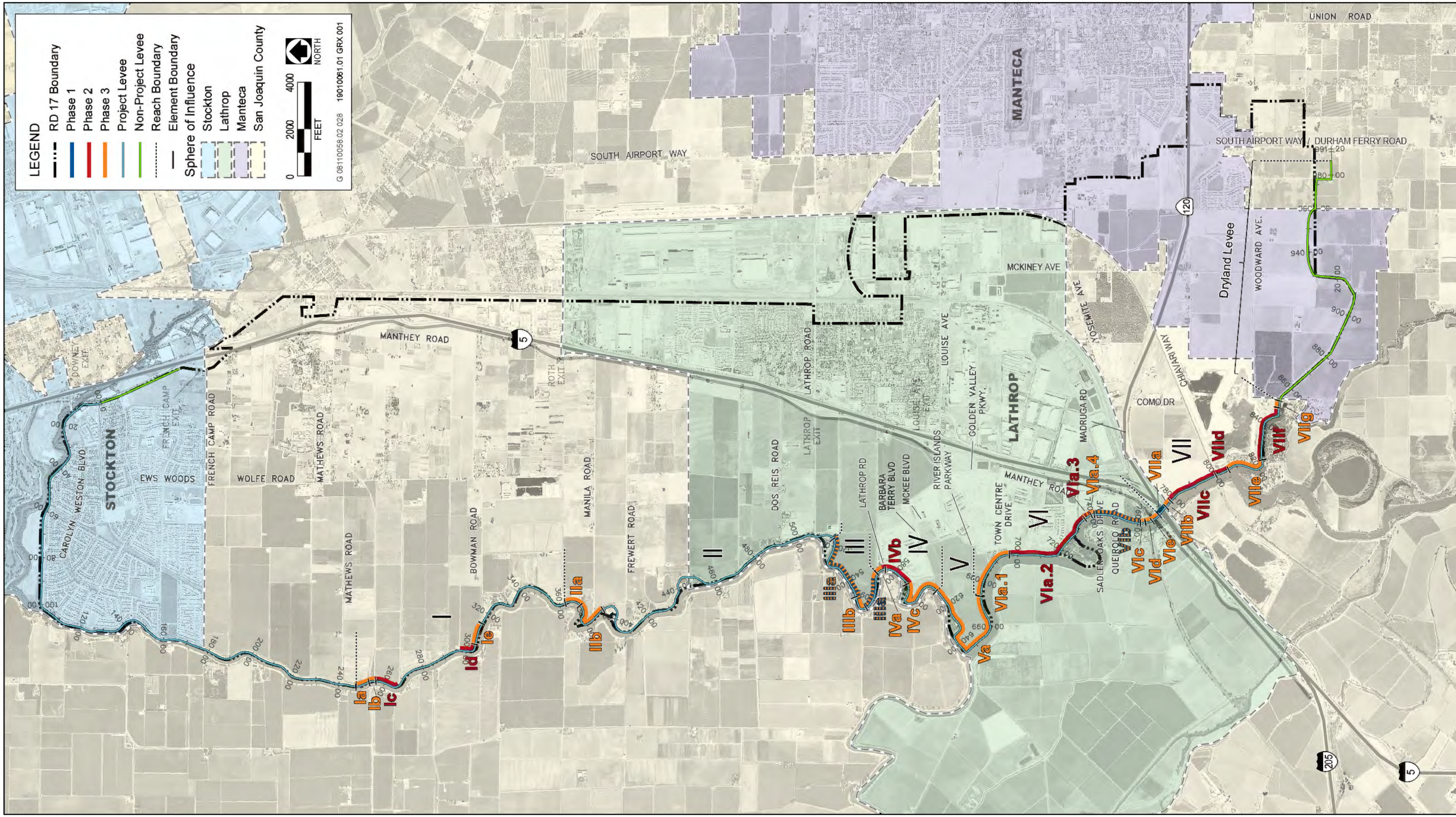
Several decades later, Congress authorized the Lower San Joaquin River and Tributaries Project (LSRTP) in the Flood Control Act of 1944, and USACE subsequently began this work. Included in the LSRTP were the RD 17 levees along the left bank of French Camp Slough, those along the right bank of the San Joaquin River, and those along the right bank of Walthall Slough. In 1950, the levee along the San Joaquin River failed and RD 17 was flooded. The levee was repaired, and in May 1963, the LSRTP was completed.

Figure 1-1. Location of Reclamation District 17



Source: DWR 1995:68; adapted by AECOM in 2010

Figure 1-2. RD 17 Levee System and Levee Seepage Repair Project



Sources: Data provided by Kjelson, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010; adapted by AECOM in 2014

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In 1988 and 1989, the RD 17 levees, including those authorized as part of the LSRTP, were substantially improved as a part of the development of Weston Ranch in the city of Stockton. The purpose of the improvement project was to meet Federal Emergency Management Agency (FEMA) 100-year flood event requirements to allow urban development. In February 1990, FEMA accredited the levee as meeting the requirements for flood protection for urban development during a 100-year flood event.

During a high-water event on the San Joaquin River in January 1997, seepage and boils occurred at a number of locations along the RD 17 levees. USACE, DWR, CVFPB, and RD 17 actively and successfully contained the seepage and boils, and the levees did not breach. After the 1997 event, USACE, CVFPB, and RD 17 funded a project to repair the seepage and boil areas under the Public Law (PL) 84-99 (Rehabilitation Assistance Program). The project, referred to as “Reconstruction of the California Central Valley Levees San Joaquin Basin #4, Reclamation District #17,” consisted of the installation of landside drainage stability berms. Design and construction was conducted by USACE. In October 2004, USACE provided an addendum to the Standard Operation and Maintenance Manual for work completed as of October 2001.

In 2006, FEMA began a comprehensive update to the Flood Insurance Rate Map. The update is referred to as the Map Modernization Program. FEMA described the Map Modernization Program as a digitizing effort, rather than a reevaluation process, with simple recognition of “fatal flaws.” After review of the data supporting the 1990 accreditation and subsequent information, FEMA stated its intention to RD 17 to confirm full accreditation of the RD 17 levees as meeting the 100-year flood event requirements. On June 19, 2007, DWR wrote a letter to the City of Lathrop with a copy to FEMA, stating that it could not support recertification of the RD 17 levees or the granting of provisional accreditation because of concerns regarding seepage exit gradients. “Seepage exit gradient” is an expression in numeric form of the potential for under seepage to exit on the landside of a levee as seepage or a boil. The lower the number used to express the seepage exit gradient, the more resistant the system is to seepage or boils; the higher the number, the more likely seepage or boils may occur during a high-water event. In fall 2007, in response to the DWR concerns, RD 17 initiated the LSRP and requested state funding through DWR’s Proposition 1E Early Implementation Program (EIP). Because of DWR’s concern, FEMA then denied full accreditation and instead granted provisional accredited levee (PAL) status. A PAL is a levee that FEMA has previously credited with providing a 100-year flood event level of flood risk reduction (0.01 AEP).

Since 2008, RD 17 has been undertaking the LSRP at various locations along the landside of the levees to increase the levee system’s resistance to under seepage and through seepage and bring RD 17’s approximately 19-mile levee system into compliance with USACE seepage criteria. To facilitate design and implementation of the LSRP, the RD 17 levees along the east bank of the San Joaquin River from just south of Mathews Road to Walthall Slough and the levees along the north bank of Walthall Slough have been divided into seven distinct “reaches” identified by Roman numerals (i.e., I, II, III,…, VII), and have been subdivided further into a total of 24 “elements,” identified by the reach number followed by a lowercase letter and, where needed to further distinguish elements, an Arabic numeral (e.g., Ia, IIa, IIb,…, Va, VIa.1, VIa.4,…, VIe, VIIa, VIIb,…, VIIg) (**Figure 1-2**).

Implementation of the LSRP was divided into three phases (**Figure 1-2**). The Phase 1 Project was completed in 2009. The Phase 2 Project, analyzed in previous environmental documents (see Section 1.4.2), was completed in summer 2010. Following completion of Phase 1 and 2 levee improvements, RD 17 submitted a recertification application to FEMA and received a letter in response (September 2010) declaring that FEMA had accredited the area protected by the RD 17 levee system, including the dryland levee, thereby removing the PAL status.

1.4.1 Phase 1 Project

The Phase 1 Project included construction of seepage berms in two project elements, located in Reaches III and VI of the LSRP (**Figure 1-2**). The project consisted of reconstruction and extension of the drained landside levee toe berms with earthen and gravel fill both landward and along the levee toe, to reduce seepage exit gradients. Work areas were designed to avoid any environmental resources of possible significance. The project was determined to be exempt from CEQA because it was:

- considered to be an ongoing project (California Code of Regulations [CCR] 15261[a]);
- intended to repair, restore, or replace facilities damaged as a result of the 1997 flood, which was the subject of a state of emergency declaration by the governor (CCR 15269[a]);
- considered to constitute emergency repairs to publicly owned facilities necessary to maintain service essential to public health, safety, and welfare (CCR 15269[b]);
- necessary to prevent or mitigate a flood emergency (CCR 15269[c]);
- intended to repair existing public facilities with no expansion of use; and
- intended to reconstruct existing facilities located on the same site, with new facilities having the same purposes and capacity (CCR 15302).

No Federal authorizations or funding was required for the Phase 1 work; therefore, no NEPA analysis was needed. The Phase 1 Project work was completed in January 2009.

1.4.2 Phase 2 Project

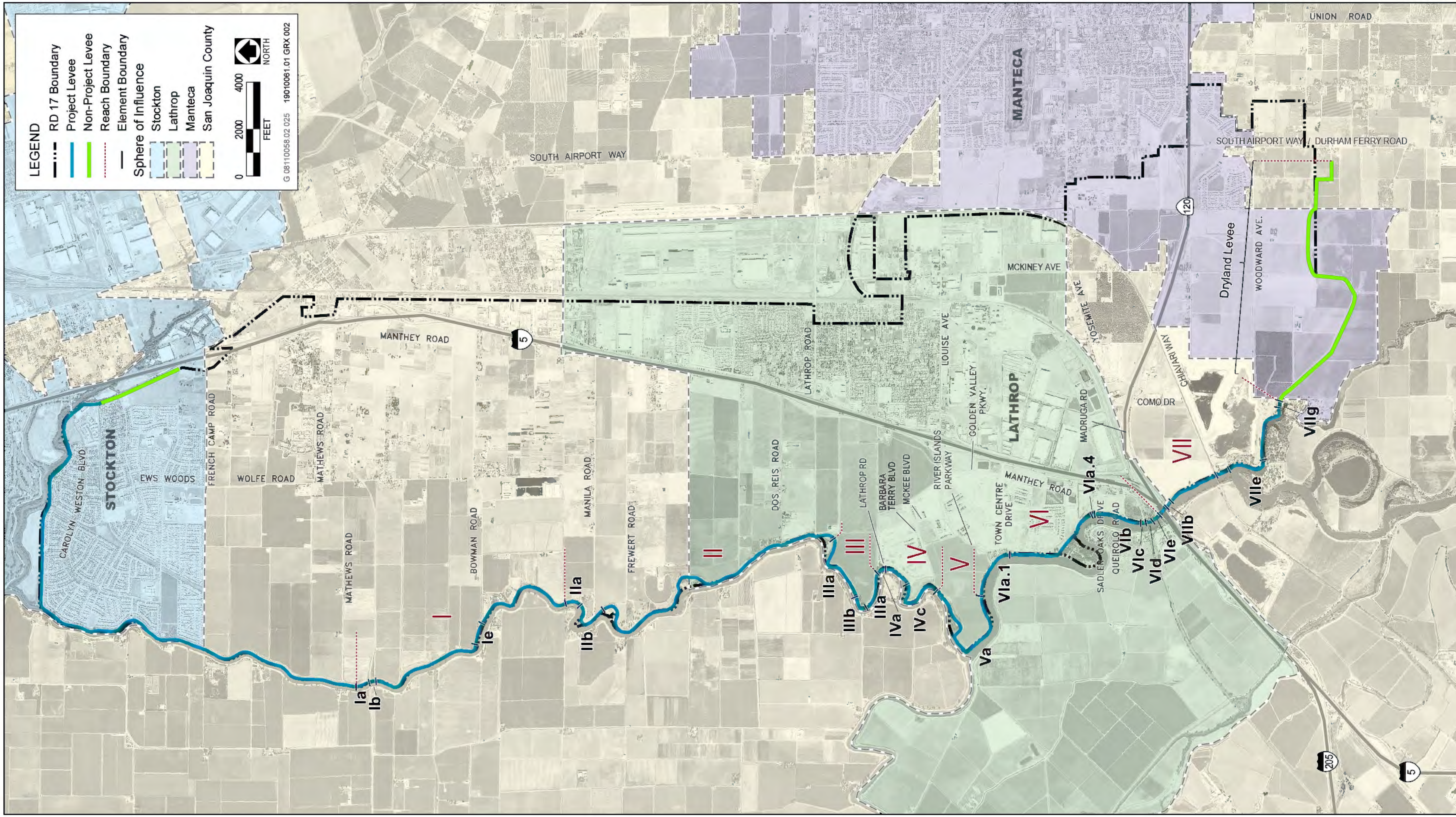
The Phase 2 Project affected nine elements in the LSRP area (**Figure 1-2**). For eight of the nine elements, project activities consisted of construction of drained seepage berms along the landside levee toe. At the site without seepage berm construction, RD 17 acquired an easement on land along the levee toe and performed various maintenance and site cleanup activities. Environmental considerations of the Phase 2 Project were disclosed in an initial study/mitigated negative declaration under CEQA (RD 17 2009a). The initial study/mitigated negative declaration concluded that no significant effects on the physical environment would occur after mitigation measures were implemented. No Federal authorizations or funding were required for the Phase 2 work; therefore, no NEPA analysis was warranted. All Phase 2 work was completed in summer 2010.

1.4.3 Phase 3 Repair Project

The Phase 3 Repair Project is the last of the currently planned LSRP phases. Phase 3, as originally defined and evaluated in the September 2011 DEIS/DEIR, involved improvements at the 19 LSRP elements listed below and the dryland levee (**Figure 1-3**). Following completion of the September 2011 DEIS/DEIR, the dryland levee was removed from the Phase 3 Repair Project and the preferred seepage remediation methods were identified by RD 17 for each of the 19 elements comprising the LSRP:

1. **Ia**
2. **Ib**
3. **Ie**
4. **IIa**
5. **IIb**
6. **IIIa**
7. **IIIb**
8. **IVa**
9. **IVc**
10. **Va**
11. **VIa.1**
12. **VIa.4**
13. **VIb**
14. **VIc**
15. **VId**
16. **VIe**
17. **VIIb**
18. **VIIe**
19. **VIIg**

Figure 1-3. RD 17 Seepage Repair Project: Phase 3 Levee Elements



Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010; adapted by AECOM in 2014

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Preferred Seepage Remediation Methods

The preferred repairs for the 19 elements of the Phase 3 Repair Project consisted of drained seepage berms with chimney drains and toe drains at seven elements (Ia, Ib, Ie, IIIb, IVa, VIIb, and VIIg), a chimney drain in an existing seepage berm at one element (IIIa), a setback levee with a seepage berm and cutoff walls at one element (IVc), and cutoff walls at the remaining 10 elements (IIab, Va–VIa.1, VIa.4, VIb, VIcde, and VIIe). The preferred repairs also would include retaining vegetation on the waterside slope, managing this vegetation in compliance with the existing RD 17 vegetation management strategy, and removing landside levee vegetation, except perennial grasses, as previously evaluated in the September 2011 DEIS/DEIR.

Emergency Flood Response Construction Project

In February 2017, subsequent to identification of the preferred repair for each of the 19 Phase 3 Repair Project elements but prior to preparation of this FEIS, the RD 17 Board of Trustees issued a Declaration of Emergency in response to a severe flood threat due to a historical snowpack, significant encroachment in upstream reservoir flood reservation space, king tides, ongoing forecasts of atmospheric-river-fed storm systems, and elevated San Joaquin River stages. Under the declaration, RD 17 constructed seepage berms at 10 Phase 3 Repair Project elements (Ia, Ib, Ie, IIIb, Va–VIa.1, VIcde, and VIIb), parking lot improvements at element VId, and haul road improvements in element VIIb. None of these emergency actions were subject to authorization under Section 408. However, emergency work at elements Ib and Ie involved impacts on waters of the United States requiring authorization under Section 404 of the CWA. Authorization was provided under Regional General Permit No. 8 (Permit File No. SPK-2009-01466) for the discharge of dredged or fill material into waters of the United States, including wetlands, necessary for repair or protection measures associated with an emergency situation. The 2017 Emergency Flood Response Construction Project was completed in October 2017.

Categorical Permissions Construction Project

In early 2019, USACE established a Categorical Permission (CP) for projects requiring Section 408 authorization to streamline the review and decision process for USACE Section 408 requests for a preapproved list of levee alterations. In May 2019, prior to preparation of this FEIS, RD 17 requested Section 408 permission under Category 19, "Seepage and Stability Berms," of the CP for construction of a seepage berm and chimney drain at element VIIg and installation of chimney drains in the existing seepage berm at element IIIa and in seven of the seepage berms constructed under the 2017 Emergency Project (Ia, Ib, Ie, IIIb, and VIcde). Construction of this work was initiated in October 2019 and is anticipated to be completed in spring 2020..

1.5 Project Purpose and Objectives

NEPA requires the lead agency to explain the purpose to which it is responding, while CEQA requires the lead agency to specify project objectives.

1.5.1 Overall Project Purpose

The overall purpose of the Phase 3 Repair Project is to implement landside and isolated waterside levee improvements along portions of the approximately 19-mile RD 17 levee system to reduce the risk of flooding in the RD 17 service area during a 100-year flood event.

1.5.2 Reclamation District 17 Objectives

RD 17's objectives for the Phase 3 Repair Project improvements are to repair seepage deficiencies where needed to meet USACE seepage criteria, thereby increasing the levee's resistance to under seepage and/or through seepage by providing under seepage exit gradients equal to or less than 0.5 at the landside levee toe and equal to or less than 0.8 at the landside drained seepage berm toe at the water surface elevation associated with the design water surface, and to meet geometry requirements of the permitting agencies in the specific areas of repair work. Levee improvements under consideration include construction of drained seepage berms designed to address under seepage, installation of chimney drains in existing and new seepage berms designed to address through seepage, installation of deep cutoff walls designed to address both under and through seepage, and modification of levee slopes and crown widths where needed to achieve levee geometry requirements. RD 17 also is considering construction of setback levees to meet funding requirements for the project from DWR's Proposition 1E EIP. Proposition 1E—the Disaster Preparedness and Flood Protection Bond Act of 2006—authorized $4.09 billion in general obligation bonds to rebuild and repair California's most vulnerable structures for reducing flood damage. The EIP prioritizes projects to more rapidly receive funding from the overall Proposition 1E funding pool. EIP funding requires that project proponents at least consider setback levees as an option for repairing/enhancing flood control systems where setback levees can serve the combined purposes of improving flood risk reduction infrastructure, reducing water surface elevations through expansion of the floodway, and providing habitat restoration/enhancement opportunities without causing adverse hydraulic impacts.

1.6 Need for Action

1.6.1 Overview

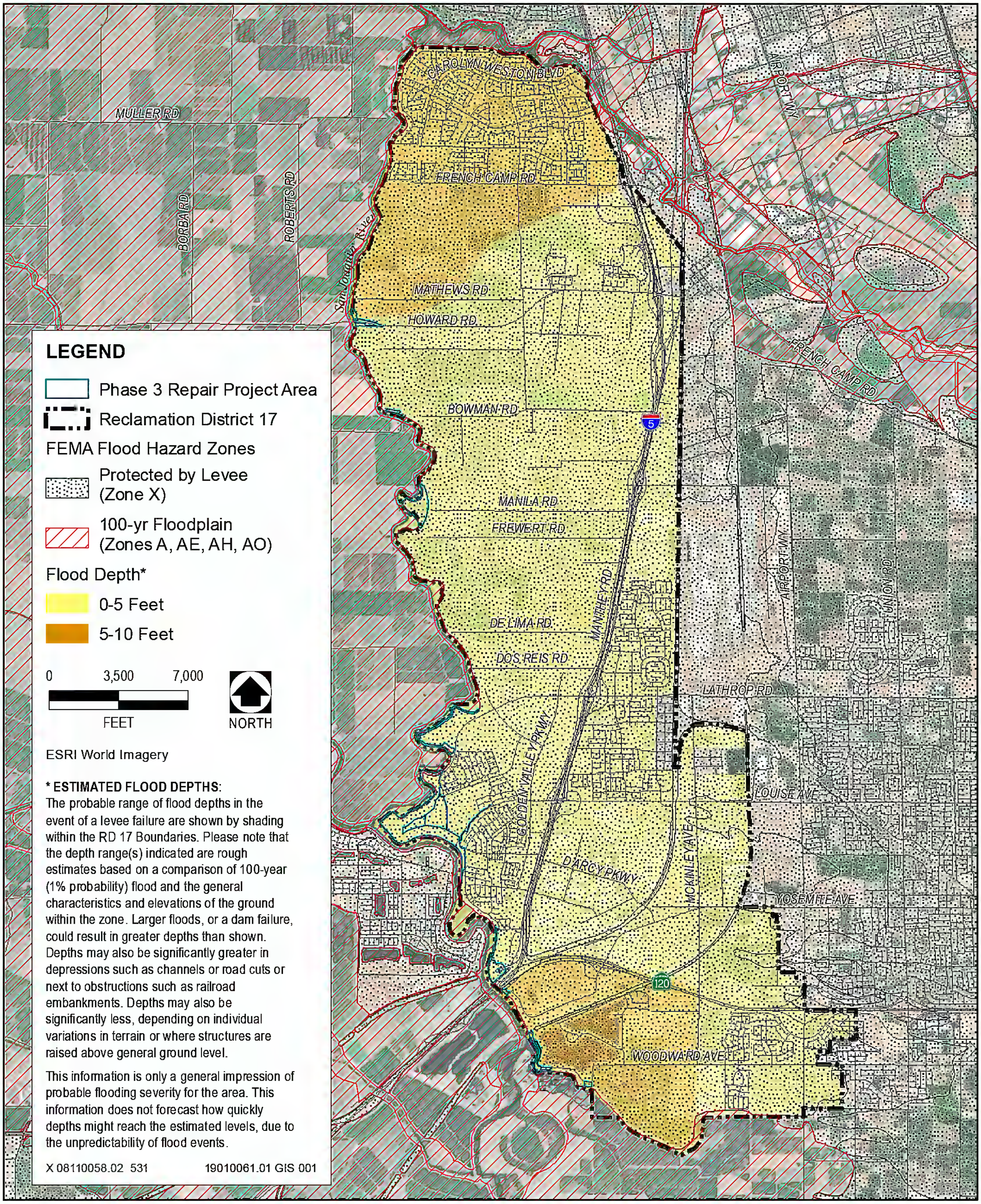
Figure 1-4 shows estimated flood depths within the boundaries of RD 17 in the event of a catastrophic levee failure. The flood risk to areas protected by the RD 17 levee system needs to be reduced because failure of this levee system and subsequent flooding would pose a significant threat to public health and safety and would cause substantial economic losses. The RD 17 levee system protects approximately 19,600 acres of mixed-use lands with a population estimated at approximately 43,000 people and an estimated $5 billion in damageable property. Examples of some large commercial facilities within RD 17 include Del Monte Foods Distribution Center, In-N-Out Burger Distribution Center, Ghirardelli Chocolate manufacturing facility, and Daimler Chrysler parts center. Main transportation arteries within RD 17 include Interstate 5, State Route 120, and two Union Pacific Railroad lines. Other critical infrastructure protected by RD 17 levees includes 18 schools, 33 long-term care facilities, a minimum-security facility, a juvenile detention center, a children's shelter, fire and police stations, the county jail, Sharpe Army Depot, and a hospital. Approximately 13,000 acres in RD 17 are used for agricultural purposes. Crops produced on this land include tomatoes, alfalfa, and corn (RD 17 2009b:12–15).

1.6.2 Flood Problems and Needs

Seepage

Seepage remediation to be performed by RD 17 is intended to provide seepage exit gradients equal to or less than 0.5 at the landside levee toe and equal to or less than 0.8 at the landside seepage berm toe at the water surface elevation associated with the design water surface.

Figure 1-4. RD 17 Inundation Areas

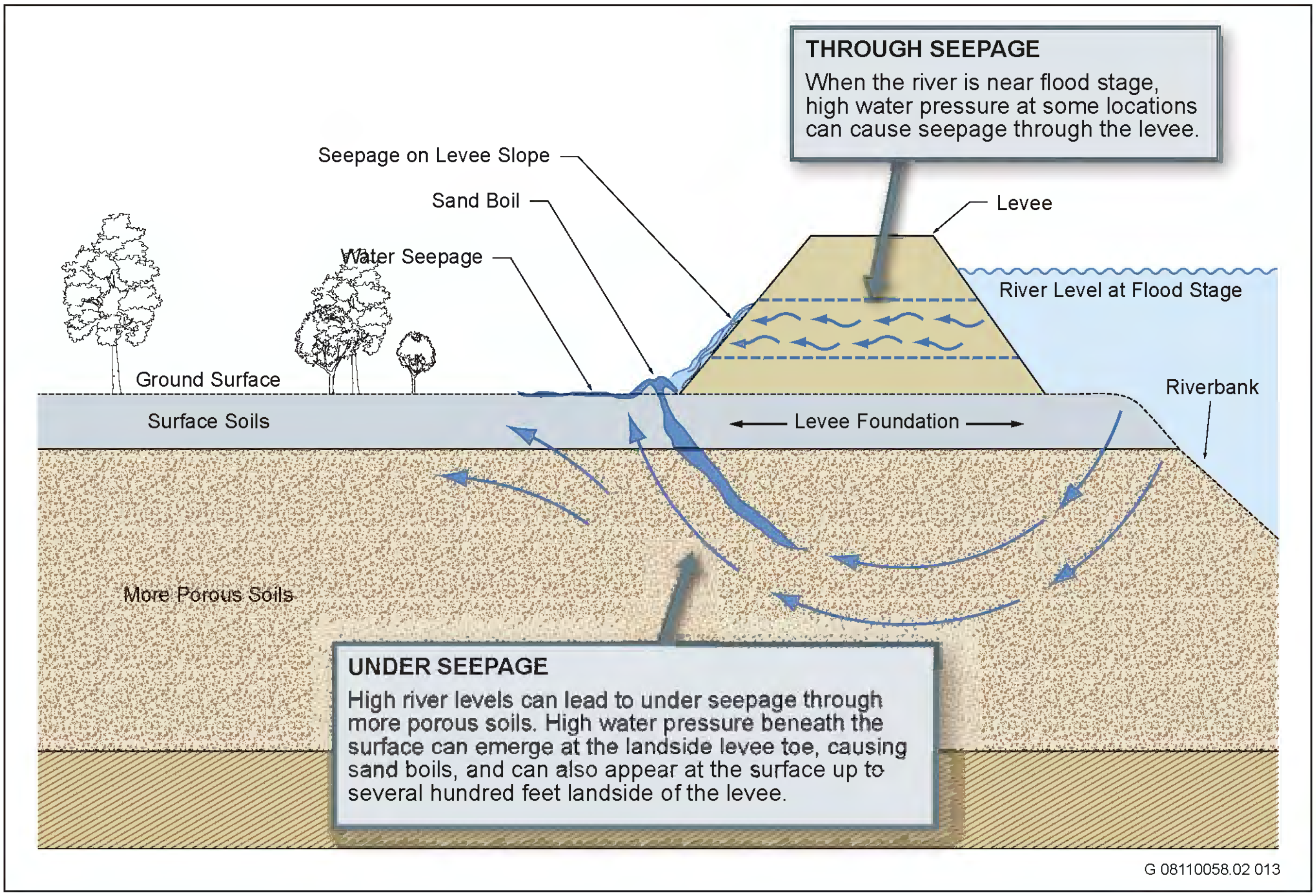


Source: San Joaquin County Office of Emergency Services 2008; adapted by AECOM in 2016

Under seepage occurs below the aboveground levee prism and is caused by the buildup of water pressure in the subsurface foundation soils when high river stages are present on the waterside of the levees. This pressure head causes water to flow through the earthen foundation layers under the levee and exit onto the ground surface on the landside of the levee prism. Such seepage is not uncommon and does not inherently imply the levee is failing; however, excessive and uncontrolled under seepage can carry fine-grained material with the water flow that can undermine the levee and can lead to levee failure.

In addition to addressing under seepage issues, the Phase 3 Repair Project would address through seepage at the Phase 3 Repair Project levee elements. Through seepage is the movement of water through the levee prism when high river stage conditions exist on the waterside of the levee. Depending on the duration of high water and the permeability of the levee embankment soil, seepage may exit onto the landside slope of the levee, thereby adversely affecting the stability of the landside levee slope. **Figure 1-5** shows a schematic of these two failure mechanisms.

Figure 1-5. Levee Seepage



Source: SAFCA 2007; adapted by AECOM in 2010

Management of Vegetation Encroachments

With issuance of Engineering Technical Letter (ETL) 1110-2-571 in 2009,[2] USACE updated its vegetation management standards for levees requiring the removal of all vegetation, with the exception of perennial grasses, on levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2009). In September 2011, USACE issued a DEIS/DEIR for the Phase 3 Repair Project. The September 2011 DEIS/DEIR considered two options for complying with ETL 1110-2-571, as follows:

- Full Implementation of USACE ETL 1110-2-571: All vegetation, other than perennial grasses, would be removed from the levee slopes and out 15 feet from the waterside and landside levee toes; or

- Acquisition of a Variance from Full Compliance with USACE ETL 1110-2-571: Permission would be obtained from USACE to retain all vegetation on the lower two-thirds of the waterside levee slope and out 15 feet from the waterside levee toe; all other levee vegetation still would be removed, in accordance with USACE policy.

These two options were designed to meet PL 84-99, which authorizes USACE to provide rehabilitation assistance for levees as long as the system is operated and maintained to acceptable or minimally acceptable standards. However, on March 21, 2014, USACE issued a memorandum, "Interim Policy for Determining Eligibility Status of Flood Risk Management Projects for the Rehabilitation Program Pursuant to Public Law (PL) 84-99," to provide interim criteria for determining eligibility for PL 84-99 assistance. Under this interim policy, vegetation management is not to be considered in making a PL 84-99 eligibility determination.

Therefore, RD 17 will continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which includes trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground to 5 feet above the ground (or 12 feet above the crown road). However, within the Phase 3 Repair Project area under the action alternatives evaluated in this FEIS, landside vegetation would be removed as previously evaluated in the September 2011 DEIS/DEIR; only waterside vegetation would be managed in accordance with RD 17's existing practices.

1.7 Agency Roles and Responsibilities

1.7.1 Lead Federal and State Agencies

USACE will use this FEIS to exercise its regulatory authority under Section 408 and CWA Section 404, as the Federal lead agency for purposes of compliance with NEPA. USACE is not responsible for funding, design, or construction of the Phase 3 Repair Project. RD 17 is the state lead agency responsible for implementing project design and construction.

1.7.2 Cooperating Agencies

Under NEPA, any Federal agency other than the lead agency that has jurisdiction by law or special expertise regarding any environmental effect involved in an action requiring an EIS is eligible to be a cooperating agency (40 CFR 1501.6). Cooperating agencies are encouraged to actively participate in the NEPA process of the Federal lead agency, review the NEPA documents of the Federal lead agency, and

[2] USACE ETL 1110-2-571 subsequently was replaced by ETL 111-2-583 on April 30, 2014 (USACE 2014).

use the documents when making their own decisions on the action. No Federal agencies are acting as NEPA cooperating agencies for the Phase 3 Repair Project.

1.8 Intended Uses of this FEIS

NEPA provides an interdisciplinary framework for Federal agencies to develop information that will help them to consider environmental factors in their decision making (42 USC 4321, 40 CFR 1500.1). According to NEPA, an EIS is required whenever a proposed major Federal action (e.g., a proposal for legislation or an activity financed, assisted, conducted, or approved by a Federal agency) would result in significant effects on the quality of the human environment.

Implementation of the Phase 3 Repair Project depends on Federal action because various elements or alternatives would require Federal approval for the following activities:

(i) alteration of Federal project levees (requires permission from USACE pursuant to Section 408) or

(ii) placement of fill material into jurisdictional waters of the United States (requires permission from USACE pursuant to Section 404) (16 USC 1531).

This FEIS will be used by USACE in making decisions pursuant to Section 408 and CWA Section 404, and is intended to provide full and open disclosure of environmental consequences prior to agency action.

1.9 Alternatives Evaluated in this FEIS

The September 2011 DEIS/DEIR evaluated the No-Action Alternative and two action alternatives: Alternative 1 – Minimum Footprint Alternative and Alternative 2 – Maximum Footprint Alternative. Alternatives 1 and 2 considered method(s) for reducing flood risk at 19 levee elements and the dryland levee. Following completion of the public review process for the September 2011 DEIS/DEIR, the dryland levee was removed from the Phase 3 Repair Project, and RD 17 identified the preferred seepage remediation method (preferred repair) for each of the 19 elements of the Phase 3 Repair Project from among the seepage remediation methods evaluated as part of Alternatives 1 and 2.

The following subsections summarize the alternatives evaluated in this FEIS. More detailed descriptions are included in Chapter 2, "Alternatives."

1.9.1 No-Action Alternative

The No-Action Alternative under NEPA is the expected future condition without project implementation. The No-Action scenario in this analysis consists of the conditions that would be reasonably expected to occur in the foreseeable future if no additional permits are granted to RD 17 by the state (i.e., DWR and CVFPB) or USACE to further improve the RD 17 levee system beyond the accomplishments of Phases 1 and 2 of the LSRP and the Phase 3 actions implemented under the 2017 Emergency Flood Response and 2019 CP Construction Projects. Under this scenario, RD 17's current operation and maintenance responsibilities would continue, including all weather road maintenance; vegetation control and eradication; repair of minor slip-outs and erosion; rodent control, abatement, and hole grouting; and regrading of levee slopes.

Under this scenario, vegetation management presumably would continue to be implemented consistent with current RD 17 vegetation management practices. Therefore, regarding levee vegetation management related to the No-Action Alternative, this document acknowledges and analyzes the trimming of trees up to 5 feet above the ground (or 12 feet above the crown road) within the levee prism on the landside slope and waterside slope and within 15 feet of the landside and waterside toes. Under this scenario, key segments of the RD 17 levee system would continue to exhibit undesirable seepage conditions during periods of sustained high river stage, resulting in a continuation of the existing risk of flooding. However, it is unlikely that this elevated flood risk would be allowed to continue over the long term and more likely that levee repairs would be enacted at some time in the future. Without these additional improvements to the RD 17 levee system in the interim, a sustained high river stage event could cause portions of the RD 17 levee system to fail, triggering widespread flooding and extensive damage to existing residential, commercial, institutional (i.e., schools, hospitals, prisons), agricultural, and industrial structures protected by these levees. Utilities, roadways, and other infrastructure systems also would likely be extensively damaged. The magnitude of the flood damage would depend on the location of the levee breach, severity of the storm event, and river flows at the time of the levee failure.

1.9.2 Alternative 1—Minimum Footprint Alternative

The Minimum Footprint Alternative (Alternative 1) encompasses the proposed method(s) for reducing flood risk for the 19 levee elements that would result in the least area of disturbance relative to other options being evaluated for the same element (e.g., cutoff wall for any elements where a cutoff wall and either a seepage berm or a setback levee are under consideration, because the disturbance area would be less than that of these other two seepage remediation methods; seepage berm for any elements where the options under consideration are a seepage berm or a setback levee, because a setback levee by itself would not address seepage issues and would also require a seepage berm, and therefore would result in a greater area of disturbance relative to the area that would be disturbed by construction of a seepage berm along an existing levee).

Under Alternative 1, cutoff walls would be installed to address levee seepage in six elements: IIa and IIb (hereafter referred to as IIab), VIc, Va and VIa.1 (hereafter referred to as Va–VIa.1), and VIIe. In one element under Alternative 1, seepage remediation would be addressed by installation of a chimney drain in an existing seepage berm: IIIa. In the remaining 12 elements, seepage remediation under Alternative 1 would be addressed by seepage berms with or without chimney drains: Ia; Ib; Ie; IIIb; IVa; VIa.4; VIb; VIc, VId, and VIe (hereafter referred to as VIcde); VIIb; and VIIg.

As stated previously in the "Management of Vegetation Encroachments" section, the September 2011 DEIS/DEIR evaluated two vegetation management options: (1) removing all waterside and landside vegetation in compliance with USACE ETL 1110-2-571 and (2) removing vegetation, except perennial grasses, on the landside levee slope and within 15 feet of the landside levee toe. This FEIS evaluates retaining vegetation on the waterside slope and managing this vegetation in compliance with the existing RD 17 vegetation management strategy (trees within the levee prism on the waterside slope and within 15 feet of the waterside toe are trimmed from the ground up to 5 feet above the ground [or 12 feet above the crown road]) and removing all landside levee vegetation, except perennial grasses as previously evaluated in the September 2011 DEIS/DEIR.

1.9.3 Alternative 2—Maximum Footprint Alternative

The Maximum Footprint Alternative (Alternative 2) would encompass the proposed method(s) for reducing flood risk for each of the 19 levee elements that would result in the greatest area of disturbance relative to other options under consideration for the same element. Under this alternative, levee seepage would be addressed by seepage berms with or without chimney drains or toe drains at 11 elements (Ia, Ib, Ie, IIIb, IVa, Va–VIa.1, VIa.4, VIb, VIIb, and VIIg), by a chimney drain in an existing seepage berm at one element (IIIa), by setback levees with seepage berms at six elements (IIab, IVc, and VIcde), and by a cutoff wall at the remaining element (VIIe).

The September 2011 DEIS/DEIR also evaluated the two previously described vegetation management options for Alternative 2. However, as with Alternative 1 above, this FEIS evaluates only retaining vegetation on the waterside slope and managing this vegetation in compliance with the existing RD 17 vegetation management strategy (trees within the levee prism on the landside slope and waterside slope and within 15 feet of the landside toe are trimmed from the ground up to 5 feet above the ground [or 12 feet above the crown road]); and removing all landside levee vegetation, except perennial grasses, as previously evaluated in the September 2011 DEIS/DEIR.

1.9.4 Requester's Preferred Alternative

With completion of the 2017 Emergency Flood Response and 2019 CP Construction Projects, eight of the 19 elements of the Phase 3 Repair Project were fully implemented. The remaining 11 elements comprise the Requester's Preferred Alternative evaluated in this FEIS. These remaining actions consist of construction of a seepage berm at element Ia and placement of levee fill material where needed along the landside levee slope to provide minimum 3:1 slopes and 20-foot levee crown width; construction of cutoff walls at nine Phase 3 Repair Project elements (IIab, IVa, Va–VIa.1, VIa.4, VIb, VIc, and VIIe) and placement of levee fill material where needed along the landside levee slopes to provide minimum 3:1 slopes and 20-foot levee crown widths; and construction of a setback levee with a seepage berm and cutoff wall at element IVc.

1.10 Regulatory Requirements, Permits, Authorizations, and Approvals

1.10.1 Federal Actions/Permits/Authorizations

The Federal actions, permits, or authorizations that would be required for project implementation are as follows:

- **U.S. Army Corps of Engineers** would be responsible for ensuring compliance with the RHA and CWA, including provision of Section 408 authorization for alteration of a Federal Project levee and issuance of a Nationwide 404 Permit for fill or discharge into waters of the U.S.

- **U.S. Environmental Protection Agency** would be responsible for reviewing and commenting on this FEIS, filing and noticing this FEIS, and ensuring conformity with the Clean Air Act.

- **U.S. Fish and Wildlife Service** would be responsible for determining whether a biological opinion under the Federal Endangered Species Act (ESA) and incidental-take authorization for the take of, or concurrence with a conclusion of not likely to adversely affect for, species federally listed as endangered or threatened should be issued.

- **National Marine Fisheries Service** would be responsible for determining whether a biological opinion under the Federal ESA and incidental-take authorization for the take of, or concurrence with a conclusion of not likely to adversely affect for, species federally listed as endangered or threatened should be issued.

- **California State Office of Historic Preservation** would be responsible for compliance with the National Historic Preservation Act, Section 106, in relation to Federal project authorizations.

1.10.2 State Actions/Permits

The state actions or permits that would be required for project implementation are as follows:

- **California Department of Fish and Wildlife, Bay-Delta and North Central Regions** would be responsible for ensuring compliance with the California Endangered Species Act and California Fish and Game Code Section 1602 for streambed alteration and for ensuring protection of raptors (California Fish and Game Code Section 3503.5).

- **California State Lands Commission** would be responsible for determining if the proposed action would encroach on sovereign lands and for issuing a lease, if required.

- **Central Valley Flood Protection Board** would be responsible for approving levee, floodway, and other encroachment permits.

- **Central Valley Regional Water Quality Control Board (Region 5)** would be responsible for approving a construction stormwater permit under the National Pollutant Discharge Elimination System (Notice of Intent [NOI] to proceed under the General Construction Permit) for disturbance of more than 1 acre, a discharge permit for stormwater, a general order for dewatering, and CWA Section 401 certification or waste discharge requirements.

- **California Department of Transportation** would be responsible for approving an encroachment permit and/or transportation management plan if needed for construction traffic on state highways.

1.10.3 Regional and Local Actions/Permits

The following regional and local actions and permits would be required for project implementation:

- **San Joaquin County** would be responsible for possible construction authorizations and/or encroachment permits.

- **Cities of Lathrop and Manteca** would be responsible for possible construction authorizations and/or encroachment permits.

- **San Joaquin County Air Pollution Control District** would be responsible for approving the authority to construct (for devices that emit air pollutants) and permit to operate, providing Indirect Source Review, and determining consistency with the Air Quality Management Plan.

1.11 Public Involvement under NEPA

On April 23, 2010, USACE issued an NOI for preparing a joint EIS/EIR. The NOI is provided in **Appendix A1**. A public scoping meeting was held on May 11, 2010, from 2 p.m. to 5 p.m. at the City Council Chambers, Lathrop City Hall in Lathrop, California, to brief interested parties on the Phase 3 Repair Project and obtain the views of agency representatives and the public on the scope and content of the DEIS/DEIR. **Appendix A2** contains the public outreach materials for the May 11, 2010, scoping meeting. No oral or written comments were received during the scoping meeting. Two individuals attended the scoping meeting and informally discussed their individual properties with the engineers while there. However, when asked, neither wished to enter comments into the record. No time limit is mandated for receiving written comments in response to an NOI under NEPA. Chapter 6, “Consultation and Coordination,” of this FEIS includes a summary listing of the substantive comments received in response to the NOI. Copies of the comment letters received are included in **Appendix A3.**

The DEIS/DEIR was completed in September 2011, and two public meetings were held from 2 p.m. to 4 p.m. and 5 p.m. to 7 p.m. on October 13, 2011, in the Lathrop City Council Chambers. The public comment period for the joint DEIS/DEIR ended on October 24, 2011. The comment letters received on the DEIS/DEIR and the responses to those comments are provided in **Appendix B** of this FEIS. Specifically, each comment has been considered and responded to individually. References in **Appendix B** to a "chapter" or a "section" should be assumed to refer to this FEIS, unless otherwise noted. If a comment resulted in a change to the text of this FEIS, it is noted in the response to the comment.

1.12 Organization of this FEIS

The content and format of this FEIS are designed to meet the requirements of NEPA, as set forth by the Council on Environmental Quality and USACE's NEPA policy and guidance, including Appendix B, "NEPA Implementation Procedures for the Regulatory Program," appended to 33 CFR Part 325, "Processing of Department of Army Permits." This FEIS is organized as follows:

- The **Abstract** identifies the project title and lead agencies, presents an abstract of this FEIS, and includes comment submission information.

- The **Executive Summary** presents a brief summary of the project history and purpose and need, an overview of the alternatives under consideration; a listing of the associated environmental impacts and mitigation measures; and conclusions regarding growth inducement, irreversible environmental changes, and known areas of controversy and issues to be resolved.

- **Chapter 1, "Introduction and Project Purpose, Need, and Objectives,"** explains the project history, including related documents; specifies the project purpose, need, and objectives; lists the agencies that may have discretionary authority over the proposed project; briefly describes the alternatives evaluated in this FEIS; summarizes required permits, approvals, and authorizations; provides information on past public participation; and outlines the organization of the document.

- **Chapter 2, "Alternatives,"** presents the alternatives evaluated to meet through seepage and under seepage criteria under the Phase 3 Repair Project, including the Requester's Preferred Alternative. This chapter constitutes the project description and describes the project components in detail. It also describes alternatives considered but rejected from further consideration and provides a summary matrix that compares the environmental consequences of the alternatives that were evaluated.

- **Chapter 3, "Affected Environment, Environmental Consequences, and Mitigation Measures,"** consists of 15 issue area sections. Each of the sections in this chapter is devoted to a particular topic area, describes the baseline or existing conditions, provides an analysis of impacts at an equal level of detail for each alternative evaluated, and identifies mitigation measures that would avoid or eliminate significant impacts or reduce them to a less-than-significant level, where feasible and available.

- **Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements,"** provides information related to potential incremental contributions from Phase 3 Repair Project impacts that could be cumulatively considerable and provides information related to potential growth-inducing effects from construction of the proposed repairs to reduce damage from flooding, substantial short-term employment opportunities, and removal of an obstacle to additional growth and development in the areas protected by RD 17 levees. The chapter also addresses the relationship between short-term uses of the environment and long-term productivity, and the irreversible and irretrievable commitment of resources.

- **Chapter 5, "Compliance with Federal Environmental Laws and Regulations,"** summarizes Federal laws and regulations that apply to the project and describes the project's compliance with them.
- **Chapter 6, "Consultation and Coordination,"** summarizes public and agency involvement activities, agency consultation and coordination, and Native American consultation.
- **Chapter 7, "References,"** provides a bibliography of sources cited in this FEIS and identifies the names and affiliations of persons who provided information used in preparing the document.
- **Chapter 8, "List of Preparers,"** lists individuals who were involved in preparing this FEIS, their education, and their years of experience.
- **Chapter 9, "List of Recipients,"** lists Federal, state, and local agencies that received the DEIS/DEIR.
- **Chapter 10, "Index,"** contains the NEPA-required index for easy reference of topics and issues.
- **Chapter 11, "Glossary,"** contains a list of terms commonly used in this EIS and their definitions.
- The **Appendices** contain the background information that supports this FEIS and can be found on the CD located in the back cover of the printed FEIS. The appendices are as follows:
    - Appendix A, "Public Outreach and Involvement"
    - Appendix B, "Responses to Comments on the DEIS/DEIR"
    - Appendix C, "Form NRCS-CPA-106: Farmland Conversion Impact Rating for Corridor-Type Projects"
    - Appendix D, "Hydraulic Analysis of Setback Levee Alternatives"
    - Appendix E, "Preliminary Jurisdictional Determination"
    - Appendix F, "Native American Correspondence and SHPO Consultation"
    - Appendix G, "Air Quality Modeling Results"
    - Appendix H, "Noise Modeling Results"
    - Appendix I, "Environmental Permits Issued to Date for the Phase 3 Repair Project"
    - Appendix J, "Endangered Species Act Section 7 Consultation Administrative Record"

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Chapter 2. Alternatives

2.1 Introduction

This chapter describes the no-action alternative and the action alternatives that have been considered to feasibly accomplish the primary purpose and objectives of the Phase 3 Repair Project. As discussed in Chapter 1, “Introduction and Project Purpose, Need, and Objectives,” of this FEIS, the project involves improving the existing levee integrity and continuing to provide 100-year flood risk reduction for surrounding areas in order to reduce the likelihood of flooding in areas within RD 17. Alternatives 1 and 2 provide contrasting advantages and disadvantages, and the Requester’s Preferred Alternative includes elements of both with some modifications that account for completion of the 2017 Emergency Response Construction Project and the 2019 CP Construction Project. Each alternative is considered feasible for the purpose of analysis, based on relevant economic, environmental, social, technological, and legal factors.

The following four alternatives are evaluated at an equal level of detail in this FEIS:

- No-Action Alternative,
- Alternative 1—Minimum Footprint Alternative,
- Alternative 2—Maximum Footprint Alternative, and
- Requester’s Preferred Alternative.

These represent a reasonable range of alternatives, consistent with the requirements of NEPA and when considered in the context of prior alternatives analyses described in this FEIS (see Section 2.4, “Alternatives Evaluated in This FEIS”). The action alternatives include components that could avoid or substantially lessen one or more of the Phase 3 Repair Project’s significant effects.

2.2 National Environmental Policy Act Requirements for Evaluation of Alternatives

The White House Council on Environmental Quality’s regulations (40 CFR 1502.14) require that an EIS include:

- an objective evaluation of reasonable alternatives;
- identification of the alternatives considered but eliminated from detailed study, along with a brief discussion of the reasons why these alternatives were eliminated;
- information that would allow reviewers to evaluate the comparative merits of the proposed action and alternatives;
- consideration of the no-action alternative;
- identification of the agency’s preferred alternative (referred to in this FEIS as the Requester’s Preferred Alternative), if any; and
- appropriate mitigation measures not already included in the proposed action or alternatives.

NEPA requires the analysis of the proposed action and all alternatives at a substantially similar level of detail. The regulations (40 CFR 1502.14) require agencies to rigorously explore and objectively evaluate all reasonable alternatives and to devote substantial treatment to each alternative considered. An alternative is considered reasonable if it meets the purpose and need and is practical or feasible from a technical and economic standpoint and using common sense (CEQ 1986). All alternatives considered, including the Requester's Preferred Alternative, if any, must be compared to the no-action alternative (future without authorization from USACE).

2.3 Phase 3 Repair Project Alternatives Screening

USACE as the NEPA lead agency, in close coordination with RD 17, the Requester and CEQA lead agency, formulated a reasonable range of alternatives that would achieve the project purpose under NEPA and the project objectives under CEQA through the following steps:

- identification of the deficiencies in the RD 17 levee system that must be addressed to meet state and Federal under seepage and through seepage criteria as quickly as possible,
- identification of feasible remedial measures to address the deficiencies,
- determination of the likely environmental effects of the remedial measures, and
- development of a reasonable range of alternatives for implementing the remedial measures to reduce flood damage risk.

For several levee elements, this screening process resulted in a single remediation approach being identified as best suited to the conditions of the particular element because of issues such as access, proximity to housing or other development, cost, feasibility, environmental constraints, and ability to meet project objectives. For other elements, two or more remediation options remained as approaches warranting further consideration. The Phase 3 Repair Project levee elements where two or more remediation options were identified provided the basis for the alternatives analyzed in this FEIS.

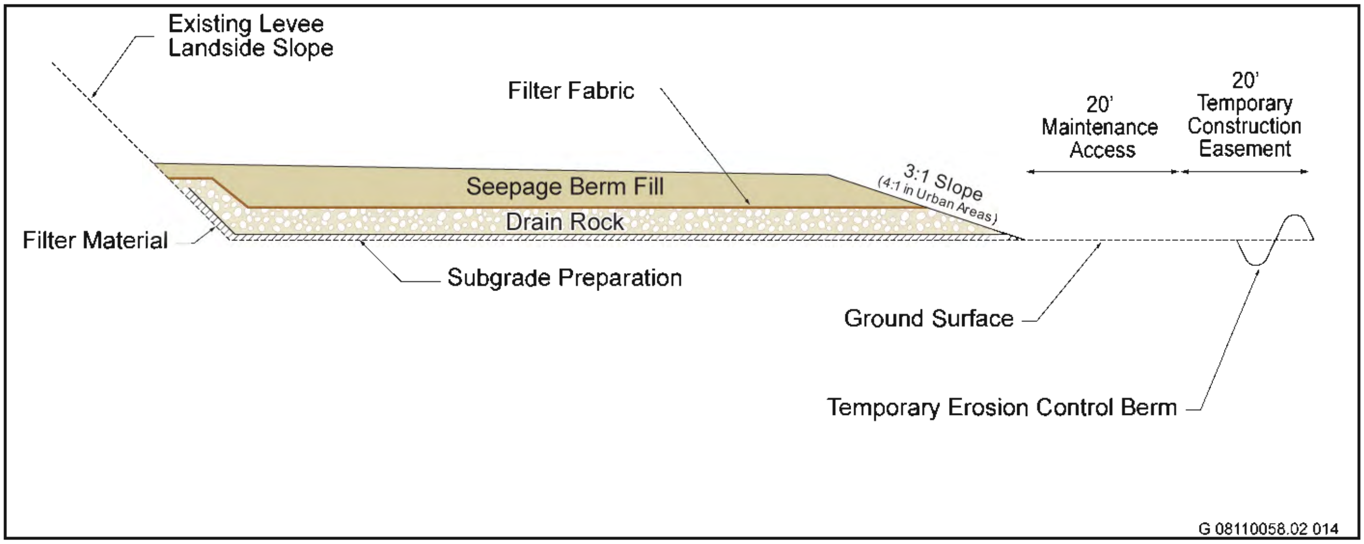
2.3.1 Types of Seepage Remediation Considered

Seepage remediation to be performed by RD 17 is proposed to address under seepage and/or through seepage concerns. "Under seepage" is the movement of water under the levee prism and through the foundation soils; the water exits the soil onto the ground surface on the landside of the levee. "Through seepage" is the movement of water through the levee prism soils when high river stage conditions exist on the waterside of the levee. See the "Seepage" discussion in Section 1.6.2, "Flood Problems and Needs," and **Figure 1-4** for more details on these two levee failure mechanisms.

Seepage Berm

Reducing the risk of levee failure caused by under seepage and through seepage may be achieved by constructing a drained seepage berm. A drained berm collects and conveys seepage, thereby reducing the flood risk associated with a high-water event. A drained seepage berm is built on the landside of the levee and consists of layers of sand filter material, drain rock, geosynthetic filter fabric, and a seepage berm soil fill (**Figure 2-1**).

Figure 2-1. Typical Seepage Berm



Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010, adapted by AECOM in 2010

The drained seepage berm reduces flood risk during sustained high river stage events by collecting seepage that otherwise would flow onto the landside ground surface at and beyond the levee's landside toe of slope, and then conveying the seepage away from the levee.

The layer of sand filter material placed on the natural ground surface reduces the transmission of fine-grained soils into the drain rock, thereby maintaining the drain rock's ability to be a conductive soil unit that conveys collected seepage. Similarly, the filter fabric that separates the drain rock from the seepage berm fill soil prevents the migration of finer soils into the drain rock. The weight of the berm acts as ballast, reducing the potential for detrimental boils and piping.

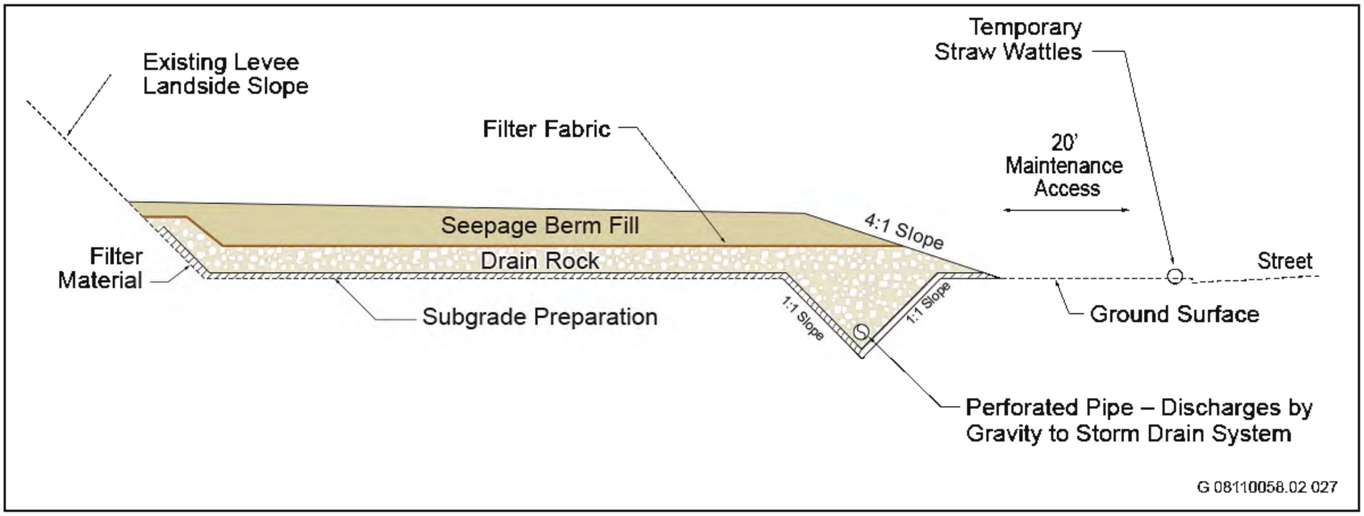
The design width and height of a seepage berm are dependent on the relative permeability of the underlying soil layers and the amount of pressure head that would push water under the levee and through these soils during sustained high river stage events. The higher the water pressure head and the more dissimilar the porosity of the underlying soil layers, the wider and/or taller the seepage berm must be to prevent boils and reduce flood risk.

For the Phase 3 Repair Project, drained seepage berm widths of 65–120 feet are expected to be adequate to meet the design criteria in most cases. However, these types of berms may extend up to 400 feet inland from the landside toe of the levee. Seepage berms are typically constructed using select materials excavated from borrow sites or obtained from commercial sources. For the Phase 3 Repair Project, soil material for seepage berms would be purchased from commercial sources.

Seepage Berm with Toe Drain

In urban areas, some seepage berms also would include a toe drain system to discharge the seepage water into an urban storm drainage system. A toe drain pipe is a below-grade, perforated pipe surrounded by a layer of sand and drain rock (**Figure 2-2**). The toe drain pipe is a mechanism to safely collect and convey seepage water away from the levee and seepage berm. If the toe drain pipe were unable to convey the seepage water, the water would exit the seepage berm through the drain rock at the face of the berm, similar to a nonurban berm.

Figure 2-2. Typical Seepage Berm with Toe Drain



Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010, adapted by AECOM in 2010

Seepage Berm with Chimney Drain

A chimney drain is a drainage system that collects seepage waters that are flowing through the aboveground portion of the levee structure. This type of drain is used to collect and convey through seepage. A chimney drain consists of a 1- to 3-foot-thick layer of sand and drain rock. Filter fabric is placed between the soil and rock layer to avoid migration of the soil into the rock, which could clog the rock layer and reduce its ability to carry seepage flows. The chimney drain is placed directly on the landside slope of the levee and is tied into an existing or new seepage berm at the landside base of the levee (**Figure 2-3**). The chimney drain conveys the through seepage flows to the seepage berm.

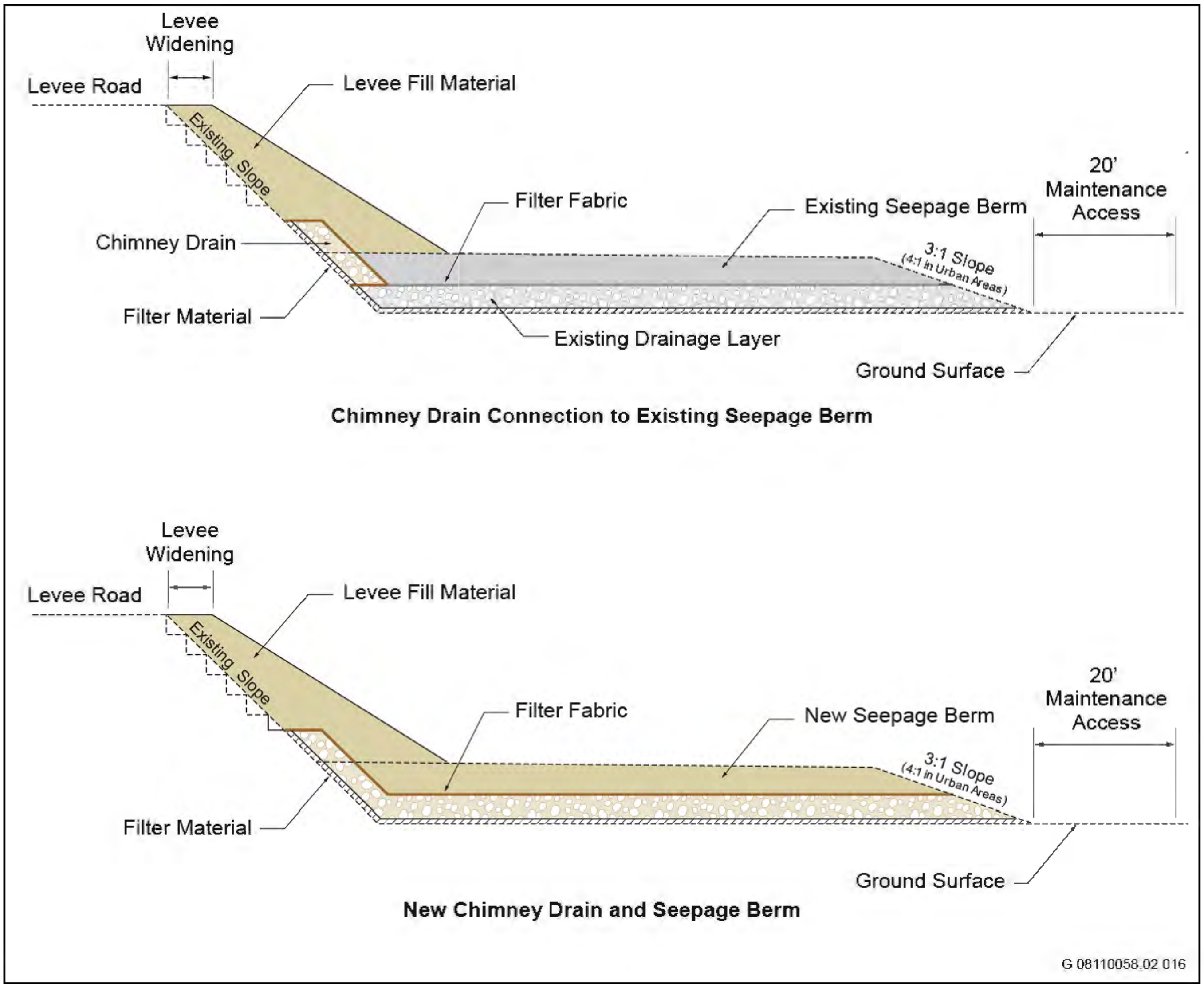
Installation of a chimney drain in an existing seepage berm would include adding the through seepage material on top of the existing seepage berm, and tying this material into the existing seepage berm material by removing the seepage berm fill material and physically tying the two drainage rock layers together (Neudeck, pers. comm., 2010). When the remediation includes construction of a new seepage berm with a chimney drain, the chimney drain would be installed during construction of the seepage berm.

Cutoff Wall

In selected locations of the RD 17 project, cutoff walls are being considered for placement through the levee prism (parallel to the river). The low-permeability soil (often a mixture including bentonite clay) cutoff wall being considered would be constructed vertically through the levee prism and would extend into or through a deeper low-permeability soil (a layer in which seepage does not flow readily through), thereby substantially reducing potential under and through seepage flow during high river stage events.

Construction of cutoff walls is slow and may require specialized equipment that can extend deep into the subsurface, allowing cutoff walls to reach depths of up to 120 feet (**Figure 2-4**). RD 17 proposes to use a deep soil mixing (DSM) method for installation of some of the proposed cutoff walls. This method involves mixing the soil in place with bentonite and cement using augers or other in-situ mixing methods, thereby reducing the risk of failure during construction. The DSM method does not require levee crown degradation.

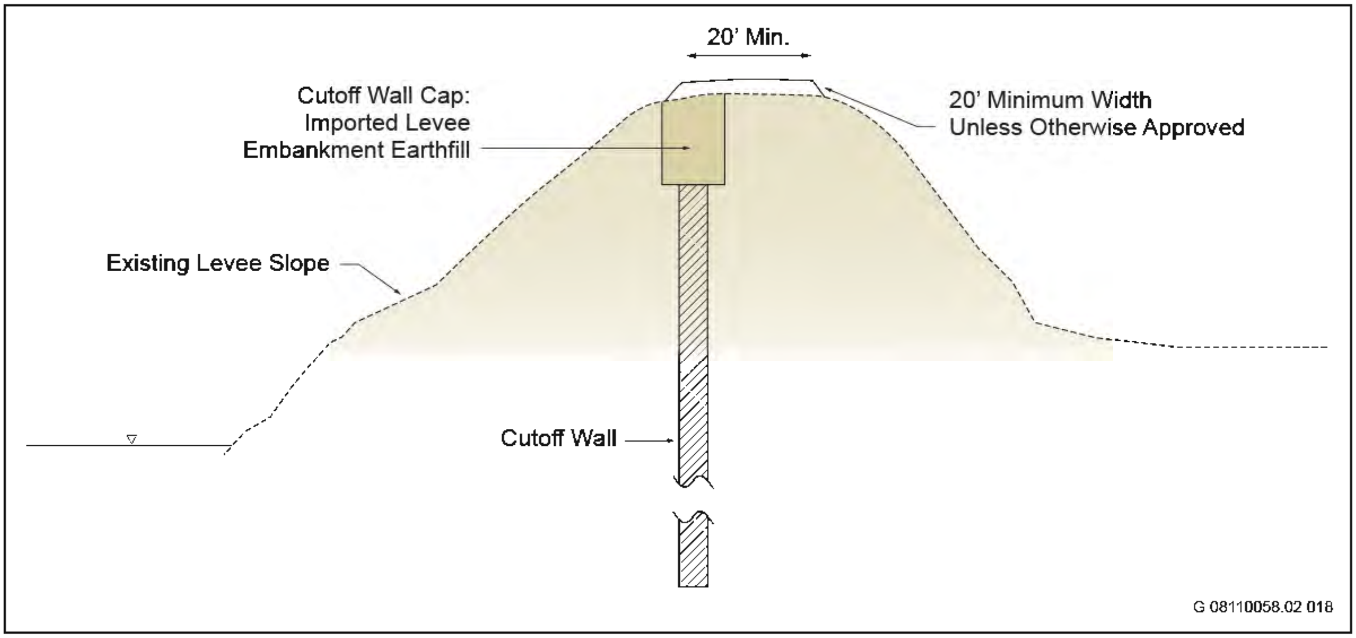
Figure 2-3. Typical Seepage Berm with Chimney Drain



Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010, adapted by AECOM in 2010

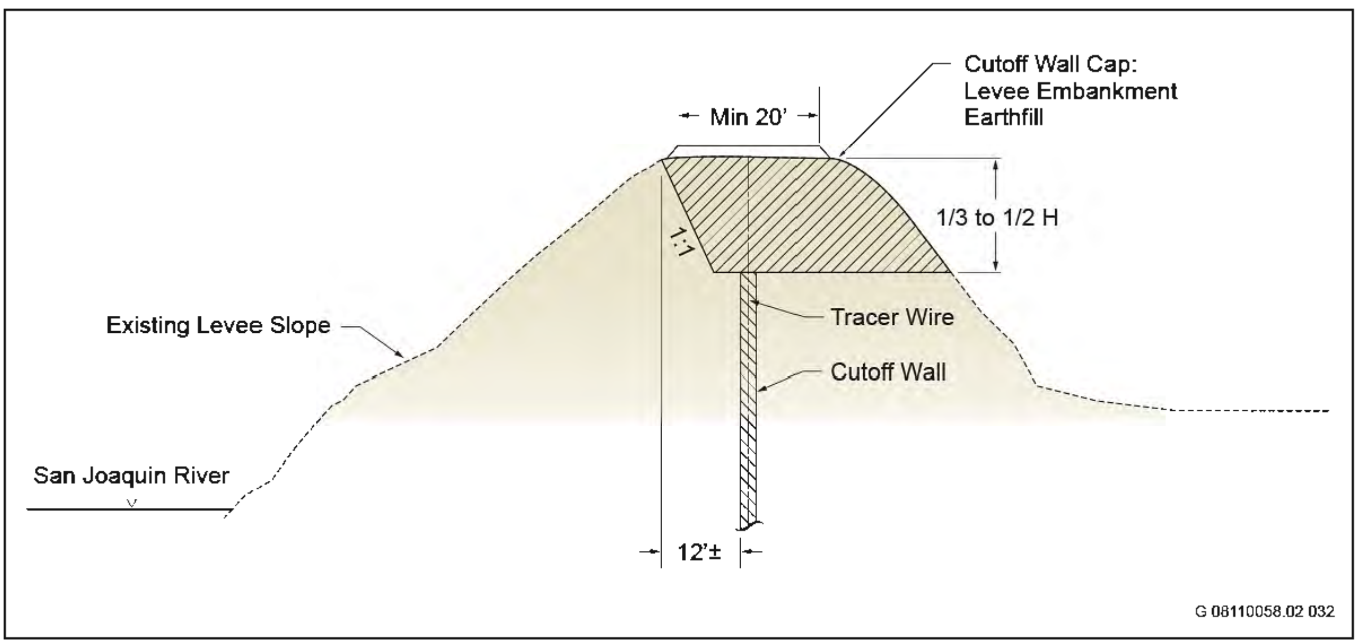
The conventional method of cutoff wall construction, which RD 17 proposes to use for installation of some cutoff walls, is the “open-trench” method (**Figure 2-5)**. This method allows cutoff walls to be installed to a maximum depth of approximately 80 feet. This method involves excavating material in an open trench (the trench is filled with a bentonite slurry to maintain the side slopes of the excavation) and then replacing it with the select materials, typically a bentonite or bentonite/cement slurry. In this case, the levee crown is “degraded,” meaning that it is excavated to ensure that any weakness in the narrow upper portion of the levee would not result in failure of the levee during construction. RD 17 also has been considering the use of a sheet pile cutoff wall at one location in lieu of a slurry cutoff wall. This method would not require degradation of the levee, and pile-driving technology would be used for installation of steel sheet piles.

Figure 2-4. Typical Deep Soil Mixing Method Cutoff Wall



Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010, adapted by AECOM in 2010

Figure 2-5. Typical Open Cut Method Cutoff Wall



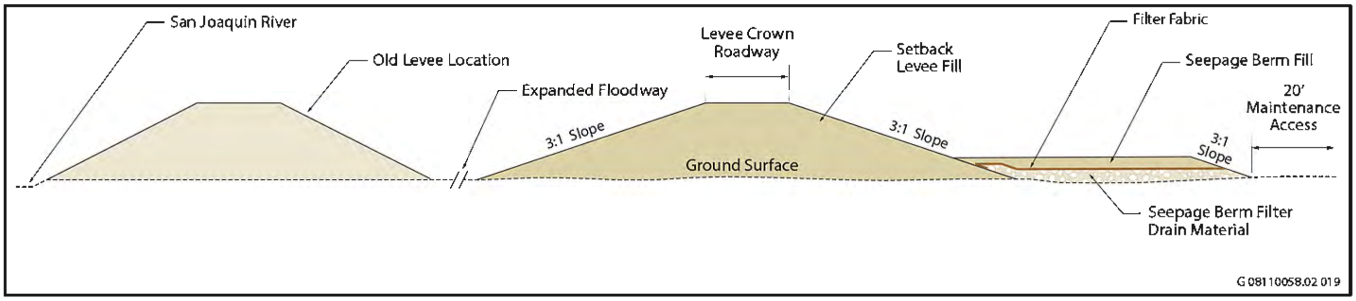
Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010, adapted by AECOM in 2010

Setback Levee with Seepage Berm or Cutoff Wall

Setback levees are levees constructed some distance behind an existing levee. The setback is tied into the existing levee at the upstream and downstream end of the setback area. All or a portion of the existing levee between these two points then typically is removed to allow high-water events to inundate the newly expanded floodway. Soil from the old levee may be used as a source of fill for other flood protection improvement projects depending on the quality and quantity of material generated from demolition of the old levee. In some cases, it may be necessary to continue to maintain the existing levee after a setback levee is constructed (e.g., to protect existing development in the setback area) and to use the newly constructed levee as a backup levee.

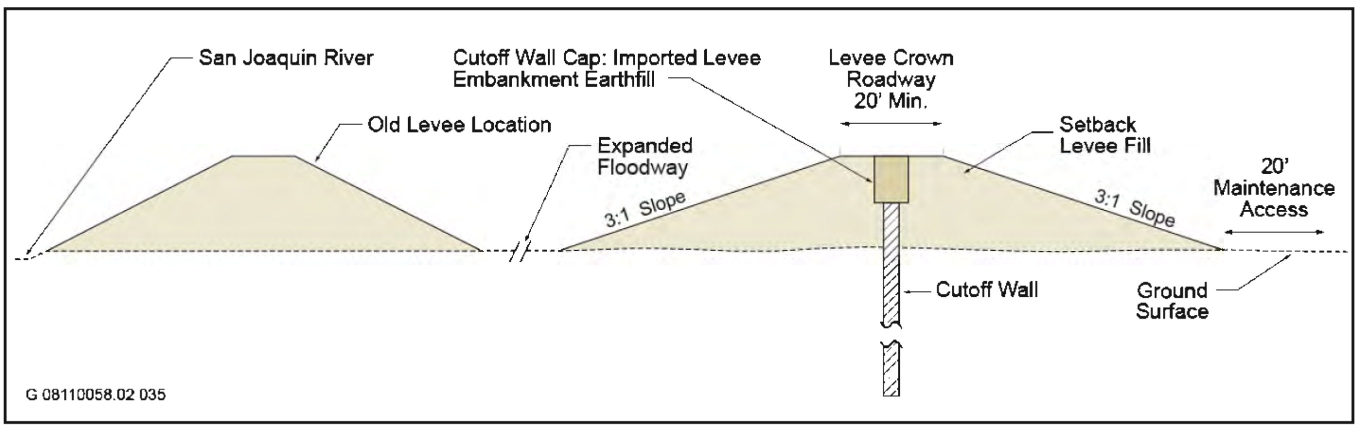
In the Phase 3 Repair Project area, soil materials below setback levees are anticipated to have properties similar to those of the materials below the existing levees. Therefore, a setback levee would have no seepage-related benefit in the RD 17 area relative to other seepage control methods. Like the existing levees, the setback levees would require either cutoff walls or seepage berms to sufficiently reduce the potential adverse effects associated with under seepage flows (**Figures 2-6** and **2-7**). Nevertheless, implementation of a setback levee could provide some additional capacity in the river for floodwaters and would have the potential to provide habitat in the area between the new and old levee locations. In the Phase 3 Repair Project area, any newly expanded floodway created by a proposed setback levee would be designed to drain surface water after a high-water event to prevent fish stranding.

Figure 2-6. Typical Setback Levee with Seepage Berm



Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010, adapted by AECOM in 2010

Figure 2-7. Typical Setback Levee with Cutoff Wall



Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010, adapted by AECOM in 2010

2.3.2 Alternatives Eliminated from Further Consideration

Continuous Setback Levee Approach

As discussed in Section 1.5.2, "Reclamation District 17 Objectives," RD 17 also considered constructing new setback levees because they not only could provide flood protection infrastructure but also could reduce water surface elevations through the expansion of the floodway and provide habitat restoration/enhancement opportunities. However, a continuous levee setback approach was not considered for the RD 17 levee system because substantial cost implications and land acquisition difficulties would make the approach infeasible.

To develop a continuous setback levee along the length of the project area, large amounts of land, estimated at more than 337 acres, would need to be acquired adjacent to the existing levee (RD 17 2009a). The land acquisition would not be limited to the width of the setback area, the proposed levee prism, and the area required for access roads along the toe of the slope. Because the proposed levee foundation soil stratigraphy would be nearly identical to that of the existing adjacent levee, seepage control berms would be required at the levee toe or cutoff walls within the levee prism. In many locations, the landside area of the levee was developed previously or is planned for development, complicating the process for acquisition and increasing the cost per acre.

In addition to the increased land acquisition costs, a continuous setback levee would require substantially more imported soil and other materials (i.e., aggregate base, riprap, drain rock, etc.), estimated at more than 6.5 million tons, to construct (RD 17 2009a). As mentioned previously, seepage controls, such as landside seepage berms or cutoff walls, still would be required to address existing soil conditions. Acquiring suitable fill material from commercial sources on a per-yard basis for a project of this scope likely would be cost prohibitive. Therefore, borrow areas in the vicinity of the project site would need to be identified and acquired. Development of the borrow areas would result in substantial adverse effects during construction related to noise, air quality, agriculture, land use, and biological resources, which in turn would result in substantial mitigation costs.

In March 2009, to support its Early Implementation Program funding request, RD 17 evaluated 12 locations including 16 levee elements (Ie, IIab, IIIb, IVa, IVc, Va–VIa.1, VIa.4, VIb, VIcde, VIIb, VIIe, and VIIg) as potential sites for setback levees (RD 17 2009a). These 12 locations were determined through a coordinated effort between DWR and RD 17 to comply with the provisions of the Early Implementation Program. The conclusion of that evaluation was that nine of the 12 locations were not viable for setback levees (Ie, IIIb, IVa, Va–VIa.1, VIa.4, VIb, VIIb, VIIe, and VIIg); however, three of the locations (IIab, IVc, and VIcde) were found to be worthy of further consideration. DWR concurred with this conclusion. The nine setback locations that were not viable were eliminated from further consideration primarily because of their potential effects on cities, land acquisition complications, and cost considerations. The other three locations were carried forward for analysis in Alternative 2. However, only the setback levee at element IVc was selected for inclusion in the Requester's Preferred Alternative.

Seepage Remediation Approaches

As described in Section 2.3, "Phase 3 Repair Project Alternatives Screening," the alternatives screening process led to the elimination of one or more remediation approaches for a number of Phase 3 Repair Project elements because some approaches were not suited to the conditions at some locations or would be substantially more costly than another equally viable approach. This section briefly summarizes the alternative remediation approaches considered but eliminated from further consideration for Phase 3 Repair Project elements. (See **Figure 1-3** for the location of the Phase 3 Repair Project elements discussed below.)

- **Element Ia (under seepage and through seepage):** A setback levee was not considered at this location. A setback levee would require relocation of existing high-voltage power lines and the Matthews Road bridge. A cutoff wall was eliminated from consideration for under seepage remediation at this location because it would have to extend 300 feet upstream and downstream from the boundaries of this reach, effectively increasing the length by 600 feet to provide an overlap with the adjacent and more favorable existing seepage conditions. To accomplish this, Howard Road would need to be excavated to the levee grade and then rebuilt, which would entail closing the road, possibly for several months. The estimated cost for this approach would be approximately $2.35 million [M]), nearly twice the cost for a seepage berm (approximately $1.2M) (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019).

- **Element Ib (under seepage and through seepage):** A setback levee was not considered at this location. The estimated cost of a cutoff wall would be approximately $1.7M, three and a half times the cost of a seepage berm ($0.5M) (Guenther, pers. comm., 2011; Mueller, pers. comm., 2015; Guenther, pers. comm., 2019).

- **Element Ie (under seepage and through seepage):** A setback levee was eliminated from consideration at this location because the cost would be nearly 23 times the cost of a seepage berm, or $18.9M compared to $0.8M (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016). A cutoff wall also was eliminated from consideration because, as described for element Ia, the cutoff wall would need to provide 300 feet of overlap with the adjacent seepage berms and more favorable seepage conditions on either end of this element, and the cost to accomplish this at this location ($2.7M) would be more than three times the cost of implementing the seepage berm (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019).

- **Elements IIab (under seepage and through seepage):** A seepage berm with a chimney drain was eliminated from consideration at this location after the geotechnical analysis concluded that because of the adjacent human-made lake, a seepage berm could not reduce the seepage gradient to an acceptable level (ENGEO 2010).

- **Element IIIa (through seepage):** A setback levee was not considered at this location. A cutoff wall to address through seepage was also eliminated from consideration at this location because a properly functioning seepage berm is already in place and the addition of a chimney drain would cost approximately $142 per linear foot, or $1.2M, compared to approximately $2,050 per linear foot, or $10.8M, for a cutoff wall (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019).

- **Element IIIb (under seepage and through seepage):** Installation of a cutoff wall at this location would require 300 feet of overlap on either end with the adjacent seepage berms and would increase the cost nearly fourfold ($2.7M) compared to construction of a seepage berm ($0.7M) that would need to tie into only the adjacent seepage berms and would not require any overlap because of the relatively short length of this element (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019). As previously stated, a setback levee would also require a seepage berm, significantly increasing the cost for element IIIb ($38.8M) relative to just installing a seepage berm on the landside of the existing levee (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019). Therefore, both the setback levee and cutoff wall were eliminated from further consideration at this location.

- **Element IVa (under seepage and through seepage):** A setback levee was eliminated from consideration at this location because the cost of a setback levee ($41.5M) would be more than 26 times the cost to construct a seepage berm ($1.6M) and more than 14 times the cost to install a cutoff wall ($2.9M) (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019). New seepage berms have been constructed previously on the landside of the adjacent levee elements. Therefore, a cutoff wall would require installation of an additional 300 feet of overlap along either side of the element boundary, which would increase the cost by approximately 33 percent and would result in added disturbance compared to construction of a seepage berm. In addition, a cutoff wall would require pump station improvements on the landside of the levee, at an additional estimated cost of $0.6M to conform to current USACE and DWR standards, whereas a seepage berm would not (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019). Because the levee at this location also would require slope geometry corrections that would result in landside effects on wetlands similar to effects that would be associated with construction of a seepage berm, and a cutoff wall would not preserve the continuity of levee repairs in this area for maintenance purposes, a cutoff wall also was eliminated from consideration.

- **Element IVc (under seepage and through seepage):** No alternatives at this location were eliminated from consideration in this FEIS.

- **Elements Va–VIa.1 (under seepage and through seepage):** A setback levee at this location would cost approximately $48.5M compared to $17.0M to construct a seepage berm and $20.9M to install a cutoff wall (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019). Although a setback levee was eliminated from consideration at this location, construction cost was not the primary reason. A setback levee was eliminated from consideration because of the proximity of elements Va–VIa.1 to the bifurcation at Old River. The change in hydraulic conditions as a result of constructing a setback levee at this location would result in increased flows down the San Joaquin River during flood events, which could lead to increased flooding in downtown Stockton or other locations downstream (RD 17 2009b:30–34).

- **Element VIa.4 (under seepage and through seepage):** A setback levee at this location would cost approximately $15.3M because there is no deep bend in this stretch of the river that would facilitate affordable incorporation of a setback levee. Therefore, the setback levee was eliminated from consideration at this location because the cost of a setback levee would be more than 64 times the cost to construct a seepage berm ($0.25M) and almost 12 times the cost to install a cutoff wall ($1.3M) (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019).

- **Element VIb (through seepage):** A setback levee was eliminated from consideration at this location for the same reasons as discussed for element VIa.4, above. A setback levee would cost approximately $26.4M, whereas a cutoff wall would cost approximately $5.2M and a seepage berm would cost approximately $0.45M (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019).

- **Elements VIcde (under seepage):** A setback levee was eliminated at this location because it would cost approximately $7.5M, whereas the cost to install a cutoff wall would be approximately $2.3M and the cost to construct a seepage berm would be $1.8M (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019).

- **Element VIIb (under seepage and through seepage):** A setback levee was eliminated from further consideration at this location because the cost to place this area into the floodplain ($17.0M) would be more than 47 times higher than the cost to construct a seepage berm ($0.34M) (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019). A cutoff wall also was eliminated from consideration at this location because of difficulties associated with tying into Interstate 5, which would result in costs ($1.9M) greater than five times the cost to construct a seepage berm (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019).

- **Element VIIe (under seepage and through seepage):** A setback levee and a seepage berm were both eliminated from consideration at this location because the site is constrained by existing landside development.

- **Element VIIg (under seepage and through seepage):** A setback levee was eliminated from consideration at this location for the same reason discussed for element VIIe, above. Installing a cutoff wall at this location also would require an additional 300 feet of overlap on either side of the element boundary, which would increase the cost and result in added disturbance compared to construction of a seepage berm. The road that cuts through the levee adjacent to the eastern end of this element would need to be closed for approximately 3 days to allow installation of the cutoff wall overlap section (Neudeck, pers. comm., 2010). Because of the additional ground disturbance and higher cost to install a cutoff wall at this location, approximately $2.0M compared to approximately $0.6M to construct a seepage berm and chimney drain (Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019), the cutoff wall was eliminated from consideration.

Waterside Vegetation Removal

In addition, for all elements in the Phase 3 Repair Project, levee vegetation management to fully comply with the USACE Engineer Technical Letter (ETL) 1110-2-583 (USACE 2014),[1] which would require removal of all vegetation on the landside and waterside levee slopes and within 15 feet of the levee toe, has been eliminated from further consideration. Full compliance with the vegetation management requirements in the ETL was one of the two vegetation management strategies considered under both action alternatives that were evaluated in the September 2011 DEIS/DEIR for the Phase 3 Repair Project. The USACE policy for Section 408 permission requires any proposed alteration to meet current USACE designs and construction standards. However, a requester is not required to bring those portions or features of the existing USACE project that are not affected by the alteration up to current USACE design standards. Because the proposed construction methods would not result in effects on the waterside of the levee, compliance with the ETL is not required for the approval of the Section 408 permission. Therefore, removal of vegetation on the waterside slope, which potentially would have resulted in more substantial adverse effects related to biological resources, air quality, geology and soils, greenhouse gas emissions, hydrology and water quality, noise, and visual resources, is no longer being considered for the Phase 3 Repair Project and is not evaluated further in this FEIS.

RD 17 will continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which includes trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up to 5 feet above the ground (or 12 feet above the crown road). In the Phase 3 Repair Project area, landside vegetation would be removed as previously evaluated in the September 2011 DEIS/DEIR (USACE and RD 17 2011). Long-term vegetation management practices, for both landside and waterside vegetation, would be managed in accordance with the USACE Supplement to Standard Operation and Maintenance Manual – Lower San Joaquin River and Tributaries Project that includes RD 17's existing practices (USACE 2016).

[1] USACE ETL 1110-2-583 (USACE 2014) replaced ETL 1110-2-571 (USACE 2009), the ETL referenced in the September 2011 DEIS/DEIR, on April 30, 2014.

2.3.3 Phase 3 Repair Project Alternatives Carried Forward for Consideration in this FEIS

The September 2011 DEIS/DEIR evaluated the No-Action Alternative and two action alternatives designed to represent the potential minimum and maximum effects associated with implementing seepage remediation at all 19 elements that make up the Phase 3 Repair Project:

- Alternative 1—Minimum Footprint Alternative and
- Alternative 2—Maximum Footprint Alternative.

In the September 2011 DEIS/DEIR, Alternatives 1 and 2 addressed method(s) for reducing flood risk at the 19 levee elements, as well as the dryland levee. Following publication of the September 2011 DEIS/DEIR, RD 17 determined that remediation of the dryland levee was not required to achieve the project purpose and objectives and subsequently removed the dryland levee from the Phase 3 Repair Project. Of the 19 elements retained in the Phase 3 Repair Project, the proposed seepage remediation method (seepage berm and chimney drain, cutoff wall, setback levee) differed between Alternatives 1 and 2 at eight elements (IIab, IVc, Va–VIa.1, and VIcde). The proposed seepage remediation methods at the other 11 elements (Ia, Ib, Ie, IIIa, IIIb, IVa, VIa.4, VIb, VIIb, VIIe, and VIIg) were the same for both alternatives (**Table 2-1**).

Alternative 1 encompassed the proposed method(s) for reducing flood risk at each levee element that would result in the least disturbance relative to other options under consideration for the same element (**Table 2-1, Figures 2-8a through 2-8c**). Alternative 2 encompassed the proposed method(s) for reducing flood risk for each levee element that would result in the greatest disturbance relative to other options under consideration for the same element (**Table 2-1, Figures 2-8a through 2-8c**). Both of these alternatives also included right-of-way acquisition, removal of all landside vegetation within 15 feet of the landside toe of the levee, and the trimming of trees on the waterside levee slope for all 19 Phase 3 Repair Project levee elements.

As noted above, Alternatives 1 and 2 propose different methods to sufficiently lower potential adverse effects associated with under seepage for some levee elements along the RD 17 levee system. Therefore, the differences between Alternatives 1 and 2, including cost and effect on habitats, are the result of these differences in design options for the levee repairs. **Table 2-2** shows the estimated difference in costs of the two alternatives based on the eight elements where different design options are under consideration.

2.3.4 Preferred Phase 3 Repair Project

Upon completion of the public review process for the September 2011 DEIS/DEIR, RD 17 identified a preferred seepage remediation method (preferred repair) for all 19 elements of the Phase 3 Repair Project from among the seepage remediation methods evaluated as part of Alternatives 1 and 2 (see **Table 2-1** and **Figures 2-8a through 2-8c**).

However, in 2017 subsequent to RD 17's identification of the preferred repairs for each Phase 3 Repair Project element and before preparation of this FEIS, extreme weather, river, and reservoir conditions caused RD 17 to declare an emergency, resulting in construction of some of the preferred repairs at some of the Phase 3 Repair Project elements. Then in 2019, with implementation by the USACE Sacramento District of a new categorical permissions process for certain types of Section 408 requests, RD 17 received permission and implemented more of the preferred repairs to the Phase 3 Repair Project elements.

Table 2-1. Phase 3 Repair Project Alternatives and Preferred Repairs

Levee Reach	Levee Element	Minimum Footprint Alternative (Alternative 1)	Maximum Footprint Alternative (Alternative 2)	Preferred Repair
I	Ia	Seepage berm	Seepage berm	Seepage berm with chimney drain
	Ib	Seepage berm with chimney drain	Seepage berm with chimney drain	Seepage berm with chimney drain
	Ie	Seepage berm with chimney drain	Seepage berm with chimney drain	Seepage berm with chimney drain
II	IIa	Cutoff wall[1]	Setback levee	Cutoff wall[1]
	IIb	Cutoff wall[2]	Setback levee	Cutoff wall[1]
III	IIIa	Chimney drain in existing seepage berm	Chimney drain in existing seepage berm	Chimney drain in existing seepage berm
	IIIb	Seepage berm with chimney drain	Seepage berm with chimney drain	Seepage berm with chimney drain
IV	IVa	Seepage berm with chimney drain	Seepage berm with chimney drain	Seepage berm with chimney drain
	IVc	Cutoff wall[2]	Seepage berm with chimney drain/toe drain or setback levee with seepage berm	Setback levee with cutoff wall and section of seepage berm
V	Va	Cutoff wall[2]	Seepage berm with toe drain	Cutoff wall[1]
VI	VIa.1	Cutoff wall[2]	Seepage berm with toe drain	Cutoff wall[1]
	VIa.4	Seepage berm with toe drain	Seepage berm with toe drain	Cutoff wall[3]
	VIb	Chimney drain in existing seepage berm	Chimney drain in existing seepage berm	Cutoff wall[3]
	VIc	Seepage berm and fill	Setback levee	Cutoff wall[3]
	VId	Seepage berm and fill	Setback levee	Seepage berm with chimney drain
	VIe	Seepage berm and fill	Setback levee	Seepage berm with chimney drain
VII	VIIb	Seepage berm with chimney drain	Seepage berm with chimney drain	Seepage berm with chimney drain
	VIIe	Slurry cutoff wall[1] or sheet pile cutoff wall[4]	Slurry cutoff wall[1] or sheet pile cutoffwall[4]	Slurry cutoff wall[2]
	VIIg	Seepage berm with toe drain and fill	Seepage berm with toe drain and fill	Seepage berm with chimney drain/toe drain and fill

Notes:
1 Slurry cutoff wall to be constructed with open-trench method.
2 Slurry cutoff wall to be constructed with deep soil mixing method.
3 Slurry cutoff wall to be constructed with a combination of open-trench and deep soil mixing methods.
4 Sheet piles to be installed using pile-driving technology.
Source: Data created by AECOM in 2011 and 2014 based on information provided by Kjeldsen, Sinnock & Neudeck

Table 2-2. Cost Comparison of Phase 3 Repair Project Alternatives 1 and 2

Element		Minimum Footprint Alternative (Alternative 1)	Maximum Footprint Alternative (Alternative 2)
		Estimated Cost (millions)	
Ia		$1.2	$1.2
Ib		$0.5	$0.5
Ie		$0.8	$0.8
IIa **IIb**	**IIab**	**$2.9**	**$48.5**
IIIa		$1.2	$1.2
IIIb		$0.7	$0.7
IVa		$1.6	$1.6
IVc		**$5.1**	**$3.1** (seepage berm with chimney drain/toe drain) or **$6.3** (setback levee)
Va **VIa.1**	**Va–VIa.1**	**$20.9**	**$17.0**
VIa.4		$0.2	$0.2
VIb		$0.4	$0.4
VIc **VId** **VIe**	**VIcde**	**$1.8**	**$7.5**
VIIb		$0.3	$0.3
VIIe		$2.5 (slurry cutoff wall) or $5.5 (sheet pile cutoff wall)	$2.5 (slurry cutoff wall) or $5.5 (sheet pile cutoff wall)
VIIg		$0.6	$0.6
Total		**$40.7** (with element VIIe slurry cutoff wall) or **$43.7** (with element VIIe sheet pile cutoff wall)	**$56.7** (with element IVc seepage berm with chimney drain/toe drain and element VIIe slurry cutoff wall) or **$62.9** (with element IVc setback levee and element VIIe sheet pile cutoff wall)

Source: Guenther, pers. comm., 2011; Mueller, pers. comm., 2016; Guenther, pers. comm., 2019

Figure 2-8a. Requester's Preferred Alternative—Levee Elements in Reaches I–II

Source: Ascent Environmental, Inc., 2019

Figure 2-8b.   Requester's Preferred Alternative—Levee Elements in Reaches III–VI

Source: Ascent Environmental, Inc., 2019

Figure 2-8c. Requester's Preferred Alternative—Levee Elements in Reach VII

Source: Ascent Environmental, Inc., 2019

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The following specific repairs were completed as part of the 2017 Emergency Response Construction Project and the 2019 Categorical Permissions Construction Project:

- **2017 Emergency Flood Response Construction Project.** On February 14, 2017, the RD 17 Board of Trustees issued a Declaration of Emergency in response to a severe flood threat related to a historical snowpack, encroached upstream reservoirs, king tides, and ongoing forecasts of atmospheric river–fed storm systems. The 2017 Emergency Flood Response Construction Project was quickly initialized upon the declaration, and construction using predeployed materials began on seven Phase 3 Repair Project elements: IIIb, Va, VIa.1, VIc, VId, VIe, and VIIb.

  On March 14, 2017, as RD 17 continued flood fight efforts to mitigate seepage, boils, and erosion, a continued Declaration of Emergency was adopted. The declaration included the addition of four more Phase 3 Repair Project elements to the ongoing emergency project: Ia, Ib, Ie, and IVa. The emergency project carried through the summer alongside the extended high water levels of the San Joaquin River and was concluded in October 2017.

  The emergency project involved the construction of seepage berms and raised landside grades. These activities are consistent with flood risk reduction features identified as the preferred repair for each of the identified elements with the exception of two elements: the conjoined elements Va–VIa.1. The preferred repair is a cutoff wall for conjoined elements Va–VIa.1. Construction of seepage berms at elements Va–VIa.1 is addressed under Alternative 2—Maximum Footprint Alternative. RD 17 is still proposing to construct the cutoff wall at conjoined elements Va–VIa.1 as part of the Requester's Preferred Alternative (see "Requester's Preferred Alternative" section in Section 2.4.2).

- **2019 Categorical Permission Construction Project.** On January 14, 2019, USACE established a categorical permission (CP) for federally authorized civil works projects (Federal projects) within the boundaries of the South Pacific Division, Sacramento District, to expedite and streamline the review and decisions of Section 408 requests that are similar in nature and have similar effects. For an alteration to be approved under the CP, the proposed design, construction, or replacement must meet one or more of the predetermined alteration descriptions, have no disqualifying circumstances, and adhere to applicable standard engineering and environmental conditions. The types of alteration requests that qualify under the CP are listed in **Table 2-3**.

  The alterations described in the CP can be stacked. That is, a single proposed project can combine multiple categories of alterations (for example, a utility pole, a fence, and a maintenance shed) and still fit under the CP. Each individual alteration type contained within the overall project must adhere to the size limitations for that specific type of alteration, and the total area associated with the overall project must not exceed the largest alteration size limit.

  To address the potential environmental effects of implementing the CP, as required under NEPA, USACE prepared a Programmatic Environmental Assessment and adopted a Finding of No Significant Impact on January 14, 2019.

  In August 2019, RD 17 submitted a request for a CP to construct the preferred flood risk reduction features at elements Ib, Ie, IIIa, IIIb, IVa, VIIb, and VIIg. A CP for this work was issued in September 2019. Construction of these features was initiated in October 2019, and would be completed by spring 2020.

Table 2-3. Categorical Permission Alteration Types

Type	Alteration
1	Agriculture and Landscaping
2	Borings, Levee Explorations and Instrumentation
3	Borrow Areas
4	Bridges
5	Buildings and Structures
6	Ditches and Canals
7	Docks
8	Environmental Restoration
9	Erosion Control
10	Fences, Gates, and Signage
11	Fiber Optic and Dry Utility Pipes
12	Fish Screens
13	Gravity Pipes
14	Horizontal Directional Drilling (HDD)
15	Landside Pump Stations
16	Pressurized Pipes
17	Research and Monitoring
18	Retaining Walls
19	Seepage and Stability Berms
20	Stairs and Handrails
21	Swimming Pools
22	Trails, Roads, and Ramps
23	Utility Poles
24	Water Supply Pump Stations
25	Wells

The CP Construction Project involved the construction of several cutoff walls, the setback levee in element IVc, and seepage berm and chimney drains. These activities are consistent with flood risk reduction features identified as the preferred repair for each of the identified elements.

2.4 Alternatives Evaluated in This FEIS

This FEIS evaluates the NEPA-required No-Action Alternative, Alternative 1—Minimum Footprint Alternative, Alternative 2—Maximum Footprint Alternative, and the Requester's Preferred Alternative, which are described in detail below, at an equal level of detail. The Requester's Preferred Alternative includes only the Phase 3 Repair Project preferred repairs that remain to be constructed (**Figures 2-9a through 2-9c**). It does not include any Phase 3 Repair Project work previously completed as part of the 2017 Emergency Flood Response Construction Project or the 2019 CP Construction Project. The effects of the 2017 Emergency Flood Response Project and 2019 CP Construction Project are addressed as past actions from a cumulative perspective in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements."

Figure 2-9a. Phase 3 Repair Project Action Alternatives—Levee Elements in Reaches I–II

Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010, adapted by AECOM in 2014

Figure 2-9b. Phase 3 Repair Project Action Alternatives—Levee Elements in Reaches III–VI

Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010, adapted by AECOM in 2014

Figure 2-9c. Phase 3 Repair Project Action Alternatives—Levee Elements in Reaches VI–VII

Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010, adapted by AECOM in 2014

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2.4.1 No-Action Alternative

For NEPA compliance, the No-Action Alternative serves as the baseline against which the effects and benefits of the action alternatives are evaluated. The No-Action Alternative consists of the conditions that would be reasonably expected to occur in the foreseeable future if no additional permissions and permits are granted to RD 17 by USACE or by the state to alter the existing levees or discharge dredged or fill material into waters of the United States.

Under the No-Action Alternative, USACE would not grant permission or permits under Section 408 or 404 to allow implementation of the remaining repairs under the Phase 3 Repair Project. Operations and maintenance (O&M) activities (e.g., all-weather road maintenance; vegetation control and eradication; repair of minor slip-outs and erosion; rodent control, abatement, and hole grouting; and regrading of levee slopes) would continue, and levee vegetation management would be undertaken in accordance with RD 17's existing practices (see "Management of Vegetation Encroachments" in Section 1.6.2, "Flood Problems and Needs").

Although the FEMA flood zone status may not change if the remaining repairs under the Phase 3 Repair Project are not constructed, the community rating for flood insurance would likely be lowered, and therefore the cost of flood insurance would likely increase (Nomellini, pers. comm., 2010). The decision to impose any moratorium on development, however, is the responsibility of local land use authorities. Without repairs, state floodplain regulations could force local land use authorities to make decisions that would prevent new development in Lathrop and parts of Manteca, Stockton, and unincorporated San Joaquin County that lie within the RD 17 area. Existing residential, commercial, and industrial development would continue to be concentrated in the portion of RD 17 that is within the incorporated boundaries of the cities of Lathrop, Manteca, and Stockton, occupying approximately 9,551 acres of the 19,600 acres protected by the RD 17 levee system. Approximately 13,000 acres of the 19,600 acres would likely remain in some form of agricultural, agricultural support, or open space use. Approximately 1,173 acres of the 19,600 acres encompass areas other than incorporated cities or uses other than agricultural or open space.[2] Floodplain restrictions in the area protected by the RD 17 levee system would interrupt the implementation of the regional blueprint for future (2050) growth, which was adopted by the San Joaquin Council of Governments in 2010.

The blueprint's future growth strategies that target growth in existing urban areas, with an emphasis on efficient design, land conservation, infill, and redevelopment (SJCOG 2010:3), would not be fully realized because dwelling units and associated commercial and industrial developments would need to be redirected to other areas in the region over the next four decades. Although Phase 1 and Phase 2 of the LSRP, and the Emergency Flood Response Construction Project and CP Construction Project provided seepage exit gradients of 0.5 at the water surface elevation associated with the 0.01 annual exceedance probability along some levee sections, without the additional actions under the Requester's Preferred Alternative, the RD 17 levee system would not meet applicable Federal and state design recommendations for levees protecting urban areas, and the urbanized portion of the area protected by the RD 17 levee system would continue to face elevated risks of structural and environmental damage resulting from flooding. Therefore, Phases 1 and 2 and the Emergency Flood Response and CP Construction Projects by themselves have not achieved the overall project purpose and need.

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2 Other areas include residential outside the incorporated boundaries of the cities of Lathrop, Manteca, and Stockton and other uses include commercial and industrial.

Because of the deficiencies that remain in the RD 17 levee system after implementation of the earlier phases of the RD 17 LSRP and the 2017 and 2019 construction projects, the risk of levee failure would remain at current levels for portions of the RD 17 levee system, potentially triggering widespread flooding and extensive damage to existing residential, commercial, agricultural, and industrial structures protected by these levees. Flooding also would be likely to cause extensive damage to utilities, roadways, and other infrastructure. In response, people, equipment, and supplies (e.g., sandbags, rock riprap, filter fabric) would be mobilized (i.e., transported by trucks or barges) for emergency flood-fighting activities. The magnitude of the flood damage and flood-fighting requirements would depend on the location of the levee breach, severity of the storm, and river flows at the time of the levee failure. Flood damage estimates prepared for RD 17 in 2009, based on a levee breach at a 17-foot water surface elevation, included costs associated with residential structural and content damage, residential cleanup costs, and emergency costs (including housing assistance and public assistance) within the boundaries of RD 17. These costs amounted to a replacement value in 2009 dollars of greater than $900 million ($984,093,632) (RD 17 2009b:4–15). For the purposes of this analysis, effects conclusions are based on anticipated potential effects in the event of a catastrophic levee failure. Large-scale inundation of the area within the boundaries of RD 17 during such an event could result in widespread damage to residential and commercial properties and loss of large swaths of cropland; destruction of a number of prehistoric sites; substantial damage to recreational facilities, as well as the street infrastructure along a substantial number of collectors and local streets, including freeway on- and off-ramps; extensive interruption of utilities and public services; widespread release of contaminants (i.e., oil, gasoline, agricultural pesticides, and other hazardous materials) into waterways; extensive degradation of terrestrial and aquatic habitat; and the additional indirect effects resulting from the large-scale cleanup and repair-related construction activities to repair damaged homes, utility infrastructure, roads, and highways.

2.4.2 Action Alternatives

Alternative 1: Minimum Footprint Alternative

Alternative 1, the Minimum Footprint Alternative, addresses under seepage and through seepage along approximately 7 miles of the RD 17 levee system, including portions of the San Joaquin River east levee and portions of the levee along the north bank of Walthall Slough (see **Figure 1-3**).

This alternative would include repairs to the 19 levee elements (see **Table 2-1 and Figures 2-8a through 2-8c**) and would affect a total of approximately 82 acres. Alternative 1 would use the seepage remediation options with the minimum footprint at the eight elements (IIab, IVc, Va–VIa.1, and IVcde) where the methods for reducing flood damage risk would differ from those proposed for use in Alternative 2. Alternative 1 would include construction of seepage berms or fill, some with and some without chimney drains, along the landside of 11 levee elements; installation of chimney or blanket drains in existing seepage berms at two levee elements, construction of cutoff walls through the levee prism at four elements using the DSM method, and construction of cutoff walls through the levee prism at two elements using the open-trench method.

Components for Reducing Flood Damage Risk

Table 2-4 briefly summarizes the activities proposed for each of the 19 Phase 3 Repair Project elements under Alternative 1, as well as information on the existing use. Levee work under Alternative 1 would include the following components:

- **Seepage Berms:** Total linear footage of new seepage berms would be approximately 3,905 feet. Seepage berm width would range from 60 to more than 120 feet from the landside toe of the existing levee (see **Figure 2-2**). The seepage berms would be approximately 5–8 feet thick at the toe of the existing levee and gradually would slope downward to about 5 feet thick at the landside edge, with a 3:1 (4:1 in urban areas) horizontal (H) to vertical (V) slope to ground level. A compacted-surface patrol road would be constructed near the outside edge of the seepage berm.

  Among the elements where new seepage berms would be installed (Ia, Ib, Ie, IIIb, IVa, VIa.4, VIcde, VIIb, and VIIg), the length, width, and surface area of the berm and amount of soil required to construct the berm would vary. Berms constructed along levee elements located adjacent to developed areas (VIa.4 and VIIg) also would include a toe drain system to safely collect and channel water to the local storm drain system (see **Figure 2-2**). Total linear footage of new toe drains would be approximately 455 feet.

- **Cutoff Walls:** Total linear footage of new slurry cutoff walls would be approximately 16,875 feet. Slurry cutoff walls would be a minimum of 2 feet wide and would be made of either soil bentonite or a soil-cement-bentonite mixture for the DSM method, or bentonite or cement-bentonite slurry for the open-trench method. Sheet pile cutoff walls would be steel and would feature connections allowing each sheet to interlock with the adjacent piles, to create a rigid barrier for seepage. The piles would be installed through the center of the existing levee crown as close to the waterside edge of the road as possible. Slurry cutoff walls would be installed through the center of the existing levee (see **Figures 2-4 and 2-5**).

  The top of deep cutoff walls would be 3 feet below the crown of the levee, and the top of the open-trench cutoff walls would be 5–8 feet below the crown of the levee. Cutoff walls would extend to 40–120 feet below the top of the levee, depending on the depth of the impermeable soil layers. For cutoff walls designed to block under seepage and through seepage, the intent would be to reach and embed the cutoff wall into an existing natural clay layer that would block the water flow vertically and would keep the water from flowing under the wall. For cutoff walls designed to block through seepage, the intent would be to construct a wall deep enough to alter the flow path of the seepage and thereby reduce landside effects to acceptable rates. Final depths would be confirmed during final engineering design and construction. Cutoff walls would be extended approximately 300 feet beyond the element boundary to provide the required overlap when seepage berms have been or are being installed along the landside of adjacent levee elements. Estimated linear extents of the proposed cutoff walls are identified in **Table 2-4**. Levee slopes where cutoff walls would be installed (elements IIab, IVc, Va–VIa.1, and VIIe) also would be modified to the extent practicable to achieve the required 3:1 slope. (Element VIIe has landside residences that may prevent the slope from being widened throughout.)

- **Chimney Drains:** All of the elements proposed for seepage berms, except elements Ia, VIa.4, and VIIg, also would require installation of a chimney drain (elements Ib, Ie, IIIb, IVa, and VIIb) to convey through seepage flows to the seepage berm at the landside base of the levee. Chimney drains also would be installed in the existing seepage berms in elements IIIa and VIb. The height of the proposed chimney drains would vary from 5 to 20 feet above the elevation of the landside levee toe. Total linear footage of new chimney drains would be approximately 8,430 feet, including approximately 5,500 feet in existing seepage berms.

Table 2-4. Summary of Major Activities Proposed for Each Element: Minimum Footprint Alternative (Alternative 1)

Element/ Type of Remediation	Proposed Activities
Ia and VIIg— under seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width, and construct seepage berms with lengths 590 feet (Ia) and 385 feet (VIIg) to meet required exit gradients. Maximum seepage berm width would be 65 feet.
Ib— under seepage and through seepage	Fill existing depression (freshwater marsh) to 300 feet from toe of existing levee and construct 125-foot-long seepage berm (maximum 60 feet wide) with chimney drain on top of fill to meet required exit gradients, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
Ie, IIIb, IVa, VIa.4, and VIIb— under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and construct seepage berms with lengths of 655 feet (Ie), 720 feet (IIIb), 525 feet (IVa), 70 feet (VIa.4), and 340 feet (VIIb), and chimney drains to meet required exit gradients. Maximum seepage berm widths would be 65 feet wide (Ie, IVa, and VIa.4), 70 feet wide (IIIb), and 125 feet wide (VIIb).
IIab and VIIe— under seepage and through seepage	Install cutoff walls with lengths of 2,470 feet (IIab) and 2,500 feet (VIIe) to meet required exit gradients. Cutoff walls would be constructed using either the open-trench method (for walls 40–60 feet deep) or the DSM method (for walls 60–120 feet deep). The open-trench method would involve degrading the top one-third to one-half of the levee crown and would begin with 1:1 cut at waterside crown. The DSM method would be used for deeper walls. Levee fill material would be placed along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Repair Project. As alternative to cutoff wall at element VIIe, drive 40-foot-deep steel sheet piles through the center of levee crown as close to waterside edge of road as possible. Sheet piles would include cathodic protection with sacrificial anodes located within rights-of-way or easements owned by RD 17.
IVc and Va–VIa.1— under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width, and install cutoff walls with lengths of 2,405 feet (IVc) and 9,500 feet (Va and VIa.1) to meet required exit gradients. Cutoff walls would be constructed using the DSM method (60–120 feet deep). Maximum seepage berm width would be 75 feet wide (IVc).
IIIa and VIb— through seepage	Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths and install chimney drains in existing 3,700-foot-long (IIIa) and 1,800-foot-long (VIb) seepage berms to meet required exit gradients.
VIcde— under seepage and through seepage	Remove existing parking lot pavement; place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width; construct 490-foot-long seepage berm (maximum 85 feet wide) with chimney drain; and install new paved parking lot on top of the new berm.

Note: DSM = deep soil mixing.
Source: Data provided by Kjeldsen, Sinnock & Neudeck in 2010

The following additional activities also would occur under Alternative 1:

- **Levee Geometry Corrections:** Phase 3 Repair Project elements currently do not meet requirements for levee geometry (i.e., slopes, crown width). To correct levee geometry, levee fill material would be placed along the landside of existing levee slopes where needed to provide the minimum 3:1 slope and 20-foot-wide levee crown. All elements would undergo some level of levee geometry corrections.

- **O&M Access and Utility Corridors:** A 20-foot-wide permanent O&M access corridor[3] would be established adjacent to the landside toe of seepage berms and levees (if not already present for levees) (see **Figures 2-1 through 2-3, 2-6, and 2-7**); any relocated power poles and other utility infrastructure serving the adjacent properties would be located outside this easement.

- **Temporary Construction Easements:** Where needed, a 20-foot-wide temporary construction easement and construction turnaround areas (up to 80 feet in diameter) would be included adjacent to the inland side of the permanent O&M access corridor to provide access to the site during construction. These features would be removed and sites returned to preproject conditions at the end of construction.

- **Stormwater Management:** Drainage swales would be constructed around the outside of levee repairs where needed, and other stormwater best management practices would be implemented to manage stormwater runoff during and after construction. These swales would not affect woody habitat and would be located so that they would not drain wetlands or other waters of the United States.

- **Landside Vegetation Removal:** Landside vegetation within the footprint of the proposed levee work, including maintenance roadway corridors and temporary access easements, would be cleared to prepare for levee improvement work.

- **Right-of-Way Acquisition:** Lands would be acquired within the Phase 3 Repair Project footprint as needed to accommodate levee repairs and establish the minimum 20-foot-wide O&M access corridor at the landside toes of all the improved levees to prevent encroachment. Under Alternative 1, land acquisition adjacent to elements Ia, Ie, IVa.4, VIcde, VIIb, and VIIg is proposed, totaling approximately 37 acres.

  Privately owned lands would be acquired in fee preferably but may be taken as easements if needed. Where the project footprint overlies land owned and managed by other agencies (i.e., City of Lathrop, San Joaquin County, Union Pacific Railroad), either acquiring the land in fee or obtaining and securing easements would be required.

  Real property acquisition and any relocation services if needed (although no relocations are anticipated) would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 USC 4601 et seq.) and implementing regulation, Title 49 of CFR Part 24, and California Government Code Section 7267 et seq. Refer to Section 3.3.1, "Regulatory Setting," in Section 3.3, "Land Use, Socioeconomics, and Population and Housing," for more details regarding these regulations.

- **Encroachment Management:** Several features, including power poles, vegetation, and a variety of agriculture-related facilities (e.g., irrigation infrastructure, fences), are within the project footprint (**Table 2-5**). Utility infrastructure would be relocated as needed to accommodate the levee repairs, and any pipelines or other underground utility crossings would be relocated as needed. Other encroachments in the project area would be removed or relocated as required to meet the criteria of USACE, CVFPB, and FEMA.

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3 CVFPB would require that a 20-foot-wide access corridor be established. However, on a case-by-case basis, effects on woody vegetation within this corridor may be avoided in place. However, for the purposes of the analysis in this FEIS, it was assumed that any vegetation within the 20-foot-wide corridor would be removed.

- **Long-Term Vegetation Management:** Vegetation on the levees and within the access easements would be managed in accordance with current O&M practices to maintain access and visibility. These practices include mechanical trimming of existing trees and removal of large dead and downed trees annually, as described under "Management of Vegetation Encroachments" in Section 1.6.2, "Flood Problems and Needs"; regular summer and winter application of herbicides for weed control; and summer application of herbicides to control woody plants and berries.

- **Long-Term Operations and Maintenance Activities:** O&M activities would be conducted in accordance with existing practices. These activities include periodic all-weather road maintenance; vegetation control and eradication; repair of minor slip-outs and erosion; rodent control, abatement, and hole grouting; and regrading of levee slopes.

Table 2-5. Encroachments within the Minimum Footprint Alternative (Alternative 1)

Element	Encroachments
Ia	**Irrigation lines**, gas lines, drainage, irrigation pipe outfall, overhead high-voltage electric lines
Ib	**Vegetation**, drainage
Ie	**Steel irrigation pipe**, fence, power poles, drainage
IIab	Survey markers, overhead electric lines, **fence, pipe**
IIIa	None
IIIb	Vegetation
IVa	Overhead electric lines, fence, storm drain, drainage swales, reinforced concrete pipe culvert, gas line, irrigation line, underground electric line, sheet pilings, irrigation pump, service pole, vegetation, steel pipe associated with pump
IVc	**Elderberry bushes, chain-link fence, toe drains, concrete trail, wall**
Va–VIa.1	**Storm drain, abandoned power pole and wooden barricade, City of Lathrop pipe and air valve, fence and gate, pump, San Joaquin River outfall structure**
VIa.4	Gas line, overhead electric line, underground electric line, fence, **storm drain, irrigation line**
VIb	None
VIcde	Storm drain, haul routes, gas line, high-pressure gas main, streetlights, retaining wall, restroom facility, septic tank, irrigation water tank, leach field, air valves, fiber optic line, overhead electric line, irrigation line, pump station, **fence, pavement, vegetation, abandoned telephone pole and appurtenances**
VIIb	Gas line, overhead electric line, underground electric line, **riprap, drainage swale, irrigation line**
VIIe	Union Pacific Railroad, gate utility vault, storm drain control unit, storm drain outfall, overhead electric lines, fence, streetlight, sheet pile wall, water line, power pole, sidewalk, fence
VIIg	Gas line, overhead electric line, retaining wall, **vegetation**, underground electric line, irrigation line, **standpipe, steel pipe, service pole**

Note: Encroachments in **bold** to be removed/relocated.
Source: Data compiled by AECOM in 2014

Construction Schedule and Methods

Construction of this alternative would begin in late spring 2020 and be completed by December 2022, assuming receipt of all required environmental clearances, permits, and approvals for implementation. Some related activities, such as relocating power poles and removing other encroachments, may be conducted before levee work is begun.

The general levee construction window for this region is seasonal (July 1 through November 1) because of the timing when high-water levels have the potential to occur within the San Joaquin River system (November through June). However, depending on hydrologic conditions and subject to compliance with species work windows, a work window variance that allows an extension outside the July 1 through November 1 work period may be granted by the Central Valley Flood Protection Board (CVFPB). CVFPB may stipulate that RD 17 must comply with additional conditions and commitments as a component of any work window variance.

Approximately 489,310 cubic yards of imported material (i.e., soil, aggregate, cement) would be required to construct these levee repairs (**Table 2-6**). These materials would be hauled to the work sites from commercial sources up to 11 miles away. The average round-trip distance for truck hauls would be approximately 8 miles. Assuming the general levee construction window (July 1 through November 1), a 123-day construction season would include a minimum of 80 work days, haul trucks capable of carrying 13 and 18 cubic yards would be used, and about 226 trips per day would be required to transport this material.

Assuming a maximum of six construction crews on any given day, the peak number of construction workers per shift would be up to 185. For construction of slurry cutoff walls, work would occur in two 12-hour shifts. The construction sequence would include concurrent work on several different elements to meet the project schedule.

Table 2-6. Quantities of Imported Fill Required for the Minimum Footprint Alternative (Alternative 1)

Material Type	Quantity
Levee fill material	94,244 tons/47,122 cy
Seepage berm fill	685,927tons/342,963 cy
Drain rock	59,589 tons/83,901 cy
Filter material (3/8-inch sand)	16,059 tons/8,029 cy
Aggregate base	28,132 tons/14,066 cy
Asphalt concrete	93,599 tons/44,571 cy
Steel sheet piles (element VIIe only)	1,071 tons/100,000 sf
Total	**978,621 tons/489,310cy+100,000 sf**

Notes: cy = cubic yards; sf = square feet.
Source: Data provided by Mackay and Somps in 2019; data compiled by Ascent Environmental in 2019

A 24/7 construction schedule for cutoff walls would be required because of the relatively short seasonal levee construction window (July 1 through November 1). Personnel, equipment, and imported materials would be transported to the Phase 3 Repair Project levee using various surface roads connecting with Interstate 5 or State Route 120 (**Figure 2-10**). The primary corridors where construction activity would take place would be public roadways on and within 300 feet of the levees and existing unpaved roads used for access to the work areas and levee patrol roads atop the levee crown.

The sequence of construction activities would be as follows:

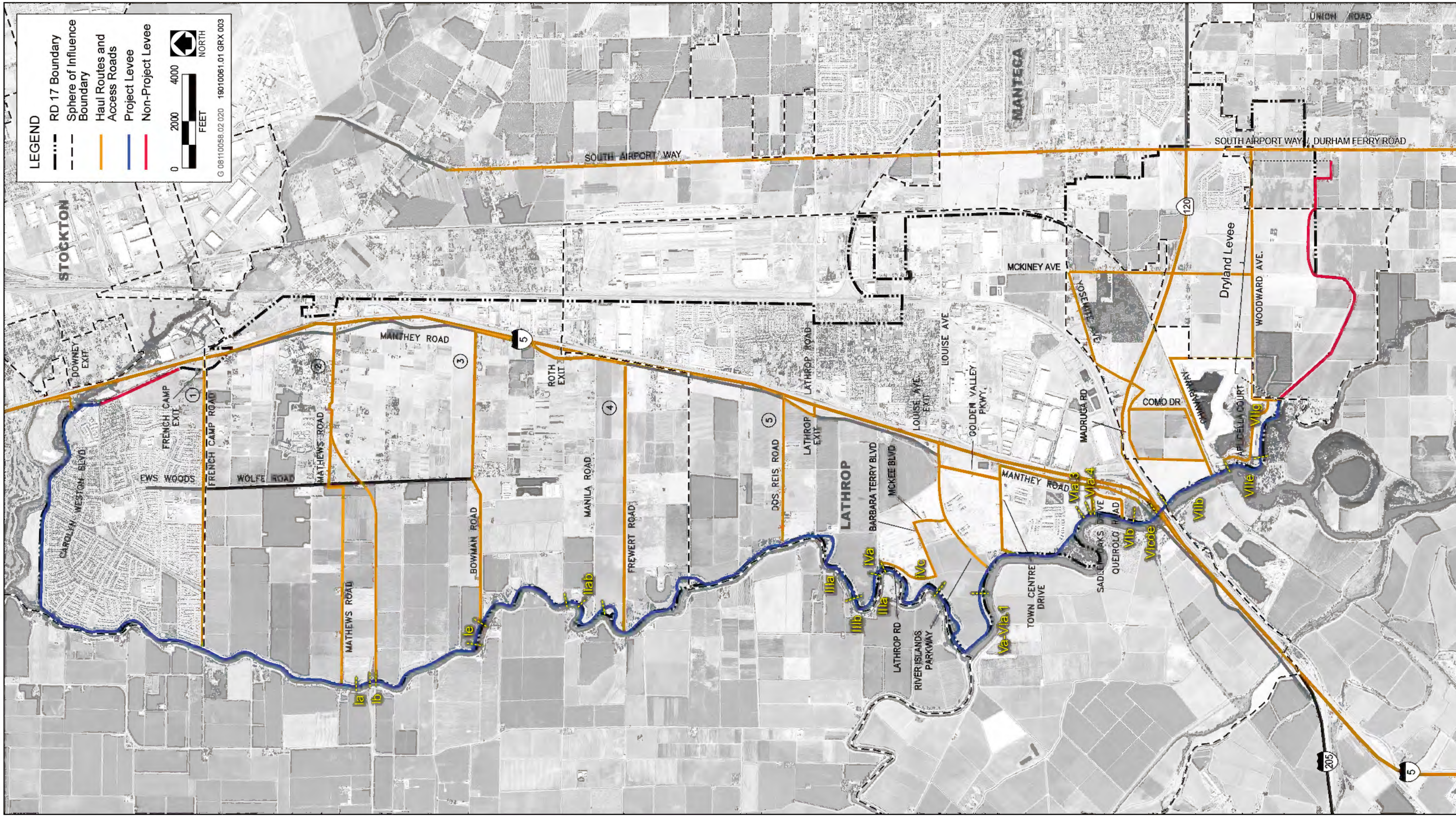
- **Relocation of Power Poles:** Power poles currently situated on the landside of the levee toe of some elements would be relocated to accommodate proposed seepage berms. To the extent feasible, power poles would be relocated beyond the toe of the new berm, outside the maintenance access easement. If placing poles on top of the new seepage berms is required, either raised foundations or steel-reinforced concrete piers would be constructed to prevent the poles from affecting the seepage berms. RD 17 would oversee relocation of the power poles in coordination with the appropriate utility and construction companies.

- **Site Preparation at Existing Levee Sites:** Site preparation (i.e., clearing, grubbing, and stripping) of the levee elements would begin by clearing structures (see discussion in next bulleted item) and woody vegetation from the footprint of the proposed levee work and the permanent O&M access and utility corridors. This operation would require removal of some trees and relocation or removal of some elderberry shrubs. Large trees would be felled approximately 3 feet above ground level, with stumps temporarily left in place. Where feasible, small trees and elderberry shrubs would be relocated. A minimal amount of belowground disturbance would occur. The clearing operation would be followed by grubbing operations to remove stumps, root balls, and any belowground infrastructure. The area would then be disked to chop surface vegetation and mix it with the near-surface organic soils. The disking operation would be followed by stripping the top 12 inches of earthen material from the landside slope of the existing levee and the footprint of proposed seepage berms. Excess earthen materials (i.e., organic soils, and excavated material that does not meet levee embankment criteria) would be temporarily stockpiled and then respread on the surface of the new levee slopes and seepage berms provided this material is not contaminated with vegetation. Any stripped material contaminated with vegetation and other debris generated during the clearing and grubbing operations would be hauled off-site to landfills.

- **Removal or Modification of Landside Structures and Other Facilities:** A few levee elements include agricultural facilities (e.g., fences, drainage infrastructure) or parking lots located within the footprint of the landside levee improvements. These facilities would be removed or relocated out of the project footprint before levee construction begins in those areas. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. Demolished concrete could be sent to a concrete recycling facility. If any wells or septic systems would be affected, they would be abandoned in accordance with the applicable state and county requirements.

- **Construction of Seepage Berms, Seepage Berms with Chimney Drains, and Chimney Drains within Existing Seepage Berms:** Fill material for levee improvements would be obtained from commercial sources and delivered to the levee construction sites using haul trucks. The material would then be spread by motor graders and compacted by sheep’s foot rollers to build new seepage berms and seepage berms with chimney drains. A water truck would be used to properly moisture-condition the soils for compaction. Installation of the chimney drains in existing seepage berms would also require the use of an excavator or scraper to remove the existing seepage berm fill material so that the chimney drain fill material could be tied into the drainage rock layer of the existing seepage berm.

Figure 2-10. Anticipated Haul Routes



Source: Data provided by Kjeldsen, Sinnock & Neudeck in 2010, adapted by AECOM in 2010

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- **Construction of Cutoff Walls:** Cutoff walls are anticipated to be constructed 24/7, with occasional shut downs for equipment maintenance when necessary. Lights and possibly power generators would be used during nighttime construction hours. Additional equipment and facilities would include slurry batch plants or slurry ponds to prepare bentonite or bentonite cement mix, pumps, and support vehicles. Four to five batch plants or slurry ponds would be required for the project and would be located near the site of cutoff wall construction. Each batch plant or slurry pond with associated pumps and support equipment would occupy an approximately 100-square-foot area that would be restored to preproject conditions following completion of cutoff wall construction. Cutoff walls may be installed concurrently in two or more different directions within an element. RD 17 proposes to use the DSM method for installing deep cutoff walls, which would avoid having to degrade the top of the levee, and conventional slurry trench walls (open-cut method) for shallow cutoff walls. RD 17 would also consider driving sheet piles using a drop impact hammer or other pile-driving technology in lieu of cutoff wall installation at element VIIe. Sheet piles at this location would require approximately 20 working days with 24/7 construction. The number of slurry cutoff wall rig setups would depend on the project schedule and contractor preference. Each DSM cutoff wall rig would move continuously along the proposed alignment to attain an uninterrupted cutoff wall and to reduce prolonged disturbance to residences near some cutoff wall segments. Each cutoff wall rig could move between 50 and 100 feet horizontally during a 12-hour work shift, and each conventional slurry trench rig could move between 75 and 200 feet horizontally during a 12-hour work shift. Disturbances to residences are expected to be minor because of the limited number of residences near the cutoff wall installation areas. However, where lights, noise, and/or vibration exceed allowable nighttime standards for the applicable local jurisdiction, work hours would be restricted to daytime work hours.

- **Traffic Control during Construction:** Traffic control and detours could be required in the immediate vicinity of some levee improvements. Examples of traffic-control measures include flaggers for one-way traffic control, use of advance construction signs and other public notices to alert drivers to activity in the area, and use of "positive guidance" detour signage on alternate access roads to reduce inconvenience to the driving public. Detours for through traffic are not likely to be required.

- **Site Restoration and Demobilization:** Upon completion of construction activities, previously stripped topsoil material not contaminated with vegetation would be placed on top of the completed seepage berms and any disturbed levee slopes. Any previously nonagricultural vegetated areas disturbed during construction would be hydroseeded. An aggregate-base patrol road would be constructed at the landside edge of any seepage berms. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to preproject conditions. Demobilization would likely occur in various locations as construction proceeds along various elements.

Table 2-7 summarizes the types of equipment that may be used throughout the construction sequence, along with a range of approximate durations for each activity. The duration of each activity would vary from element to element, depending on the length of the element.

Table 2-7. Anticipated Equipment Types and Duration of Use for Levee Repairs (i.e., Seepage Berms and Cutoff Walls) under Alternative 1

Construction Phase	Equipment Type and Number of Each Type	Estimated Duration (Work Days)
Site preparation (i.e., clearing, grubbing, stripping)	Scrapers (3) Front-end loaders (2) Crawler/tractors tree pusher(s) (2) Water trucks (1) Motor graders (1) Chippers/grinders (2) Haul trucks (6)	5 days
Removal of landside structures and other facilities	Excavators (1) Haul trucks (2) Front-end loaders (1)	5 days
Construction of seepage berms, seepage berms with chimney drains, and chimney drains in existing seepage berms	Compactor—sheep's foot roller (1) Loaders (2) Motor graders (2) Scrapers (2) Bulldozer (1) Water trucks (2) Excavators (1) Fuel maintenance truck (1) Double-bottom dump trucks (14 cubic yards) (10) Haul trucks (12 cubic yards) (2) Pickup trucks (2) Compactor—sheep's foot roller (1)	17 linear feet per day
Construction of cutoff walls (DSM or open-trench)	Loaders (2) Motor graders (1) Large drill rigs (five people each) (2) – DSM Only Long stick excavator (2) – Conventional Only Water trucks (2) Fuel maintenance/service truck (1) Supply truck (1) Double bottom dump trucks (14 cubic yards) (10) Pickup trucks (2) Haul trucks (12 cubic yards) (0) 300-kilowatt generators (2) Slurry pumps (2) Hydroseeding trucks (1)	72 linear feet per day (DSM) 150 linear feet per day (Conventional)
Installation of sheet piles (possibly in lieu of slurry cutoff wall at VIIe only)	Crane with 3 laborers (1) Pickup trucks (2) Grade All (1) 300-kilowatt generators (1) Impact diesel type drop hammer (1) or Vibratory Hammer (1) or hydraulic press installer (1) Backhoe (1) Fuel maintenance/service truck (1)	92 linear feet per day
Site restoration and demobilization	Water trucks (1) Haul trucks (2) Haul trucks (2)	3 days

Note: DSM = deep soil mixing.
Source: Data provided by Kjeldsen, Sinnock & Neudeck in 2010; data compiled by AECOM in 2010

Alternative 2: Maximum Footprint Alternative

Alternative 2 addresses under seepage and through seepage along the same approximately 7 miles of the RD 17 levee system as Alternative 1 but proposes levee improvement options with the greatest disturbance footprint at the eight elements (IIab, IVc, Va–VIa.1, and IVcde) where the methods for reducing flood damage risk would differ from those proposed for use in Alternative 1. Alternative 2 would use the same methods for reducing flood damage risk as Alternative 1 at the other 11 of the 19 elements (see **Figures 2-8a through 2-8c**). Up to approximately 176 acres would be affected under Alternative 2.

Components for Reducing Flood Damage Risk

Of the eight elements that would be addressed differently under Alternative 2 from those of Alternative 1, RD 17 is considering constructing a seepage berm with a toe drain at elements Va–VIa.1 and setback levees at elements IIab and VIcde. At element IVc, RD 17 may construct either a seepage berm with a chimney drain or a setback levee. Seepage berms also would be constructed along the landside toe of any setback levees to address seepage issues. **Table 2-8** summarizes the activities proposed at each project element, as well as shows the existing use. Levee work under Alternative 2 would include the following components:

- **Seepage Berms:** Seepage berm dimensions would be similar to those described for Alternative 1. The length, width, and surface area of the berm and amount of soil required to construct the berm in the elements proposed for a seepage berm would vary, and some berms also would include a toe drain. Details are shown in **Table 2-8**. Total linear footage of new toe drains would be approximately 9,255 feet.

- **Cutoff Walls:** Only one cutoff wall is proposed under this alternative (element VIIe), and the same methods, materials, and 24/7 construction process as described for cutoff walls proposed under Alternative 1 would be used to construct this cutoff wall. As in the case of the cutoff wall for element VIIe under Alternative 1, the final depth for the cutoff wall would be confirmed during engineering design and construction, and the estimated linear extent of this proposed cutoff wall would be the same as previously indicated (2,500 feet). Soil from degradation of the levee would be stockpiled on adjacent RD 17 property and may be used for rebuilding the levee after completion of cutoff wall construction. Also, as is the case under Alternative 1, RD 17 may opt to install steel sheet piles in lieu of a slurry cutoff wall at element VIIe. These would be installed as described for Alternative 1.

- **Chimney Drains:** As under Alternative 1, all of the elements proposed for seepage berms under Alternative 2, except elements Ia, VIa.4, and VIIg, also would require installation of a chimney drain (elements Ib, Ie, IIIb, IVa, IVc, and VIIb) to convey through seepage flows to the seepage berm at the landside base of the levee. The height of the proposed chimney drains would vary in the same way described for Alternative 1. In addition, chimney drains would be installed in the existing seepage berms in elements IIIa and VIb as under Alternative 1.

- **Setback Levees:** As stated above, Alternative 2 includes up to three setback levees (elements IIab, IVc, and VIcde). Setback levees are newly constructed levee segments landside of the existing levee. The setback levee ties into the existing levee, and the segment of the existing levee replaced by the setback levee is typically breached or removed entirely. Construction of setback levees proposed under Alternative 2 are described in more detail below under the heading "Construction Schedule and Methods."

Table 2-8. Summary of Major Activities Proposed for Each Element: Maximum Footprint Alternative (Alternative 2)

Element/ Type of Remediation	Proposed Activities
Ia and VIIg— under seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width, and construct seepage berms with lengths of 590 feet (Ia) and 385 feet (VIIg) to meet required exit gradients. Minimum seepage berm width would be 65 feet.
Ib— under seepage and through seepage	Fill existing depression (freshwater marsh) to 300 feet from toe of existing levee and construct 125-foot-long seepage berm (minimum 60 feet wide) with chimney drain on top of fill to meet required exit gradients; place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
Ie, IIIb, IVa, VIa.4, and VIIb— under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and construct seepage berms with lengths of 655 feet (Ie), 720 feet (IIIb), 525 feet (IVa), 70 feet (VIa.4), and 340 feet (VIIb), and chimney drains to meet required exit gradients. Minimum seepage berm widths would vary (65–75 feet) depending on the element.
IIab— under seepage and through seepage	**Construct 2,188-foot-long setback levee with landside seepage berm. Seepage berm would be minimum 65 feet wide or four times levee height, whichever would be wider.**
IIIa through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and install chimney drain in existing 3,700-foot-long seepage berm to meet required exit gradient.
IVc— under seepage and through seepage	**Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and construct 2,500-foot-long seepage berm (minimum 75 feet wide) with chimney drain to meet required exit gradient; or construct 1,239-foot-long setback levee with seepage berm along landside toe of setback levee. Seepage berm would be minimum 65 feet wide or four times levee height, whichever would be wider.**
Va–VIa.1— under seepage and through seepage	**Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and construct 8,800-foot-long seepage berm with chimney drain to meet required exit gradient. Seepage berm width would vary along length of berm (80–400 feet wide) because of oxbow in river at this location and would result in peninsula-shaped landform behind levee.**
VIb— through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and install blanket drain in existing 1,800-foot-long seepage berm to meet required exit gradient.
VIcde— under seepage and through seepage	**Construct 1,016-foot-long setback levee with seepage berm landward of existing levee on north and south side of UPRR facilities and tie into UPRR and Manthey Road abutment.**
VIIe— under seepage and through seepage	Install cutoff wall with length of 2,500 feet to meet required exit gradients. Cutoff walls would be constructed using the open-trench method (for walls 40–60 feet deep). Shallow cutoff wall would involve degrading the top one-third to one-half of the levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the project. As alternative to cutoff wall, drive 40-foot-deep steel sheet piles through the center of levee crown as close to waterside edge of road as possible. Sheet piles would include cathodic protection with sacrificial anodes within RD 17 rights-of-way or easements.

Notes: DSM = deep soil mixing; UPRR = Union Pacific Railroad.
Text in **bold** denotes activities that would differ from Alternative 1.
Source: Data provided by Kjeldsen, Sinnock & Neudeck in 2010

Additional activities that would occur under Alternative 2 would generally be the same as previously described for Alternative 1. Any differences would be as follows:

- **Right-of-Way Acquisition:** Under Alternative 2, land acquisition is proposed adjacent to elements IVc, Va, VIa.1, VIa.4, VIcde, VIIb, and VIIg, totaling approximately 160 acres.

- **Encroachment Management:** Features including power poles discussed previously, vegetation, and a variety of agriculture-related facilities (e.g., irrigation infrastructure, fences) are within the footprint of Alternative 2 (**Table 2-9**). Utility and agricultural infrastructure would be relocated as needed to accommodate the levee repairs, and any pipelines or other underground utility crossings would be replaced as needed. Other encroachments in the Phase 3 Repair Project area would be removed or relocated as required to meet the criteria of USACE, CVFPB, and FEMA.

Table 2-9. Encroachments within the Maximum Footprint Alternative (Alternative 2)

Element	Encroachments
Ia	**Irrigation lines,** gas lines, drainage, irrigation pipe outfall, overhead high-voltage electric lines
Ib	**Tree removal**
Ie	**Steel irrigation pipe,** fence
IIab	Lake, **fence, electric power line (to be removed by Pacific Gas and Electric Company), storm drain irrigation lines, residence, standpipe, trees, horse corral**
IIIa	None
IIIb	Vegetation
IVa	Overhead electric lines, fence, storm drain, drainage swales, reinforced concrete pipe culvert, gas line, irrigation line, underground electric line, **sheet pilings, irrigation pump, service pole, underground electric line, tree removal, steel pipe associated with pump, storm drain**
IVc	**Trail, tree**
Va–VIa.1	**Steel irrigation pipe, storm drain, pavement access ramp, house and utility connections, abandoned power pole and wooden barricade, abandoned City of Lathrop separated grade crossing of Towne Center Drive,** fence, transformer, electrical control box, City of Lathrop pump station
VIa.4	Gas line, overhead electric line, underground electric line, fence, irrigation line, **storm drain, irrigation pipeline**
VIb	**Tree removal**
VIcde	Utility pipes, parking lot, Union Pacific Railroad
VIIb	Gas line, overhead electric line, underground electric line, **riprap, drainage swale, irrigation line**
VIIe	Union Pacific Railroad, gate utility vault, storm drain control unit, storm drain outfall, overhead electric lines, fence, streetlight, sheet pile wall, water line, power pole, sidewalk, fence
VIIg	Gas line, overhead electric line, retaining wall, tree removal, underground electric line, irrigation line, **standpipe, steel pipe, service pole**

Note: Encroachments in **bold** to be removed/relocated.

Source: Data compiled by AECOM in 2010

Construction Schedule and Methods

Construction of Alternative 2 would occur on the same general schedule and include a potential work window variance with conditions and commitments as described previously for Alternative 1.

Approximately 821,325 cubic yards of imported material (i.e., soil, aggregate, cement) would be required to construct the levee repairs proposed under Alternative 2 (**Table 2-10**). As in the case of Alternative 1, the materials would be hauled to the work sites from commercial sources up to 11 miles away, with an average round-trip distance for truck hauls of approximately 8 miles. The assumed construction season would be the same as for Alternative 1, (123 days) and would be based on the same haul truck capacity as for Alternative 1. About 318 trips per day would be required to transport the material necessary for levee repairs proposed under Alternative 2. Crew size, shifts, and concurrent construction activities would be the same as described for Alternative 1.

Table 2-10. Quantities of Imported Fill Required for Maximum Footprint Alternative (Alternative 2)

Material Type	Quantity
Seepage berm and levee fill	1,057,778 tons/528,889 cy
Drain rock	437,817 tons/218,908 cy
Filter material (3/8-inch sand)	122,397 tons/61,198 cy
Aggregate base	23,587 tons/11,793 cy
Asphalt concrete	0 sf/0 cy
Steel sheet piles (element VIIe only)	1,071 tons/100,000 sf
Total	**1,642,650 tons/821,325 cy + 100,000 sf**

Notes: cy = cubic yard; sf = square feet.
Source: Data provided by MacKay and Somps in 2019; data compiled by Ascent Environmental in 2019

Personnel, equipment, and imported materials would be transported to the Phase 3 Repair Project levee using the same surface roads connecting with Interstate 5 or State Route 120 as described under Alternative 1 (see **Figure 2-10**). The primary corridors where construction activity would take place would be public roadways on and within 300 feet of the levees, existing unpaved roads used for access to the work areas, and levee patrol roads atop the levee crown. The sequence of activities and the types of equipment used for construction of repairs proposed under Alternative 2 would be the same as for Alternative 1, except where setback levees are proposed. Alternative 1 would not include any setback levees, whereas construction of a setback levee in up to three locations is proposed under Alternative 2. The site preparation activities for the setback levee sites are described below, and **Table 2-11** summarizes the types of equipment that may be used for this activity. Equipment used for other types of levee work (e.g., seepage berms, cutoff walls) would be the same as described for Alternative 1 in **Table 2-7**.

- **Site Preparation at Setback Levee Sites:** Site preparation (i.e., clearing, grubbing, and stripping) at the setback levee sites would begin by clearing structures (see discussion below) and woody vegetation from the footprint of the proposed levee work and the permanent O&M access and utility corridors. The clearing operation would be followed by grubbing operations to remove stumps, root balls, and belowground infrastructure. The area would then be disked to chop surface vegetation and mix it with near-surface organic soils. The disking operation would be followed by stripping the top 12 inches of earthen material from the footprint of the proposed setback levee and seepage berm. Excess earthen materials (i.e., organic soils and grass and excavated material that does not meet levee embankment criteria) and debris generated during the clearing and grubbing operations would be hauled off-site to landfills.

- **Removal or Modification of Landside Structures and Other Facilities:** A few elements would include agricultural structures (e.g., fences, drainage infrastructure) or parking lots located within the footprint of the levee work. These structures, and the facilities supporting them, would be removed or relocated outside the project footprint before the start of levee construction in those areas. In addition, one residence, which is located within the footprint of the proposed setback levee at elements IIab, would be removed, and its residents would be relocated. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. Demolished concrete could be sent to a concrete recycling facility. If any wells or septic systems would be affected, they would be abandoned in accordance with the applicable state and county requirements.

- **Construction of Setback Levees with Seepage Berms:** Construction of the setback levee embankment would begin as soon as sufficient lengths of levee foundation are prepared and weather conditions allow. Foundation preparation would include construction of a levee keyway excavated 3 to 5 feet deep across the entire proposed setback levee footprint. A smaller but deeper excavated inspection trench, centered beneath the new waterside hinge point of the setback levee, then would be constructed beneath a small portion of the keyway to meet DWR standards. After the foundation layers are backfilled with engineered soil, a geotechnical geogrid fabric then would be installed at ground level across the entire setback levee footprint. A second layer of geogrid fabric would be placed at midheight of the new levee fill section to further reduce the potential for postconstruction settlement of the new levee. The embankment would be constructed as an engineered fill, with the fill placed in 3-foot maximum lifts by motor graders. Each lift would be moisture-conditioned using water trucks and would be compacted to the specified density using a suitable compactor, such as a sheep's foot, tamping foot, or rubber-tired roller. Quarry stone riprap would be applied next to armor the newly completed setback levee's waterside slope to provide protection against erosion. A seepage berm then would be constructed on the landside of the setback levee. Fill material for setback levee and seepage berm construction would be obtained from commercial sources and would be delivered to the levee construction sites using haul trucks.

- **Setback Levee Site Restoration and Demobilization:** After completion of construction activities, the previously stripped topsoil material would be placed on top of the completed setback levee and associated seepage berms, and levee slopes and the tops of the seepage berms would be hydroseeded. An aggregate-base patrol road would be constructed at the landside edge of the seepage berm, the landside edge of setback levees, and on the new setback levee crown. The existing levee would be fully restored at the tie-in points to the new setback levee. The existing levee crown patrol road would be redressed with aggregate base to restore it to preconstruction levels, and any disturbed riprap also would be supplemented to provide a uniform layer across the connection point with the new setback levee. Immediately after final construction, setback levee fill slopes would be covered with erosion control material until application of the hydroseed. Any construction debris would be hauled to an appropriate off-site waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to preproject conditions. Demobilization would be likely to occur in various locations as construction proceeds along various elements.

- **Removal of Existing Levee at Setback Levee Elements, Site Restoration, and Demobilization:** After completion of the new setback levee and seepage berm, the existing outboard levee then could be degraded entirely (IIab: 2,490 linear feet, VIc: 2,105 linear feet; VIcde: 490 linear feet) or in sections, and the footprint of the degraded levee would be hydroseeded. This work would be completed after flood season, April through November, primarily using scrapers, excavators, and bulldozers to remove the entire levee section and all present levee encroachments.

- **Existing Levee Site Restoration and Demobilization:** Following removal of the existing levee, the newly expanded floodway would be graded as necessary to allow the site to fully drain after a high-water event so that no fish entrapment would occur. For purposes of this analysis, the entire setback area presumably would be graded. Final construction demobilization would occur at this stage.

Table 2-11. Anticipated Equipment Types and Duration of Use for Construction of Setback Levees under Alternative 2[1]

Construction Phase	Equipment Type and Number of Each Type	Estimated Duration (Work Days)
Site preparation at setback levee sites (i.e., tree removal, clearing, grubbing, stripping)	Scrapers (2–3)	5 days
Removal or modification of landside structures and other facilities	Front-end loaders (2)	5 days
Construction of setback levees with seepage berms	Crawler/tractors (tree pushers) (2) Haul trucks (30)	7 linear feet per day 18 days
Setback levee site restoration and demobilization	Water trucks (1)	3 days
Removal of existing levee at setback levee elements	Motor graders (1)	100 linear feet per day 45 days
Existing levee site restoration and demobilization	Chippers/grinders (2)	3 days

Note:

1 Equipment used for other types of levee work (e.g., seepage berms, cutoff walls, chimney drains) under the Maximum Footprint Alternative (Alternative 2) would be the same as described for Alternative 1 in **Table 2-7**.

Source: Data provided by Kjeldsen, Sinnock & Neudeck in 2010

Requester's Preferred Alternative

Components for Reducing Flood Damage Risk

Following receipt of comments on the September 2011 DEIS/DEIR, RD 17 identified the preferred repairs for each of the 19 elements of the Phase 3 Repair Project (see **Figures 2-8a through 2-8c**). However, with completion of the 2017 Emergency Flood Response Construction Project and the 2019 CP Construction Project, construction of the preferred repairs was completed at eight of the 19 Phase 3 Repair Project elements. The Requester's Preferred Alternative would include the preferred repairs at the remaining 11 elements not previously constructed as part of the 2017 Emergency Flood Response Construction Project and the 2019 CP Construction Project and affect a total of approximately 60 acres along approximately 5 miles of RD 17 levees (see **Figures 2-9a through 2-9c**). **Table 2-12** summarizes the Requester's Preferred Alternative and provides a comparison to all the features that make up the preferred repairs for the 19 Phase 3 Repair Project elements, and the features constructed during the 2017 Emergency Response Construction Project and the 2019 CP Construction Project.

Table 2-12. Comparison of the Requester's Preferred Alternative with RD 17 Phase 3 Repair Project Features Completed in 2017 under the Emergency Declaration and Those Completed in 2019 under the Categorical Permission

Element	Type of Remediation	Phase 3 Repair Project Major Features of Preferred Repairs	Phase 3 Repair Project Features Constructed as Part of the 2017 Emergency Project	Phase 3 Repair Project Features Constructed as Part of the 2019 Categorical Permission Project	Phase 3 Repair Project Features Remaining To Be Constructed—Requester's Preferred Alternative
Ia	Under seepage and through seepage	Construct approximately 590 feet of seepage berm (approximately 110 feet wide) and approximately 590 feet of chimney drain to meet required exit gradients. Construct PG&E high-voltage tower footing raisings. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 350 feet of seepage berm (approximately 110 feet wide) to meet required exit gradients.	*None.*	Construct approximately 240 feet of seepage berm (approximately 110 feet wide) and approximately 590 feet of chimney drain to meet required exit gradients. Construct PG&E high-voltage tower footing raisings. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
Ib	Under seepage and through seepage	Fill existing depression to approximately 300 feet from toe of existing levee. Construct approximately 130 feet of seepage berm (approximately 80 feet wide) and approximately 130 feet of chimney drain on top of fill to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Filled existing depression to approximately 300 feet from toe of existing levee. Constructed approximately 130 feet of seepage berm on top of fill to meet required exit gradients. The constructed seepage berm width is approximately 80 feet.	Constructed approximately 130 feet of chimney drain in existing seepage berm to meet required exit gradients. Placed levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	*None.*
Ie	Under seepage and through seepage	Construct approximately 655 feet of seepage berm (approximately 70 feet wide) and approximately 655 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width. Relocate power poles.	Constructed approximately 655 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 70 feet.	Constructed approximately 655 feet of chimney drain in existing seepage berm to meet required exit gradients. Placed levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width. Relocated power poles.	*None.*

Table 2-12. Comparison of the Requester's Preferred Alternative with RD 17 Phase 3 Repair Project Features Completed in 2017 under the Emergency Declaration and Those Completed in 2019 under the Categorical Permission

Element	Type of Remediation	Phase 3 Repair Project Major Features of Preferred Repairs	Phase 3 Repair Project Features Constructed as Part of the 2017 Emergency Project	Phase 3 Repair Project Features Constructed as Part of the 2019 Categorical Permission Project	Phase 3 Repair Project Features Remaining To Be Constructed—Requester's Preferred Alternative
IIab	Under seepage and through seepage	Construct approximately 2,600 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 40 to 60 feet. Cutoff wall would involve degrading top one-third to one-half of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.	*None.*	*None.*	Construct approximately 2,600 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 40 to 60 feet. Cutoff wall would involve degrading top one-third to one-half of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.
IIIa	through seepage	Construct approximately 4,750 feet of chimney drain in existing seepage berm to meet required exit gradients. Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths.	*None*	Constructed approximately 4,750 feet of chimney drain in existing seepage berm to meet required exit gradients. Placed levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths.	*None.*
IIIb	Under seepage and through seepage	Construct approximately 720 feet of seepage berm (approximately 90 feet wide) and approximately 720 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 720 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 90 feet.	Constructed approximately 720 feet of chimney drain in existing seepage berm to meet required exit gradients. Placed levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	*None.*
IVa	Under seepage and through seepage	Construct approximately 525 feet of seepage berm (approximately 90 feet wide) and approximately 525 feet of chimney drain to meet required	Constructed approximately 450 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 90 feet.	Constructed approximately 450 feet of chimney drain in existing seepage berm to meet required exit gradients. Placed levee fill material along landside of	Fill in existing drainage sump, relocate existing power pole and pump station, and construct remaining 75 feet of seepage berm and chimney drain.

Table 2-12. Comparison of the Requester's Preferred Alternative with RD 17 Phase 3 Repair Project Features Completed in 2017 under the Emergency Declaration and Those Completed in 2019 under the Categorical Permission

Element	Type of Remediation	Phase 3 Repair Project Major Features of Preferred Repairs	Phase 3 Repair Project Features Constructed as Part of the 2017 Emergency Project	Phase 3 Repair Project Features Constructed as Part of the 2019 Categorical Permission Project	Phase 3 Repair Project Features Remaining To Be Constructed—Requester's Preferred Alternative
		exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width. Relocate power pole and install new pump station.		existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	
IVc	Under seepage and through seepage	Construct approximately 1,100-foot-long setback levee containing approximately 300 feet of seepage berm and approximately 1,100 feet of cutoff wall to meet required exit gradients. Depth of the cutoff wall would be approximately 60 feet. Cutoff wall would involve degrading the top one-third to one-half of the levee crown and would begin with a 1:1 cut at the waterside crown. Seepage berm would be a minimum of 65 feet wide. Install riprap on waterside of existing levee above the high-tide line where it would intersect setback levee. After setback levee is completed, remove 400 linear feet of the existing levee above the high-tide line on the downstream side of oxbow. Grade approximately 8 acres of setback area to drain to the river through the downstream opening in the remnant levee, and restore at least 9.9 acres, and up to 11.1 acres, of riparian scrub and great valley oak woodland in the area between the landside toe of the setback levee and the river.	*None*	*None.*	Construct approximately 1,100-foot-long setback levee containing approximately 300 feet of seepage berm and approximately 1,100 feet of cutoff wall to meet required exit gradients. Depth of the cutoff wall would be approximately 60 feet. Cutoff wall would involve degrading the top one-third to one-half of the levee crown and would begin with a 1:1 cut at the waterside crown. Seepage berm would be a minimum of 65 feet wide. Install riprap on waterside of existing levee above the high-tide line where it would intersect setback levee. After setback levee is completed, remove 400 linear feet of the existing levee above the high-tide line on the downstream side of oxbow. Grade approximately 8 acres of setback area, to drain to the river through the downstream opening in the remnant levee, and restore at least 9.9 acres, and up to 11.1 acres, of riparian scrub and great valley oak woodland in the area between the landside toe of the setback levee and the river.

Table 2-12. Comparison of the Requester’s Preferred Alternative with RD 17 Phase 3 Repair Project Features Completed in 2017 under the Emergency Declaration and Those Completed in 2019 under the Categorical Permission

Element	Type of Remediation	Phase 3 Repair Project Major Features of Preferred Repairs	Phase 3 Repair Project Features Constructed as Part of the 2017 Emergency Project	Phase 3 Repair Project Features Constructed as Part of the 2019 Categorical Permission Project	Phase 3 Repair Project Features Remaining To Be Constructed—Requester’s Preferred Alternative
Va and VIa.1	Under seepage and through seepage	Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width. Construct 9,500 feet of continuous cutoff wall to meet required exit gradients. Depth of cutoff walls would vary from 60 to 85 feet. Cutoff wall would involve degrading top one-third to one-half of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls. The existing levee would be widened where necessary as part of cutoff wall construction.	Constructed approximately 5,900 feet of seepage berm to provide increased emergency flood protection. The constructed seepage berm width is approximately 60 feet.	*None.*	Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width. Construct 9,500 feet of continuous cutoff wall to meet required exit gradients. Depth of cutoff walls would vary from 60 to 85 feet. Cutoff wall would involve degrading top one-third to one-half of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls. The existing levee would be widened where necessary as part of cutoff wall construction.
VIa.4	Under seepage and through seepage	Construct approximately 70 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 90 to 100 feet. Cutoff wall would involve degrading top one-third to one-half of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.	*None.*	*None.*	Construct approximately 70 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 90 to 100 feet. Cutoff wall would involve degrading top one-third to one-half of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.
VIb	Under seepage and through seepage	Construct approximately 2,050 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 70 to 80 feet. Cutoff wall in levee prism would involve both deep slurry mix construction and	At the southern end of element VIb, constructed approximately 50 feet of seepage berm to tie into the new seepage berm at element VIc and meet required exit gradients. The constructed	At the southern end of element VIb, constructed approximately 400 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 400 feet.	Construct approximately 2,050 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 70 to 80 feet. Cutoff wall in levee prism could involve deep slurry mix construction or degrading

Table 2-12. Comparison of the Requester's Preferred Alternative with RD 17 Phase 3 Repair Project Features Completed in 2017 under the Emergency Declaration and Those Completed in 2019 under the Categorical Permission

Element	Type of Remediation	Phase 3 Repair Project Major Features of Preferred Repairs	Phase 3 Repair Project Features Constructed as Part of the 2017 Emergency Project	Phase 3 Repair Project Features Constructed as Part of the 2019 Categorical Permission Project	Phase 3 Repair Project Features Remaining To Be Constructed—Requester's Preferred Alternative
		degrading top one-third to one-half of levee crown and would begin with 1:1 cut at waterside crown.	seepage berm width was approximately 100 feet.		top one-third to one-half of levee crown beginning with 1:1 cut at waterside crown.
VIcde	Under seepage and through seepage	At element VIc, construct approximately 250 feet of seepage berm (approximately 100 feet wide) and approximately 300 feet of chimney drain to meet required exit gradients, and construct a new earthen railroad embankment to replace the existing wooden trestle bridge.	At element VIc, constructed approximately 250 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 100 feet.	At element VIc, constructed additional seepage berm on the landside of the existing 250 feet of seepage berm to meet required exit gradients. The additional seepage berm width is approximately 300 feet for a total width of approximately 400 feet.	At element VIc, construct approximately 250 feet of cutoff wall to tie into cutoff wall in element VIb. Depth of cutoff wall would vary from 70 to 80 feet and could involve deep slurry mix construction or degrading top one-third to one-half of levee crown beginning with 1:1 cut at waterside crown. Construct a new earthen railroad embankment to replace the existing wooden trestle bridge.
		At element VId, construct approximately 150 feet of seepage berm (approximately 100 feet wide) and 150 feet of chimney drain to meet required existing gradients and raise grade.	At element VId, constructed approximately 150 feet of seepage berm to meet required exit gradients and raised grade. The constructed seepage berm width is approximately 100 feet.	At element VId, constructed approximately 150 feet of chimney drain in the existing seepage berm to meet required exit gradients.	*None.*
		At element VIe, construct approximately 250 feet of subgrade seepage collection drain system and 250 feet of chimney drain to meet required exit gradients, raise approximately 200 feet of parking lot grade, and widen levee.	At element VIe, constructed approximately 250 feet of subgrade seepage collection drain system to meet required exit gradients and raised approximately 200 feet of parking lot grade, and widened levee.	At element IVe, constructed approximately 100 feet of chimney drain in the existing seepage berm to meet required exit gradients and widen levee.	*None.*

Table 2-12. Comparison of the Requester's Preferred Alternative with RD 17 Phase 3 Repair Project Features Completed in 2017 under the Emergency Declaration and Those Completed in 2019 under the Categorical Permission

Element	Type of Remediation	Phase 3 Repair Project Major Features of Preferred Repairs	Phase 3 Repair Project Features Constructed as Part of the 2017 Emergency Project	Phase 3 Repair Project Features Constructed as Part of the 2019 Categorical Permission Project	Phase 3 Repair Project Features Remaining To Be Constructed—Requester's Preferred Alternative
VIIb	Under seepage and through seepage	Construct approximately 350 feet of seepage berm (approximately 135 feet wide) and 350 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 350 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 135 feet.	Constructed approximately 350 feet of chimney drain to meet required exit gradients. Placed levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	*None.*
VIIe	Under seepage and through seepage	Construct approximately 2,500 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 60 to 120 feet. Deep slurry mixing method would be used. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Repair Project.	*None.*	*None.*	Construct approximately 2,500 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 60 to 120 feet. Deep slurry mixing method would be used. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Repair Project.
VIIg	Under seepage and through seepage	Construct approximately 400 feet of seepage berm (approximately 65 feet wide) and 400 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	*None.*	Constructed approximately 400 feet of seepage berm (minimum 65 feet wide) and 400 feet of chimney drain to meet required exit gradients. Placed levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	*None.*

Note: PG&E = Pacific Gas and Electric Company.
Source: Data provided by Kjeldsen, Sinnock & Neudeck, Inc. in 2014, updated 2017

Additional activities that would occur under the Requester's Preferred Alternative would generally be the same as previously described for Alternative 1. Any differences would be as follows:

- **Right-of-Way Acquisition:** Land acquisition is proposed adjacent to elements Ia, IIab, IVc, Va–VIa.1, VIa.4, VIc, and VIIe, totaling approximately 23.26 acres.

- **Encroachment Management:** Certain features (including the power poles discussed previously), vegetation, and a variety of agriculture-related facilities (e.g., irrigation infrastructure, fences) are within the footprint of the Requester's Preferred Alternative (**Table 2-13**). Utility and agricultural infrastructure would be relocated as needed to accommodate the levee repairs, and any pipelines or other underground utility crossings would be replaced as needed. Other encroachments in the Phase 3 Repair Project area would be removed or relocated as required to meet the criteria of USACE, CVFPB, and FEMA.

Table 2-13. Encroachments within the Requester's Preferred Alternative

Element	Encroachments
Ia	**Irrigation lines**, gas lines, drainage, irrigation pipe outfall, overhead high-voltage electric lines
IIab	Survey markers, overhead electric lines, **fence, pipe**
IVa	Overhead electric lines, fence, storm drain, irrigation line, sheet pilings, irrigation pump, service pole, **trees**, steel pipe associated with pump, storm drain
IVc	**Elderberry shrubs, chain-link fence, toe drains, concrete trail, wall, tree**
Va–VIa.1	**Storm drain abandoned power pole and wooden barricade, City of Lathrop pipe and air valve, fence and gate, pump, San Joaquin River outfall structure**
VIa.4	Gas line, overhead electric line, underground electric line, fence, irrigation line, **storm drain, irrigation pipeline**
VIb	**Trees**
VIc	Storm drain, haul routes, gas line, high-pressure gas main, street lights, retaining wall, restroom facility, septic tank, irrigation water tank, leach field, air valves, fiber optic line, overhead electric line, irrigation line, pump station, **fence, pavement, vegetation, abandoned telephone pole and appurtenances,** utility pipes, parking lot, Union Pacific Railroad
VIIe	Union Pacific Railroad, gate utility vault, storm drain control unit, storm drain outfall, overhead electric lines, fence, streetlight, sheet pile wall, water line, power pole, sidewalk, fence

Note: Encroachments in **bold** to be removed/relocated.
Source: Data compiled by AECOM in 2014

Construction Schedule and Methods

Construction of the Requester's Preferred Alternative would occur on the same general schedule and include a potential work window variance with conditions and commitments as described previously for Alternative 1.

Approximately 153,500 cubic yards of imported material (i.e., soil, aggregate, cement) would be required to construct levee repairs proposed under the Requester's Preferred Alternative (**Table 2-14**). As for Alternatives 1 and 2, materials would be hauled to work sites from commercial sources up to 11 miles away, with an average round-trip distance for truck hauls of approximately 8 miles. The assumed construction season would be the same as Alternatives 1 and 2 (123 days) and would be based on the same haul truck capacity as for Alternatives 1 and 2. About 81 trips per day would be required to transport the material. Crew size, shifts, and concurrent construction activities also would be the same as described for Alternatives 1 and 2.

Personnel, equipment, and imported materials would be transported to the levee using the same surface roads connecting with Interstate 5 or State Route 120, as described for Alternatives 1 and 2 (see **Figure 2-10**). The primary corridors where construction activity would take place would be public roadways on and within 300 feet of the levees, existing unpaved roads used for access to work sites, and levee patrol roads on top of the levee crown.

The sequence of activities and equipment to be used for all levee improvements, except the setback levee (e.g., seepage berms, cutoff walls), would be the same as described for Alternative 1 (see **Table 2-7**), and for the setback levee, would be the same as described for Alternative 2 (see **Table 2-11**).

Table 2-14. Quantities of Imported Fill Required for the Requester's Preferred Alternative

Material Type	Quantity
Seepage berm	14,000 tons/7,000 cy
Levee fill	262,000 tons/131,000 cy
Drain rock	11,000 tons/5,500 cy
Filter material (3/8-inch sand)	3,000 tons/1,500 cy
Aggregate base	17,000 tons/8,500 cy
Asphalt concrete	0 tons/0 cy
Total	**307,000 tons/153,500 cy**

Note: cy = cubic yards.
Source: Data provided by MacKay and Somps in 2019; data compiled by Ascent Environmental in 2019

Chapter 3. Affected Environment, Environmental Consequences, and Mitigation Measures

This chapter describes the approach to the Phase 3 Repair Project environmental analysis, details the existing conditions in the Phase 3 Repair Project area, analyzes the significant environmental effects of the Phase 3 Repair Project, and presents mitigation measures, organized by environmental topic.

3.1 Approach to the Environmental Analysis

The Council on Environmental Quality (CEQ) regulations for implementing NEPA specify that a Federal agency preparing an EIS must consider the effects of the Proposed Action or the Requester's Preferred Alternative and alternatives under consideration on the environment; these include effects on ecological, aesthetic, and historical and cultural resources, and economic, social, and health effects. An EIS must also discuss possible conflicts with the objectives of Federal, state, regional, and local adopted land use plans, policies, or controls for the area concerned; energy requirements and conservation potential; urban quality; the relationship between short-term uses of the environment and long-term productivity; and irreversible or irretrievable commitments of resources. An EIS must identify relevant, reasonable mitigation measures that are not already included in the Proposed Action or the Requester's Preferred Alternative and alternatives under consideration that could avoid, minimize, rectify, reduce, eliminate, or compensate for the project's adverse environmental effects (40 Code of Federal Regulations 1502.14, 1502.16, 1508.8).

An environmental document prepared to comply with NEPA must consider the context and intensity of the environmental effects that would be caused by, or result from, the alternatives under evaluation and determine whether effects are significant.

3.1.1 Section Contents

Sections 3.2 through 3.16 of this FEIS follow the same general format and are each organized into the following major components:

Regulatory Setting: The "Regulatory Setting" section in each issue area identifies current Federal and State laws and regulations relevant to RD 17. (More detailed descriptions of the relevant Federal laws and regulations are presented in Chapter 5, "Compliance with Federal Environmental Laws and Regulations.") Because this FEIS is prepared by a Federal lead agency (i.e., USACE), the regulatory framework focuses on Federal laws, regulations, plans and policies that are relevant to the Phase 3 Repair Project. However, in certain topic areas where regional or local laws, regulations, plans and policies have a direct bearing on and relationship to the thresholds of significance, a state and/or regional or local regulatory framework is also presented for informational purposes and to assist with NEPA review.

Environmental Setting: The baseline environmental conditions assumed in this FEIS for analyzing the effects of the Phase 3 Repair Project generally consist of the existing physical environment as of April

23, 2010, the date when RD 17 published the Notice of Intent to prepare the DEIS/DEIR for Phase 3 of the RD 17 Levee Seepage Repair Project in the Federal Register. However, where appropriate, environmental conditions have been updated to include present conditions. This portion of each Chapter 3 section constitutes the "Affected Environment" section required under NEPA.

Methodology and Thresholds of Significance: This subsection describes the methods, process, procedures, and/or assumptions used to formulate and conduct the effect analysis. It also presents the significance criteria (or "thresholds of significance") used to define the level at which an effect would be considered significant. Thresholds may be quantitative or qualitative; they may be based on agency or professional standards or on legislative or regulatory requirements that are relevant to the effect analysis. The basis for determining the significance of effects for the FEIS effects analysis is based on professional standards, project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements. The significance thresholds were developed in the joint DEIS/DEIR based on NEPA and California Environmental Quality Act (CEQA) requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. For consistency between the NEPA and CEQA documents developed for this proposed project, this FEIS uses a combination of NEPA and CEQA terminology.

Effects and Mitigation Measures: This analysis examines the significant effects that would occur with implementation of an alternative under consideration. Effects and mitigation measures are numbered sequentially in each section, with mitigation measures corresponding to the effect being addressed. For instance, effects identified in Section 3.2, "Agricultural Resources," are numbered Effect 3.2-a, Effect 3.2-b, and so on, and Mitigation Measure 3.2-a corresponds with Effect 3.2-a. An effect title precedes the analysis of the effect as applicable to each alternative. The discussions that follow the effect title include substantial evidence to support a significance conclusion, which is stated in bold at the end of each alternative's effect analysis.

Many of the significant effects that may result from implementation of the action alternatives would be temporary effects resulting from construction activities, including the hauling of borrow material and the movement of heavy construction equipment. However, effects related to most agricultural land conversion, modification and loss of habitats, including fill of waters of the United States, and disturbance of cultural resources would be either short-term effects or permanent long-term effects.

Following each discussion of a significant or potentially significant effect, mitigation measures are identified, where available and feasible, to avoid, minimize, rectify, or reduce the effect to a less-than-significant level. Council on Environmental Quality NEPA Implementing Regulations (Code of Federal Regulations 40 1508.20) defines "mitigation" as:

- avoiding the effect altogether by not taking a certain action or parts of an action;
- minimizing effects by limiting the degree of magnitude of the action and its implementation;
- rectifying the effect by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the effect over time by preservation and maintenance operations during the life of the action; or
- compensating for the effects by replacing or providing substitute resources or environments.

Mitigation measures are not required for effects identified under the No-Action Alternative because, under the No-Action Alternative, no Phase 3 Repair Project would be approved, no activity would be undertaken by RD 17, and RD 17 would not be required to obtain permits or enter into agreements associated with the Phase 3 Repair Project. In addition, USACE would not issue permission, permits, or authorizations for the No-Action Alternative. The primary environmental effect of the No-Action Alternative would be a continuation of the current elevated flood risks in the RD 17 service area and potential effects from a possible flood event. The mechanism to reduce the flood risks would be implementation of one of the action alternatives or a project comprising any combination of the various actions included in the three action alternatives. This is not considered mitigation for the No-Action Alternative because the mitigation for one alternative cannot be to implement another alternative; that is, implementation of the No-Action Alternative should not result in the de facto implementation of an action alternative. For these reasons, mitigation measures are not identified for the No-Action Alternative. The No-Action Alternative is included in this FEIS to meet the requirements of NEPA and to provide a point of comparison against which the action alternatives can be evaluated.

USACE, as Federal lead agency, has no authority over the enforcement of many of the mitigation measures proposed in this FEIS because they are under the purview of the Requester, RD 17. The record of decision (ROD) will identify the mitigation measures that RD 17 has voluntarily agreed to implement.

Residual Significant Effects: This subsection describes which effects would remain significant following implementation of mitigation measures. For each significant effect, either the effect would be reduced to a level below the significance threshold after mitigation (reduced to a less-than-significant level), or it is concluded that feasible mitigation is not available or is insufficient to fully reduce the effect to a less-than-significant level. When an effect cannot be reduced to a less-than-significant level, it is called a “significant and unavoidable” effect on the environment.

3.1.2 Terminology Used to Describe Effect Levels

In order to maintain consistency between terminology used in the DEIS/DEIR and this FEIS, the following terminology is used to denote the significance of environmental effects:

“No effect” indicates that the construction, operation, and maintenance of an alternative under consideration would not have any direct or indirect effects on the physical environment. It means that no change from existing conditions would result. This effect level does not require mitigation.

A **less-than-significant effect** is one that would not result in a substantial or potentially substantial change in the physical environment. This effect level does not require mitigation, even if applicable measures are available; however, measures may be recommended to further reduce less-than-significant effects.

A **significant effect** is defined as one that would cause “a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project.” Mitigation measures and alternatives are identified, where applicable and feasible, to avoid, minimize, rectify, compensate for, or eliminate or reduce significant effects to a less-than-significant level.

A **potentially significant effect** is one that, if it were to occur, would be considered a significant effect as described above; however, the occurrence of the effect cannot be immediately determined with certainty. A potentially significant effect is treated as if it were a significant effect. Therefore, mitigation measures have been identified, where feasible, to avoid, minimize, rectify, compensate for, or eliminate or reduce significant effects to a less-than-significant level.

A **significant and unavoidable effect** is a substantial or potentially substantial adverse effect on the physical environment that cannot be fully reduced to a less-than-significant level even with implementation of any applicable feasible mitigation.

It is important to note that under NEPA, no specific thresholds of significance exist and environmental effects for each issue area are analyzed based on their context and intensity. Although appropriate CEQA thresholds and professional judgment have been applied because a DEIS/DEIR, or joint NEPA/CEQA document, was prepared previously for this proposed action and the CEQA thresholds are better defined and more stringent, to comply with NEPA, the context and intensity of the environmental effects were considered for each effect mechanism.

3.1.3 Effect Mechanisms

Mechanisms that could cause effects are discussed for each issue area. General categories of effect mechanisms are project construction and activities related to future operations and maintenance, as described in Chapter 2, "Alternatives."

Under NEPA, the effects of the alternatives under consideration, including a no-action alternative, are determined by comparing effects between alternatives and against effects from the no-action alternative. The no-action alternative (i.e., expected future conditions without the project) is the baseline to which the action alternatives are compared, and the no-action alternative is compared to existing conditions. (See Chapter 2, "Alternatives," for a description of the no-action alternative.)

Project effects are categorized, under NEPA, to describe their context and intensity. Project effects fall into the following categories:

A **temporary effect** would occur only during construction.

A **short-term effect** would last from the time construction ceases to within 3 years following construction.

A **long-term effect** would last longer than 3 years following construction. In some cases, a long-term effect could be considered a permanent effect.

A **direct effect** is an effect that would be caused by an action and would occur at the same time and place as the action.

An **indirect effect** is an effect that would be caused by an action but would occur later in time or at a distance that is removed from the project area, and it would be reasonably foreseeable, such as growth-inducing effects and other changes related to changes in land use patterns and related effects on the physical environment.

A **residual effect** is an effect that would remain after implementation of mitigation.

A **cumulative effect** is an effect that is cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project, even if individually limited, are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.

3.1.4 Mitigation for Effects Under the No-Action Alternative

The No-Action Alternative does not meet the definition of a "project" under NEPA and would not require a permit for fill of wetlands or alter Federal levees; therefore, RD 17 would not be required to implement mitigation measures under the No-Action Alternative regardless of the effect conclusion. The No-Action Alternative is not a proposal put forth by the project requester. Therefore, RD 17 is not responsible for implementing mitigation for adverse effects caused by the No-Action Alternative. The No-Action Alternative consists of the effects that could be expected if the 404 permit or 408 permission were not approved by USACE and the Phase 3 Repair Project was not implemented. When the FEIR was certified in July 2016, the Final Mitigation Monitoring and Reporting Plan (MMRP) was adopted. The mitigation measures in the MMRP were implemented during the 2017 Emergency Response Construction Project and the 2019 CP Construction Project. Thus, the No-Action Alternative assumes implementation of the mitigation measures included in the FEIR.

3.1.5 Implementation of Mitigation and Record of Decision

If USACE approves the permit, the ROD will reflect USACE's final decision, the rationale behind the decision, and a commitment to monitoring and mitigation. According to Section 1505.2 of the NEPA regulations adopted by the Council on Environmental Quality, the ROD must do all of the following:

(a) State what the decision was.

(b) Identify all alternatives considered by the agency in reaching its decision, specifying the alternative or alternatives which were considered to be environmentally preferable. An agency may discuss preferences among alternatives based on relevant factors including economic and technical considerations and agency statutory missions. An agency shall identify and discuss all such factors including any essential considerations of national policy which were balanced by the agency in making its decision and state how those considerations entered into its decision.

(c) State whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted, and if not, why they were not. A monitoring and enforcement program shall be adopted and summarized where applicable for any mitigation.

If the ROD results in changes to any of the mitigation measures included in the MMRP that was adopted by RD 17 in 2016, RD 17 will update its MMRP at the time that USACE issues the ROD to reflect the mitigation measures included in the ROD.

3.1.6 Comparison of the Effects of the Alternatives

Table 3.1-1 shows the overall level of significance of effects for each of the 15 environmental issue areas evaluated in this FEIS and provides a comparison of significance determinations among the No-Action Alternative and the three action alternatives (i.e., Alternative 1, Alternative 2, and the Requester's Preferred Alternative). As noted in the table, significance conclusions for this alternatives comparison are the result of the combination of all environmental effects associated with a particular issue area.

Table 3.1-1. Comparison of the Environmental Effects (after Mitigation Implementation) of the Phase 3 Repair Project Alternatives[1, 2]

Environmental Issue Area	Phase 3 Repair Project Alternatives: No-Action Alternative	Minimum Footprint (Alternative 1)	Maximum Footprint (Alternative 2)	Requester's Preferred Alternative
Agricultural Resources	PSU	SU	SU	SU
Land Use, Socioeconomics, and Population and Housing	SU	LS	LS	LS
Geology, Soils, Minerals, and Paleontological Resources	PSU	LSM	LSM	LSM
Hydrology and Water Quality	PSU	LSM	LSM	LSM
Biological Resources				
Fish	PSU	LSM	LSM	LSM
Sensitive Aquatic Habitats	PSU	LSM	LSM	LSM
Vegetation and Wildlife	PSU	LSM	LSM	LSM
Special-Status Terrestrial Species	PSU	PSU	PSU	PSU
Local Plans and Policies	PSU	LSM	LSM	LSM
Cultural Resources	PSU	PSU	PSU	PSU
Transportation and Circulation	PSU	LSM	LSM	LSM
Air Quality	PSU	LSM	LSM	LSM
Climate Change	PSU	LS	LS	LS
Noise	PSU	SU	SU	SU
Recreation	PSU	LS	LS	LS
Visual Resources	PSU	SU	SU	SU
Utilities and Service Systems	PSU	LSM	LSM	LSM
Hazards and Hazardous Materials	PSU	LSM	LSM	LSM
Environmental Justice	DHA	NDHA	NDHA	NDHA

Notes: DHA = disproportionately high and adverse without mitigation; DHAM = disproportionately high and adverse with mitigation; NDHA = not disproportionately high and adverse; LS = less than significant; LSM = less than significant with mitigation; PSU = potentially significant and unavoidable; SU = significant and unavoidable

1 The overall effect conclusion listed for each issue area for each alternative is based on the most severe significance conclusion after the implementation of mitigation measures for the issue. For example, if four effects were determined to be LTS and two effects were determined to be SU, the effect conclusion would be SU.

2 The effect conclusions presented in this table reflect the level of effect following implementation of mitigation for significant and potentially significant effects. Mitigation is not required for significant and potentially significant effects that would occur under the No-Action Alternative.

Source: Data compiled by AECOM in 2014

The effects under all three action alternatives would be a result of the same effect mechanisms (e.g., reduction of habitat, increases in traffic), and the same number of significant and unavoidable effects would result from implementing any of the action alternatives (see **Table ES-1**).

To compare and contrast the significant and unavoidable effects that would result from implementing each action alternative, **Table 3.1-2** compares the quantifiable environmental effects associated with the action alternatives.

Table 3.1-2. Summary of Quantifiable Environmental Effects of the Action Alternatives[1]

Environmental Effect	Minimum Footprint Alternative (Alternative 1)	Maximum Footprint Alternative (Alternative 2)	Requester's Preferred Alternative
Permanent Conversion of Important Farmland	32.6 acres	129.6 acres	14.3 acres
Potential Permanent Loss of Habitat			
Landside Woodlands	5.44 acres	3.56 acres	2.21 acres
Waterside Woodlands (SRA habitat)	0.0 acre	0.87 acre	0.0 acres
Agricultural	14.20 acres	85.69 acres	10.85 acres
Ruderal	27.14 acres	35.76 acres	21.44 acres
Potential Permanent Loss of Waters of the United States, Including Wetlands	0.85 acre	5.19 acres	0.0 acres
Potential Temporary Traffic Increases	18 trips per day	26 trips per day	7 trips per day
Potential Temporary Annual Air Pollutant Emissions			
San Joaquin County:			
ROG	0.85 ton per year	1.4 tons per year	0.47 ton per year
NO_X	9.6 tons per year	15.8 tons per year	5.4 tons per year
PM_{10}	1.8 tons per year	2.2 tons per year	1.7 tons per year
Potential Greenhouse Gas Effects			
Amortized Loss of Carbon Stock[2]	46.7 $MTCO_2$ per year	52.8 $MTCO_2$ per year	27.4 $MTCO_2$ per year
Loss of Carbon Sequestration	4.1 $MTCO_2$ per year	4.6 $MTCO_2$ per year	2.6 $MTCO_2$ per year
Total Construction Emissions	4,422 $MTCO_2$ per year	5,963 $MTCO_2$ per year	2,840 $MTCO_2$ per year

Notes: CO_2 = carbon dioxide; MT = metric tons; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; ROG = reactive organic gases; SRA = shaded riverine aquatic habitat.

1 All values are approximate. Refer to Chapter 3, "Affected Environment, Environmental Consequences, and Mitigation Measures," for more detail, including significance criteria, mitigation measures, and other aspects of the environmental analysis. Some quantifiable environmental effects are not presented in this table because there is no significant difference between the effects, or data are not quantifiable. Values in **bold** denote the greater effect.

2 Loss amortized over 30 years.

Source: Data compiled by AECOM in 2014

Implementation of the Phase 3 Repair Project would substantially lessen the probability of a flood in the RD 17 area caused by levee failure. All of the action alternatives would have the same residual risk of flooding (1-in-100 chance). As described throughout Chapter 3, "Affected Environment, Environmental Consequences, and Mitigation Measures," the potential environmental effects of a levee failure, as would occur under the No-Action Alternative, would be significant and unavoidable. Under all action alternatives, RD 17 would be required to maintain an ongoing, residual risk management program, as described below.

In recognition of the need to incorporate management of this residual risk into local land use planning efforts, and as part of the cost-sharing agreement between USACE and RD 17 and between the State of California and RD 17, RD 17 would be obligated to prepare a floodplain management plan (FPMP) consistent with Section 202(c) of the Water Resources Development Act of 1996 (WRDA) and would provide the State with a safety plan that would be consistent with recently adopted requirements of State law.

USACE Policy Guidance Letter No. 52 (PGL No. 52), Floodplain Management Plans (December 8, 1997) defines USACE policy on Section 202(c) of the WRDA. It states that the non-Federal sponsor of the project should develop an FPMP that: (1) implements measures, practices, and policies that will reduce loss of life, injuries, damages to property and facilities, public expenditures, and other adverse effects associated with flooding; (2) preserves and enhances natural floodplain values; and (3) addresses measures that will help preserve levels of protection provided by the USACE flood damage reduction or hurricane or storm damage reduction project.

Enclosures to PGL No. 52 include "Guidance on the Development of Floodplain Management Plans (November 7, 1997)," which provides further clarification on the development of an FPMP in accordance with Section 202(c) of the WRDA. It states that the primary focus of the plan should be to address potential measures (both structural and nonstructural), practices, and policies that will reduce the effects of future residual flooding, help preserve levels of protection provided by the USACE project, and preserve and enhance natural floodplain values. An element of the plan will include provisions related to post-storm activities following a catastrophic event.

USACE further requires communities receiving funding for flood protection projects to prepare an FPMP following procedures similar to the National Flood Insurance Program's minimum standards. Communities participating in the program must adopt certain land use regulations for flood hazard areas. In exchange for adopting these regulations the Federal government makes flood insurance available to those communities.

RD 17 also would prepare a safety plan in compliance with State law. This safety plan, at a minimum, would include the following elements:

- a flood preparedness plan that includes storage of materials that can be used to reinforce or protect a levee when a risk of failure exists;
- a levee patrol plan for high-water situations;
- a flood-fight plan for the period before Federal or State agencies assume control over the flood fight;
- an evacuation plan that includes a system for adequately warning the general public in the event of a levee failure, and a plan for the evacuation of every affected school, residential care facility for the elderly, and long-term health care facility;
- a floodwater removal plan; and

- a requirement, to the extent reasonable, that new buildings in which the inhabitants are expected to be essential service providers either are located outside an area that may be flooded or are designed to be operable shortly after the floodwater is removed.

3.1.7 Environmentally Preferable Alternative

Federal NEPA guidelines require identification of an environmentally preferable alternative in the ROD from among the alternatives evaluated. Under the No-Action Alternative, without repairs to the RD 17 levee system, the risk that portions of the RD 17 levee system would fail would remain at current levels, resulting in the potential for unavoidable significant adverse effects on environmental resources (see **Table 3.1-1**). Based on the severity of adverse environmental effects that could occur from a flood event (depending on the size, location, and duration of the flood event), the No-Action Alternative is not considered the environmentally preferable alternative. Although the overall effect conclusions for each resource area under Alternative 1, Alternative 2, and the Requester's Preferred Alternative would be the same (see **Table 3.1-1**), the magnitude of effects related to habitat loss (i.e., important farmland, waterside woodlands, agricultural, ruderal, and wetlands), traffic increases, and air pollutant and greenhouse gas emissions under Alternative 2 would be greater than under Alternative 1, and the magnitude of these effects under Alternative 1 would be greater than that under the Requester's Preferred Alternative (**Table 3.1-2**). As shown in **Tables 3.1-1** and **3.1-2**, the Requester's Preferred Alternative would have the least environmentally damaging effects and would be the environmentally preferable alternative under NEPA.

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3.2 Agricultural Resources

This section discusses existing agricultural resources within the Phase 3 Repair Project area and surrounding areas, identifies applicable Federal and state laws and regulations, and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to agricultural resources. A discussion of cumulative effects related to agricultural resources is provided in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements," of this FEIS.

3.2.1 Regulatory Setting

As required under NEPA, applicable Federal laws and regulations are identified in this section. State laws and regulations applicable to implementation of the Phase 3 Repair Project by RD 17 are described for informational purposes and to assist with NEPA review. Regional and local plans and ordinances are also considered as a part of the environmental review process for this FEIS, where applicable to the Phase 3 Repair Project.

Federal

Farmland Protection Policy Act

The National Agricultural Land Study, conducted in 1980–1981, found that each year millions of acres of farmland were being converted to other uses. In addition, a 1981 Congressional report acknowledged the need for Congress to carry out programs and policies to protect farmland. Congress passed the Agriculture and Food Act of 1981, which contained the Farmland Protection Policy Act (FPPA). The FPPA requires Federal agencies to identify the amount of farmland converted by Federal programs to nonagricultural use, assess the potential effects of a proposed project on Prime and Unique Farmland, and consider alternative actions that would lessen such effects. Projects are subject to FPPA requirements if they may, directly or indirectly, irreversibly convert farmland to nonagricultural use and are being implemented by a Federal agency or with assistance from a Federal agency. The U.S. Natural Resources Conservation Service (NRCS) is the Federal agency responsible for ensuring compliance with these laws and policies.

The purpose of the FPPA is to minimize Federal contributions toward conversion of farmland to nonagricultural uses by ensuring that Federal programs are administered in a manner compatible with state governments, local governments, and private programs designed to protect farmland. Lands subject to the FPPA do not have to be used currently for crops, but they do include Prime Farmland, Unique Farmland, Farmland of Statewide Importance, and Farmland of Local Importance. These lands can be forestland, pastureland, cropland, or other land, but not water or urban built-up land.

NRCS administers the Agricultural Conservation Element Program, which helps landowners, land trusts, and other entities protect, restore, and enhance working farms and ranches through conservation easements. The program provides financial assistance to partners for purchasing Agricultural Land Easements to American Indian tribes, state and local governments, and nongovernmental organizations with existing farmland protection programs. Participating landowners agree not to convert the land to nonagricultural uses and retain all rights to the property for future agriculture. Under the Agricultural Land Easements component, NRCS may contribute up to 50 percent of the fair market value of the easement (NRCS 2019).

The FPPA applies only to Federal or federally funded activities. Because the Phase 3 Repair Project area includes Federal project levees, consultation with NRCS is required. The NRCS Farmland Conversion

Impact Rating for Corridor Type Projects (Form NRCS-CPA-106) was completed on January 15, 2015, and addresses the alternatives evaluated in the FEIR: Alternatives 1 and 2 including impacts from proposed seepage berms along the dryland levee, and the overall preferred Phase 3 Repair Project consisting of all 19 elements (the preferred action prior to the 2017 Emergency Flood Response and 2019 Categorical Permissions Construction Projects). Form NRCS-CPA-106 is used to determine a Farmland Conversion Impact Rating and to ensure that all Important Farmland in a project area subject to conversion has been properly identified and considered in the analysis. The form was approved by NRCS on February 3, 2015. The final scoring for Alternatives 1 and 2 with the dryland levee, as well as the 19 elements that make up the preferred Phase 3 Repair Project on Form NRCS-CPA-106, is shown in Section 3.2.2, "Environmental Setting," and the completed form is provided in **Appendix C**.

Form NRCS-CPA-106 uses a point-based approach to assess the relative value of agricultural land resources. For the first set of factors, the Land Evaluation Criteria, the NRCS measures the relative value of the farmland in the project location based on the acreage of Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance that would be converted by the Phase 3 Repair Project; the total percentage of farmland in the county; and the percentage of farmland in the county with the same or higher relative value. The second set of factors, the Corridor Assessment Criteria, is based on the following criteria:

- the percent of land in agricultural uses adjacent to the project area and within a 1-mile radius;
- the percent of agricultural land that would be converted to nonagricultural uses;
- the acreage of farmland on the remainder of the parcel that would become fragmented, reduced in size, or irregularly shaped to such a degree that continuing agricultural land uses would be difficult or infeasible; and
- and the compatibility of the proposed use with off-site agricultural uses.

A single score is generated for a given project after the relative value of the farmland and the Corridor Assessment Criteria are scored and weighted. Final project scoring is based on a scale of 260 points, with a maximum score of 100 points for the relative value of the farmland and a maximum score of 160 points for the Corridor Assessment Criteria. The total number of points is used to determine the level of significance a project is expected to have on farmland. If the total score is less than 160, no further consideration for protection is required and no other alternative sites need to be evaluated. If the total score is 160 or more, additional alternatives, locations, or designs that would serve the proposed purpose but convert either fewer acres of farmland or convert other farmland that has a lower relative value need to be evaluated.

State

California Important Farmland Inventory System and Farmland Mapping and Monitoring Program

The California Department of Conservation (DOC), Office of Land Conservation, maintains a statewide inventory of farmland. This land is mapped by the Division of Land Resource Protection as part of the Farmland Mapping and Monitoring Program (FMMP). The maps are updated every 2 years with the use of aerial photographs, a computer mapping system, public review, and field reconnaissance. Farmland is divided into the following five categories, based on suitability for agriculture:

- **Prime Farmland**—land that has the best combination of physical and chemical characteristics for crop production. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed.

- **Farmland of Statewide Importance**—land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production.

- **Unique Farmland**—land that does not meet the criteria for Prime Farmland or Farmland of Statewide Importance, but has been used for the production of specific crops with high economic value.

- **Farmland of Local Importance**—land that currently is either producing crops or has the capability of production, but does not meet the criteria of the categories above.

- **Grazing Land**—land on which the vegetation is suited to the grazing of livestock.

Prime Farmland, Unique Farmland, and Farmland of Statewide Importance are sometimes collectively referred to as Important Farmland. The term “Important Farmland” is used in this FEIS to refer to these three farmland categories. Other categories used in the FMMP mapping system are “Urban and Built-Up Lands,” “Lands Committed to Nonagricultural Use,” and “Other Lands” (land that does not meet the criteria of any of the other categories).

The Rural Land Mapping Project provides more detail on the distribution of various land uses within the Other Land category in nine FMMP counties, including all eight San Joaquin Valley counties. The Rural Land categories include:

- Rural Residential Land
- Semi-Agricultural and Rural Commercial Land
- Vacant or Disturbed Land
- Confined Animal Agriculture
- Nonagricultural or Natural Vegetation

Figure 3.2-1 shows the designated farmland in and adjacent to the Phase 3 Repair Project area according to the latest data available from the FMMP (DOC 2016).

California Land Conservation Act of 1965

The California Land Conservation Act of 1965, commonly known as the Williamson Act (California Government Code Section 51200 et seq.), enables local governments to enter into contracts with private landowners to promote the continued use of the relevant land in agricultural or related open space use. In return, landowners receive property tax assessments that are based on farming and open space uses instead of full market value. Local governments receive an annual subvention (subsidy) of forgone property tax revenues from the state under the Open Space Subvention Act of 1971.

The Williamson Act empowers local governments to establish “agricultural preserves,” consisting of lands devoted to agricultural uses and other compatible uses. After establishment of such preserves, the locality may offer to owners of included agricultural land the opportunity to enter into annually renewable contracts that restrict the land to agricultural use for at least 10 years (i.e., the contract continues to run for 10 years following the first date on which the contract is not renewed). In return, the landowner is guaranteed a relatively stable tax rate, based on the value of the land for agricultural/open space use only and unaffected by its development potential. Financial consequences occur for the landowner on the early cancellation of a Williamson Act contract, and cancellations must go through a rigorous approval process.

A farmland security zone is an area created within an agricultural preserve by a county board of supervisors on request by a landowner or group of landowners. It is an enforceable contract between a private landowner and a county that restricts land to agricultural or open space uses. The minimum initial term is 20 years. Like a Williamson Act contract, farmland security zone contracts self-renew annually; thus, unless either party files a “notice of nonrenewal,” the contract is automatically renewed each year for an additional year. Farmland security zones offer landowners greater property tax reduction. Land restricted by a farmland security zone contract is valued for property assessment purposes at 65 percent of its Williamson Act valuation, or 65 percent of its Proposition 13 valuation, whichever is lower.

RD 17 is a public agency that may acquire land within agricultural preserves, including land under contract, and is exempt from the normal cancellation process for Williamson Act contracts. The contract is nullified for the portion of the land that RD 17 actually acquires (California Government Code Section 51295). RD 17 must provide notice to DOC before acquiring such land (California Government Code Section 51291[b]). A second notice is required within 10 working days after the land actually is acquired (California Government Code Section 51291[c]). The land under the Phase 3 Repair Project would be acquired for implementing measures to reduce flood damage. RD 17 is exempt from the findings required in California Government Code Section 51292 (California Government Code Section 51293[e][1]) because the Phase 3 Repair Project would consist of work to reduce potential flood damage. The preliminary notice to DOC, provided before land actually is acquired, would demonstrate the Phase 3 Repair Project purpose and the exemption from the findings.

Farmland in RD 17 that is in an agricultural preserve and currently is held in Williamson Act contracts is shown in **Figure 3.2-2**.

3.2.2 Environmental Setting

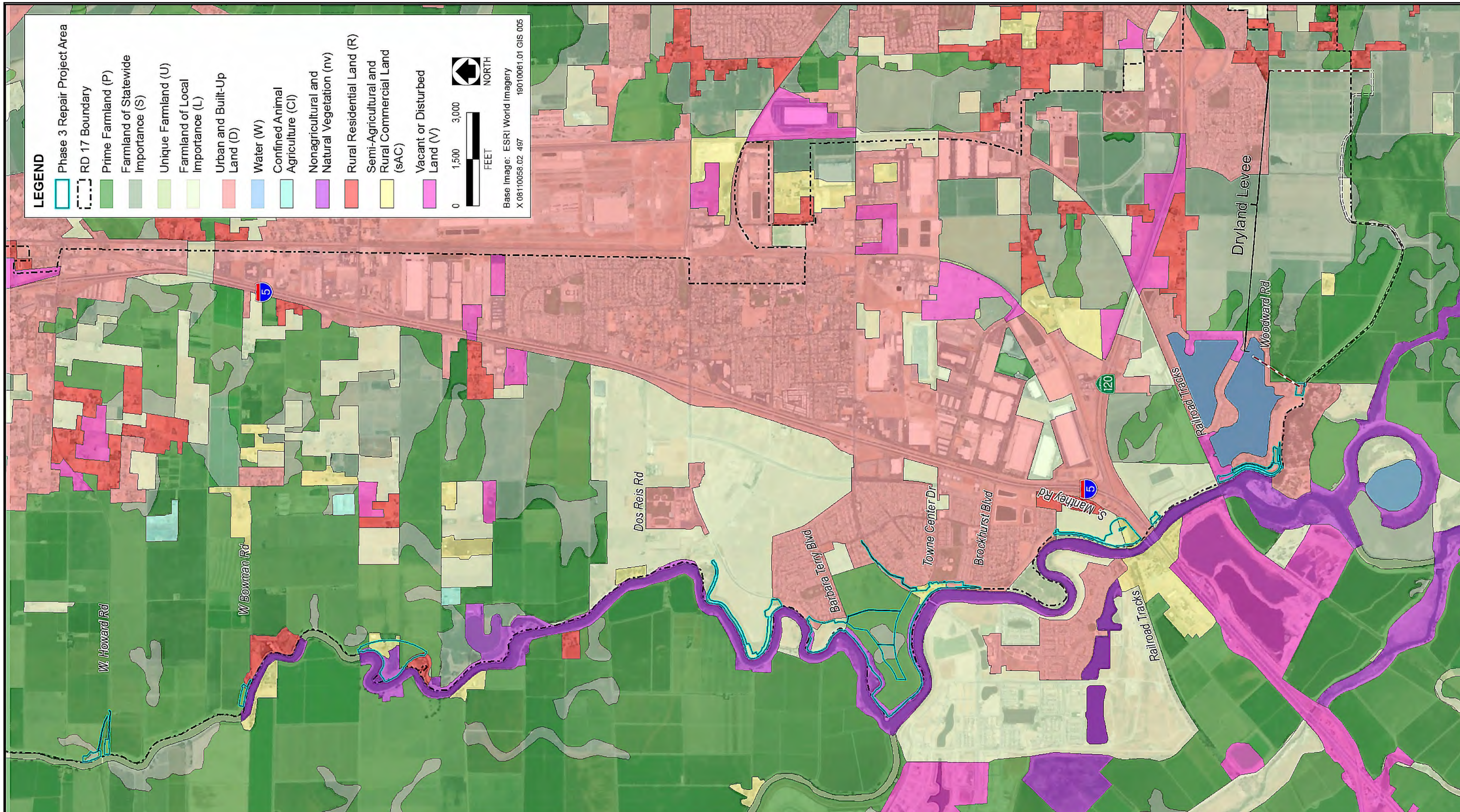
Within the Phase 3 Repair Project area, agricultural land uses are located on nonurbanized lands along the east levee of the San Joaquin River. **Table 3.2-1** shows existing land uses and Important Farmland classifications for lands within the project footprint for each element.

California Important Farmland System and Farmland Mapping and Monitoring Program

Table 3.2-1 shows the designated Important Farmland in and adjacent to the Phase 3 Repair Project area according to the latest data available from the FMMP (DOC 2016). As shown in **Figure 3.2-1**, much of the Phase 3 Repair Project area where Phase 3 Repair Project elements would be located are designated by the FMMP as Prime Farmland and Farmland of Statewide Importance.

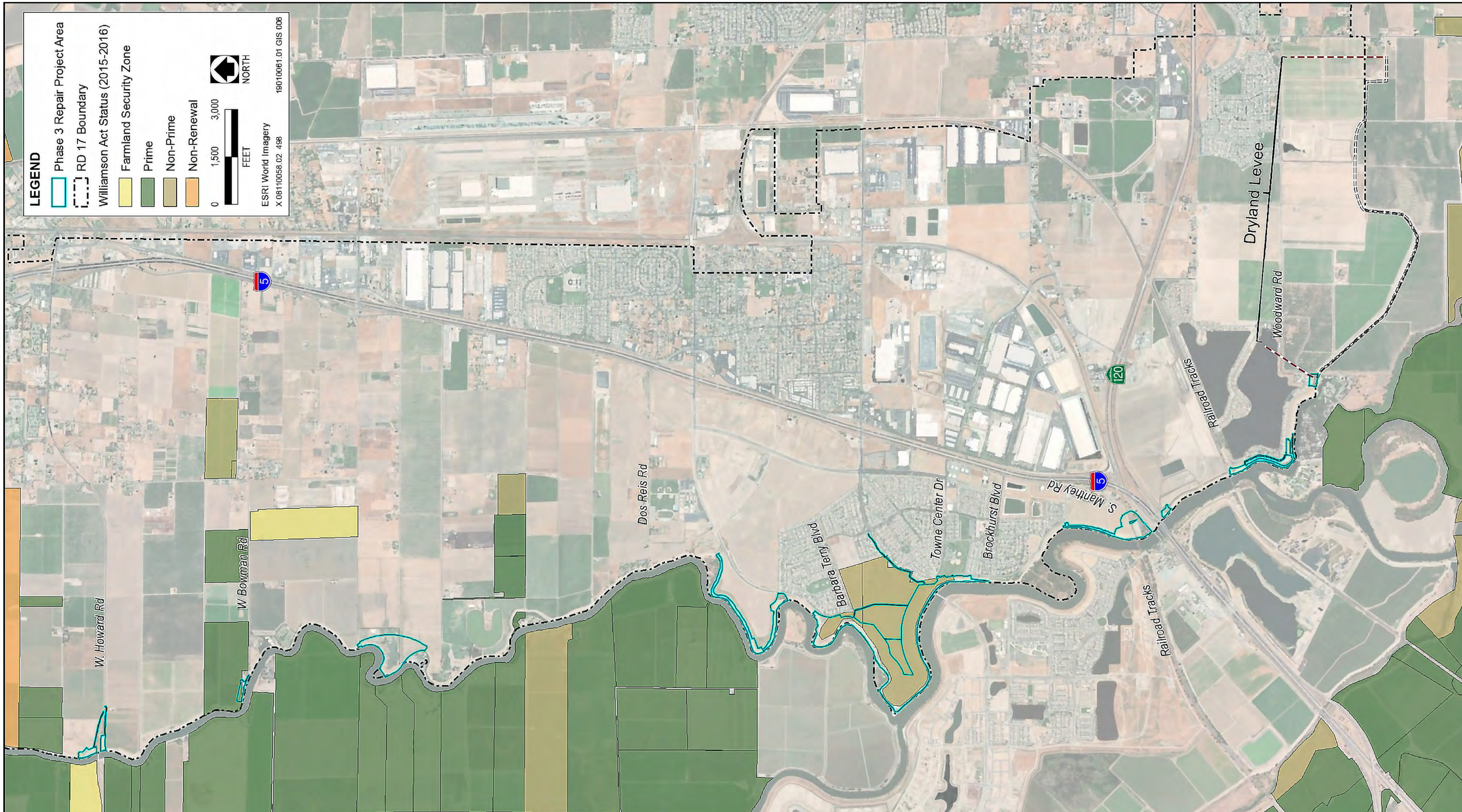
Table 3.2-2 shows the Important Farmland acreage, including Farmland of Local Importance, that is located within the Phase 3 Repair Project footprint, by levee element.

Figure 3.2-1. Important Farmland in the Phase 3 Repair Project Area



Source: DOC 2016; data compiled by Ascent Environmental in 2019

Figure 3.2-2. Parcels Subject to Williamson Act Contracts



Source: DOC 2016; data compiled by Ascent Environmental in 2019

Table 3.2-1. Existing Land Uses and Important Farmland Classifications for Phase 3 Repair Project Elements

Element	Jurisdiction	Existing Land Use	Important Farmland Classification
Ia	San Joaquin County	Agriculture	Prime/Statewide Importance
Ib		Agriculture	Prime
Ie		Agriculture/rural residence and River Mill Event Center (commercial) adjacent on downstream side	Prime
IIab		Agriculture/rural residence/human-made lake/Haven Acres Marina at south end of element	Prime/Rural Residential/Non-agricultural or Natural Vegetation/Semi-agricultural and Rural Commercial Land
IIIa	City of Lathrop	Existing levee and seepage berm	Not applicable
IIIb		Agriculture	Prime
IVa		Agriculture/residential subdivision	Prime/Non-agricultural or Natural Vegetation
IVc		Undeveloped open space on riverside/residential subdivision on landside	Prime/Non-agricultural or Natural Vegetation
Va–VIa.1		Agriculture/rural residence/farm complex/subdivision and City of Lathrop park	Prime/Statewide Importance/Unique/Non-agricultural or Natural Vegetation
VIa.4		Agriculture	Prime/Local Importance
VIb		Existing levee and seepage berm	Not applicable
VIcde		Union Pacific Railroad; San Joaquin County Park—Mossdale Crossing Regional Park	Urban and Built Up
VIIb	San Joaquin County	Agriculture; ramp embankment and road	Local Importance
VIIe		Residential subdivision and human-made lake	Urban and Built Up
VIIg		Vacant/levee	Urban and Built Up

Table 3.2-2. Acres of Important Farmland within Each River Levee Element[1]

Element	Minimum Footprint Alternative (Alternative 1)	Maximum Footprint Alternative (Alternative 2)[2]	Requester's Preferred Alternative
Ia	3.2	3.2	1.2
Ib	2.0	2.0	1.1
Ie	2.0	2.0	0
IIab	1.5	9.7	0
IIIa	8.4	8.4	0
IIIb	2.1	2.1	0
IVa	3.4	3.4	0
IVc	5.3	10.2/ 1.1	11.2
Va–VIa.1	6.0	63.4	8.1
VIa.4	0.3	0.3	0
VIb	3.0	3.0	3.4[3]
VIcde	0	5.0	--[4]
VIIb	1.3	1.3	0

Table 3.2-2. Acres of Important Farmland within Each River Levee Element[1]

Element	Minimum Footprint Alternative (Alternative 1)	Maximum Footprint Alternative (Alternative 2)[2]	Requester's Preferred Alternative
VIIe	0	0	0
VIIg	0	0	0
Total Prime	13.2	72.7/73.1	9.6
Total Statewide Importance	1.7	8.3	0.8
Total Unique	0	0	0
Total Local Importance	23.5	31.6/22.1	14.6
Total	**38.4**	**112.6/103.5**	**25.0**

Notes:
1 Total number may not be precise because of rounding of numbers.
2 Where two values are provided for Alternative 2, the first value is for Alternative 2 with a seepage berm at element IVc, and the second value is for Alternative 2 with a setback levee at element IVc. If only one number is shown for Alternative 2, this value is the same for Alternative 2 whether a seepage berm or a setback levee is proposed at element IVc.
3 Under the Requester's Preferred Alternative, elements VIb and VIc have been combined. This value corresponds to impacts for VIbc.
4 Under the Requester's Preferred Alternative, element VIc is combined with element VIb. See VIb for the value that corresponds to impacts for VIbc.
Source: DOC 2016; data compiled by Ascent Environmental in 2019

Williamson Act Contracts

The Williamson Act (California Government Code Section 51200 et seq.) is described previously in Section 3.2.1, "Regulatory Setting." **Table 3.2-3** shows the acres of farmland within the Phase 3 Repair Project footprint that are under Williamson Act contract, by levee element.

Table 3.2-3. Acres of Land under Williamson Act Contract within Each Levee Element[1,2]

Element	Minimum Footprint Alternative (Alternative 1)	Maximum Footprint Alternative (Alternative 2)[3]	Requester's Preferred Alternative
Ia	0	0	0
Ib	0	0	0
Ie	1.3	1.3	0
IIab	0	0	0
IIIa	0	0	0
IIIb	0	0	0
IVa	0	0	0
IVc	3.3	5.7/7.8	7.2
Va–VIa.1	10.2	72.3	13.0
VIa.4	0	0	0
VIb	0	0	0
VIcde	0	0	0
VIIb	0	0	0
VIIe	0	0	0
VIIg	0	0	0

Table 3.2-3. Acres of Land under Williamson Act Contract within Each Levee Element[1,2]

Element	Minimum Footprint Alternative (Alternative 1)	Maximum Footprint Alternative (Alternative 2)[3]	Requester's Preferred Alternative
Total under contract	14.8	81.44	20.2
Total contract in nonrenewal	0	0	0
Total	**14.8**	**79.3/81.4**	**20.2**

Notes:
1 Williamson Act contract acreage data are estimated based on California Department of Conservation Williamson Act mapping and do not equate to property acquisition acreage.
2 Total number may not be precise because of rounding of numbers.
3 Where two values are provided for Alternative 2, the first value is for Alternative 2 with a seepage berm at element IVc, and the second value is for Alternative 2 with a setback levee at element IVc. If only one number is shown for Alternative 2, this value is the same for Alternative 2 whether a seepage berm or a setback levee is proposed at element IVc.
Source: DOC 2016; data compiled by Ascent Environmental in 2019

Farmland Conversion Impact Rating

The Farmland Conversion Impact Rating for Corridor-Type Projects (Form NRCS-CPA-106) is described in Section 3.2.1, "Regulatory Setting." The final scoring for the alternatives on Form NRCS-CPA-106 completed in 2015 is shown in **Table 3.2-4**, and the completed form is provided in **Appendix C**. As shown in **Table 3.2-4**, the final score for the overall preferred Phase 3 Repair Project (including the 10 elements that make up the Requester's Preferred Alternative and the other nine elements implemented during the 2017 Emergency Flood Response and 2019 Categorical Permissions Construction Projects) was 123, the final score for Alternative 1 with the dryland levee was 123, and the final score for Alternative 2 with the dryland levee was 124. The Phase 3 Repair Project would result in less acreage of Prime Farmland, Statewide Important Farmland, and Local Important Farmland under Alternatives 1 and 2 than was previously included in Form NRCS-CPA-106 because work along the dryland levee was removed from these alternatives following completion of the DEIS/DEIR, and these acreages would be less for the Requester's Preferred Alternative because this alternative only includes 10 of the 19 elements included in the overall preferred Phase 3 Repair Project evaluated in the form; therefore, the scores would not increase from the previous totals. Because the scores for Alternative 1, Alternative 2, and the Requester's Preferred Alternative would be less than the Farmland Conversion Impact Rating scoring threshold of 260 points, the project alternatives would not result in a substantial effect on farmlands, and no further analysis of additional alternatives, locations, or designs is necessary to ensure that farmlands would be protected per the requirements of the FPPA.

Table 3.2-4. Form NRCS-CPA-106 Scoring for the Proposed Project Alternatives[1]

Element	Minimum Footprint Alternative (Alternative 1)	Maximum Footprint Alternative (Alternative 2)	Requester's Preferred Alternative
Land evaluation subtotal	67	68	67
Corridor assessment subtotal	56	56	56
Total NRCS-CPA-106 form score	123	124	123

Note: NRCS = Natural Resources Conservation Service.
1 Form NRCS-CPA-106 was completed for each alternative for the proposed project by AECOM on January 15, 2015, and the form was completed and approved by the NRCS on February 3, 2015.
Source: Data compiled by AECOM in 2015

3.2.3 Methodology and Thresholds of Significance

Methodology

Evaluation of the Phase 3 Repair Project's potential effects on agricultural resources was based on a review of planning documents pertaining to the Phase 3 Repair Project area, including goals and policies from San Joaquin County's general plan (San Joaquin County 2016), the City of Lathrop's general plan (City of Lathrop 2004), the City of Manteca's general plan (City of Manteca 2003), and consultation with appropriate agencies. In addition, the maps of DOC's Important Farmland (DOC 2016) and maps of land under the Williamson Act (DOC 2016) in San Joaquin County were used to determine the agricultural significance of the lands within the Phase 3 Repair Project area.

In addition, Form NRCS-CPA-106 was used to quantitatively assess the relative value of agricultural lands in the Phase 3 Repair Project area. Based on the scoring thresholds, the project alternatives would not result in a substantial effect on farmlands, and no further analysis of additional alternatives, locations, or designs is necessary. As discussed in the "Thresholds of Significance" section, below, this analysis focuses on thresholds developed in the joint DEIS/DEIR that encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. These guidelines state that conversion of agricultural land on Prime Farmland, Farmland of Statewide Importance, or Unique Farmland would be a significant effect.

Thresholds of Significance

The basis for determining the significance of effects for this analysis is based on professional standards and project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to agricultural resources if they would do any of the following:

- convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) as shown on the maps prepared pursuant to the FMMP of the California Resources Agency, to nonagricultural use;
- conflict with existing zoning for agricultural use or a Williamson Act contract;
- conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220[g]), timberland (as defined in Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104[g]); or
- result in the loss of forest land or conversion of forest land to nonforest use.

The land cover in the Phase 3 Repair Project area consists of agriculture and urban land. Because the Phase 3 Repair Project area does not include forest land or timberland (as defined by the Public Resources Code sections referenced above), the Phase 3 Repair Project would not conflict with existing zoning for either land category or result in the loss or conversion of these lands. Therefore, these issues are not addressed further in this FEIS.

3.2.4 Effects and Mitigation Measures

Effect 3.2-a: Conversion of Important Farmland to Nonagricultural Uses and Other Changes in the Existing Environment That Could Result in Conversion of Important Farmland to Nonagricultural Uses.

Table 3.2-5 shows acreage of Important Farmland that would be affected by the construction of the Phase 3 Repair Project for each project alternative. Loss and conversion of agricultural lands on a cumulative basis, or resulting from growth-inducing effects, are addressed in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements."

Table 3.2-5. Phase 3 Repair Project Important Farmland[1] Conversion (acres)

Project Feature	Minimum Footprint Alternative (Alternative 1)	Maximum Footprint Alternative (Alternative 2)[2]	Requester's Preferred Alternative
Seepage berms	24.5	113.8/100.6	9.7[3]
Setback levees	0	14.7	0
Access road element IVc	0	1.1	0
Cutoff walls with 3:1 slopes	8.1	0	4.6[4]
Total permanent conversion	**32.6**	**129.6/116.4**	**14.3**

Notes:
1 Important Farmland acreage data are estimated based on California Department of Conservation Important Farmland mapping and do not equate to property acquisition acreage.
2 Important Farmland includes Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance. Where two values are provided for Alternative 2, the first value is for Alternative 2 with a seepage berm at element IVc, and the second value is for Alternative 2 with a setback levee at element IVc. If only one number is shown for Alternative 2, this value is the same for Alternative 2 whether a seepage berm or a setback levee is proposed at element IVc.
This includes conversion of Important Farmland in elements Ia and IVc,
This includes conversion of Important Farmland in elements IIab, Va–VIa.1, VIa.4, VIb, and VIc.
Source: DOC 2016; data compiled by Ascent Environmental in 2019

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2), and no levee repairs would be constructed. Therefore, no direct conversion of Important Farmland to nonagricultural uses would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could result in scouring of agricultural land and the long-term loss of topsoil in locations near the levee breach. This could result in the long-term loss of Important Farmland in those locations. Such losses typically would be limited to localized areas within several hundred feet of the levee breach. (The indirect effects of lack of flood protection on urban development and Important Farmland conversion have been addressed as part of the cumulative and growth-inducing effects analyses [see Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements"].) However, in the event of simultaneous levee failures in more than one location in the levee system, adverse effects would be more widespread. Flooding of agricultural areas would likely destroy or severely damage agricultural outbuildings and residences, leading to reduction in agricultural productivity and depression of the agricultural economy. Abandonment of, or failure to maintain cultivation of productive agricultural land after a flood event, as well as damage of residential and commercial properties, would likely result in adverse effects on the physical and economic wellbeing of the local agricultural community, which could be difficult to reverse and could lead to conversion of existing agricultural land to some other use because agricultural landowners may have to sell their land out of choice or necessity. Therefore, the effect related to the conversion of farmland would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Table 3.2-5 shows the acreage of Important Farmland that would be converted to nonagricultural uses under Alternative 1. Under this alternative, construction of seepage berms and cutoff walls would result in permanent conversion of Important Farmland. The seepage berms are expected to be vegetated with grasses. Some existing seepage berms under RD 17 jurisdiction are used for agricultural purposes that do not conflict with the flood control function of the berms, such as cultivation of shallow-rooted crops, livestock pasture, and storage of farm equipment; however, these uses may not be acceptable under USACE authorization and funding required for the Phase 3 Repair Project. Therefore, Important Farmland affected by construction of seepage berms presumably would be permanently converted to nonagricultural uses. This adverse effect on Important Farmland would be **significant**.

Alternative 2: Maximum Footprint Alternative

Table 3.2-5 shows the acreage of Important Farmland that would be converted to nonagricultural uses under Alternative 2. Under this alternative, Important Farmland acreage would be required for construction of seepage berms, setback levees, and an access road. As described under Alternative 1, construction of seepage berms would be considered a permanent conversion of Important Farmland to nonagricultural uses. Alternative 2 also would result in permanent conversion of Important Farmland for construction of setback levees in elements IIab, IVc, and VIcde. The Important Farmland on the waterside of the setback levee would be converted to nonagricultural uses, such as habitat or open space. This adverse effect on the permanent conversion of Important Farmland would be **significant**.

Requester's Preferred Alternative

Table 3.2-5 shows the acreage of Important Farmland that would be converted to nonagricultural uses under the Requester's Preferred Alternative. Under this alternative, Important Farmland acreage would be required for construction of seepage berms and an access road. Only Farmland of Local Importance would be converted in element IVc. As described under Alternative 1, construction of seepage berms would be considered a permanent conversion of Important Farmland to nonagricultural uses. This adverse effect on the permanent conversion of Important Farmland would be **significant**.

Mitigation Measure 3.2-a: Minimize Important Farmland Conversion to the Extent Practicable and Feasible.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

RD 17 shall implement the following measures concerning Prime Farmland, Unique Farmland, and Farmland of Statewide Importance to minimize adverse effects on these lands:

a) During Phase 3 Repair Project construction, utilities disturbance that is needed for agricultural purposes (including wells, pipelines, and power lines) and agricultural drainage systems will be minimized so that agricultural operations are not substantially disrupted. If any agricultural infrastructure, such as wells, pipelines, and drainage canals, need to be removed during project construction, the function of these facilities will be restored as soon as possible for lands that are to remain in agricultural production.

b) Disturbance of agricultural land and agricultural operations during Phase 3 Repair Project construction will be minimized by locating construction staging areas on sites that are fallow, that already are developed or disturbed, or that are to be discontinued for use as agricultural land, and by using existing roads to the extent possible to access project construction sites.

c) To the extent practicable and feasible, when expanding the footprint of a flood control facility (e.g., levee or berm) onto agricultural land, the most productive topsoil from the project construction footprint will be salvaged and redistributed to less productive agricultural lands near the project construction site that can benefit from the introduction of good quality soil. By agreement between the implementing agencies or landowners of affected properties and the recipient(s) of the topsoil, the recipient(s) will be required to use the topsoil for agricultural purposes. RD 17 shall implement all terms and conditions of agreements.

Responsibility: RD 17 and its primary construction contractors.

Timing: Minimize loss of Important Farmland and reuse topsoil before construction and avoid disruption to current agricultural operations during construction. Replace function of agricultural infrastructure as soon as possible after construction in a particular location is complete.

Implementation of Mitigation Measure 3.2-a would reduce the adverse effect on Important Farmland associated with the three alternatives, but not to a less-than-significant level. The effect would remain **significant and unavoidable** for all alternatives because of the permanent conversion of Important Farmland to nonagricultural uses.

Effect 3.2-b: Conflict with Land under Williamson Act Contracts.

Table 3.2-6 compares the Phase 3 Repair Project's potential effects on land under the Williamson Act contract.

Table 3.2-6. Phase 3 Repair Project Potential Effects on Lands under Williamson Act Contracts

Project Feature/ Williamson Act Status	Minimum Footprint Alternative (Alternative 1)	Maximum Footprint Alternative (Alternative 2)	Requester's Preferred Alternative
Seepage Berms			
Contracted land	1.3	78.7/73.0	See note 2
Contract in nonrenewal	0	0	0
Total	**1.3**	**78.7/73.0**	**See note 2**
Setback Levees			
Contracted land	0	0	See note 2
Contract in nonrenewal	0	0	0
Access road (prime enrolled)	0	0	0
Total	**0**	**0**	**See note 2**

Table 3.2-6. Phase 3 Repair Project Potential Effects on Lands under Williamson Act Contracts

Cutoff Wall 3:1 Slope			
Contracted land	7.0	0	See note 2
Contract in nonrenewal	0	0	0
Total	**7.0**	**0**	**See note 2**
Total Permanent Effects	**8.3**	**78.7/73.0**	**7.9**

Note: Important Farmland acreage data are estimated based on California Department of Conservation Williamson Act mapping and do not equate to property acquisition acreage.

1 Where two values are provided for Alternative 2, the first value is for Alternative 2 with a seepage berm at element IVc, and the second value is for Alternative 2 with a setback levee at element IVc. If only one number is shown for Alternative 2, this value is the same for Alternative 2 whether a seepage berm or a setback levee is proposed.

2 This includes Effects on Williamson Act Contracts in Elements 4C and 5A-6A.

Source: DOC 2016; data compiled by Ascent Environmental in 2019

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2) and no levee repairs would be constructed. As a result, no Phase 3 Repair Project Williamson Act contracts would be terminated. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could result in scouring of agricultural land and the long-term loss of topsoil in locations near the levee breach. In the event of simultaneous levee failures in more than one location in the levee system, adverse effects on agricultural lands would be more widespread. However, **no effect** would occur related to cancellation of Williamson Act contracts.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Alternative 1 would affect properties under Williamson Act contract in elements Ie, IVc, and Va–VIa.1. **Table 3.2-6** shows the permanent effects that would occur associated with acquisition of property for the construction of Phase 3 Repair Project elements, including seepage berms and an access road. If project construction does not require acquisition of an entire parcel, the contract would be terminated only on the portion of the parcel required for the Phase 3 Repair Project; the remainder of the parcel that would be unaffected by construction would remain under contract. The effect of termination of Williamson Act contracts for the purposes of construction of flood control facilities would be **significant**.

Alternative 2: Maximum Footprint Alternative

Alternative 2 would affect properties under Williamson Act contract in elements Ie, IVc, and Va–VIa.1. **Table 3.2-6** shows the permanent effects that would occur associated with acquisition of property for the construction of Phase 3 Repair Project elements, including seepage berms, setback levees and an access road. If project construction does not require acquisition of an entire parcel, the contract would be terminated only on the portion of the parcel required for the Phase 3 Repair Project; the remainder of the parcel that would be unaffected by construction would remain under contract.

The permanent termination of Williamson Act contracts would affect more acreage under this alternative than under Alternative 1. The effect of termination of Williamson Act contracts to construct flood control facilities would be **significant**.

Requester's Preferred Alternative

The Requester's Preferred Alternative would affect properties under Williamson Act contract in elements IVc and Va–VIa.1. **Table 3.2-6** shows the permanent effects that would occur associated with acquisition of property for construction of Phase 3 Repair Project elements, including seepage berms, a setback levee, and an access road. If construction would not require acquisition of an entire parcel, the contract would be terminated only on the portion of the parcel required for the Phase 3 Repair Project; the remainder of the parcel that would be unaffected by construction would remain under contract.

The permanent termination of Williamson Act contracts would affect less acreage under this alternative than under Alternative 1 or Alternative 2. However, the effect of termination of a Williamson Act contract to construct the flood control facilities would be **significant**.

Mitigation Measure 3.2-b: Minimize Effects on Agricultural Preserve Land and Land under Williamson Act Contracts, Comply with California Government Code Sections 51290–51293, and Coordinate with Landowners and Agricultural Operators.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

To reduce adverse effects on land under Williamson Act contracts, RD 17 shall comply with the dictates of the following California Government Code Sections 51290–51295 concerning acquisition of land under Williamson Act contracts:

- The policy of the State, consistent with the purpose of the Williamson Act to preserve and protect agricultural land, is to avoid, whenever practicable, locating public improvements and any public utilities improvements in agricultural preserves. If it is necessary to locate within a preserve, it shall be on land that is not under contract whenever possible (California Government Code Section 51290[a][b]). More specifically, the basic requirements are:
    - Whenever it appears that land within a preserve or under contract may be required for a public improvement, the public agency or person shall notify the DOC and the city or county responsible for administering the preserve (California Government Code Section 51291[b]).
    - Within 30 days of being notified, DOC and the city or county shall forward comments, which shall be considered by the public agency or person (California Government Code Section 51291[b]).
    - The contract shall be terminated when land is acquired by eminent domain or in lieu of eminent domain (California Government Code Section 51295).
    - DOC and the city or county shall be notified before project completion of any proposed substantial changes to the public improvement (California Government Code Section 51291[d]).
    - DOC shall be notified within 10 working days upon completion of the acquisition (California Government Code Section 51291[c]).

- If, after acquisition, the acquiring public agency determines that the property will not be used for the proposed public improvement, before returning the land to private ownership, DOC and the city or county administering the involved preserve shall be notified. The land shall be reenrolled in a new contract or encumbered by an enforceable restriction at least as restrictive as that provided by the Williamson Act (Government Code Section 51295).

Responsibility: RD 17.

Timing: Comply with policies regarding the Williamson Act before and during construction; and coordinate with landowners and agricultural operators before construction.

Implementation of Mitigation Measure 3.2-b would potentially reduce the adverse effects from conversion of land under Williamson Act contracts, but not to a less-than-significant level since no feasible mitigation is available to lessen or avoid the permanent loss of land under Williamson Act contracts converted to nonagricultural use within a levee setback area and on lands used for construction of seepage berms. For this reason, this adverse effect would remain **significant and unavoidable** under Alternative 1, Alternative 2, and the Requester's Preferred Alternative.

3.2.5 Residual Significant Effects

Because mitigation would not be required for the No-Action Alternative, adverse effects related to conversion of Important Farmland would be significant and unavoidable. Under the No-Action Alternative, no effects would occur related to cancellation of Williamson Act contracts.

The implementation of Mitigation Measures 3.2-a and 3.2-b would partially reduce the adverse effects of permanent conversion of Important Farmland to nonagricultural uses and loss of land under Williamson Act contracts for all of the action alternatives. However, no feasible mitigation is available that would lessen, reduce to a less-than-significant level, or avoid these losses; therefore, residual significant and unavoidable adverse effects would occur under Alternative 1, Alternative 2, and the Requester's Preferred Alternative of the Phase 3 Repair Project.

3.3 Land Use, Socioeconomics, and Population and Housing

This section discusses existing resources related to land use, socioeconomics, and population and housing within the Phase 3 Repair Project area and surrounding areas; identifies applicable Federal and state laws and regulations; and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to land use, socioeconomics, population, and housing. A discussion of cumulative effects related to these resources is provided in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements," of this FEIS. See Section 3.15, "Hazards and Hazardous Materials," for a discussion of effects related to schools in the action area.

3.3.1 Regulatory Setting

As required under NEPA, applicable Federal laws and regulations are identified in this section. State laws and regulations applicable to implementation of the Phase 3 Repair Project by RD 17 are described for informational purposes and to assist with NEPA review. RD 17 also has considered regional and local plans and ordinances as a part of the environmental review process for this FEIS, where applicable to the Phase 3 Repair Project.

Federal

Uniform Relocation Assistance and Real Property Acquisition Policies Act

All or portions of some parcels within the Phase 3 Repair Project footprint would need to be acquired for project construction. Federal, state, and local government agencies, and others receiving Federal financial assistance for public programs and projects that require the acquisition of real property, must comply with the policies and provisions set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended in 1987 (42 U.S. Code Section 4601 et seq.) (Uniform Act), and implementing regulation, 49 Code of Federal Regulations Part 24. Relocation advisory services, moving costs reimbursement, replacement housing, and reimbursement for related expenses and rights of appeal are provided in the Uniform Act.

State

Relocation Assistance and Property Acquisition

Section 7260 et seq. of the California Government Code brings the California Relocation Act into conformity with the Federal Uniform Act. In the acquisition of real property by a public agency, both the Federal and state acts seek to (1) ensure consistent and fair treatment of owners of real property, (2) encourage and expedite acquisition by agreement to avoid litigation and relieve congestion in the courts, and (3) promote confidence in public land acquisition.

The Relocation Assistance and Real Property Acquisition Guidelines were established by Title 25 of the California Code of Regulations, Section 1.6. The guidelines were developed to assist public entities with developing regulations and procedures implementing Title 42, Chapter 61 of the U.S. Code—the Uniform Act, for Federal and Federally assisted programs. The guidelines are designed to ensure that uniform, fair, and equitable treatment is given to people displaced from their homes, businesses, or farms as a result of the actions of a public entity. Under the act, persons required to relocate temporarily are not considered "displaced," but must be treated fairly. Such persons have a right to temporary housing that is decent, safe, and sanitary and must be reimbursed for all reasonable out-of-pocket expenses. In accordance with these guidelines, people should not suffer disproportionate injury as a result of action taken for the benefit of the public as a whole. In addition, public entities must ensure consistent and fair treatment of owners of such property, and encourage and expedite acquisitions by agreement with owners of displaced property to avoid litigation.

Implementation of the Phase 3 Repair Project (Alternative 1, Alternative 2, and the Requester's Preferred Alternative) would require acquisition of property to construct flood control facilities.

Property acquisition and relocation services and compensation for living expenses for temporarily relocated residents would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act and Section 7267 et seq. of the California Government Code.

3.3.2 Environmental Setting

Land Use

The Phase 3 Repair Project area is in the southeastern portion of the Delta, within the legal boundary of the Delta as defined by Section 12220 of the California Water Code. The legal Delta encompasses an area of approximately 851,000 acres (of which approximately 135,000 acres consist of waterways, marshland, or other water surfaces). The Delta is divided into a Primary Zone and a Secondary Zone, as defined by the Delta Protection Act of 1992. Land uses in the Primary Zone are regulated to protect the area for agriculture, wildlife habitat, and recreational uses. Where urban development activities occur in the Secondary Zone, efforts are to be taken so that these activities do not adversely affect Delta waters, Primary Zone habitat, or recreational uses. The San Joaquin River delineates the boundary between the Primary Zone to the west and the Secondary Zone to the east. The Phase 3 Repair Project is located in the Secondary Zone.

The Delta is a hydrologically complex region of interlacing channels, marshland, and islands. The Delta has been reclaimed into more than 60 islands and tracts, interlaced with about 700 miles of waterways. About 520,000 acres are used for farming. An approximately 1,100-mile network of levees protects the reclaimed land, most of which lies near or below sea level, from flooding. Some of the island interiors are as much as 25 feet below sea level. Water flowing into the Delta is used for urban and agricultural use, recreation, navigation, wildlife, and fisheries. The Delta provides drinking water for millions of Californians.

A majority of the levees protecting RD 17 are considered Federal project levees. Federal project levees were either constructed by the Federal government (typically by USACE) or were built by others and later brought under Federal jurisdiction.

Phase 3 Repair Project elements Ia through VIIg are located along the east levee of the San Joaquin River. Some of these elements are adjacent to agricultural land, and other elements are located adjacent to areas that are either proposed for development, have approved plans for development, or currently are undergoing development for residential and parkway uses.

Table 3.3-1 summarizes the land uses immediately adjacent to the Phase 3 Repair Project area.

Table 3.3-1. Land Uses Adjacent to RD 17 Phase 3 Repair Project Elements

Element	Jurisdiction	General Plan/Specific Plan Planning Area and Planned Land Uses Adjacent to Each Element	Existing Land Use
Ia	San Joaquin County	Stockton planning area: Agriculture/General—Crop production, grazing, and livestock raising facilities; agricultural processing facilities, support and sales; single-family detached dwellings; farm-employee housing and farm labor camps; accessory second units and ancillary residential structures, compatible public, quasi-public, and special uses; natural open space areas.	Agriculture
Ib	San Joaquin County	Stockton planning area: Agriculture/General—Crop production, grazing, and livestock raising facilities; agricultural processing facilities, support and sales; single-family detached dwellings; farm-employee housing and farm labor camps; accessory second units and ancillary residential structures, compatible public, quasi-public, and special uses; natural open space areas.	Agriculture
Ie	San Joaquin County	Lathrop planning area: Agriculture/General—Crop production, grazing, and livestock raising facilities; agricultural processing facilities, support and sales; single-family detached dwellings; farm-employee housing and farm labor camps; accessory second units and ancillary residential structures, compatible public, quasi-public, and special uses; natural open space areas.	Agriculture/rural residence and River Mill Event Center (commercial) adjacent on downstream side
IIab	San Joaquin County	Lathrop planning area: Agriculture/General—Crop production, grazing, and livestock raising facilities; agricultural processing facilities, support and sales; single-family detached dwellings; farm-employee housing and farm labor camps; accessory second units and ancillary residential structures, compatible public, quasi-public, and special uses; natural open space areas. Within the City of Lathrop SOI.	Agriculture/rural residence/artificial lake/ Haven Acres Marina adjacent south end of element
IIIa/IIIb	City of Lathrop	Central Lathrop Specific Plan: Open Space on the waterside of levee. Open Space encompasses natural features, buffers, stormwater and water quality management, natural habitat preservation and maintenance, and active or passive recreational opportunities, which include the river, associated lands along the river and levee, drainage corridors, and other uses (e.g., boat launches, picnic facilities, and fishing sites). In addition to recreation, permitted uses include linear detention basins and other stormwater and water quality features, as well as trails. (Lathrop General Plan 4-A-21) On the Landside of the Levee: Variable Density Residential—3 to 16 du/acre; single-family and multifamily units, detached or attached. (Lathrop General Plan 4-A-17)	Agriculture
IVa	City of Lathrop	Central Lathrop Specific Plan: Levee, Open Space, and River.	Open space
IVc	City of Lathrop	Mossdale Village Planning Area: Public (schools, parks, and open space); Recreation Residential; Residential Low Density to east.	Undeveloped open space and residential subdivision to the east
Va	City of Lathrop	Mossdale Village Planning Area: Recreational Residential; Public; Residential Low Density to the east with a small area of Village Commercial.	Agriculture on the landside of the levee and open space on the waterside of the levee

Table 3.3-1. Land Uses Adjacent to RD 17 Phase 3 Repair Project Elements

Element	Jurisdiction	General Plan/Specific Plan Planning Area and Planned Land Uses Adjacent to Each Element	Existing Land Use
VIa.1	City of Lathrop	Mossdale Village Planning Area: Low Density Residential and Public.	Agriculture and rural residence/farm complex/ subdivision and City of Lathrop park
VIa.4	City of Lathrop	Mossdale Landing South Planning Area: Open Space/Park adjacent to levee; Medium Density Residential.	Agriculture
VIb	City of Lathrop	Mossdale Landing South: Open Space.	Agriculture
VIc	City of Lathrop	Mossdale Landing South: undesignated setback area between railroad right-of-way and Service Commercial.	Agriculture
VId/VIe	City of Lathrop	San Joaquin County Park–Mossdale Crossing Regional Park.	Regional park with boat ramps and picnic facilities.
VIIb	San Joaquin County	Within the City of Lathrop SOI, South Lathrop Specific Plan: Industrial/Commercial.	Agriculture, freeway embankment, and road
VIIe	San Joaquin County	Within the City of Manteca SOI: Low Density Residential (2.1 to 8 du/acre).	Partially constructed residential subdivision and artificial lake (Oakwood Lake)
VIIg	San Joaquin County	Within the City of Manteca SOI: Designated Low Density Residential (2.1 to 8 du/acre).	Vacant, artificial lake to north

Notes: du/acre: dwelling units per acre; SOI = sphere of influence.
Under Section 56000 et seq. of the California Government Code, the SOI is a plan for the probable physical boundaries and service area of a local government agency.
Sources: San Joaquin County 2016:3.1-13, 3.1-57; City of Lathrop 2008; City of Lathrop 2004:4-A-21; compiled in May 2010 and updated in September 2019

Manteca Unified School District provides educational services to the Phase 3 Repair Project area. Lathrop High School is located within 0.25 miles of element IIIa and Mossdale Elementary School is located within 0.28 mile of element VIa.1. See **Table 3.14-1** in Section 3.14, “Utilities and Public Services” for a list of schools and their location within the Manteca Unified School District.

Socioeconomics, Population, and Housing

Population

Approximately 80 percent of the San Joaquin County population resides in cities; of this number, 54 percent lives in Stockton. The majority of San Joaquin County’s population growth between 2000 and 2014 occurred in incorporated areas, particularly the cities of Stockton, Lathrop, Ripon, Tracy, and Manteca (San Joaquin County 2015). **Table 3.3-2** shows the population in 2000 and population projections to 2030 for the cities within the RD 17 service area (i.e., Lathrop, Manteca, and Stockton) and for the county as a whole (San Joaquin County 2010:7-12).

Table 3.3-2. Census Population in 2000 and Population Projections to 2030

City/County	2000	2010	2020	2030
Lathrop	10,455	15,543	24,144	41,556
Manteca	49,258	66,210	85,605	108,719
Stockton	243,771	298,267	366,332	438,770
Unincorporated San Joaquin County	130,087	153,657	180,478	209,443
Total San Joaquin County	**563,598**	**708,364**	**888,536**	**1,117,006**

Source: San Joaquin County 2010:7-12

Table 3.3-3 shows a breakdown by race/ethnicity for the cities of Lathrop, Manteca, and Stockton, and for San Joaquin County as a whole based on estimates from the U.S. Census Bureau.

Table 3.3-3. Population Breakdown by Race/Ethnicity for Year 2018 (percent)

Race/Ethnicity	Lathrop	Manteca	Stockton	Countywide
White alone	44.9	68.1	43.9	66.5
Hispanic or Latino alone or in combination[1]	40.7	40.3	42.2	41.9
African American alone	6.4	4.2	11.5	8.3
Asian alone	26.0	8.6	21.7	17.0
American Indian or Alaska Native alone	0.4	0.8	0.6	2.0

Note:
1 In combination with one or more of the other races listed, may add up to more than 100 percent because individuals may report more than one race.
Source: U.S. Census Bureau 2018a

Housing

Table 3.3-4 summarizes the data compiled by the U.S. Census Bureau in 2000 and 2010, showing the total number of housing units occupied in San Joaquin County and the cities of Stockton, Manteca, and Lathrop at that time. This information was obtained from U.S. Census Bureau because it provided the most comprehensive dataset for these geographic areas. The updated estimate of housing units for San Joaquin County for 2018 was 245,541 units (U.S. Census Bureau 2018b).

Table 3.3-4. Number of Housing Units in San Joaquin County and the Cities of Stockton, Manteca, and Lathrop

City/County	Number of Housing Units and Year		
	2000[1]	2010[2]	2017[3]
San Joaquin County	181,629	233,755	239,253
Stockton	82,125	90,637	101,764
Manteca	16,897	23,132	24,644
Lathrop	2,980	5,261	5,718

Notes:
1 Source: U.S. Census Bureau 2000
2 Source: U.S. Census Bureau 2010
3 Source: U.S. Census Bureau 2017a

According to the San Joaquin County General Plan Housing Element (San Joaquin County 2015:7-31), unincorporated and incorporated San Joaquin County experienced historically high rates of housing growth from 2000 to 2014. The incorporated areas grew slightly faster than unincorporated areas, with a 2.4 percent annual average housing growth rate between 2000 and 2010. The substantial growth in the cities was related to the influx of San Francisco Bay Area workers seeking more affordable housing in San Joaquin County. Building permit activity peaked in 2003, at approximately 7,000 permits, and dropped back to early-1990 levels of approximately 2,000 permits by late 2007 (San Joaquin County 2010:7-36). The number of new permits was the lowest in 2009, with approximately 770 permits. In 2012, the number of new home permits in the County increased to approximately 1,100 permits (California Economic Forecast 2013). This trend is expected to continue, and it is anticipated that approximately 3,650 new permits will be approved in 2020 (California Economic Forecast 2013).

Since 2007, the San Joaquin County housing market has recovered from the recession and foreclosure crisis. In 2013, annual housing starts were up 55 percent to 4,904 from the first quarter of 2012 in the Central Valley, whereas closings increased by 26 percent to 4,400, thereby bringing inventory levels closer to equilibrium (Metrostudy.com 2013). As of July 2019, the California Association of Realtors reports that the median home price has increased from the 2008 low of $190,000 to $380,000 (California Association of Realtors 2018). **Table 3.3-5** summarizes the vacancy rates for housing in the Phase 3 Repair Project area as recorded in the Year 2000 U.S. Census, and U.S. Census 2017 American Community Survey 5-Year Estimates. Estimates from the American Community Survey are all “period” estimates that represent data collected over a period of time and provide increased statistical reliability of the data for less populated areas.

Table 3.3-5. Vacancy Rates for Housing in the Phase 3 Repair Project Area

City/County	2000[1] Vacancy Rates (percent)	2017[2] Vacancy Rates Estimated (percent)
San Joaquin County	4.0	6.4
Stockton	4.2	7.9
Manteca	3.4	4.7
Lathrop	2.8	4.1

Notes:
1 Source: U.S. Census Bureau 2000
2 Source: U.S. Census Bureau 2017a

Income

Persons living with income below the poverty level are identified as “low-income” populations, according to the annual statistical poverty thresholds established by the U.S. Census Bureau. Income thresholds vary by family size and composition to determine which families are living in poverty. Poverty thresholds do not vary geographically but are updated annually for inflation using the Consumer Price Index. According to the U.S. Census Bureau, the poverty threshold in 2018 was $12,784 for an individual and $25,701 for a family of four (U.S. Census Bureau 2018c). **Table 3.3-6** shows the median income and percentage of families with income below the poverty level in the Phase 3 Repair Project area (U.S. Census Bureau 2017a, 2017b).

Table 3.3-6. Median Household Income and Poverty Levels for Phase 3 Repair Project Area, 2010

Geographical Area	Median Income (2017 $)	Percentage of Families with Income Below Poverty Level in the Preceding 12 Months
Lathrop	$72,094	12.6
Manteca	$68,019	11.8
Stockton	$48,396	22.4
San Joaquin County	$57,813	17.1
Stockton-Lodi MSA	$57,813	17.1

Note: MSA = Metropolitan Statistical Area.
MSA is a geographic entity defined by the Federal government for the purpose of collecting, tabulating, and publishing Federal statistics. MSA refers to a core urban area of 50,000 or more population and consists of the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration with the urban core. The U.S. Department of Housing and Urban Development defines "low income" as 80 percent of the median income for the MSA and adjusted for household size and the specific housing program
Sources: U.S. Census Bureau 2017b, 2017c

3.3.3 Methodology and Thresholds of Significance

Methodology

The proposed alternatives under consideration were evaluated for potential effects related to socioeconomics (required under NEPA) and population and housing using data from the 2010 U.S. Census, 2006–2010 American Community Survey, and aerial photographs, of the area protected by the RD 17 levee system.

Thresholds of Significance

Under NEPA, economic or social effects must be discussed if they are interrelated with the natural or physical environmental effects of a project (40 Code of Federal Regulations 1508.14). Economic effects discussed in this section are not considered physical effects on the environment; however, economic effects can be used to judge the significance of other changes caused by them, such as changes in water supply or water quality. The significance of those associated environmental impacts is evaluated in each technical section of this FEIS. For this analysis, the magnitude of economic effects resulting from implementation of the proposed alternatives under consideration were identified and used to help characterize the associated socioeconomic, population, and housing effects.

The basis for determining the significance of effects for this analysis is based on professional standards and project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to land use, socioeconomics, and population and housing if they would do any of the following:

- cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect;
- physically divide an established community;

- displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere; or
- displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

3.3.4 Effects and Mitigation Measures

Effect 3.3-a: Physically Divide an Established Community.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2) and no levee repairs would be constructed; therefore, no potential would exist to divide any established community. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. Depending on the location and severity of the levee failure and duration of flooding, the location and extent of damage and adverse effects on existing agricultural, residential, commercial, and industrial structures that are protected by the levees could be minor to extensive. A levee failure along the RD 17 levee system and subsequent flooding would have the potential to cut off access to certain portions of the affected communities. Levee failure and subsequent inundation would require temporary or permanent relocation of residents and businesses to nearby communities. **Figure 2-8** shows estimated flood depths within the boundaries of RD 17 in the event of levee failure. An estimated 10,698 residential units are within the RD 17 service area (RD 17 2009:4). The magnitude of the effect of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. Depending on the location of a levee breach, portions of the communities located within the RD 17 service area could be cut off or divided from the remainder of the established community. The effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures" in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

The Phase 3 Repair Project would repair existing levees, and would not include construction of new levees other than three small segments of setback levees under Alternative 2 and one small segment of setback levee under the Requester's Preferred Alternative that would be located very close to the existing levees. Therefore, construction of the Phase 3 Repair Project would not result in the creation of new barriers that would divide any established community. Within the city of Lathrop, the RD 17 levee system is located on the western edge of areas within the city that are either planned for urbanization or currently are undergoing development for residential and parkway uses. Therefore, construction of levee repairs, including seepage berms, would not divide the community. No circumstances exist where Phase 3 Repair Project implementation would separate one portion of an established community from another portion of the community under any of the action alternatives. Therefore**, no effect** would occur.

Mitigation Measure: No mitigation is required.

Effect 3.3-b: Conflict with Any Adopted Applicable Land Use Plan, Policy, or Regulation (e.g., General Plan, Specific Plan, Local Coastal Program, or Zoning Ordinance) of an Agency with Jurisdiction over the Project and Adopted to Avoid or Mitigate an Environmental Effect.

Consistency of the Phase 3 Repair Project alternatives with the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP) is described in Effect 3.6-m in Section 3.6, "Biological Resources," which includes a detailed discussion of the Phase 3 Repair Project's potential effects on biological resources related to implementation of the SJMSCP.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2) and no levee repairs would be constructed. This lack of action would not be consistent with the goals and policies contained in local agency plans that support flood reduction measures. The current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. Existing urban development and agricultural operations would be subject to damage in the event of levee failure. Depending on the location and severity of the levee failure and duration of flooding, the location and extent of damage could be minor to extensive. In addition, without levee repairs that would provide flood damage reduction, restrictions may be placed on new urban development. For these reasons, the effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Work associated with the Phase 3 Repair Project would be consistent with policies contained in the San Joaquin County General Plan and the Lathrop General Plan. The Phase 3 Repair Project would be consistent with the San Joaquin County General Plan's Flood Control Policies 5, 6, and 7, which affirm the primary function of levees for flood control, while allowing for other compatible uses as appropriate and providing for resource conservation.

The San Joaquin County General Plan's Agricultural Lands Policy 5 addresses compatibility of nonfarm uses with agricultural operations. Implementing seepage repair to the Phase 3 Repair Project segments adjacent to agricultural land would reduce the potential for under seepage to occur. The Phase 3 Repair Project would not have a detrimental effect on the management or use of surrounding agricultural properties located in the unincorporated portion of the county (refer to Section 3.2, "Agricultural Resources," for the discussion regarding Important Farmlands and the Williamson Act).

Construction of the Phase 3 Repair Project would not adversely affect the County's or partner cities' implementation of the goals contained in the San Joaquin County Regional Blueprint under any of the alternatives. Levee repairs would reduce flood risk for higher density urban development encouraged by the Blueprint's guiding principles (SJCOG 2010). Therefore, **no effect** would occur.

Mitigation Measure: No mitigation is required.

Effect 3.3-c: Displace Substantial Numbers of Existing Housing, Necessitating the Construction of Replacement Housing Elsewhere, or Displace Substantial Numbers of People, Necessitating the Construction of Replacement Housing Elsewhere.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2) and no levee repairs would be constructed. Therefore, no potential would exist to displace existing housing or people. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. Levee failure would have the potential to destroy residences located near the levee, severely damaging other residences in RD 17 through different levels of inundation and flooding, and to require temporary or permanent relocation of residents to nearby communities. An estimated 10,698 residential units are within the RD 17 service area (RD 17 2009:4). The magnitude of the effect of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. Flood damage estimates prepared for RD 17, based on a levee breach at 17 feet water surface elevation, examined costs associated with residential structural and content damage, residential cleanup costs, and emergency costs (including housing assistance and public assistance,) within the RD 17 service area. These costs amounted to over $875 million ($875,220,033) (RD 17 2009:4-10). It is unknown what percentage of residential relocations would be temporary and what percentage may be permanent and would require construction of replacement housing elsewhere. However, levee failure would result in the displacement of substantial numbers of people and the need for replacement housing (temporary and/or permanent) within the RD 17 service area or in nearby communities. Under this alternative, this effect would be **significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative and the Requester's Preferred Alternative

Alternative 1 and the Requester's Preferred Alternative would not displace existing housing or displace people because the proposed elements would not require the removal of existing residences. Therefore, under these alternatives, **no effect** would occur.

Mitigation Measure: No mitigation is required.

Alternative 2: Maximum Footprint Alternative

Alternative 2 would require removal or acquisition of approximately two residences. One residence, which is located within the footprint of the proposed setback levee at elements IIab, would be removed, and its residents would be relocated. All property acquisition would be conducted in compliance with Federal and state law. Acquisition would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 USC 4601 et seq.), implementing Part 24, Title 49 of the Code of Federal Regulations, Section 7267 et seq. of the California Government Code, Sections 1263.010–1263.620 and 1255.010–1255.060 of the California Code of Civil Procedure, California Community and Housing Development Title 25, and adhering to Chapter 10 of the *State and Caltrans Right of Way Manual* (Caltrans 2019). These laws would require that appropriate compensation be provided to the landowners. Refer to Section 3.3.1, "Regulatory Setting," and Chapter 5, "Compliance with Federal Environmental Laws and Regulations," for more details. Sufficient housing stock exists in the area to accommodate the relocation of approximately two residences, and the project would not necessitate the construction of replacement housing elsewhere. Therefore, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

3.3.5 Residual Significant Effects

The No-Action Alternative would not be consistent with adopted goals and policies contained in local agency plans that support flood reduction measures, and therefore, effects would remain significant and unavoidable. However, the No-Action Alternative would not conflict with adopted policies supporting agricultural land uses. This alternative would be partially inconsistent with adopted plans and policies in the jurisdictions of local agencies where the Phase 3 Repair Project is located.

No significant effects were identified with respect to land use, socioeconomics, population, and housing under Alternative 1, Alternative 2, and the Requester's Preferred Alternative. Therefore, no residual significant adverse effects associated with the Phase 3 Repair Project would occur.

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3.4 Geology, Soils, Minerals, and Paleontological Resources

This section discusses existing geology, soils, minerals, and paleontological resources within the Phase 3 Repair Project area and surrounding areas; identifies applicable Federal and state laws and regulations; and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to geology, soils, minerals, and paleontological resources. A discussion of cumulative effects related to geology, soils, minerals, and paleontological resources is provided in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements," of this FEIS.

3.4.1 Regulatory Setting

As required under NEPA, applicable Federal laws and regulations are identified in this section. State laws and regulations applicable to implementation of the Phase 3 Repair Project by RD 17 are described for informational purposes and to assist with NEPA review. RD 17 also has considered regional and local plans and ordinances as a part of the environmental review process for this FEIS, where applicable to the Phase 3 Repair Project.

Federal

Federal Clean Water Act Section 402 General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities

The U.S. Environmental Protection Agency (EPA) is the lead Federal agency responsible for managing water quality. The Clean Water Act (CWA) of 1972 is the primary Federal law that governs and authorizes EPA to implement activities to control water quality. CWA Section 402 regulates discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program, administered by EPA. In California, the State Water Resources Control Board (SWRCB) is authorized by EPA to oversee the NPDES program through the nine regional water quality control boards (RWQCBs). The NPDES program provides for both general permits (those that cover a number of similar or related activities) and individual permits.

The NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (General Construction Permit, Order 2009-009-Division of Water Quality [DWQ]) is applicable to all land-disturbing construction activities that would affect 1 acre or more. Construction activities subject to the General Construction Permit include clearing, grading, stockpiling, and excavation. The General Construction Permit requires the applicant to file an NOI to discharge stormwater, and to prepare and implement a stormwater pollution prevention plan (SWPPP) that considers the use of post-construction permanent Best Management Practices (BMPs) to protect water quality throughout the life of the project. The SWPPP is to include a site map and a description of proposed construction activities, a demonstration of compliance with relevant local ordinances and regulations, and an overview of the BMPs to be implemented to prevent soil erosion and discharge of other construction-related pollutants that could contaminate nearby water resources. Permittees are further required to conduct annual monitoring and reporting so that the BMPs can be correctly implemented and effective in controlling the discharge of stormwater-related pollutants. Types of BMPs include source controls, treatment controls, and site planning measures. RD 17 would file an NOI with the Central Valley RWQCB to obtain coverage under the General Construction Permit before any Phase 3 Repair Project construction activities were begun.

Federal Earthquake Hazards Reduction Act

In October 1977, the U.S. Congress passed the Earthquake Hazards Reduction Act to "reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards and reduction program." To accomplish this, the act established the National Earthquake Hazards Reduction Program. This program was amended substantially in November 1990 by the National Earthquake Hazards Reduction Program Act, which refined the description of agency responsibilities, program goals, and objectives. The program's mission includes improved understanding, characterization, and prediction of hazards and vulnerabilities; improvement of building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improvement of mitigation capacity; and accelerated application of research results. The act designates FEMA as the lead agency of the program and assigns it several planning, coordinating, and reporting responsibilities. Other agencies with responsibility include the National Institute of Standards and Technology, National Science Foundation, and the U.S. Geological Survey.

The closest active fault to the Phase 3 Repair Project area is located approximately 25 miles to the west, as shown in **Table 3.4-1**. Because no active faults are within or near the Phase 3 Repair Project area, the risk of ground rupture caused by a fault is low. In addition, geotechnical investigations of improvements to reduce levee seepage are designed in consideration of the longevity of the levee system, including secondary seismic hazards such as shaking, liquefaction, subsidence, and seiches.

Table 3.4-1. Active Faults in the Phase 3 Repair Project Region

Fault Name	Approximate Distance (miles)[1]	Fault Class[2]	Maximum Moment Magnitude[3]	Slip Rate (mm/year)
Greenville Fault Zone, Clayton Section	25	B	6.6	2.0
Greenville Fault Zone, Marsh Creek-Greenville Section	30	B	6.6	2.0
Concord-Green Valley Fault	38	B	6.2	4.0
Calaveras Fault (Northern Segment)	51	B	6.0	6.8
Hayward Fault (Northern Segment)	53	A	6.4	9.0

Notes: mm/year = millimeters per year.

1 Approximate distance is measured from the San Joaquin River to the respective active fault line.

2 Faults with an "A" classification are capable of producing large magnitude (M) events (M greater than 7.0), have a high rate of seismic activity (e.g., slip rates greater than 5 millimeters per year), and have well-constrained paleoseismic data (e.g., evidence of displacement within the last 700,000 years). Class B faults are those that lack paleoseismic data necessary to constrain the recurrence intervals of large-scale events. Faults with a "B" classification are capable of producing an event of M 6.5 or greater.

3 The moment magnitude scale is used by seismologists to compare the energy released by earthquakes. Unlike other magnitude scales, it does not saturate at the upper end, meaning that no particular value exists beyond which all earthquakes have about the same magnitude, which makes it a particularly valuable tool for assessing large earthquakes.

Sources: Cao et al. 2003; Jennings 1994; Petersen et al. 1996; data compiled by AECOM in 2010

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (California Public Resources Code Sections 2621–2630) was passed in 1972 to mitigate the hazard of surface faulting to structures designed for human occupancy. The main purpose of the law is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The law addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards. The act requires the State Geologist to establish regulatory zones known as Earthquake Fault Zones around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning efforts. Before a project can be permitted in a designated Alquist-Priolo Earthquake Fault Zone, cities and counties must require a geologic investigation to demonstrate that proposed buildings would not be constructed across active faults.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 (California Public Resources Code Sections 2690–2699.6) addresses earthquake hazards from nonsurface fault rupture, including liquefaction and seismically induced landslides. The act established a mapping program for areas that have the potential for liquefaction, landslide, strong ground shaking, or other earthquake and geologic hazards. The act also specifies that the lead agency for a project may withhold development permits until geologic or soils investigations are conducted for specific sites and mitigation measures are incorporated into plans to reduce hazards associated with seismicity and unstable soils.

Central Valley Flood Protection Board

All levee improvements are required to comply with standard engineering practices for levee design. The Central Valley Flood Protection Board's (CVFPB's) standards are the primary state standards applicable to the proposed levee repairs; these are stated in Title 23, Division 1, Article 8, Sections 111–137 of the California Code of Regulations. These standards direct that levee design and construction be in accordance with USACE Engineering Design and Construction of Levees (USACE 2000), the primary Federal standards applicable to levee improvements.

Society of Vertebrate Paleontology

The Society of Vertebrate Paleontology (1995, 1996), a national scientific organization of professional vertebrate paleontologists, has established standard guidelines that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, specimen preparation, analysis, and curation. Most practicing professional paleontologists in the nation adhere to the Society of Vertebrate Paleontology assessment, mitigation, and monitoring requirements, as specified in its standard guidelines.

3.4.2 Environmental Setting

Geology

The Phase 3 Repair Project is located in the Great Valley Geomorphic Province of California, a large northwest-trending valley bounded by the Sierra Nevada range to the east and south, the Coast Ranges to the west, and the Klamath Mountains to the north. The Great Valley is drained by the Sacramento and San Joaquin Rivers, which join and flow out of the province through San Francisco Bay. The Great Valley is subdivided into the San Joaquin Valley in the south (area drained by the San Joaquin River) and the Sacramento Valley in the north (area drained by the Sacramento River). RD 17 is located in the northern portion of the San Joaquin Valley. This geomorphic province is an asymmetric trough, approximately 400 miles long and 50 miles wide, and filled with a thick sequence of sediments ranging from Jurassic (180 million years ago) to recent age. The sediments in the Great Valley vary between 3 and 6 miles in thickness and were derived primarily from erosion of the Sierra Nevada to the east, with lesser amounts of material from the Coast Ranges to the west.

The region of the Great Valley where the Sacramento and San Joaquin Rivers meet is called the Delta. Most of the sediments in the Delta were deposited between 175 million and 25 million years ago and were accumulated in marine environments. Younger deposits (25 million years ago to recent) generally are described as nonmarine; however, some of the younger deposits may have formed as marine deposits in shallow seas and estuaries. The depositional history of the Delta during the late Quaternary period (the last 1 million years) probably was controlled by several cycles related to fluctuations in regional and global climate, in which each cycle consisted of a period of deposition followed by a period of nondeposition and erosion. Thus, the Delta region during the late Quaternary period had stages of wetlands and floodplain creation as tidewaters rose in the Valley from the west, areas of erosion when tidewaters receded, deposition of alluvial fans that were reworked by wind to create extensive sand dunes, and alluvial fan deposition from streams emanating from the adjacent mountain ranges.

Geologic mapping by Wagner, Bortugno, and McJunkin (1991) indicates that the geologic formations exposed at the surface within RD 17 consist of the Dos Palos Formation and the Modesto Formation. The locations of these formations are shown in **Figure 3.4-1**, and they are described in further detail next. In

addition to surface excavation in the Modesto Formation, a potential exists that the excavation activities for the slurry cutoff walls could encounter the Modesto Formation, which is found at depths below the Dos Palos Formation.

Dos Palos Formation

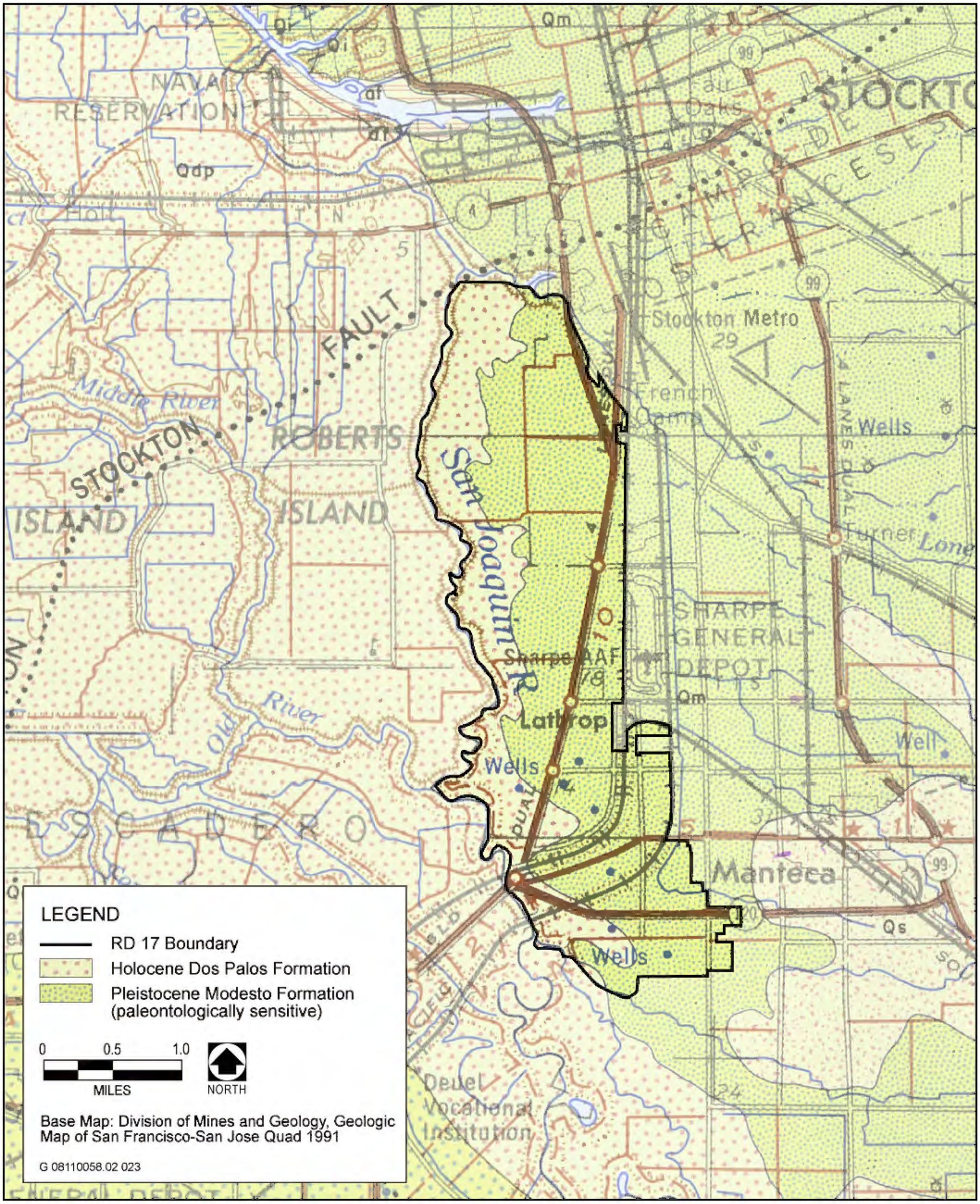
Sediments of the Dos Palos Formation are exposed at the surface of the western portion of RD 17, adjacent to the San Joaquin River. This formation consists of Holocene alluvial deposits of unweathered, unconsolidated arkosic gravel, sand, silt, and clay, covering the flood basin of the lower San Joaquin River. The Dos Palos Formation generally occurs in a northwest-trending belt in the San Joaquin Valley between the Coast Range and Sierra Nevada alluvial fans. The arkosic composition of this formation indicates that the sediments originated from plutonic rocks of the Sierra Nevada and were deposited during overflow and channel migration of the San Joaquin River and associated sloughs (Lettis 1982:128-131). Phase 3 Repair Project elements Ia–VIIg are located within the Dos Palos Formation. These Holocene alluvial deposits overlie an older alluvial fan system that is composed of Pleistocene-age sediments of the Modesto Formation, described next.

Modesto Formation

Piper et al. (1939) were the first to publish detailed geologic maps in the southern Sacramento/northern San Joaquin Valley areas, and they designated the older alluvial Pleistocene deposits as the Victor Formation. However, in 1959, Davis and Hall proposed a subdivision of the Victor Formation into the Turlock Lake (oldest), Riverbank (middle), and Modesto (youngest) Formations. The type section of Modesto was designated along the south bluff of the Tuolumne River south of Modesto. Marchand and Allwardt (1981) proposed that the name Victor Formation be abandoned and that the Turlock Lake, Riverbank, and Modesto Formations be adopted as formal nomenclature for Quaternary deposits in the Sacramento and San Joaquin Valleys. Most researchers subsequently have followed this recommendation.

In the San Joaquin Valley, the Modesto Formation forms the ancient alluvial fans of several major Sierra Nevada rivers. The thickness of the Modesto Formation in the Phase 3 Repair Project area currently is undetermined; borings in Pleistocene-age sediments throughout the San Joaquin Valley suggest that the thickness of the Modesto Formation varies widely from location to location (e.g., 65 feet deep along the Chowchilla River, 130 feet deep along the Merced River). Element VIIg of the Phase 3 Repair Project area is located in Pleistocene-age sediments of the Modesto Formation.

Figure 3.4-1 Location of Geologic Formations within the Phase 3 Repair Project Area



Source: Wagner, Bortugno, and McJunkin 1991

Seismicity

No active faults have been mapped within RD 17 or any of the Phase 3 Repair Project reaches by the California Geological Survey or U.S. Geological Survey (Jennings 1994), and the Phase 3 Repair Project area is not located in an Alquist-Priolo Earthquake Fault Zone (California Geological Survey 2007; Hart and Bryant 1999).

The Stockton Fault (or Stockton Arch) traverses RD 17 in a northeast to southwest direction, adjacent to and north of element Ia of the Phase 3 Repair Project area. However, the Stockton Fault has not been active in the last 1.6 million years. The Vernalis, San Joaquin, and Black Butte faults are located approximately 1, 2, and 2.5 miles west of the Phase 3 Repair Project area, respectively. However, these faults have not been active in the last 11,700 to 1.6 million years. None of these four faults is classified as "active" by the California Geological Survey.

The closest known active faults to the Phase 3 Repair Project area are listed in **Table 3.4-1**. In addition, the approximate distance from the Phase 3 Repair Project area, fault class, probable maximum moment magnitude that could be generated at the fault, and slip rate are identified.

Potential seismic hazards resulting from a nearby moderate to major earthquake generally can be classified as primary and secondary. The primary effect is fault ground rupture, also called surface faulting. Neither the California Geological Survey nor the U.S. Geological Survey map active faults in RD 17 or in the Phase 3 Repair Project reaches, and the area is not located within an Alquist-Priolo Earthquake Fault Zone; thus, fault ground rupture is unlikely in the Phase 3 Repair Project area.

Common secondary seismic hazards include ground shaking, liquefaction, subsidence, and seiches. These hazards are discussed briefly as follows:

- **Ground shaking.** Seismic ground shaking refers to ground motion that results from the release of stored energy during an earthquake. The intensity of ground shaking depends on the distance from the earthquake epicenter to the site, the magnitude of the earthquake, site soil conditions, and the characteristic of the source.

- **Ground failure/liquefaction.** Liquefaction is a process by which water-saturated materials (including soil, sediment, and certain types of volcanic deposits) lose strength and may fail during strong ground shaking, when granular materials are transformed from a solid state into a liquefied state as a result of increased pore-water pressure. Structures on ground that undergoes liquefaction may settle or suffer major structural damage. Liquefaction is most likely to occur in low-lying areas where the substrate consists of poorly consolidated to unconsolidated water-saturated sediments or similar deposits of artificial fill. Evidence of liquefaction may be observed in "sand boils," which are expulsions of sand and water from below the surface due to increased pore-water pressure below the surface. Areas paralleling the San Joaquin River that contain clean sand layers with low relative densities coinciding with a relatively high water table have generally high liquefaction potential.

- **Subsidence and settlement.** Subsidence is the gradual settling or sudden sinking of the ground surface resulting from subsurface movement of earth materials. Seismically induced settlement refers to the compaction of soils and alluvium caused by ground shaking. Fine-grained soils are subject to seismic settlement and differential settlement. Areas underlain by low-density silts and clays associated with fluvial depositional environments are susceptible to seismically induced settlement. These environments include old lakes, sloughs, swamps, and streambeds. The amount of settlement may range from a few inches to several feet. The potential for differential settlement is highest and occurs over the largest areas during large magnitude earthquakes.

- **Seismic seiches.** A seiche is an earthquake-induced wave within an enclosed or restricted body of water, such as a lake, reservoir, or channel. Seiches can cause a body of water to overtop and damage levees and dams and may lead to inundation of surrounding areas.

Geotechnical engineering studies performed for Phase 3 Repair Project of the RD 17 Levee Seepage Repair Project (LSRP) (RD 17 2010) were required to comply with CVFPB's standard engineering practices for levee design. Because the design, construction, and maintenance of levee improvements must comply with the regulatory standards of USACE and CVFPB, it is assumed that the design and construction of all levee modifications under the Phase 3 Repair Project would meet or exceed applicable design standards for static and dynamic stability, seismic ground shaking, liquefaction, subsidence, and seepage.

Soils

The San Joaquin County soil surveys (NRCS 2009) identify a variety of soil map units in the Phase 3 Repair Project area (see **Figures 3.4-2a, 3.4-2b, and 3.4-2c**). Selected characteristics of each of the soils within the Phase 3 Repair Project elements are shown in **Table 3.4-2**.

Minerals

In compliance with the California Surface Mining and Reclamation Act, the California Geological Survey has established the classification system shown in **Table 3.4-3** to denote both the location and significance of key extractive resources.

Under the California Surface Mining and Reclamation Act, the State Mining and Geology Board may designate certain mineral deposits as being regionally significant to satisfy future needs. The Board's decision to designate an area is based on a classification report prepared by California Geological Survey and on input from agencies and the public. The project site lies within the designated Stockton-Lodi Production-Consumption Region for Portland cement concrete aggregate, which includes all designated lands within the marketing area of the active aggregate operations supplying the Stockton-Lodi urban center. The Phase 3 Repair Project area is classified as follows:

- MRZ-1: elements Ib, Ie, IIab, IIIa, IIIb, IVa, IVc, Va, and VIIe
- MRZ-2: elements VIa.1, VIa.4, VIb, VIcde, VIIb, and VIIg

Paleontological Resources

Paleontological Resource Inventory Methods

A stratigraphic inventory was completed to develop a baseline paleontological resource inventory of the Phase 3 Repair Project area and surrounding area by rock unit, and to assess the potential paleontological productivity of each rock unit. Research methods included a review of published and unpublished literature and a search for recorded fossil sites at the University of California Museum of Paleontology (UCMP). These tasks complied with Society of Vertebrate Paleontology guidelines (1995).

Stratigraphic Inventory

Geologic maps and reports covering the geology of the Phase 3 Repair Project area and RD 17 were reviewed to determine the exposed rock units and delineate their respective aerial distributions.

Paleontological Resource Inventory

Published and unpublished geological and paleontological literature were reviewed to document the number and locations of previously recorded fossil sites from rock units exposed in and near the Phase 3 Repair Project area, and the types of fossil remains each rock unit has produced. The literature review was supplemented by an archival search, conducted at the UCMP in Berkeley, California, on July 2, 2010.

Paleontological Resource Assessment Criteria

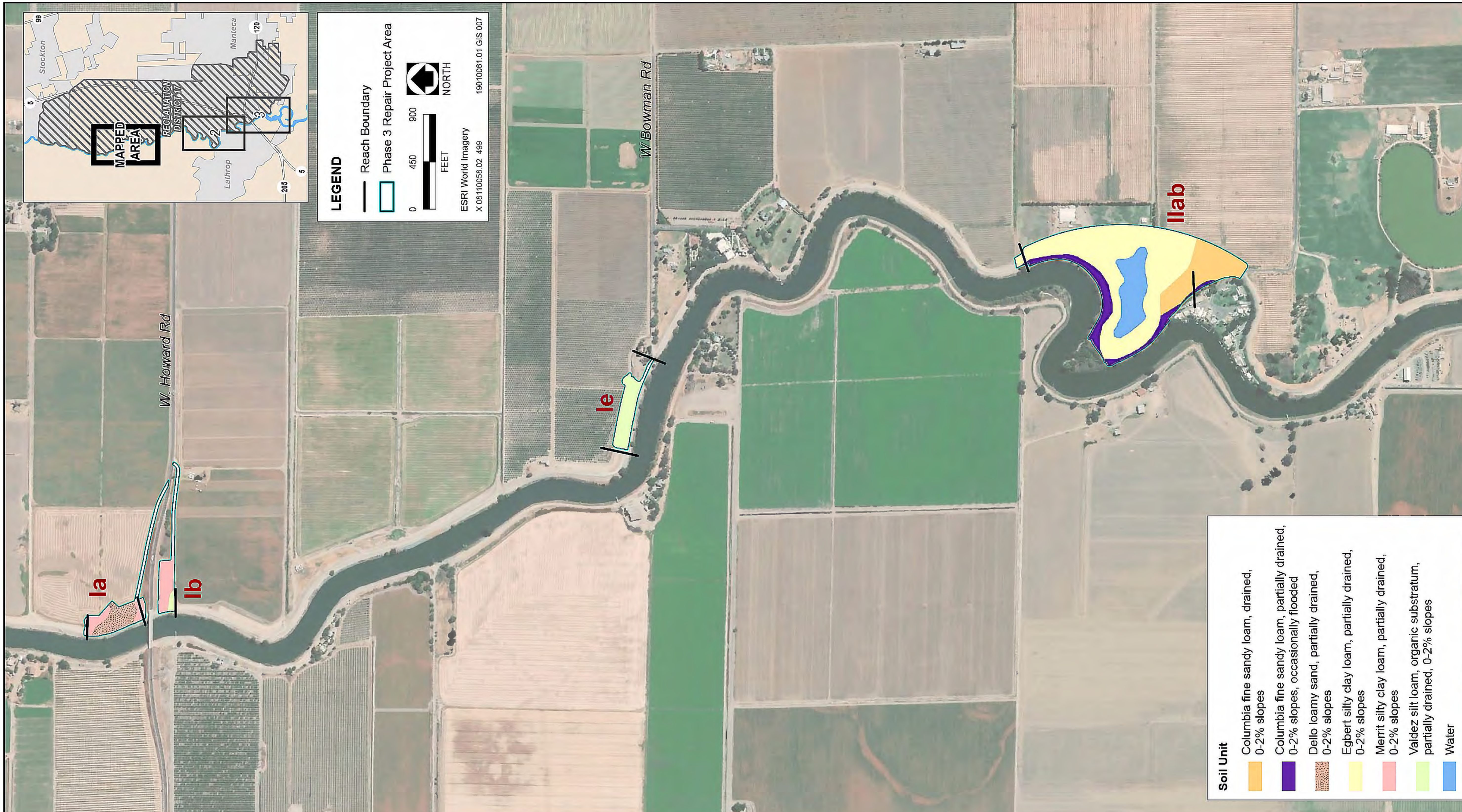
The potential paleontological importance of the Phase 3 Repair Project area can be assessed by identifying the paleontological importance of exposed rock units within the Phase 3 Repair Project area. Because the areal distribution of a rock unit can be easily delineated on a topographic map, this method is conducive to delineating parts of the Phase 3 Repair Project area that are of higher and lower sensitivity for paleontological resources, and to delineating parts of the Phase 3 Repair Project area that may require monitoring during construction.

A paleontologically important rock unit is one that has a high potential paleontological productivity rating and is known to have produced unique, scientifically important fossils. The potential paleontological productivity rating of a rock unit exposed in the Phase 3 Repair Project area refers to the abundance/densities of fossil specimens and/or previously recorded fossil sites in exposures of the unit in and near the area. Exposures of a specific rock unit in the Phase 3 Repair Project area are most likely to yield fossil remains representing particular species, in quantities or densities similar to those previously recorded from the unit in and near the area.

An individual vertebrate fossil specimen may be considered unique or significant if it is identifiable and well preserved, and it meets one of the following criteria:

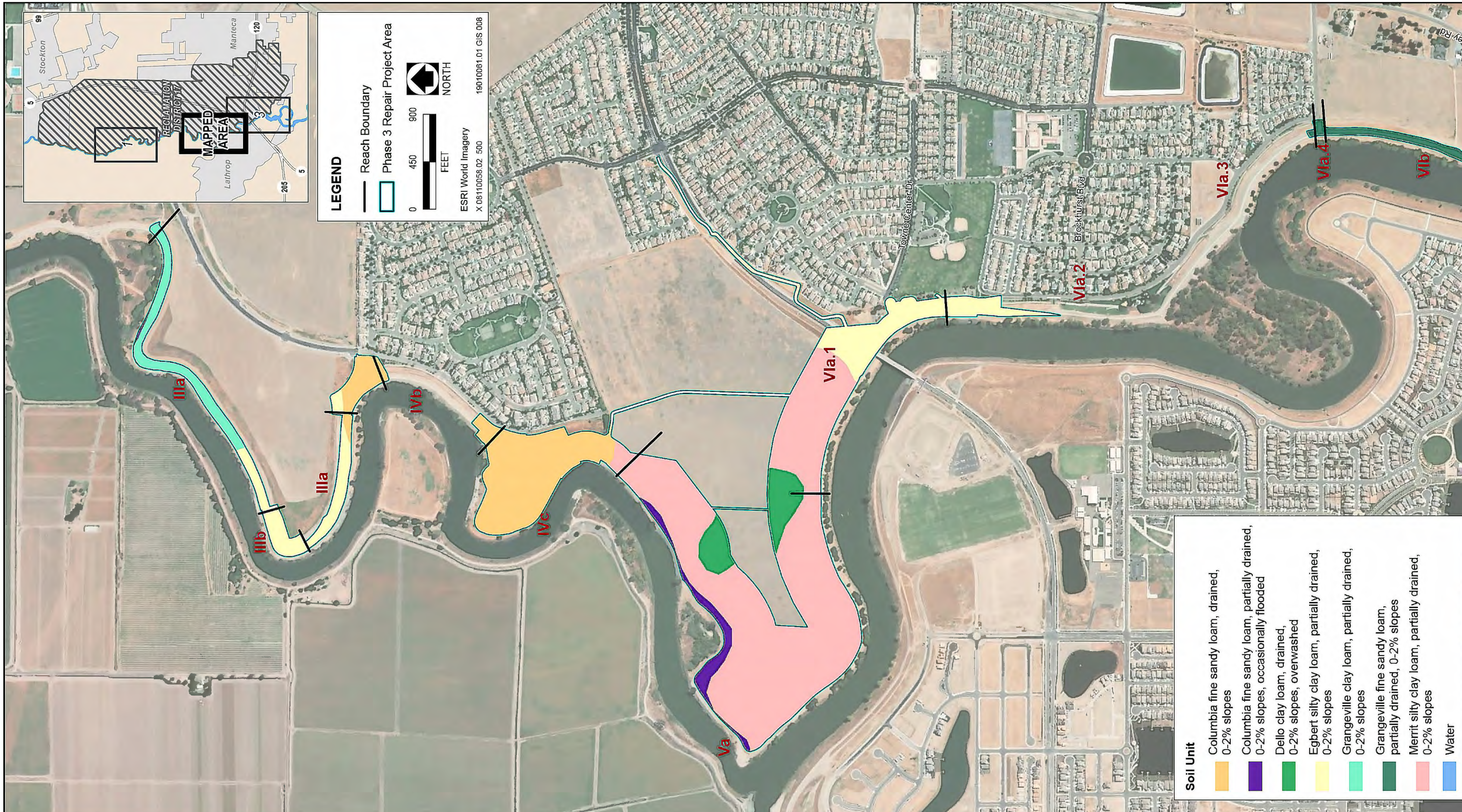
- a type specimen (i.e., the individual from which a species or subspecies has been described);
- a member of a rare species;
- a species that is part of a diverse assemblage (i.e., a site where more than one fossil has been discovered) wherein other species are also identifiable, and important information regarding life history of individuals can be drawn;
- a skeletal element different from, or a specimen more complete than, those now available for its species; or
- a complete specimen (i.e., all or substantially all of the entire skeleton is present).

Figure 3.4-2a. Soils Units for Elements Ia, Ib, Ie, and IIab



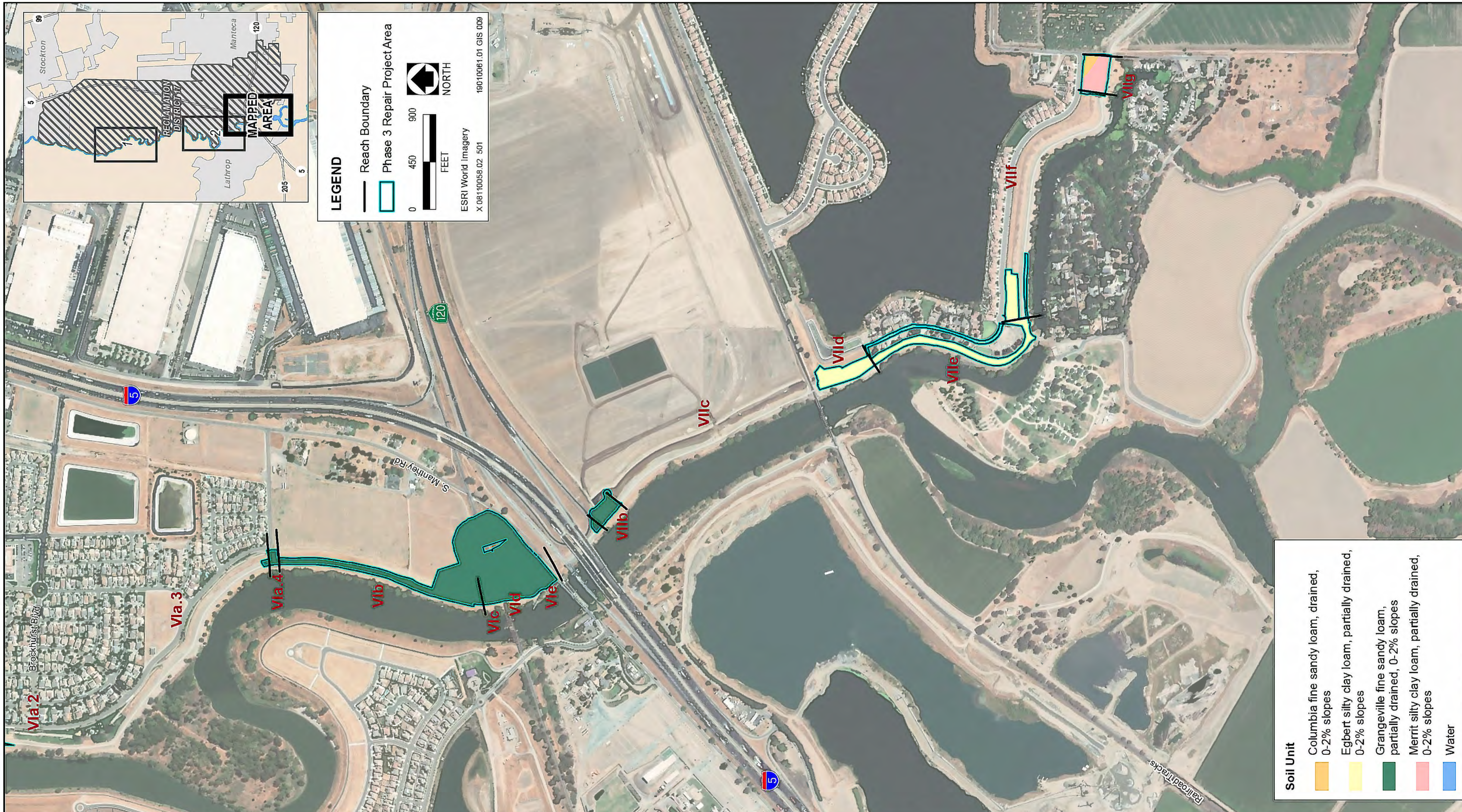
Source: NRCS 2007

Figure 3.4-2b. Soils Units for Elements IIIa, IIIb, IVa, IVc, Va-VIa.1, VIa.4, and VIb



Source: NRCS 2007

Figure 3.4-2c. Soils Units for Elements VIa.4, VIb, VIcde, VIIb, VIIe, and VIIg



Source: NRCS 2007

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Table 3.4-2. Soil Characteristics

Soil Map Unit Name	Shrink-Swell Potential[1]	Permeability[2]	Water Erosion Hazard[3]	Wind Erosion Hazard[4]	Drainage
Arents, Saline-Sodic, 0-2% slopes	Moderate	Moderately high	Moderate	3	Somewhat poorly drained
Columbia fine sandy loam, drained, 0-2% slopes	Low	High	Moderate	7	Somewhat poorly drained
Columbia fine sandy loam, partially drained, 0-2% slopes, occasionally flooded	Low	High	Moderate	7	Somewhat poorly drained
Delhi loamy sand, 0-2% slopes	Low	High	Moderate	2	Somewhat excessively drained
Dello loamy sand, drained, 0% slopes	Low	High	Low	1	Very poorly drained
Dello loamy sand, partially drained, 0-2% slopes	Low	High	Low	1	Very poorly drained
Dello clay loam, drained, 0-2% slopes, overwashed	Low	High	Moderate	2	Very poorly drained
Egbert silty clay loam, partially drained, 0-2% slopes	High	Moderately high	Moderate	4	Poorly drained
Galt clay, 0-2% slopes	Moderate	Moderately low	Moderate	7	Moderately well drained
Grangeville clay loam, partially drained, 0-2% slopes	Low	High	Moderate	6	Somewhat poorly drained
Grangeville fine sandy clay loam, partially drained, 0-2% slopes	Low	High	Moderate	7	Somewhat poorly drained
Merritt silty clay loam, partially drained, 0-2% slopes	Moderate	Moderately high	Moderate	7	Poorly drained
Tinnin loamy coarse sand, 0-2% slopes	Low	High	Low	2	Well drained
Valdez silt loam, organic substratum, partially drained, 0-2% slopes	Moderate	Moderately high	Moderate	5	Poorly drained

Notes:
1 Based on percentage of linear extensibility. Shrink-swell potential ratings of “moderate” to “very high” can result in damage to buildings, roads, and other structures.
2 Based on standard U.S. Department of Agriculture (USDA) saturated hydraulic conductivity (Ksat) class limits; Ksat refers to the ease with which pores in a saturated soil transmit water.
3 Based on the erosion factor “Kw whole soil,” which is a measurement of relative soil susceptibility to sheet and rill erosion by water.
4 Based on USDA wind erodibility groups. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible.
Source: NRCS 2009

Table 3.4-3. California Division of Mines and Geology Mineral Land Classification System

Classification	Description
MRZ-1	Areas where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence
MRZ-2	Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists
MRZ-3	Areas containing mineral deposits, the significance of which cannot be evaluated from existing data
MRZ-4	Areas where available information is inadequate for assignment to any other MRZ zone

Note: MRZ = Mineral Resource Zone
Source: Jensen and Silva 1988

For example, identifiable vertebrate marine and terrestrial fossils generally are considered scientifically important because they are relatively rare. The value or importance of different fossil groups varies, depending on the age and depositional environment of the rock unit that contains the fossils, their rarity, the extent to which they have already been identified and documented, and the ability to recover similar materials under more controlled conditions, such as part of a research project. Marine invertebrate fossil specimens generally are common, well developed, and well documented. They generally would not be considered a unique paleontological resource.

The tasks listed below were completed to establish the paleontological importance of each rock unit exposed at or near the Phase 3 Repair Project area:

- The potential paleontological productivity of each rock unit was assessed based on the density of fossil remains previously documented within the rock unit.
- The potential for a rock unit exposed in the Phase 3 Repair Project area to contain a unique paleontological resource was considered.

Paleontological Resource Inventory Results

Stratigraphic Inventory

Regional and local surficial geologic mapping and correlation of the various geologic units in the Phase 3 Repair Project area and vicinity have been provided at a scale of 1:62,500 by Atwater (1982) and 1:250,000 by Wagner, Bortugno, and McJunkin (1991). The results of the stratigraphic inventory are shown in **Figure 3.4-1**.

Paleontological Resource Inventory and Assessment by Rock Unit

The Pleistocene epoch, known as the "Great Ice Age," began approximately 1.8 million years ago. Surveys of late Cenozoic land mammal fossils in northern California have been provided by Hay (1927), Lundelius et al. (1983), Jefferson (1991a, 1991b), Savage (1951), and Stirton (1939). On the basis of Savage's survey of vertebrate fauna from the nonmarine late Cenozoic deposits of the San Francisco Bay region, Savage concluded that two major divisions of Pleistocene-age fossils could be recognized: the Irvingtonian (older Pleistocene fauna) and the Rancholabrean (younger Pleistocene and Holocene fauna) (Savage 1951). These two divisions of Quaternary Cenozoic vertebrate fossils are widely recognized today in the field of paleontology. The age of the later Pleistocene, Rancholabrean fauna was based on the presence of bison and on the presence of many mammalian species that are inhabitants of the same area today. In addition to bison, larger land mammals identified as part of the Rancholabrean fauna include mammoths, mastodons, camels, horses, and ground sloths.

Dos Palos Formation

Project-related activities that would occur within the Dos Palos Formation (shown in **Figure 3.4-1)** would be located within Holocene (11,700 years B.P. and younger) alluvial sediments. By definition, an object must be more than 11,700 years old to be considered a fossil; therefore, earth-moving activities in these deposits would not have an adverse effect on unique paleontological resources.

Modesto Formation

Remains of land mammals have been found in the project region at various localities, in alluvial deposits referable to the Modesto Formation. Jefferson (1991a, 1991b) compiled a database of California late-Pleistocene vertebrate fossils from published records, technical reports, unpublished manuscripts, information from colleagues, and inspection of museum paleontological collections at more than 40 public and private institutions. He listed a number of sites in San Joaquin County that have yielded Rancholabrean vertebrate fossils, which could be referable to the Modesto Formation. For example, localities UCMP V-74136, V-48004, V-48067, and V-66150, located approximately 3 miles west of the Phase 3 Repair Project area near Tracy, have yielded remains of mammoth, ground sloth, and horse. Specimens from the Modesto Formation have been reported by Marchand and Allwardt (1981) near Modesto, and at numerous other locations throughout the Central Valley (UCMP 2010). The Tranquility site in Fresno County (UCMP 2010:V-4401), for example, has yielded more than 130 Rancholabrean-age fossils of fish, turtles, snakes, birds, moles, gophers, mice, wood rats, voles, jack rabbits, coyote, red fox, grey fox, badger, horse, camel, pronghorn antelope, elk, deer, and bison from sediments referable to the Modesto Formation.

UCMP localities V-51007 and V-70073 near Manteca (approximately 5 miles to the southeast) yielded vertebrate fossil specimens of Rancholabrean-age mammoth, bison, and horse remains. Approximately 1 mile north of the Phase 3 Repair Project area, in Stockton, locality UCMP V-5107 yielded seven Pleistocene vertebrate fossil specimens, including mammoth and horse species. Hay (1927) reported remains of camel, horse, and mammoth at another site in Stockton. Locality UCMP V-4822, approximately 3 miles north of the Phase 3 Repair Project area in Lincoln Village, yielded a Pleistocene horse tooth.

Results of a paleontological record search at the UCMP indicated no fossil remains within the Phase 3 Repair Project area.

3.4.3 Methodology and Thresholds of Significance

Methodology

Evaluation of potential geology, soils, and minerals effects relied on a review of published geologic literature and maps and San Joaquin County soil survey data.

In its standard guidelines for assessment and mitigation of adverse effects on paleontological resources, the Society of Vertebrate Paleontology (1995) established three categories of sensitivity for paleontological resources: high, low, and undetermined. Areas where fossils have been previously found are considered to have a high sensitivity and a high potential to produce fossils. Areas that are not sedimentary in origin and that have not been known to produce fossils in the past typically are considered to have low sensitivity. Areas that have not had any previous paleontological resource surveys or fossil finds are considered to be of undetermined sensitivity until surveys and mapping are performed to determine their sensitivity. After reconnaissance surveys, observation of exposed cuts, and possibly subsurface testing, a qualified paleontologist can determine whether an area should be categorized as having high or low sensitivity. In keeping with the significance criteria of the Society of Vertebrate Paleontology (1995), all vertebrate fossils generally are categorized as being of potentially significant scientific value.

Thresholds of Significance

Geology, Soils, and Minerals

The basis for determining the significance of effects for this analysis is based on professional standards and project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to geology, soils, and minerals if they would do any of the following:

- expose people, property, or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;
  - strong seismic ground shaking;
  - seismic-related ground failure, including liquefaction; or
  - landslides;
- result in substantial soil erosion or the loss of topsoil;
- be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
- be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (ICBO 1994), creating substantial risks to life or property;
- have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater; or
- result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state or a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

The Phase 3 Repair Project area is not located within or adjacent to an Alquist-Priolo Fault Zone or any known active fault. Therefore, the risk of surface fault rupture is negligible and this issue is not evaluated further in this FEIS.

As described above, it is assumed that the design and construction of all levee modifications would comply with the regulatory standards of USACE and CVFPB and meet or exceed applicable design standards for static and dynamic stability, seismic ground shaking, liquefaction, subsidence, and seepage. Therefore, effects related to strong seismic ground shaking; seismic-related ground failure, including liquefaction; or landslides are not discussed further in this FEIS. In addition, strengthening the levee system as proposed would ultimately make the system less susceptible to seismic damage relative to existing conditions.

Because the Phase 3 Repair Project area is relatively flat, no adverse effects would occur related to landslides. Therefore, this issue is not addressed further in this FEIS.

Because the Phase 3 Repair Project would not include the use of wastewater disposal systems of any kind, no effects would occur related to the ability of project area soils to support the use of septic systems. Therefore, this issue is not addressed further in this FEIS.

Although a seiche in the Phase 3 Repair Project area could be damaging, the risk of seiches is low because of the distance from active faults and the anticipated short duration of any seismic ground shaking in the area. Therefore, this issue is not addressed further in this FEIS.

Paleontological Resources

The determination of significance of effects for this analysis is based on professional standards and on project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to paleontological resources if they would directly or indirectly destroy a unique paleontological resource or site. A "unique paleontological resource or site" is one that would be significant under the professional paleontological standards described below.

The value or importance of different fossil groups varies depending on the age and depositional environment of the rock unit that contains the fossils, their rarity, the extent to which they have already been identified and documented, and the ability to recover similar materials under more controlled conditions (such as for a research project). Marine invertebrates are generally common; the fossil record is well developed and well documented, and they would generally not be considered a unique paleontological resource. Identifiable vertebrate marine and terrestrial fossils generally are considered scientifically important because they are relatively rare.

An individual vertebrate fossil specimen may be considered unique or significant if it is identifiable and well preserved and it meets one of the following criteria:

- a type specimen (i.e., the individual from which a species or subspecies has been described);
- a member of a rare species;

- a species that is part of a diverse assemblage (i.e., a site where more than one fossil has been discovered) wherein other species are also identifiable, and important information regarding life history of individuals can be drawn;
- a skeletal element different from, or a specimen more complete than, those now available for its species; or
- a complete specimen (i.e., all or substantially all of the entire skeleton is present).

3.4.4 Effects and Mitigation Measures

Effect 3.4-a: Potential Temporary Localized Soil Erosion during Construction.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2) and no levee repairs would be constructed. Under these conditions, no potential would exist for construction-related soil erosion. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The magnitude of the effect of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. Any levee failures would be likely to result in soil scouring and permanent loss of topsoil in localized areas within several hundred feet of a levee breach. Depending on the location and severity of the levee failure and duration of flooding, the location and extent of damage and effects related to soil erosion could be minor to extensive. For this reason, this effect would be **potentially significant.**

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Implementation of Alternative 1, Alternative 2, or the Requester's Preferred Alternative would include a substantial amount of construction activity along the land side of the RD 17 levees, as shown in **Figures 2-8a** through **2-8c**. Construction activities would be conducted continuously, to the extent feasible, between April and November. These activities would result in substantial soil disturbance. In addition, structures, power poles, and trees and other vegetation would need to be removed from a portion of the Phase 3 Repair Project footprint on the land side of the levee and seepage berms. These activities would temporarily disturb additional soils. As shown in **Table 3.4-2,** soils in the Phase 3 Repair Project area generally are subject to moderate water erosion hazard, and certain soil types are subject to a high to moderate erosion hazard caused by wind.

Construction of the proposed levee repairs would temporarily expose disturbed areas to erosion caused by wind or early seasonal rainfall events. Wind or rainfall of sufficient intensity could dislodge soil particles from the soil surface. After particles are dislodged, substantial localized erosion could occur. Under Alternative 2, a larger area of land (up to 176 acres) would be disturbed and the potential for soil erosion would be greater than under Alternative 1 (approximately 82 acres) (see **Figures 2-8a** through **2-8c**). The Requester's Preferred Alternative would disturb less land (60 acres) than Alternative 1 or Alternative 2 because it would not involve repairs in elements Ib, Ie, IIIa, IIIb, IVa, VIe, VIIb, or VIIg, as explained in Section 1.9, "Alternatives Evaluated in This FEIS." Because of the potential for substantial erosion or loss of topsoil during construction of Alternative 1, Alternative 2, or the Requester's Preferred Alternative, this effect would be **potentially significant**.

Mitigation Measure 3.4-a: Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

RD 17 will file a Notice of Intent with the Central Valley RWQCB to discharge stormwater associated with construction activity. Final design and construction specifications will require implementation of standard erosion, siltation, and good housekeeping BMPs. RD 17's construction contractors will be required to prepare and implement an SWPPP and comply with the conditions of the NPDES general stormwater permit for construction activity (Order No. 2009-0009-DWQ). The SWPPP will describe the construction activities to be conducted, BMPs that will be implemented to prevent discharges of contaminated stormwater into waterways, and inspection and monitoring activities that will be conducted.

The SWPPP will include the following:

- pollution prevention measures (erosion and sediment control measures and measures to control non-stormwater discharges and hazardous spills);
- demonstration of compliance with all applicable Central Valley RWQCB standards and other applicable water quality standards;
- demonstration of compliance with regional and local standards for erosion and sediment control;
- identification of responsible parties;
- checklists that document when maintenance inspections occurred, the results of the inspection, required corrective measures, and when corrective measures were implemented;
- detailed construction timelines; and
- a BMP monitoring and maintenance schedule.

BMPs will include requirements to:

- conduct all work according to site-specific construction plans that identify areas for clearing, grading, and revegetation so that ground disturbance is minimized;
- install silt fences near riparian areas or existing drainages to control erosion and trap sediment and reseed cleared areas with native vegetation;
- stabilize disturbed soils before the onset of the winter rainfall season;
- stabilize and protect soil stockpiles from exposure to rain and potential erosion;

- conduct maintenance on a regular basis to confirm proper installation and function of BMPs, and during storm events conduct maintenance daily; and

- immediately repair and replace BMPs that have failed (within 48 hours of the storm event) with sufficient devices and materials (e.g., silt fence, coir rolls, erosion blankets) provided throughout project construction to enable immediate corrective action for failed BMPs.

The SWPPP also will specify appropriate hazardous materials handling, storage, and spill response practices to reduce the possibility of adverse effects from use or accidental spills or releases of contaminants. Specific measures applicable to the Phase 3 Repair Project will include the following:

- develop and implement strict on-site handling rules to keep potentially contaminating construction and maintenance materials out of drainages and other waterways;

- conduct all refueling and servicing of equipment with absorbent material or drip pans underneath to contain spilled fuel, oil, and other fluids; and collect any fluid drained from machinery during servicing in leak-proof containers and deliver to an appropriate disposal or recycling facility;

- maintain controlled construction staging and fueling areas at least 100 feet away from channels or wetlands to minimize accidental spills and runoff of contaminants in stormwater;

- prevent substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses;

- maintain spill cleanup equipment in proper working condition. Clean up all spills immediately according to the spill prevention and response plan;

- develop a slurry spill contingency plan to respond to a potential for bentonite slurry spill and prevent slurry from entering watercourses; and

- immediately notify the California Department of Fish and Wildlife and the Central Valley RWQCB of any spills and cleanup procedures.

BMPs will be applied to meet the “maximum extent practicable” and “best conventional technology/best available technology” requirements and to address compliance with water quality standards. A monitoring program will be implemented during and after construction so that the Phase 3 Repair Project complies with all applicable standards and the BMPs are effective.

Responsibility: RD 17 and construction contractor.

Timing: Prepare a Notice of Intent and an SWPPP before the start of project construction; implement an SWPPP and BMPs during construction; and monitor effectiveness of measure during and at completion of construction.

Implementing this mitigation measure would reduce the adverse effects related to erosion from construction activities to a **less-than-significant** level because an SWPPP and BMPs to prevent erosion and siltation would be implemented.

Effect 3.4-b: Potential Soil Erosion during Project Operations.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2) and no levee repairs would be constructed. Under these conditions, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The magnitude of the adverse effect of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. Any levee failures would be likely to result in soil scouring and permanent loss of topsoil in localized areas within several hundred feet of a levee breach. Depending on the location and severity of the levee failure and duration of flooding, the location and extent of damage and effects related to soil erosion could be minor to extensive. For this reason, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion under the heading "Effects and Mitigation Measures" in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

The Phase 3 Repair Project would address through seepage and under seepage—issues that can be related to soil erosion and/or the loss of topsoil (see discussions above).

As described in Chapter 2, "Alternatives," seepage beneath and through segments of the RD 17 levee system has been identified as a risk to the stability and reliability of the system. Seepage is characterized as either under seepage or through seepage, both of which result in soil erosion. Under seepage occurs below the visible (aboveground) levee prism, and is caused by the buildup of water pressure in the subsurface foundation soils when high river stages are present on the waterside of the levees. This pressure can be great enough to force water through the earthen foundation layers under the levee such that the water finds a pathway of least resistance and exits at the landside ground surface. Such seepage is not uncommon and does not inherently imply the levee is failing; however, excessive and uncontrolled under seepage can carry fine-grained material with the water flow that could undermine the levee and could lead to levee failure. Soil erosion also can occur as a result of through seepage, which is seepage through a levee embankment that can occur during periods of high river stage. When through seepage occurs, soil erosion on the landside of the levee may result. Implementation of the Phase 3 Repair Project would address seepage issues along elements Ia, Ib, Ie, IIab, IIIa, IIIb, IVa, IVc, Va-VIa.1, VIa.4, VIb, VIcde, VIIb, VIIe, and VIIg of the RD 17 levee system. With these repairs, the potential for through seepage and under seepage, and thus potential for soil erosion, would be substantially reduced.

As discussed above, implementation of the Phase 3 Repair Project would bring the levees within RD 17 into compliance with applicable standards and requirements. These standards and requirements would include repairs that would address under seepage and through seepage, and thus the potential for soil erosion and the loss of topsoil. This effect would be **beneficial** and **less than significant**.

Mitigation Measure: No mitigation is required.

Effect 3.4-c: Possible Loss of Access to Aggregate Resources.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2) and no levee repairs would be constructed. Therefore, the current level of risk would remain for a major levee failure and flooding of areas within the Phase 3 Repair Project area. However, any levee failures ultimately would not limit the accessibility of existing aggregate resources in the area; therefore, **no effect** would occur.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion under the heading "Effects and Mitigation Measures" in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Elements VIa.1, VIa.4, VIb, VIcde, VIIe, and VIIg are classified by the California Geological Survey as MRZ-2: areas containing known aggregate mineral resources. The southern portion of element VIa.1 is in an already developed area where mineral extraction is not possible. The small area of element VIa.4 is located between two existing cutoff walls. This area is not accessible for mineral extraction. Element VIb for Alternatives 1 and 2 would involve placement of a chimney drain on top of an existing seepage berm. Under the Requester's Preferred Alternative, a cutoff wall would be placed in the existing seepage berm in element VIb. Because mineral extraction potential has been removed by the existing seepage berm, installation of the chimney drain or cutoff wall would not change the existing lack of extraction potential. Elements VIcde are located in an area already developed with a county park and road, and railroad rights-of-way. Placing fill in the parking lot that is proposed under Alternative 1 would not change the mineral extraction potential. The setback levee under Alternative 2 potentially could remove a small amount of mineral extraction potential immediately north of the Union Pacific Railroad right-of-way. The cutoff wall under the Requester's Preferred Alternatives would not change the mineral extraction potential.

Element VIIe is a small area located between an existing seepage berm and the Interstate 5/State Route 120 berm. This is not an area where minerals could be extracted. A cutoff wall is the only levee repair proposed for element VIIe, so no change would occur in access to mineral resources in this location. Also, development currently exists close to the levee (thus, the use of a cutoff wall rather than seepage berm) that already limits access to mineral resources. Element VIIg is located in an area that has been approved for development, so the loss of access to mineral resources has been accepted by local agencies. Also, the lakes in the Oakwood Lakes community exist because of historic mineral extraction (dredging out sand pits), and thus the opportunity to remove mineral resources in this area already has been taken.

Therefore, the effect of potential loss of locally or regionally significant mineral resources would be **less than significant**.

Mitigation Measure: No mitigation measures are required.

Effect 3.4-d: Possible Damage or Destruction of Previously Unknown Unique Paleontological Resources during Construction-Related Activities.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2) and no levee repairs would be constructed. Under these conditions, no potential would exist for ground-disturbing activities to encounter or damage unique paleontological resources. However, the current level of risk would remain for a major levee failure and flooding of areas within the Phase 3 Repair Project area. Any levee failures would be likely to result in soil scouring and permanent loss of topsoil in localized areas within several hundred feet of a levee breach. However, any levee failures would have no effect on unique paleontological resources, because they would be buried underground and already are subject to various geologic conditions, including flooding, under normal circumstances. Therefore, **no effect** would occur**.**

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion under the heading "Effects and Mitigation Measures" in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Phase 3 Repair Project elements Ia–VIIe are immediately adjacent to the San Joaquin River and are underlain by Holocene-age (less than 11,700 years old) Dos Palos Formation. By definition, to be considered a fossil, an object must be more than 11,700 years old. Therefore, construction activities that occur in the Holocene alluvium would have no effect on paleontological resources. However, the Phase 3 Repair Project also would include construction of slurry cutoff walls within the existing levees. Although Holocene-age sediments are present at the surface, excavation activities are expected to extend from 60 to 100 feet below the ground surface, into the Modesto Formation. As described further below, the Modesto Formation is a paleontologically sensitive rock formation.

Element VIIg of the Phase 3 Repair Project area is located within Pleistocene-age sediments of the Modesto Formation. The Modesto Formation is paleontologically sensitive rock units under Society of Vertebrate Paleontology guidelines (1995). As discussed under "Paleontological Resource Inventory and Assessment by Rock Unit" in the "Paleontological Resources" section in Section 3.4.2, "Environmental Setting," numerous vertebrate fossil specimens have been recorded from the Modesto Formation in Stockton, Manteca, Modesto, and Tracy.

Vertebrate fossils have been recovered near the Phase 3 Repair Project area, and other recorded vertebrate fossil localities have been recorded throughout the Sacramento and San Joaquin Valleys, all in sediments referable to the Modesto Formation, which suggests that the potential exists for uncovering additional similar fossil remains during construction-related earthmoving activities in the Phase 3 Repair Project area.

Therefore, the potential exists for encountering and potentially damaging unique paleontological resources under Alternative 1, Alternative 2, and the Requester's Preferred Alternative. Because of the potential for damage to unique paleontological resources during earthmoving activities in the Phase 3 Repair Project area, the effect would be **potentially significant**.

Mitigation Measure 3.4-d: Conduct Construction Personnel Education, Stop Work if Paleontological Resources Are Discovered, Assess the Significance of the Find, and Prepare and Implement a Recovery Plan as Required.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

To minimize potential adverse effects on previously unknown potentially unique, scientifically important paleontological resources, RD 17 shall do the following when Phase 3 Repair Project construction activities occur in the Modesto Formation:

- Before the start of any earthmoving activities in any Phase 3 Repair Project elements in the Modesto Formation, RD 17 shall retain a qualified paleontologist or archaeologist to train all construction personnel involved with disturbance of native soil, including the site superintendent, regarding the possibility of encountering fossils, the appearance and types of fossils likely to be seen during construction, and proper notification procedures should fossils be encountered.

  If paleontological resources are discovered during disturbance of native soil, the construction crew will immediately cease work in the vicinity of the find and will notify the appropriate lead agency (identified below). RD 17 shall retain a qualified paleontologist to evaluate the resource and prepare a recovery plan, in accordance with Society of Vertebrate Paleontology guidelines (1996). The recovery plan will include a field survey, construction monitoring, sampling and data recovery procedures, museum storage coordination for any specimen recovered, and a report of findings. Recommendations in the recovery plan that are determined by the lead agency to be necessary and feasible will be implemented before construction activities are resumed at the site where the paleontological resources were discovered.

Responsibility: RD 17.

Timing: Before and during disturbance of native soils.

Implementation of Mitigation Measure 3.4-d would reduce potentially significant adverse effects related to damage or destruction of unique paleontological resources to a **less-than-significant** level because construction workers would be alerted to the possibility of encountering paleontological resources, and in the event that resources were encountered, fossil specimens would be recovered and recorded, and would undergo appropriate curation.

3.4.5 Residual Significant Effects

Implementation of Mitigation Measures 3.4-a and 3.4-d would reduce potentially significant adverse effects from construction-related erosion and damage on potential unique paleontological resources to a less-than-significant level. Operation-related erosion effects would be beneficial (less than significant) without vegetation removal, and would be reduced to less than significant with implementation of Mitigation Measure 3.4-a. Effects on mineral resources would be less than significant with no mitigation required. Therefore, no residual significant effects would occur.

3.5 Hydrology and Water Quality

This section discusses existing hydrology and water quality within the Phase 3 Repair Project area and surrounding areas; identifies applicable Federal and state laws and regulations, and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to hydrology and water quality. Additional related information is contained in Section 3.4, "Geology, Soils, Minerals, and Paleontological Resources"; Section 3.14, "Utilities and Public Services"; and Section 3.15, "Hazards and Hazardous Materials." A discussion of cumulative effects related to hydrology and water quality is provided in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements," of this FEIS.

3.5.1 Regulatory Setting

As required under NEPA, applicable Federal laws and regulations are identified in this section. State laws and regulations applicable to implementation of the Phase 3 Repair Project by RD 17 are described for informational purposes and to assist with NEPA review. RD 17 also has considered regional and local plans and ordinances as a part of the environmental review process for this FEIS, where applicable to the Phase 3 Repair Project.

Federal

Federal Clean Water Act

The U.S. Environmental Protection Agency (EPA) is the lead Federal agency responsible for managing water quality in the United States. The Clean Water Act (CWA) of 1972 is the primary Federal law that governs and authorizes EPA to implement activities to control water quality. EPA has delegated to the State of California the authority to implement and oversee most of the programs authorized or adopted for CWA compliance, through the state's Porter-Cologne Water Quality Control Act of 1969 (Porter-Cologne Act). The various elements of the CWA that address water quality and are applicable to the Phase 3 Repair Project are discussed next.

Section 303 Impaired Waters

Under Federal law, EPA has published water quality regulations under Volume 40 of the Code of Federal Regulations (CFR), which requires states to adopt water quality standards for all surface waters of the United States as authorized by Section 303 of the CWA. Water quality standards consist of three major elements: (1) designated beneficial uses of the water body in question; (2) criteria that protect the designated uses; and (3) the antidegradation policy, designed to prevent deterioration of existing levels of good water quality (see the "California State Antidegradation Policy" section below for more information). Designated Beneficial Uses are uses that society determines, through the Federal and state governments, should be attained in the water body, such as supporting communities of aquatic life, supplying water for drinking or industrial processes, irrigating crops and landscaping, and providing recreational uses (e.g., fishing, swimming, boating). Where multiple uses exist, water quality standards must protect the most sensitive use.

Section 303(d) of the CWA also requires states to develop lists of water bodies that would not attain water quality objectives after implementation of required levels of treatment by point-source dischargers (i.e., municipalities and industries). Section 303(d) requires that states develop a total maximum daily load (TMDL) for each of the listed pollutants. The TMDL is the amount of pollutants that the water body can receive and still comply with water quality objectives. The TMDL also can act as a plan to reduce loading of a specific pollutant from various sources to achieve compliance with water quality objectives. The TMDL must include an allocation of allowable loadings to point and nonpoint sources, with consideration of background loadings and a margin of safety. The TMDL also must include an analysis that shows links between loading reductions and the attainment of water quality objectives. In addition, the calculation also must account for seasonal variation in water quality (EPA 2002:1-5). EPA must either approve a TMDL or, if it disapproves a state's TMDL, issue its own. NPDES permit limits for listed pollutants must be consistent with the waste load allocation prescribed in the TMDL. After implementation of a TMDL, the problems that led to placement of a given pollutant on the Section 303(d) list are to be remediated.

Section 401 Water Quality Certification

Under CWA Section 401(a)(1), applicants for a Federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects with a Federal component that may affect a state's water quality (including projects that require Federal agency approval such as issuance of a Section 404 permit) also must comply with CWA Section 401. The Section 401 water quality certification certifies that the proposed activity will not violate the state's water quality standards. In California, nine regional water quality control boards (RWQCBs) administer the Section 401 program with the intent of prescribing measures necessary to avoid, minimize, or mitigate adverse effects of proposed projects on water quality.

Section 402 Permits for Discharge to Surface Waters

CWA Section 402 regulates discharges to surface waters through the NPDES program, administered by EPA. In California, the State Water Resources Control Board (SWRCB) is authorized by EPA to oversee the NPDES program through the nine RWQCBs (see related discussion about the Porter-Cologne Act). The NPDES program provides both general permits (those that cover a number of similar or related activities) and individual permits.

Construction Activities

The NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (General Construction Permit, Order 2009-009-Division of Water Quality [DWQ] as amended by 2010-0014-DWQ and 2012-0006-DWQ) is applicable to all land-disturbing construction activities that would affect 1 acre or more. Construction activities subject to the General Construction Permit include clearing, grading, stockpiling, and excavation. The General Construction Permit requires the applicant to file an NOI to discharge stormwater, and to prepare and implement a SWPPP that considers the use of postconstruction permanent best management practices (BMPs) to protect water quality throughout the life of the project. The SWPPP is to include a site map and a description of proposed construction activities, a demonstration of compliance with relevant local ordinances and regulations, and an overview of the BMPs to be implemented to prevent soil erosion and discharge of other construction-related pollutants that could contaminate nearby water resources. Permittees are further required to conduct annual monitoring and reporting so that the BMPs can be correctly implemented and effective in controlling the discharge of stormwater-related pollutants. Types of BMPs include source controls, treatment controls, and site planning measures. RD 17 would file an NOI with the Central Valley RWQCB to obtain coverage under the General Construction Permit before any Phase 3 Repair Project construction activities are begun.

Dewatering Activities

Although small amounts of construction-related dewatering are covered under the General Construction Permit, the Central Valley RWQCB also has adopted a General Order for Dewatering and Other Low Threat Discharges to Surface Waters (General Dewatering Permit R5-2013-0074, NPDES No. CAG995001). This permit applies to various categories of dewatering activities and likely would apply to the proposed action area, if Phase 3 Repair Project construction requires dewatering in greater quantities than that allowed by the General Construction Permit and the effluent is discharged to surface waters. The General Dewatering Permit contains waste discharge limitations and prohibitions similar to those in the General Construction Permit. To obtain coverage, the applicant must submit an NOI and a Pollution Prevention and Monitoring Plan (PPMP) to the Central Valley RWQCB. The PPMP must include a description of the discharge location, discharge characteristics, primary pollutants, receiving water, treatment systems, spill prevention plans, and other measures necessary to comply with discharge limits. The applicant must prepare and implement a representative sampling and analysis program and must comply with recordkeeping and quarterly reporting requirements during dewatering activities. For Phase 3 Repair Project dewatering activities not covered by the General Dewatering Permit, an individual NPDES permit and waste discharge requirements (WDRs) would be obtained from the Central Valley RWQCB. However, the amount of dewatering needed for Phase 3 Repair Project construction likely would fall under the General Dewatering Permit.

Section 404 Permits for Placement of Fill in Waters or Wetlands

Section 404 of the CWA establishes a requirement for a project applicant to obtain a permit from USACE before engaging in any activity that would involve discharge of dredged or fill material into “waters of the United States,” including wetlands. “Fill material” refers to material placed in waters of the United States where the material has the effect of replacing any portion of a water of the United States with dry land or changing the bottom elevation of any portion of a water of the United States. Examples of fill material include rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mining or other excavation activities, and material used to create any structure or infrastructure in waters of the United States. Waters of the United States include navigable waters of the United States; interstate waters; all other waters where the use, degradation, or destruction of the waters could affect interstate or foreign commerce; tributaries to any of these waters; and wetlands that meet any of these criteria or that are adjacent to any of these waters. Wetlands are defined as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Jurisdictional wetlands must meet three criteria: hydrophytic vegetation, hydric soil, and wetland hydrology. In addition, under Section 404, jurisdictional wetlands must be adjacent to traditional navigable waters, directly abut relatively permanent waters, or have a significant nexus with a traditional navigable water.

Federal Antidegradation Policy

The Federal antidegradation policy, established in 1968, is designed to protect existing uses, water quality, and national water resources. The Federal policy (40 CFR 131.12) directs states to adopt a statewide policy that includes the following primary provisions:

- Existing instream uses and the water quality necessary to protect those uses shall be maintained and protected.

- Where existing water quality is better than necessary to support fishing and swimming conditions, that quality shall be maintained and protected unless the state finds that allowing lower water quality is necessary for important local economic or social development.

- Where high-quality waters constitute an outstanding national resource, such as waters of national and state parks, wildlife refuges, and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.

National Flood Insurance Program

The U.S. Congress established the National Flood Insurance Program (NFIP) with the passage of the National Flood Insurance Act of 1968. The NFIP, administered by FEMA, is a Federal program for property owners in NFIP-participating communities to purchase insurance as a protection against flood losses in exchange for state and community adoption and implementation of land use criteria that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the Federal government. If a community adopts and enforces a FEMA-approved floodplain management ordinance to reduce future flood risk to new construction in regulated floodplains, the Federal government will make flood insurance available to individuals within the community as financial protection against flood losses. This insurance is designed to provide a financial alternative and reduce the escalating costs of Federal disaster assistance for flood-damaged buildings and their contents.

The Federal Insurance and Mitigation Administration, a part of FEMA, manages the NFIP. In addition to providing flood insurance and reducing flood damages through floodplain management regulations, the NFIP identifies and maps the nation's regulated floodplains. FEMA's Flood Insurance Rate Maps or Flood Hazard Boundary Maps show flood hazard areas and provide flood zone designations according to varying levels of flood risk for geographic areas within a community. Flood hazard areas that are shown on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area, defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood also is referred to as the base flood or 100-year flood. Moderate flood hazard areas are the areas between the limits of the base flood and the 0.2-percent annual chance (or 500-year) flood. The areas of minimal flood hazard are the areas outside the Special Flood Hazard Area and higher than the elevation of the 0.2-percent annual chance flood.

For FEMA to accredit a levee as providing a 100-year level of flood risk reduction (1-percent annual chance flood, or 0.01 AEP), the levee must be shown to satisfy several criteria, including protection of the embankment against erosion. Specific requirements are contained in 44 CFR 65.10, which is the FEMA 1-percent annual chance or 100-year standard. The area protected by RD 17 levees currently is designated on the Flood Insurance Rate Map as Zone X (shaded) with accredited status, which indicates that this is a moderate to minimal flood hazard area within the base (100-year) floodplain that is protected from the 1-percent annual chance flood by an accredited levee.

Rivers and Harbors Act of 1899, As Amended (Section 10)

Section 10 of the Rivers and Harbors Act of 1899 (33 U.S. Code [USC] 403), referred to as "Section 10," prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This section provides that the construction of any structure in or over any navigable water of the United States, or the accomplishment of any other work affecting the course, location, condition, or physical capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. The Secretary's approval authority has since been delegated to the Chief of Engineers.

Rivers and Harbors Act of 1899, As Amended (Section 14)

Under Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408), referred to as "Section 408," the Secretary of the Army, on the recommendation of the Chief of Engineers, may grant permission for the alteration of a Federal project levee by a non-Federal entity if the alteration is not injurious to the public interest and does not impair the usefulness of the project. Section 408 alterations include actions that change the hydraulic capacity of the floodway or change the authorized geometry of the Federal project. This law generally requires USACE evaluation and approval for any alteration of Federally authorized levees (or other water control structures). It prohibits any encumbrance of Federally constructed facilities, unless specifically approved by USACE. Improvements (i.e., strengthening, raising, buttressing, seepage reduction) generally are encouraged and approval is expected, as long as these alterations do not cause any changes in the flood risks of adjacent or downstream levee-served areas. This FEIS will be used to support USACE's decision whether to grant permission for the Phase 3 Repair Project pursuant to Section 408.

State

Porter-Cologne Water Quality Control Act

SWRCB and the RWQCBs regulate discharges of waste into waters of the United States through NPDES permits, authorized under Section 402 of the CWA, and regulate discharges of waste into waters of the state through WDRs, authorized under California's Porter-Cologne Water Quality Control Act. The RWQCBs issue NPDES permits and WDRs so that projects that may discharge wastes to land or water conform to the regional water quality objectives, policies and procedures of the applicable water quality control plans (basin plans). The act defines waters of the state as "any surface water or ground water, including saline waters, within the boundaries of the state."

NPDES permits include submittal of NOIs to discharge to the RWQCB and implementation of BMPs to minimize those discharges. The RWQCB also may issue site-specific WDRs, or waivers to WDRs, for certain waste discharges to land or waters of the state.

Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary

SWRCB adopts basin plans to establish standards to protect beneficial uses in the Delta. The basin plan in effect in the Phase 3 Repair Project area is for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary (Bay-Delta Plan). The Bay-Delta Plan was developed as a result of the December 15, 1994, Bay-Delta Accord, which committed the Central Valley Project and State Water Project to new Delta habitat objectives. The 1995 Bay-Delta Plan identifies (1) beneficial uses of the Delta to be protected, (2) water quality objectives for the reasonable protection of beneficial uses, and (3) a program of implementation for achieving the water quality objectives. Key features of the 1995 Bay-Delta Plan include estuarine habitat objectives for Suisun Bay and the western Delta (consisting of salinity measurements at several locations), export/inflow ratios intended to reduce entrainment of fish at the export pumps, Delta Cross Channel gate closures, and San Joaquin River electrical conductivity (EC, an indicator of salinity), and flow standards. SWRCB adopted a new Bay-Delta Plan on December 13, 2006, which was updated it in 2009, revised in 2011, and amended in 2018.

California State Antidegradation Policy

In 1968, as required under the Federal Antidegradation Policy, SWRCB adopted an antidegradation policy aimed at maintaining high-quality waters in California under Resolution No. 68-16. The

California Antidegradation Policy applies to high-quality (i.e., tier 2) surface water and groundwater only, and states that the disposal of wastes into state waters are to be regulated to achieve the highest water quality consistent with maximum benefit to the people of the state and to promote the peace, health, safety, and welfare of the people of the state. The policy provides as follows:

- Where the existing quality of water is better than required under existing water quality control plans, such quality would be maintained until it has been demonstrated that any change would be consistent with maximum benefit to the people of the state and would not unreasonably affect present and anticipated beneficial uses of such water.
- Any activity which produces waste or increases the volume or concentration of waste and which discharges to existing high-quality waters would be required to meet WDRs, which would ensure (1) pollution or nuisance would not occur and (2) the highest water quality consistent with the maximum benefit to the people of the state would be maintained.

The Phase 3 Repair Project area is located along a portion of the San Joaquin River that is listed on EPA's 303(d) Impaired Waters List. This reach of the river was listed under the Delta Waterways Southern Portion (Water body ID CAE5440000020041005161347) for impairment by pesticides, conductivity, invasive species, mercury, and unknown toxicity (see "Surface Water Quality" discussion in the "Water Quality" section in Section 3.5.2). In addition, the shallow groundwater in the vicinity of the Phase 3 Repair Project area also has become polluted with salts, pesticides, and other pollutants. Therefore, the water bodies located within, adjacent to, and downstream from the area are not considered "high-quality" waters under the California State Antidegradation Policy because the policy applies only to "high-quality waters" that have better water quality than the standards established for that water body.

Although construction activities would have the potential to temporarily impair receiving water quality through the introduction of contaminants from stormwater runoff and erosion, with implementation of appropriate BMPs and mitigation measures (discussed in Section 3.5.4, "Effects and Mitigation Measures") employed during construction activities, RD 17 would be able to maintain surface and groundwater quality in and downstream from the Phase 3 Repair Project area. The Phase 3 Repair Project would be consistent and would not conflict with the California State Antidegradation Policy.

Urban Level of Flood Protection Criteria

Criteria were developed in response to requirements from the Central Valley Flood Protection Act of 2008—enacted by Senate Bill (SB) 5 (2007)—to strengthen the link between flood management and land use; specifically, California Government Code Section 65007(n):

> "Urban level of flood protection" means the level of protection that is necessary to withstand flooding that has a 1-in-200 chance of occurring in any given year using criteria consistent with, or developed by, the Department of Water Resources. "Urban level of flood protection" shall not mean shallow flooding or flooding from local drainage that meets the criteria of the national Federal Emergency Management Agency standard of flood protection.

Senate Bill 5 as amended does not specify any enforcement authority for the urban level of flood protection, but instead relies on the due diligence of cities and counties to incorporate flood risk considerations into floodplain management and planning. However, the law tasked DWR with developing Urban Levee Design Criteria (DWR 2012) that cities and counties could use to make findings related to an urban level of flood protection. The law also provides that cities and counties may develop their own criteria as long as it is consistent with the criteria developed by DWR. These criteria are incorporated by reference into the Urban Level of Flood Protection Criteria when levees and floodwalls are used to provide the necessary level of flood protection.

Title 23 of the California Code of Regulations

The CVFPB (formerly the California Reclamation Board) regulates the alteration and construction of levees and floodways in the Central Valley, defined as part of the Sacramento Valley and San Joaquin Valley flood control projects. Rules promulgated in Title 23 of the California Code of Regulations (23 CCR Division 1, Article 8 [Sections 111 through 137]) regulate the alteration and construction of levees to provide public safety. The rules state that existing levees may not be excavated or left partially excavated during the flood season, which generally is November 1 through April 15 for the San Joaquin River. The CVFPB guidance requires that USACE levee criteria be used.

The CVFPB has primary jurisdiction approval of levee design and construction. Section 120 of the CCR directs that levee design and construction be in accordance with USACE's Engineer Manual, EM 1110-2-1913, Design and Construction of Levees. This document is the primary Federal standard applicable to this project, as supplemented by additional prescriptive standards contained in Section 120 of the CCR. These additional standards prescribe minimum levee cross sectional dimensions, construction material types, and compaction levels.

Sustainable Groundwater Management Act

The Sustainable Groundwater Management Act (SGMA), which comprises a three-bill legislative package (Assembly Bill 1739, SB 1168, and SB 139), provides a framework for sustainable groundwater management. It requires governments and water agencies of high- and medium-priority basins to halt overdraft and bring groundwater basins into balanced levels of pumping and recharge. Under the SGMA, these basins should reach sustainability within 20 years of implementing their sustainability plans. For critically overdrafted basins, that will be 2040. For the remaining high- and medium-priority basins, 2042 is the deadline.

Regional

2014 Eastern San Joaquin Integrated Regional Water Management Plan

The Northeastern San Joaquin County Groundwater Banking Authority (GBA) was established in 2001 to collectively develop locally supported projects to strengthen water supply reliability in eastern San Joaquin County. On July 25, 2007, GBA adopted the Eastern San Joaquin Integrated Regional Water Management Plan (IRWMP). The IRWMP defines and integrates key water management strategies to establish protocols and courses of action to implement the Eastern San Joaquin Integrated Conjunctive Use Program. The 2014 Eastern San Joaquin IRWMP is an update and expansion of the 2007 IRWMP prepared for the eastern San Joaquin region. There has been significant progress toward implementing the goal of improving the sustainability and reliability of water supplies in the region, but the process is ongoing and as yet incomplete. The plan update complies with the most recent DWR guidelines and adds additional considerations, including examination of climate change impacts, interregional cooperation, and expanded analysis of stormwater and floodwater management.

3.5.2 Environmental Setting

Climate and Precipitation

The levees protecting RD 17 are located in a part of the San Joaquin Valley that is characterized by a semi-arid climate. Summers are hot and dry while winters are cool and moist. In general, the area is heavily influenced by northwest winds, averaging 10 miles per hour and featuring marine breezes. These westerly winds flow through the Carquinez Strait and follow the San Joaquin River. Easterly winds, which are cool, and northerly winds, which are warm or hot, also run through the area and affect the climate (City of Lathrop 2004). West of RD 17 and the San Joaquin River, the Coast Ranges provide a buffer from the Pacific Ocean, moderating the influence of the marine environment. Precipitation in the Phase 3 Repair Project area occurs primarily from November through March, with the average annual precipitation ranging from about 8 inches near Tracy to approximately 17 inches near Lodi. Near Lathrop, the annual precipitation is approximately 12 inches.

Surface Water Hydrology

Water movement in the Delta responds to four primary forcing mechanisms: (1) freshwater inflows draining to the ocean; (2) Delta exports and diversions; (3) operation of water control facilities such as dams, export pumps, and flow barriers; and (4) the regular tidal movement of seawater into and out of the Delta. In addition, winds and salinity behavior within the Delta can generate a number of secondary currents, which, although of low velocity, can be of considerable significance with respect to transporting contaminants and mixing different sources of water. Changes in flow patterns within the Delta, whether caused by export pumping, winds, atmospheric pressure, flow barriers, tidal variations, inflows, or local diversions, can influence water quality at drinking water intakes.

San Joaquin River

The San Joaquin River originates in the Sierra Nevada and enters the San Joaquin Valley at Friant Dam. The majority of the flow in the lower San Joaquin River is derived from inflow from the Merced, Tuolumne, and Stanislaus Rivers (Northeastern San Joaquin County Groundwater Banking Authority 2004:44). The San Joaquin River contributes approximately 15 percent of the inflow to the Delta (Delta Protection Commission 2000). Flowing through portions of Fresno, Madera, Merced, Stanislaus, San Joaquin, Sacramento, and Contra Costa Counties, the river has flows ranging from 1,500 cubic feet per second (cfs) in dry years to more than 40,000 cfs in wet years (Friant Water Users Authority and Natural Resources Defense Council 2002:2-50). The San Joaquin River is tidally influenced throughout the Phase 3 Repair Project area. During a typical summer tidal cycle on the San Joaquin River in the northern portion of the Phase 3 Repair Project area, flows vary from 1,000 cfs upstream to 2,000 cfs downstream, and water levels vary from +0.5 foot to +2.0 feet.

Local Drainage and Flooding

Stormwater runoff in the Phase 3 Repair Project area commonly is collected in agricultural ditches, channels, municipal stormwater sewers, or human-made ponds before being pumped to the San Joaquin River. Runoff from the area east of the San Joaquin River, along levee elements Ie and VIIb, is directed west through agricultural swales and ditches, and then is pumped into the river by means of private agricultural pumps. Runoff from developed lands adjacent to elements IVa, IVc, and VIa.4 is directed to the City of Lathrop's storm drainage system, held in detention basins, and ultimately pumped into the San Joaquin River through a municipal stormwater outfall. Runoff in the area around element VIIe, which encompasses the Oakwood

Lake development, first flows into the artificial lakes in the center of the development, and then is pumped into the river if lake levels become too high.

As discussed in Chapter 1, "Introduction and Project Purpose, Need, and Objectives," implementation of the Map Modernization Program, initiated by FEMA in 2006, and input from DWR led to a determination that without further repairs, the RD 17 levees would not meet USACE's and DWR's desired criteria for seepage exit gradients. Based in part on input from DWR, the RD 17 levees have been assigned "provisional status" from FEMA (rather than full accreditation) regarding meeting 100-year level of flood risk reduction (1-percent chance of occurring in any given year, or 0.01 AEP). The primary deficiencies identified in the RD 17 levees relate to portions of the levee system that do not provide seepage exit gradients less than 0.5 at the water surface elevation for the 100-year flood event. This analysis considered two water surface elevations to satisfy the 100-year flood protection level: the 1990 FEMA accredited 100-year Design Water Surface Elevation and the 200-year water surface elevation established in the USACE Comprehensive Study (2002). Depending on the reach under consideration, the analysis used the higher (or more conservative) of the two water surface elevations.

Flooding along portions of the RD 17 levee system occurred in 1950, and in 1997, the RD 17 levee system showed under seepage and boils in several locations during a high-water event but did not flood. On the basis of DWR's concern, FEMA denied full accreditation and granted provisional accredited levee status instead. Following completion of Phase 1 and 2 levee repairs, RD 17 submitted a recertification application to FEMA and subsequently received a letter of map revision from FEMA (September 2011) indicating that the agency had accredited the area protected by the RD 17 levee system and had removed the provisional accredited levee status (FEMA 2011).

Groundwater Hydrology

The groundwater basin in the Phase 3 Repair Project area is within the Delta subregion, a part of the Central Valley aquifer system. Within this basin, the San Joaquin River divides the Tracy Subbasin to the west and the San Joaquin Subbasin to the east. Both subbasins are located in the San Joaquin Valley. The Phase 3 Repair Project is located within both the Tracy Subbasin (5-022.15) and the Eastern San Joaquin Subbasin (5-022.01). Most of the fresh groundwater is unconfined (i.e., not bounded by an impermeable or less permeable confining geologic formation) and occurs at depths of less than 2,500 feet (DWR 2006:169–170). The shallower aquifers are used as sources of freshwater.

Groundwater use in San Joaquin County has resulted in the decline of groundwater elevations by 40–60 feet over the last 20–30 years. This decline in groundwater elevation has created a gradient that has allowed saline water underlying the Delta region to migrate northeast (CALFED 2005:3-24, 3-25). The Eastern San Joaquin Subbasin has been deemed a critically overdrafted basin by DWR (DWR 2016). In July 2019, the Eastern San Joaquin Groundwater Authority prepared a draft groundwater sustainability plan (GSP) that addresses measures necessary to attain sustainable conditions in the subbasin by 2020 (Eastern San Joaquin Groundwater Authority 2019). By July 2021, DWR will complete an assessment of the draft GSP and provide recommended corrective actions to address any identified deficiencies. Because the Tracy Subbasin is not a critically overdrafted subbasin, a draft GSP has not been prepared.

Groundwater levels in the Phase 3 Repair Project area generally are very shallow because of the low elevation and proximity to the San Joaquin River channel. High groundwater levels can be influenced by the water level in the river, subsurface groundwater flow from areas of higher elevation to the east, and local irrigation practices.

Water Quality

Surface Water Quality

Water quality in the Delta and portions of the San Joaquin River are heavily influenced by the operations of the Central Valley Project and State Water Project. Generally, Delta water quality is best during the winter and spring months and is poorer through the irrigation season and early fall. Water quality in the San Joaquin River is influenced by factors such as rain and snowmelt runoff, reservoir operations, and irrigation return flows in the San Joaquin River basin. Agricultural return flows commonly discharge elevated salt loads into the San Joaquin River. SWRCB has set flow and water quality objectives at Vernalis, located just upstream from the Phase 3 Repair Project area. To meet the Vernalis objective, the U.S. Bureau of Reclamation supplements flows on the San Joaquin River with releases from New Melones Reservoir on the Stanislaus River (Northeastern San Joaquin County Groundwater Banking Authority 2004:44, 45).

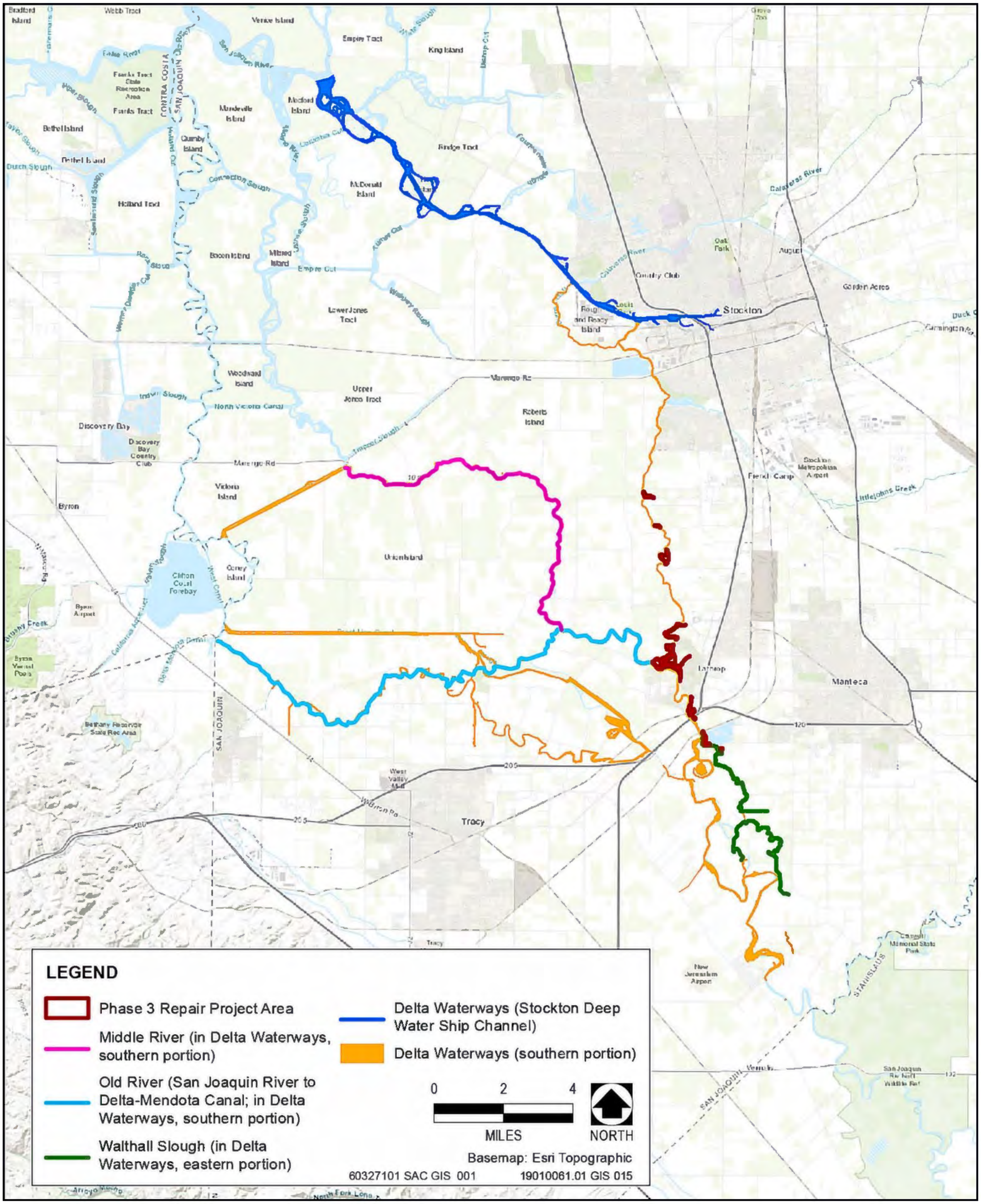
In April 2018, EPA approved SWRCB's Section 303(d) list, which identifies the impaired status for waterways in the Delta, including the upper San Joaquin River. Potential sources of pollution for all the listed constituents in the basin include agriculture, urban runoff/storm sewers, resource extraction, and unknown sources. The following water bodies in the vicinity of the Phase 3 Repair Project area (shown in **Figure 3.5-1**) are included in the 2010 Section 303(d) impaired water bodies list:

- Delta Waterways (southern portion, adjacent to elements Ia, Ib, Ie, IIab, IVa, IVb, IVc, Va-VIa.1, VIcde, VIIa, VIIb): pesticides (chlorpyrifos, diazinon, group A pesticides, and dichlorodiphenyltrichloroethane [DDT]); invasive species; mercury; electrical conductivity; and toxicity.
- Walthall Slough (in Delta Waterways, eastern portion, adjacent to element VIIe): pesticides (chlorpyrifos, diazinon, group A pesticides, and DDT); invasive species; mercury; and unknown toxicity.
- Old River (San Joaquin River to Delta-Mendota Canal; in Delta Waterways, southern portion; west of element Va): total dissolved solids (TDS), dissolved oxygen, electrical conductivity, and pesticides (chlorpyrifos).
- Middle River (in Delta Waterways, southern portion, downstream of Old River west of the Phase 3 Repair Project Area): dissolved oxygen.
- Delta Waterways (Stockton Ship Channel, downstream from the Phase 3 Repair Project Area): pesticides (chlorpyrifos, diazinon, group A pesticides, and DDT); dioxins (dioxin and furan); invasive species; mercury; dissolved oxygen; pathogens; polychlorinated biphenyls; and unknown toxicity.

TMDLs have not been completed yet for all of the listed water bodies, or for all of the listed pollutants that impair the water bodies. TMDLs for other listed pollutants are scheduled to be developed at various times over the next 10 years, in accordance with the priorities contained in the Section 303(d) list.

Major monitoring programs in the San Joaquin River include the DWR Municipal Water Quality Investigations Program and the DWR Water Quality Monitoring Program, in compliance with D-1641 (as revised from D-1485). The City of Stockton also monitors ambient water quality to assess potential effects associated with discharges from the Stockton Regional Wastewater Control Facility. Data is collected at five water quality monitoring sites near the Phase 3 Repair Project area along the San Joaquin River. The Mossdale Bridge sampling site at the Interstate 5 crossing over the San Joaquin River is near elements VIcde and VIIb. The Vernalis sampling site is located near the unincorporated community of Vernalis, just upstream from the Phase 3 Repair Project area.

Figure 3.5-1. Section 303(d) Impaired Water Bodies



Source: EPA 2018

Salinity in the Delta is the result of tidal exchange with San Francisco Bay, variations in freshwater inflow from the San Joaquin and Sacramento Rivers, agricultural and urban exports/diversions, and agricultural return flows. The salinity of surface waters often is measured by the concentration of TDS and/or EC. EC commonly is used as a surrogate parameter on which to evaluate TDS. Discharges from agriculture, wetlands, mines, industries, and urban areas contribute TDS, and therefore EC, to the San Joaquin River and the Delta. Median TDS concentrations are greater during critical (drought) water years than during wet or above-normal water years.

Table 3.5-1 provides the available surface water quality data from California Department of Water Resources – Water Data Library. Not all stations in Water Data Library have consistent and/or most current monitoring data. Stations located closest to the Project area with available water quality data are represented in **Table 3.5-1**. Overall, for the constituents identified in **Table 3.5-1**, the downstream Station located at the San Joaquin River near Vernalis (C10) has slightly higher concentrations than upstream Station located at the San Joaquin River at Highway 4, except for field dissolved oxygen readings, which show similar concentrations at both stations.

Table 3.5-1. Surface Water Quality Results Located Upstream and Downstream of Project Area

Location to Project Area	Upstream			Downstream		
Water Data Library Station Name	San Joaquin River @ Hwy 4			San Joaquin River Near Vernalis (C10)		
Water Data Library Station Number	B9D75571196			B9D74051159		
Data Range	01/1999 - 08/2001			03/2004 - 03/2005		
Constituent (units)	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
Field Conductivity (uS/cm)	220	901	571	259	934	675
Field Dissolved Oxygen (mgL)	6.2	12.4	8.9	6.5	11.3	8.9
Field Turbidity (NTU)	8	60	26	12	173	32
Dissolved Chloride (mg/L)	19	128	71	37	122	86
Dissolved Sodium (mg/L)	20	104	62	32	108	75
Dissolved Sulfate (mg/L)	24	130	71	41	137	88
Specific Conductivity (uS/cm)	224	937	581	256	998	676
Total Dissolved Solids (mg/L)	122	507	331	185	530	385
Turbidity (NTU)	7	37	20	10	124	27

Source of data from California Department of Water Resources – Water Data Library. https://wdlbeta.water.ca.gov/. Accessed March 17, 2021.

The Bay-Delta Plan, adopted by the SWRCB in 2006 and most recently amended in 2018, addresses surface and groundwater quality objectives and standards for waters in the Bay-Delta Plan area. The Phase 3 Repair Project would be consistent with the Bay-Delta Plan in terms of protecting surface water quality and designated beneficial uses within and downstream from the Phase 3 Repair Project area (discussed in Section 3.5.4, “Effects and Mitigation Measures”) for the following reasons:

- Water quality objectives for salinity, TDS, and chloride, defined in SWRCB’s D-1641 (SWRCB 2000) and the Bay-Delta Plan (SWRCB 2018), would be upheld;

- Other water quality objectives, defined in the Bay-Delta Plan, would be upheld; and

- A Section 401 Water Quality Certification would be acquired; and appropriate BMPs and mitigation measures (discussed in Section 3.5.4, "Effects and Mitigation Measures") and SWPPP would be developed and implemented during construction activities to address oil and gas spill prevention and potential short-term and temporary effects on water quality from construction-related turbidity and erosion.

Historical data indicate that seasonal water quality (April 1 to August 31) objectives in the Bay-Delta Plan for EC in the Delta were routinely exceeded in the San Joaquin River near Vernalis and at Mossdale Bridge; the standards typically were met at the other nearby monitoring locations (City of Lathrop 2001:4.2-14). In addition, the dissolved oxygen concentrations regularly fall below the Bay-Delta Plan's minimum standards in the San Joaquin River near Stockton (City of Lathrop 2001:4.2-15). Low or negative streamflow past Stockton reduces dilution and mixing, which reduces aeration of the water. Oxygen depletion in water bodies in the Central Valley typically is highest in late summer and fall, when high water temperatures reduce the oxygen-carrying capacity of the water. This suggests that dissolved oxygen levels may be influenced primarily by physical processes (i.e., temperature, solubility, and saturation capacity) rather than by biological processes, such as respiration and primary production (SWRCB 2010:3-2).

The distribution of ammonia in freshwater rivers and lakes is highly variable regionally, seasonally, and spatially, and depends on the level of productivity of the water body and the extent of inputs from organic matter. Ammonia may be acutely toxic at high concentrations or chronically toxic at low concentrations, depending on the length of the exposure period. Historical data indicate that ammonia concentrations at monitoring sites near the Phase 3 Repair Project area were below levels that would cause either acute or chronic toxicity (City of Lathrop 2001:4.2-17). Kjeldahl nitrogen is nitrogen in the form of organic proteins or their decomposition product, ammonia, as measured by the Kjeldahl method. During December 2007, Kjeldahl nitrogen levels near the Phase 3 Repair Project area had a high of 1.4 milligrams per liter. Dissolved inorganic nitrogen is a measure of total ammonium, nitrate, and nitrite, the nitrogen forms immediately available for assimilation by phytoplankton. During December 2007, dissolved inorganic nitrogen levels were found to be 3.74 milligrams per liter. The high values observed in this region of the Delta may result from runoff and drainage from agricultural operations on the San Joaquin River (SWRCB 2010:3-5, 3-6).

Trace elements (metals and minerals) may affect aquatic organisms directly or may affect human health or wildlife through water consumption or through bioaccumulation in fish or shellfish consumed by humans or high-end predators. The state currently is developing a TMDL program for mercury in the Delta, intended to result in the identification of a regulatory target(s), determination of sources and their associated loads, development of a quantitative model to predict loading, and implementation of a mercury control program to reduce loads to comply with water quality objectives.

Results from sampling in the Delta showed concentrations of the parameters discussed above to be within historical ranges (SWRCB 2010:3-11 to 3-17). Measured parameters exhibited seasonal variation and changes in response to significant rainfall events or changes in flow rates.

Groundwater Quality

Saltwater intrusion into the Delta and infiltration of runoff from the San Joaquin River, adjacent agricultural areas, and urban areas have caused groundwater quality to be poor for the shallowest aquifer in the area, which extends to a depth of approximately 150 feet below the ground surface (RD 17 2009). Saline intrusion has degraded water quality, threatening the long-term productivity of the groundwater basin and compromising the future of the basin as a source of agricultural and municipal water supply (CALFED 2005:3-24). The Bay-Delta Plan addresses groundwater quality objectives and standards for waters in the Bay-Delta Plan area. The Phase 3 Repair Project would be consistent with the amended 2018 Bay-Delta Plan in terms of protecting groundwater quality as related to protecting beneficial uses, and would not result in infiltration of pollutants, changes in groundwater level, groundwater recharge, or increased saltwater intrusion.

TDS and/or EC provides a measure of the level of saltwater intrusion into the groundwater supply. Groundwater quality from the shallow aquifer in the Lathrop area near the Phase 3 Repair Project area generally exhibits concentrations of chloride above recommended standards for drinking water. In addition, wells in the Lathrop area have been found to exhibit TDS levels above recommended standards for drinking water (GeoTracker GAMA 2010). However, wells for potable water draw from the deeper aquifer. The poor-quality shallow groundwater generally is not used for drinking water purposes.

Other groundwater quality concerns in the Stockton and Lathrop areas include nitrate, iron, manganese, and bacteriological contamination. As a result of the bacteriological contamination, the City of Lathrop began chlorinating water at all of its municipal wells in 1996. In general, groundwater within the city of Lathrop currently meets all drinking water standards (City of Lathrop 2018).

3.5.3 Methodology and Thresholds of Significance

Methodology

This analysis of the hydrologic and water quality effects of the Phase 3 Repair Project focuses on the effects of both the construction of seepage remediation facilities and the long-term project operations. Temporary and short-term effects on hydrology and water quality could occur from ground-disturbing activities and other construction-related activities, many of them near local drainages and waterways. The focus of the hydrology and water quality analysis for temporary and short-term effects is on those portions of each element that would be subject to ground disturbance during construction. The analysis of operational effects focused on how the presence of new or modified seepage remediation facilities may affect hydrology and water quality. In addition, Phase 3 Repair Project effects were assessed in light of existing regulatory requirements that would serve to mitigate potential effects. The effectiveness of existing regulations in mitigating potential effects often is affected by discretionary requirements, site characteristics, or project features not detailed yet, and design-level considerations. Because some discretion exists in how these regulations are applied, the regulations are presented as mitigation measures to outline the specific process by which the Phase 3 Repair Project would comply with these regulations.

Thresholds of Significance

The basis for determining the significance of effects for this analysis is based on professional standards and project-specific criteria developed by the lead agency to address potential effects unique to the project’s location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to hydrology and water quality if they would do any of the following:

- violate any water quality standards or waste discharge requirements or otherwise substantially degrade water quality;
- substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin;
- substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner that would:
  - result in substantial erosion or siltation on or off the site;
  - substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site; or
  - create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- impede or redirect flood flows;
- in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation; or
- conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

The Phase 3 Repair Project would not result in inundation by seiche, tsunami, or mudflow. The Phase 3 Repair Project area is approximately 50 miles inland from San Francisco Bay. The Phase 3 Repair Project area is geographically removed from locations where the potential for seiche, tsunami, or mudflow exists (e.g., near a lake, the California coastal zone, or hillsides). The San Joaquin River is not large enough to generate any sizeable seiche, and risk of a seismic event that may generate a seiche is minimal (see Section 3.4, "Geology, Soils, Minerals, and Paleontological Resources"). Therefore, no effects would occur, and these issues are not discussed further in this FEIS.

3.5.4 Effects and Mitigation Measures

Effect 3.5-a: Temporary Effects on Water Quality from Stormwater Runoff, Erosion, or Spills.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see Section 1.6.2, "Flood Problems and Needs," under the subheading "Management of Vegetation Encroachments") and no levee repairs would be constructed. Under these conditions, temporary effects on water quality would not occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could inundate lands near the breach, causing communities in the area to flood, which could result in damage to structures and other facilities and could introduce large quantities of contaminants (i.e., oil, gasoline, agricultural pesticides, and other hazardous materials) into waters and subsequently into the San Joaquin River and groundwater. Depending on the location and magnitude of a flood event, adverse effects could be localized or more widespread. To address damages, cleanup- and repair-related construction activities would occur. The location and extent of cleanup and repairs needed could be minor to extensive, depending on the location and severity of the levee failure and duration of flooding. Repair-related construction activities would be likely to involve repairing damaged homes, utility infrastructure, roads, and highways. As described under the three action alternatives below (Alternative 1, Alternative 2, and the Requester's Preferred Alternative), construction activities would have the potential to temporarily impair receiving water quality through the introduction of contaminants from stormwater runoff and erosion. For these reasons, this adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2—Maximum Footprint Alternative, and the Requester's Preferred Alternative

Project implementation would include extensive ground-disturbing activities during construction, many of them near local drainages and waterways that could become contaminated by soil or construction substances. These waterways include the San Joaquin River, Walthall Slough, and local ponds.

The Phase 3 Repair Project would include constructing seepage berms and setback levees, and installation of cutoff walls, chimney drains, and fill. Activities associated with Phase 3 Repair Project construction may require permanent structures to be relocated or woody vegetation to be removed. A setback levee would be constructed some distance behind the existing levee reach, and the existing levee may be removed to allow high-water events to inundate the newly expanded floodway. Setback levee construction would require additional ground disturbance and earthworks. Construction activities would occur primarily during the dry season, from July to the end of October.

Construction activities would have the potential to temporarily impair water quality if disturbed and eroded soil, petroleum products, or construction-related wastes (e.g., cement and solvents) are discharged into receiving waters or onto the ground where they can be carried into receiving waters. Soil and associated contaminants that may enter receiving waters through stormwater runoff and erosion could increase turbidity, stimulate algae growth, increase sedimentation of aquatic habitat, and introduce compounds that would be toxic to aquatic organisms. Accidental spills of construction-related substances such as oils and fuels could contaminate both surface water and groundwater.

The extent of potential effects on water quality would depend on the:

- tendency for erosion of soil types encountered,
- types of construction practices,
- extent of the disturbed area,
- duration of construction activities,
- timing of particular construction activities relative to rain events,
- proximity to receiving water bodies, and
- sensitivity of those water bodies to construction-related contaminants.

The cutoff walls proposed for RD 17 would be constructed using slurry of either soil-bentonite or a soil-cement-bentonite mixture. Slurry that would be used for construction of the new cutoff walls would have a fluid consistency during installation. The cutoff walls would be installed through the existing levee and would extend to depths varying from approximately 40 to 120 feet below the levee crown. Improper handling or storage of the slurry could result in releases to nearby surface water, thereby degrading water quality.

This potential for release of soil or construction-related materials into the San Joaquin River, Walthall Slough, and local ponds could adversely affect water quality in these locations. This adverse effect would be **potentially significant**.

Mitigation Measure 3.5-a: Implement Mitigation Measure 3.4-a, "Implement Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions."

<u>Alternative 1: Minimum Footprint Alternative, Alternative 2—Maximum Footprint Alternative, and the Requester's Preferred Alternative</u>

RD 17 shall implement Mitigation Measure 3.4-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions," set forth in full in Section 3.4, "Geology, Soils, Minerals, and Paleontological Resources." The final design and construction specifications for all project components will include implementation of standard erosion, siltation, and soil stabilization BMPs. In summary, this mitigation measure will require filing an NOI with the Central Valley RWQCB; implementing standard erosion, siltation, and BMP measures; preparing and implementing a SWPPP; and complying with the conditions of the NPDES general stormwater permit for construction activity.

Responsibility: RD 17 and construction contractor.

Timing: Prepare and submit an NOI and SWPPP before the start of project construction; implement SWPPP and BMPs during construction; and monitor effectiveness of measure during and at completion of construction.

Several technical studies have been conducted regarding the effects of water quality control features on groundwater (e.g., California Stormwater Best Management Practices Handbooks [CASQA 2003]) and surface water (e.g., Truckee River Basin Stormwater Management Program—Program Years 2007–2012 [Lahontan RWQCB 2007]). These studies have determined that water quality control features such as revegetation, erosion control measures, and detention and infiltration basins have been successful in avoiding adverse water quality effects (e.g., metals and organic compounds associated with stormwater typically are lost within the first few feet of soil below the retention basins). Technical studies associated with development (i.e., residential and golf course development) in the Lahontan area have demonstrated that the use of a variety of BMPs (e.g., source control, detention basins, revegetation, and erosion control) can maintain surface water quality conditions in adjacent receiving waters (e.g., Martis Creek).

Implementation of Mitigation Measure 3.4-a would reduce adverse water quality effects from temporary construction activities to a **less-than-significant** level under all three action alternatives because RD 17 and the construction contractor would conform with applicable local and state regulations regulating construction discharges and would implement recommendations in the Phase I and II Environmental Site Assessments addressing any contamination that is found in those locations before beginning ground-disturbing activities, which would reduce temporary, potentially significant effects.

Effect 3.5-b: Operational Effects on San Joaquin River Water Quality from Stormwater Runoff.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see Section 1.6.2, "Flood Problems and Needs," under the subheading "Management of Vegetation Encroachments") and no levee repairs would be constructed. Under these conditions, no increase would occur in impervious surfaces and no changes would occur in existing land uses; therefore, no potential would exist for stormwater runoff to affect San Joaquin River water quality. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could inundate lands near the breach, and flooded communities in this area could introduce large quantities of agricultural pesticides, oil, gasoline, and other hazardous materials into waters and subsequently into the San Joaquin River and groundwater. In the event of simultaneous levee failures in more than one location in the levee system, adverse effects would be more widespread. For these reasons, effects on San Joaquin River water quality from stormwater runoff under the No-Action Alternative would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2—Maximum Footprint Alternative, and the Requester's Preferred Alternative

Long-term degradation of water quality from runoff can be caused by changes in land use, introduction of new pollutant sources, or increase in impervious surfaces, such as parking lots. Under the Phase 3 Repair Project, seepage remediation activities would occur either on or adjacent to the landside of existing levees. Alternative 1, Alternative 2, and the Requester's Preferred Alternative would not increase the occurrence of impervious surfaces such as parking lots or building rooftops, nor change the existing land uses so that additional pollutant loading would occur. Seepage remediation elements would be constructed using clean fill from commercial sources and would not act as an additional source of polluted runoff. Vegetation management would continue in accordance with existing practices, including application of herbicides according to product labels, in accordance with applicable Federal and state laws, including those pertaining to herbicide application in or near wetlands. Therefore, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Effect 3.5-c: Place Housing within a 100-Year Flood Hazard Area or Place within a 100-Year Flood Hazard Area Structures That Would Impede or Redirect Flood Flows.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see Section 1.6.2, "Flood Problems and Needs," under the subheading "Management of Vegetation Encroachments") and no levee repairs would be constructed. As a result, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. As discussed in Section 2.4.1, "No-Action Alternative," the community rating for flood insurance likely would be lowered without implementation of the Phase 3 Repair Project repairs, and existing development in the urbanized portion of the area protected by the RD 17 levee system would be at risk of damage from flooding. Because the value of the existing residential, commercial, and industrial structures and their contents, located within the RD 17 service area, is substantial (having a replacement value greater than $900 million [RD 17 2009:4-15]), the adverse effect related to housing or structures within the 100-year flood hazard area would be **potentially significant**.

A levee failure along the RD 17 levee system could cause widespread flooding and extensive damage to property. Residences along the San Joaquin River near a levee breach could be engulfed, access to residences could be cut off, and interior roadways and other infrastructure could be damaged. The magnitude of the effects would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. Under this alternative, this adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Construction of seepage berms and cutoff walls either adjacent to or within the existing RD 17 levee system and the northerly bank of Walthall Slough would improve the reliability and stability of the flood protection system in the Phase 3 Repair Project area overall and would reduce the risk of a levee system failure in the Phase 3 Repair Project area. All work would be performed on the landside of the levee. Therefore, the proposed seepage berms and related repairs would not impede or redirect flood flows, nor would they place housing or other inhabited structures within a 100-year flood hazard area (area subject to the 100-year flood event). This effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Alternative 2: Maximum Footprint Alternative

Construction of setback levees, seepage berms, and cutoff walls either adjacent to or within the existing RD 17 levee system and the northerly bank of Walthall Slough would improve the reliability and stability of the flood protection system in the Phase 3 Repair Project area overall and would reduce the risk of a levee system failure in the Phase 3 Repair Project area. All work associated with construction of seepage berms and cutoff walls would be performed on the landside of the levee. Therefore, the proposed seepage berms and cutoff walls under Alternative 2 would not impede or redirect flood flows.

For Alternative 2, seepage remediation activities along elements IIab, IVc, and VIcde may include construction of setback levees. Setback levees along elements IIab would place approximately 29.7 acres of land in the San Joaquin River floodway. However, because the land is elevated relative to the San Joaquin River flows, this area likely is above the ordinary high-water mark and would not flood except during extreme high-water events (RD 17 2010). Currently, the area near the elements IIab setback levee alignment and expanded floodway is used for agricultural and residential uses, including an occupied house, pool, human-made lake, and an equestrian facility. Any facilities or developments within the setback levee footprint or expanded floodway would be removed (as well as filled in the case of the pool or pond).

For element IVc, Alternative 2 would construct either a setback levee or a seepage berm and chimney drain. Both the setback levee and seepage berm would permanently affect approximately 12.86 acres; current uses of this land include a City of Lathrop picnic area and vacant lands. A setback levee would place this area either under the footprint of the setback levee or into the floodway of the San Joaquin River, while a seepage berm would create a 5-foot-high layer of sand, rock, and soil in this area. After completion of construction activities, all disturbed areas, including the expanded floodway in the case of a setback levee, would be hydroseeded. Equipment and materials would be removed, and staging areas and any temporary access roads would be restored to preproject conditions. If a seepage berm and chimney drain is constructed along this reach, this action would neither increase the occurrence of impervious surfaces such as parking lots or building rooftops nor change the existing land uses.

For Alternative 2, elements VIcde would include the construction of a setback levee. This reach is adjacent to a San Joaquin County park and boat launch facility, just downstream from several bridges, including structures for Interstate 5. The San Joaquin County park and boat launch facility includes a large parking lot, picnic areas, restroom facilities, and a concrete boat ramp to the river. The proposed alignment of the setback levee would tie into the embankment of Manthey Road on the south and element VIb on the north while minimizing effects on the park and boat launch area. The existing levee would remain in place along elements VIcde. Therefore, no additional land would be placed within the floodway.

Flows in the river channel may be affected by the use of setback levees and associated widening of the floodway. A hydraulic analysis was conducted to estimate the magnitude of any changes in peak stages, discharges, and velocities at the proposed levee setback locations, and to document changes that would occur to the river hydraulics upstream and downstream if the levee setback alternatives were constructed, providing a regional analysis of the effect of the levee setbacks on the flow bifurcation at the Old River distributary upstream from the proposed setback levees. The Hydrologic Engineering Center—River Analysis System program developed by USACE was used to conduct the hydraulic analysis along elements IIab and IVc. No hydraulic analysis was conducted for setback levee installation along elements VIcde because the existing levee would remain in place and would continue to be maintained to protect the parking lot; therefore, no hydraulic changes would occur. For additional information on the modeling analysis, see **Appendix D-1**.

The hydraulic analysis conducted along elements IIab assumed that a new setback levee would be constructed and the existing levee would be removed. According to the analysis, water surface elevations during extreme events (100-year flood reoccurrence interval) would change minimally. The water surface elevations would decrease by approximately 0.01 feet for the 100-year flood reoccurrence interval downstream from the setback levee. Upstream from the setback levee, near the Old River bifurcation, the water surface elevations would slightly decrease by approximately 0.11 feet for the 100-year flood reoccurrence interval. The change in the water surface elevation would be caused by a slight increase in the volume of water permitted to pass through the wider channel because of the setback levee just downstream from the Old River bifurcation. The changes to the water level would be minor and would not affect the ability of local flood protection features to function. Similarly, maximum flow rate changes would be minimal during extreme events (100-year flood reoccurrence interval). As a result of the proposed setback levee, the San Joaquin River’s flow rate would slightly decrease downstream from elements IIab, from approximately 12,035 cfs to 12,031 cfs, a 4 cfs or less than 0.1-percent change. Upstream from elements IIab near the Old River bifurcation, the flow rate also would decrease slightly, from approximately 12,047 cfs to 12,041 cfs, a 6 cfs or less than 0.1-percent change for the 100-year flood recurrence interval.

For element IVc, Alternative 2 would result in construction of either a setback levee or a seepage berm with a chimney drain. A setback levee at this location would widen the floodway of the San Joaquin River. Therefore, a hydraulic analysis also was conducted, assuming that a new setback levee would be constructed and the existing levee would be removed along element IVc. According to the analysis, water surface elevations during extreme events (100-year flood recurrence interval) would change minimally. The water surface elevation would decrease by approximately 0.01 feet for the 100-year flood recurrence interval downstream from the setback levee. Upstream from the setback levee near the

Old River bifurcation, the water surface elevations would decrease by approximately 0.13 feet for the 100-year flood recurrence interval. The change in the water surface elevation would be caused by a slight increase in the volume of water permitted to pass through the wider channel as a result of the setback levee just downstream from the Old River bifurcation. The changes to the water level would be minor and would not affect the ability of local flood protection features to function. Similarly, maximum flow rate changes would be minimal during extreme events (100-year flood recurrence interval). The San Joaquin River’s flow rate would decrease slightly, from approximately 12,035 cfs to 12,032 cfs, a 3 cfs or less than a 0.1-percent change for the 100-year flood recurrence interval downstream from the Old River–San Joaquin River bifurcation because of setback levees along element IVc. Upstream from the setback levee near the Old River bifurcation, the flow rate also would decrease slightly, from approximately 12,047 cfs to 12,041 cfs, a 6 cfs or less than 0.1-percent change for the 100-year flood recurrence interval.

The results of this hydraulic analysis demonstrate that the studied levee setbacks would have negligible effects on the maximum flows and water surface elevations at their respective proposed locations. In general, the main benefit of a levee setback is a localized reduction of water surface elevations at the levee setback location. However, the proposed setbacks would not alter water elevations substantially and would not create this benefit.

A regional analysis including the bifurcation at the Old River distributary upstream from the proposed elements IIab and IVc setback levees also was conducted. The results of this analysis indicated that adding the levee setbacks may slightly increase peak flow rates in the San Joaquin River downstream from the project area, which in turn may slightly increase water surface elevations downstream from the junction with the Old River distributary because of the addition of floodplain storage. However, the changes to both water surface elevations and flow rate would be minor; therefore, a **less-than-significant** effect on changes in maximum flows and water surface elevations would occur.

The proposed seepage berms, setback levees, and related repairs under Alternative 2 would not impede or redirect flood flows, nor place housing or other inhabited structures within a 100-year flood hazard area. The setback levees would have minor effects on the water surface elevation and maximum flows during flood events. This effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

<u>**Requester’s Preferred Alternative**</u>

Construction of the setback levee, seepage berms, and cutoff walls either adjacent to or within the existing RD 17 levee system would improve the reliability and stability of the flood protection system in the Phase 3 Repair Project area overall and would reduce the risk of a levee system failure in the Phase 3 Repair Project area. All work would be performed on the landside of the levee. Therefore, the proposed seepage berms and related repairs under the Requester’s Preferred Alternative would not impede or redirect flood flows.

The Requester’s Preferred Alternative may include construction of a setback levee at element IVc. The setback levee would include a cutoff wall, and along the landside toe of the setback levee at the northern end of the alignment, it also would include a seepage berm. Following construction of the setback levee, approximately 400 feet of the existing levee on the downstream side from the oxbow at element IVc would be removed to allow the setback area to flood during high-water events. The rest of the remnant levee would be maintained in place. The setback area would be graded to drain to the river following a high-water event. The setback levee would permanently affect approximately 12.08 acres; current uses of this land include a City of Lathrop picnic area and vacant lands. A setback levee would place this area within the footprint of the setback area. After completion of project construction, the area would be hydroseeded and revegetated with riparian species, as appropriate. Equipment and materials would be removed, and staging areas and any temporary access roads would be restored to preproject conditions. Removal of construction equipment and materials as well as revegetation of disturbed areas would reduce the potential for pollutant loading, including erosion and siltation, after the downstream end of the existing levee is removed and low-lying areas are allowed to flood.

Under the Requester's Preferred Alternative, the setback levee at element IVc would have much less effect on the hydraulics of the San Joaquin River compared to the setback levee proposed under Alternative 2 because much of the remnant levee under the Requester's Preferred Alternative would be maintained in place by RD 17. The small downstream breach in the existing levee would be expected to create a backwater effect and would not result in a substantial widening of the flood plain. An analysis also was conducted to evaluate the hydraulic effects of the setback levee at element IVc under this alternative. The analysis showed that the proposed setback at element VIc essentially would have no effect on the maximum water surface elevation, with a computed maximum increase in the water surface elevation of 0.0007 feet. Additional information on the modeling analysis is provided in **Appendix D-2**.

The proposed cutoff walls, setback levee, seepage berms, and related repairs under the Requester's Preferred Alternative would neither impede nor redirect flood flows, nor place housing or other inhabited structures within a 100-year flood hazard area. The setback levee would have minor effects on the water surface elevation and would improve flows during flood events. This effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Effect 3.5-d: Alteration of Local Drainages or Exceedance of the Capacity of Stormwater Drainage Infrastructure.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see Section 1.6.2, "Flood Problems and Needs," under the subheading "Management of Vegetation Encroachments") and no levee repairs would be constructed. Therefore, local drainages or stormwater flows that could affect the capacity of existing stormwater infrastructure would not be altered. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure could alter local drainages and severely damage drainage infrastructure, thereby resulting in reduced capacity to accommodate stormwater flows. For this reason, this adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2—Maximum Footprint Alternative, and the Requester's Preferred Alternative

Long-term changes to the rate or amount of surface runoff in the form of site hydromodification potentially could affect local drainages, such as agricultural ditches, channels, or ponds. Hydromodification is a change in the hydrograph (e.g., flow rate, timing of peak flows, flow duration, and flow volume). Stream channels and other drainages are formed as a function of water flow patterns. Therefore, when patterns change the channel form (e.g., depth, width, curvature, substrate), function (e.g., habitat quality, habitat area) can be altered as beds and banks erode (or build up) in response to the change in flow regime. Hydrograph modification is caused by increased impervious cover that increases stormwater peak flow rates, volumes, and durations into a water body that is susceptible to bed or bank erosion. Runoff from the Phase 3 Repair Project area would enter local drainages or municipal storm drain systems and eventually would be pumped into the San Joaquin River.

Under Alternative 1, Alternative 2, and the Requester's Preferred Alternative, existing levees would be altered to include cutoff walls, seepage berms, setback levees, and/or chimney drains. Seepage remediation activities would occur either on or adjacent to existing levees. Alternative 1 would neither increase the occurrence of impervious surfaces, such as parking lots or building rooftops, nor change the existing land uses so that hydromodification would occur. However, existing drainage infrastructure in some cases would be replaced, relocated, or repaired. Existing drainage swales would be relocated to the toe of proposed seepage berms. For example, along elements IIab and VIa.4, storm drain pipes of varying sizes would be replaced. Seepage remediation activities along element VIa would require the replacement of a series of 30-inch steel storm-drain pipes that would connect the City of Lathrop's pump station and the San Joaquin River outfall structure. For elements Va and VIa.1 under Alternative 1 and the Requester's Preferred Alternative, an 18-inch City of Lathrop storm drain pipe would be replaced to install the cutoff wall, and an existing irrigation pipe would be removed permanently. For elements Va and VIa.1 under Alternative 2, the 18-inch City of Lathrop storm drain pipe would be extended to the outside edge of the seepage berm easement and the existing pump would be reconstructed. Construction would be phased to limit the amount of time that City of Lathrop's drainage pipe and pump station are out of service; however, if the construction timeline exceeded 1 week, temporary or emergency capacity would be provided to the City of Lathrop to eliminate potential flooding. Ultimately, although all three action alternatives could result in the relocation of some drainage and stormwater infrastructure, the capacity and function of this infrastructure would not change.

The footprint for the proposed seepage remediation activities for Alternative 1 would be approximately 70.94 acres. For Alternative 2, the footprint would be approximately 170.92 acres. The Requester's Preferred Alternative footprint would be approximately 39.79 acres. Seepage berms would rise 5 feet above the existing ground surface; would be made up of compacted sand, rock, and soil; and would be somewhat less pervious than the existing ground surface, although the change would not be sufficient to substantially alter runoff volumes or patterns. Seepage remediation features, such as seepage berms and setback levees, would be protected from erosion through planting of grasses and similar vegetation, to stabilize the soil surface and prevent them from becoming a source of sediment or siltation that could alter drainage features.

Although the action alternatives would slightly alter the location of drainage infrastructure in some areas, the function and capacity of these facilities would not be altered. Overall drainage patterns would not be altered substantially, and any changes in drainage patterns would not exceed the capacity of stormwater drainage infrastructure. Therefore, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Effect 3.5-e: Effects on Groundwater.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see Section 1.6.2, "Flood Problems and Needs," under the subheading "Management of Vegetation Encroachments") and no levee repairs would be constructed. Under these conditions, no potential would exist to disturb groundwater recharge or flow. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could result in widespread flooding. Flooding of the adjacent lands, if it were to occur in the absence of repairs to the levee system, would not inhibit groundwater recharge. However, potential groundwater contamination resulting from a flood event, as described above for the No-Action Alternative under Effects 3.5-a and 3.5-b, could limit the availability of groundwater. For these reasons, the adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2—Maximum Footprint Alternative, and the Requester's Preferred Alternative

Under Alternative 1, cutoff walls would be installed in the RD 17 levee system along elements IIab, IVc, Va–VIa.1, and VIIe. Under Alternative 2, a cutoff wall would be installed along element VIIe. Implementation of the Requester's Preferred Alternative would result in installation of cutoff walls in elements IIab, IVc, Va–VIa.1, VIb, VIc, and VIIe. The presence of cutoff walls could restrict the movement of groundwater in either direction, away from or toward the San Joaquin River, potentially increasing or decreasing localized near-surface groundwater levels in areas immediately adjacent to the cutoff wall.

A significant drop in groundwater levels could decrease the yields of nearby wells or increase the pumping costs of those wells. The proposed cutoff walls would vary from shallow (40 to 60 feet) to deep (up to 120 feet deep); however, the majority of the proposed cutoff walls would be shallow**.** The Victor Formation extends from the ground surface to a maximum depth of approximately 150 feet, and is connected hydraulically to the underlying Laguna Formation. Although the bottom of the proposed cutoff walls would extend into a layer of clay underneath this water-bearing zone, no coherent aquitards exist within the Victor Formation that could potentially isolate a portion of the shallow aquifer. Shallow wells near the slurry cutoff walls could experience some disruption in radial flow; however, recharge and overall flow to supply wells would not be affected appreciably (Crawford, pers. comm., 2010). The presence of the cutoff walls should not affect the utility of existing or future supply wells.

As a result, no substantial decrease in well yields or lowering of the local groundwater table level would occur. In addition, implementation of the Phase 3 Repair Project would not directly change land use to the extent that the rate of groundwater recharge would decrease. Therefore, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

3.5.5 Residual Significant Effects

Because mitigation would not be required for the No-Action Alternative, adverse effects related to stormwater runoff and placement of structures in the 100-year floodplain caused by the continued exposure to the risk of flooding would remain significant and unavoidable. Under the No-Action Alternative, all other effects related to hydrology and water quality would be less than significant.

Implementing Mitigation Measure 3.4-a would reduce potentially significant adverse water quality effects from construction-related stormwater runoff, erosion, or spills to a less-than-significant level. Water quality and hydrology changes caused by long-term project operations would be less than significant with no mitigation required. Therefore, Alternative 1, Alternative 2, and the Requester's Preferred Alternative would not result in any residual significant effects.

As noted in Section 3.1.6, "Comparison of the Effects of the Alternatives," implementing the Phase 3 Repair Project would substantially lessen the probability of a flood caused by levee failure in the area protected by the RD 17 levee system. However, the area protected by the RD 17 levee system would remain subject to a residual risk of flooding, which would be the same under the Requester's Preferred Alternative and both Alternatives 1 and 2.

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3.6 Biological Resources

This section describes the common and sensitive biological resources within the Phase 3 Repair Project area and surrounding areas, identifies applicable Federal and state laws and regulations, and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to biological resources. A discussion of cumulative effects related to biological resources is provided in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements," of this FEIS.

The evaluation is based on data collected during multiple biological field surveys, reviews of aerial photographs, and information obtained from previously completed studies and analyses that addressed biological resources within or near the Phase 3 Repair Project area. Surveys were conducted by AECOM biologists in the Phase 3 Repair Project area between March 2008 and July 2010, and again in January 2014. Surveys included wetland delineations on March 19, 2008, September 22, 2009, and July 1, 2010; during the wetland delineations, sensitive habitats, potential wildlife habitats, and land cover were also mapped to document areas that could support special-status species. Tree surveys were conducted on April 2, 6, and 7 and June 8 and 9, 2010, to inventory woody vegetation on the San Joaquin River side (waterside) of Phase 3 Repair Project elements Ia–VIIg. The tree survey was conducted to assist with the assessment of effects from conformity with USACE guidance regarding removal of woody vegetation within 15 feet of the toe of the levee (see the "Federal" section in Section 3.6.1). Trees on or within 15 feet of the foot of the toe of the levee were identified to the species level, and their diameter at breast height (dbh) was recorded. Focused surveys for elderberry shrubs were conducted along all levee reaches on March 8, 2011, and the area was resurveyed on January 29, 2014. Preconstruction surveys were conducted by AECOM biologists in the Phase 3 Repair Project area on October 21, 2015, along elements IIIa–VIa.1 for the Mossdale Tract Emergency Deployment action (AECOM 2015). GEI biologists conducted preconstruction surveys and construction monitoring for RD 17's 2017 Emergency Response Construction Project in April 2017 (GEI Consultants 2017). GEI biologists also conducted preconstruction surveys for sensitive biological resources, including focused surveys for elderberry shrubs in the Phase 3 Repair Project area, on September 16–17, 2019.

Documents and other sources reviewed during preparation of this section include the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP) (San Joaquin County 2000), Central Lathrop Specific Plan Draft Environmental Impact Report (City of Lathrop 2004), Draft Environmental Impact Report for the Mossdale Landing Urban Design Concept (City of Lathrop 2002), Riparian Brush Rabbit Survey: Paradise Cut along Stewart Tract, San Joaquin County, California (Williams and Hamilton 2002), Riparian Brush Rabbit: Central Lathrop Specific Plan, San Joaquin County, CA (Vincent-Williams et al. 2004), and Preliminary Delineation of Waters of the United States, Including Wetlands for the RD 17 100-Year Levee Seepage Project (AECOM 2009). The California Natural Diversity Database (CNDDB) (2014) and California Rare Plant Ranks (CRPR) Inventory (CNPS 2014) were the primary sources to identify previously reported occurrences of special-status species in the project area and vicinity.

3.6.1 Regulatory Setting

As required under NEPA, applicable Federal laws and regulations are identified in this section. State laws and regulations applicable to implementation of the Phase 3 Repair Project by RD 17 are described for informational purposes and to assist with NEPA review. RD 17 also has considered regional and local plans and ordinances as a part of the environmental review process for this FEIS, where applicable to the Phase 3 Repair Project.

Federal

Executive Order 11990, Protection of Wetlands

The purpose of Executive Order 11990 is to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands." To meet these objectives, in planning their actions, Federal agencies are required to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. The executive order applies to acquisition, management, and disposition of Federal lands and facilities construction and improvement projects that are undertaken, financed, or assisted by Federal agencies. It also applies to Federal activities and programs affecting land use, such as water and related land resources planning, regulation, and licensing activities.

Endangered Species Act of 1973, as Amended

Pursuant to the Federal Endangered Species Act (ESA), the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) have regulatory authority over federally listed species. Under ESA, a permit to "take" a listed species is required for any Federal action that may harm an individual of that species. "Take" is defined under Section 9 of the ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Under Federal regulation, "take" is further defined to include habitat modification or degradation where it would be expected to result in death or injury to listed wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. ESA Section 7 outlines procedures for Federal interagency cooperation to conserve federally listed species and designated critical habitat. Section 7(a)(2) requires Federal agencies to consult with USFWS and/or NMFS to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species.

Fish and Wildlife Coordination Act of 1934, as Amended

The Fish and Wildlife Coordination Act ensures that fish and wildlife receive consideration equal to that of other project features for projects that are constructed, licensed, or permitted by Federal agencies. The act requires that the views of USFWS, NMFS, and the applicable state fish and wildlife agency (in this case, the California Department of Fish and Wildlife [CDFW]) be considered when effects are evaluated and mitigation needs are determined.

Migratory Bird Treaty Act of 1918

The Migratory Bird Treaty Act (MBTA) implements a series of international treaties that provide for migratory bird protection. The MBTA authorizes the Secretary of the Interior to regulate the taking of migratory birds. The act provides that it will be unlawful, except as permitted by regulations, "to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird…." (16 U.S. Code 703). This prohibition includes both direct and indirect acts, although harassment and habitat modification are not included unless they result in direct loss of birds, nests, or eggs. The current list of species protected by the MBTA includes several hundred species and essentially includes all native birds. Permits for take of nongame migratory birds can be issued only for specific activities, such as scientific collecting, rehabilitation, propagation, education, taxidermy, and protection of human health and safety and personal property.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) establishes a management system for national marine and estuarine fishery resources. The purpose of the act is to take immediate action to conserve and manage the fishery resource off the U.S. coasts, and anadromous species, and promote the protection of Essential Fish Habitat (EFH). NMFS requires projects to not adversely affect EFH, as defined in the 1996 Sustainable Fisheries Act (Public Law 104-297), and to stop or reverse the continued loss of fish habitats through the goals of habitat protection, conservation, and enhancement. This legislation requires that all Federal agencies consult with NMFS regarding actions or proposed actions permitted, funded, or undertaken that may adversely affect, "essential fish habitat." EFH is defined as "waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity."

The Magnuson-Stevens Act states that migratory routes to and from spawning grounds of anadromous fish are considered EFH. The phrase "adversely affect" refers to the creation of any effect that reduces the quality or quantity of EFH. Although the concept of EFH is similar to that of designated Critical Habitat under the ESA, measures recommended to protect EFH by NMFS are advisory, not prescriptive. Federal activities that occur outside EFH but that may, nonetheless, have an effect on waters and substrate constituting EFH also must be considered in the consultation process.

Under the Magnuson-Stevens Act, effects on habitat must be considered. The Magnuson-Stevens Act states that consultation regarding EFH should be consolidated, where appropriate, with the interagency consultation, coordination, and environmental review procedures required by other Federal statutes, such as NEPA, the FWCA, the Clean Water Act (CWA), and the ESA. Consultation requirements for EFH requirements can be satisfied through concurrent environmental compliance if the lead agency provides NMFS with timely notification of actions that may adversely affect EFH, and if the notification meets requirements for the EFH assessment.

The following Federal laws related to biological resources are also relevant to this analysis and are described in detail in Section 3.5, "Hydrology and Water Quality":

- CWA, Section 404 Permits for Placement of Fill in Waters or Wetlands and
- Rivers and Harbors Appropriation Act of 1899, as amended (Section 14 and Section 10).

State

The following state laws and policies related to biological resources are relevant to this analysis and are described in detail below.

California Endangered Species Act

Pursuant to the California Endangered Species Act (CESA), a permit from CDFW is required for projects that could result in the take of a plant or animal species that is state listed as threatened or endangered. Under CESA, "take" is defined as an activity that would directly or indirectly kill an individual of a species. The CESA definition of take does not include "harming" or "harassing," as the Federal ESA definition does. Therefore, the threshold for take is higher under CESA than under ESA. RD 17 would coordinate with CDFW to discuss CESA compliance requirements and, if required, would apply to CDFW for take authorization under Section 2081 of the California Fish and Game Code.

California Fish and Game Code Section 1602—Streambed Alteration Agreement

All diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake in California that supports wildlife resources are subject to regulation by CDFW under Section 1602 of the California Fish and Game Code. Under Section 1602, it is unlawful for any person, governmental agency, or public utility to do the following without first notifying CDFW:

- substantially divert or obstruct the natural flow of, or substantially change or use any material from, the bed, channel, or bank of any river, stream, or lake or
- deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

A stream is defined as a body of water that flows at least periodically or intermittently through a bed or channel that has banks and supports fish or other aquatic life. This definition includes watercourses with a surface or subsurface flow that supports or has supported riparian vegetation. CDFW's jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife. A CDFW streambed alteration agreement must be obtained for any project that would affect a river, stream, or lake.

California Fish and Game Code Sections 3503 and 3503.5—Protection of Bird Nests and Raptors

Section 3503 of the California Fish and Game Code states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. Section 3503.5 specifically states that it is unlawful to take, possess, or destroy any raptors (i.e., species in the orders Falconiformes and Strigiformes), including their nests or eggs. Typical violations of these codes include destruction of active nests resulting from removal of vegetation in which the nests are located. Violation of Section 3503.5 could also include failure of active raptor nests resulting from disturbance of nesting pairs by nearby project construction. This statute does not provide for the issuance of any type of incidental take permit.

California Fish and Game Code—Fully Protected Species

Protection of fully protected species is described in Sections 3511, 4700, 5050, and 5515 of the California Fish and Game Code. These statutes prohibit take or possession of fully protected species and do not provide for authorization of incidental take of fully protected species.

Porter-Cologne Water Quality Control Act

Under the Porter-Cologne Water Quality Control Act, waters of the state fall under the jurisdiction of the appropriate regional water quality control board (RWQCB). The RWQCB must prepare and periodically update water quality control plans (basin plans). Each basin plan sets forth water quality standards for surface water and groundwater, as well as actions to control nonpoint and point sources of pollution to achieve and maintain these standards. Projects that discharge waste to wetlands or waters of the state must meet waste discharge requirements of the RWQCB, which may be issued in addition to a water quality certification or waiver under Section 401 of the CWA.

More recently, the appropriate RWQCB has also generally taken jurisdiction over waters of the state that are not subject to USACE jurisdiction under the CWA, in cases where USACE has determined that certain features do not fall under its jurisdiction. Mitigation requiring no net loss of wetlands functions and values of waters of the state is typically required.

See the “State” section in Section 3.5.1 in Section 3.5, “Hydrology and Water Quality,” for further discussion of the Porter-Cologne Water Quality Control Act.

3.6.2 Environmental Setting

Habitat and land cover types present in the Phase 3 Repair Project area were mapped onto aerial photographs during field surveys. The polygons were later digitized into a geographic information system overlay and used to create a map showing the location and extent of each habitat type present in the Phase 3 Repair Project area (**Figures 3.6-1a through 3.6-1c**). Habitat types described below are based on those of the classification systems presented in Preliminary Descriptions of the Terrestrial Natural Communities (Holland 1986) and A Guide to Wildlife Habitats of California (Mayer and Laudenslayer 1988), but in some cases have been modified to reflect the specific conditions observed in the project area.

Vegetation and Land Cover

Vegetation and land cover types within the Phase 3 Repair Project area include Great Valley cottonwood riparian forest (remnant), Great Valley oak riparian forest (remnant), nonnative woodland, tidal and valley freshwater marsh, agricultural (i.e., row crops, orchards, dirt roads, and irrigation ditches), ruderal, and developed (i.e., residential housing, parks, boat launch facilities, and roads). Relative to the dense riparian forest that once flanked the San Joaquin River in this area, the community today consists of linear areas and occasional remnant patches of riparian forest and related riparian scrub that grow on or adjacent to the levee, primarily on the waterside. A few larger areas of this riparian forest are present where the river turns away from the levee and creates a point bar and an upland floodplain area. Riprap or large boulders cover the lower half of most of the waterside of the San Joaquin East Levee in the Phase 3 Repair Project area and ruderal vegetation grows in open areas, especially upslope of the riprap and on large open areas on the landside of the levee. Other areas of levee on the waterside are barren and/or covered with stumps and dead vegetation, likely because of levee maintenance that includes cutting scrub and low vegetation and applying herbicide. The landside of the Phase 3 Repair Project levee elements are primarily barren or covered with ruderal vegetation. Beyond the base of the levees, riparian vegetation is rare but occasionally present in small isolated patches. Other trees include occasional single or isolated stands of native oaks and nonnative trees planted around farms, agricultural fields, and residential or other types of development.

Larger remnant patches of Great Valley cottonwood riparian forest located within the Phase 3 Repair Project area are dominated by large Fremont cottonwood (*Populus fremontii*) trees and Goodding’s willow (*Salix gooddingii*). Most of the otherwise linear or smaller patchy areas of this community lack Fremont cottonwood and are represented by Goodding’s willow, red willow (*S. laevigata*), arroyo willow (*S. lasiolepis*), narrow leaved-willow (*S. exigua*), and scattered valley oak (*Quercus lobata*), Oregon ash (*Fraxinus* latifolia), and buttonbush (*Cephalanthus occidentalis*). Native ground cover species, mainly found in the larger remnant patches of riparian forest, include California blackberry (*Rubus ursinus*) and wild rose (*Rosa californica*). Common nonnative understory species found in most elements include Himalayan blackberry (*Rubus discolor*) and tree tobacco (*Nicotina glauca*). Most of the Great Valley cottonwood riparian forest community could also be characterized as Great Valley riparian scrub, which does not include Fremont cottonwood and is characterized by a shorter canopy and more uniform structure; however, this habitat is part of the Great Valley cottonwood riparian forest that was extensive and connected along this entire reach of the San Joaquin River, and this document therefore describes all riparian habitat as such. The largest stands of Fremont cottonwood trees within the Phase 3 Repair Project area are present in elements IIIb, IVc, and Va–VIa.1.

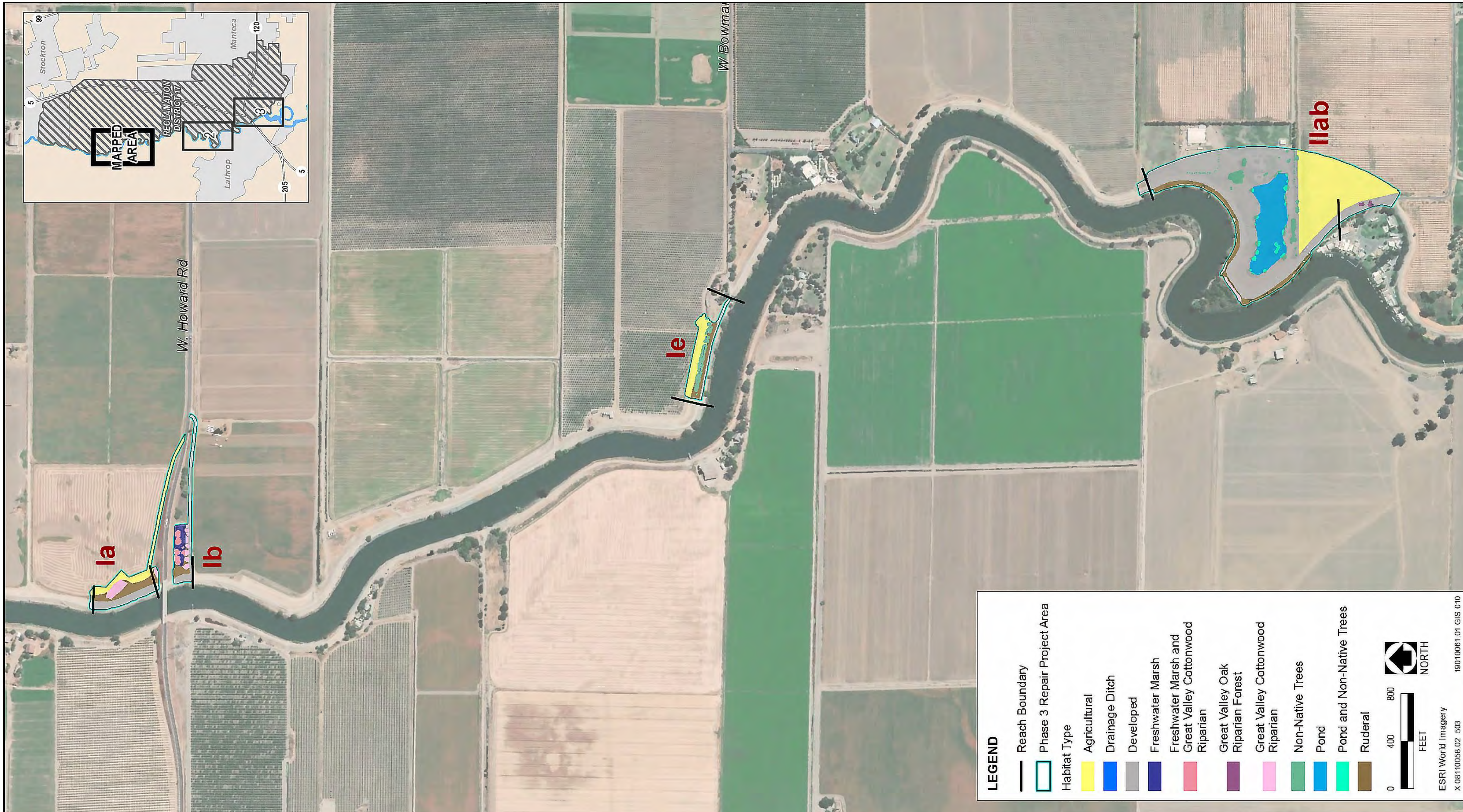
Great Valley oak riparian forest is also located within the Phase 3 Repair Project area, occurring only on the landside of the levees. Two significant oak groves of very large, healthy valley oak trees are present on the landside of elements IIIb and IVa and account for the majority of the Great Valley oak riparian forest; although several groups of smaller valley oak trees and individual valley oak trees scattered along the landside of other Phase 3 Repair Project elements also contribute to this community. Although not measured, several of the largest trees in these landside oak groves present in the Phase 3 Repair Project area are close to 100 inches dbh, which is a size that indicates they are possibly several hundred years old (Bartolome et al. 1987).

Wetland vegetation in the Phase 3 Repair Project area is limited to one area of coastal and valley freshwater marsh, several agricultural ditches, and the edges of one constructed pond. The freshwater marsh is isolated in a depression on the landside of the levee in element Ib between Howard Road to the north and a dirt farm road on the south. Vegetation in the marsh is dominated by narrow-leaved cattail (*Typha angustifolia*) and Fremont cottonwood and red willow trees grow on the perimeter. A limited amount of freshwater marsh is also present around the edges of a constructed pond that is located on a large private estate and equestrian center located east of the Phase 3 Repair Project levee in elements IIab. A second area of freshwater marsh is located just outside the Phase 3 Repair Project area in element Va, and in an area of backwater on the San Joaquin River. Agricultural ditches are located along the edges of fields and orchards and are dominated by a mix of native and nonnative aquatic and semiaquatic plant species such as curly dock (*Rumex crispus*), African pricklegrass (*Crypsis vaginiflora*), floating water primrose (*Ludwigia peploides*), willow weed (*Polypogon lapathifolium*), annual beard grass (*Polypogon monspeliensis*), and nutsedge (*Cyperus eragrostis*). Small patches of Fremont cottonwood and willow scrub occasionally appear along these drainage ditches.

Ruderal vegetation is characterized by nonnative weedy and sometimes invasive vegetation and nonnative annual grasses. Common weed species include yellow star-thistle (*Centaurea solstitialis*), black mustard (*Brassica nigra*), shortpod mustard (*Hirschfeldia incana*), Italian thistle (*Carduus pycnocephalus*), milk thistle (*Silybum marianum*), and Himalayan blackberry; common grass species include ripgut brome (*Bromus diandrus*), foxtail barley (*Hordeum murinum* ssp. *leporinum*), Bermuda grass (*Cynodon dactylon*), and Johnsongrass (*Sorghum halepense*). The levee slopes are dominated by ruderal vegetation. Large open areas in elements IIIa and IVc are also composed primarily of ruderal vegetation as are smaller open areas in elements VIcde and VIIe that border roads, parking lots, and agricultural land. Cropland within the project site is dominated by alfalfa fields, orchards, and row crops such as tomatoes. Ruderal species grow along the edges of fields and irrigation ditches, some of which contain water and associated aquatic plants. The largest areas of agricultural lands are present in elements Va–VIa.1 and VIcde within the footprint of Alternative 2 activities.

Developed areas in the Phase 3 Repair Project area consist of residential areas bordering elements IVa, IVc, Va–VIa.1, and VIIe; parks located in elements IVc and VIa.2, the latter of which is also a boat launching facility; and ranch houses and related facilities located in or adjacent to elements Ie, IIab, and Va–VIa.1. Vegetation in residential areas and parks consists of turf grasses, landscape trees, and occasional valley oak trees. Ranch lands often contain English walnut trees (*Juglans regia*), a variety of landscaped trees, and occasional native valley oak trees.

Figure 3.6-1a. Habitat Elements Ia–IIab



Source: Data compiled by AECOM in 2014

Figure 3.6-1b. Habitat Elements IIIa–VIa.1

Source: Data compiled by AECOM in 2014

Figure 3.6-1c. Habitat Elements VIa.4–VIIg

Source: Data compiled by AECOM in 2014

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Wildlife

Common wildlife species expected in the Phase 3 Repair Project area are those typically associated with agriculture (i.e., alfalfa, row crop, and orchard) and ruderal habitat, which account for 57 percent of the project footprint area under Alternative 1, 68 percent under Alternative 2, and 61 percent under the Requester's Preferred Alternative. Species include California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), western harvest mouse (*Reithrodontomys megalotis*), and California meadow vole (*Microtus californicus*). These small mammals are prey for a variety of raptor species known to occur in the area, including American kestrel (*Falco sparverius*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), and Swainson's hawk (*Buteo swainsoni*). Other birds expected to forage in or above this habitat include western kingbird (*Tyrannus verticalis*), barn swallow (*Hirundo rustica*), European starling (*Sturnus vulgaris*), western meadowlark (*Sturnella neglecta*), Brewer's blackbird (*Euphagus cyanocephalus*), and burrowing owl (*Athene cunicularia*), a California species of special concern that has not been documented in the Phase 3 Repair Project area but could potentially occur in this habitat type.

Wildlife in agricultural ditches is typically limited because of the regular disturbance associated with maintenance activities and the absence of adjacent natural upland vegetation. Agricultural ditches, however, can support marsh-associated species, including birds such as marsh wren (*Cistothorus palustris*), sparrow species (*Melospiza* spp.), and mallard duck (*Anas platyrhynchos*); amphibians such as Pacific chorus frog (*Pseudacris regilla*) and bullfrog (*Rana catesbiana*); and reptiles such as western pond turtle (*Actinemys marmorata*), which is a California species of special concern.

Nonnative and ornamental trees and landscaped vegetation associated with the city parks in elements IVc and VIcde support relatively low wildlife diversity. These areas are typically utilized by species adapted to human disturbance and altered environments, including house sparrow (*Passer domesticus*), house finch (*Carpodacus mexicanus*), mourning dove (*Zenaida macroura*), American crow (*Corvus brachyrhynchos*), raccoon (*Procyon lotor*), and opossum (*Didelphis virginiana*).

Riparian habitats in the project area provide nesting habitat for a much wider variety of bird species including acorn woodpecker (*Melanerpes formicivorus*), black phoebe (*Sayornis nigricans*), Bullock's oriole (*Icterus bullockii*), house wren (*Thryomanes bewickii*), oak titmouse (*Baeolophus inornatus*), western kingbird, western scrub-jay (*Aphelocoma californica*), and yellow-rumped warbler (*Dendroica coronata*); the larger trees provide roost sites for tree-associated bat species and nest sites for raptors, such as Swainson's hawk, red-tailed hawk, white-tailed kite (*Elanus leucurus*), red-shouldered hawk (*Buteo lineatus*), and great horned owl (*Bubo virginianus*). Understory habitat provides cover for mammals such as desert cottontail (*Sylvilagus audubonii*) and for ground-nesting birds such as spotted towhee (*Pipilo maculates*), which forages among the vegetation and leaf litter. A few large patches of riparian forest with dense understory shrub layers are known to support riparian brush rabbit (*Sylvilagus bachmani riparius*), which is federally listed and state listed as endangered.

Fisheries

Aquatic Habitats

The principal surface water bodies associated with the Phase 3 Repair Project include the San Joaquin River and Walthall Slough. Project elements Ia–IVc are located upstream from the confluence of the San Joaquin River and Old River. Element V is located directly adjacent to this confluence. Elements VIa.1–VIIe are downstream from the confluence of the San Joaquin River and Old River. Small portions of elements VIIe and VIIg are located along Walthall Slough. There is also an approximately 3.5-acre pond located within elements IIab (**Figure 3.6-1a**).

In the project vicinity, the San Joaquin River is characterized as a wide channel (approximately 300 feet) with little riparian canopy or overhead vegetation and minimal bank cover. Aquatic habitat in the San Joaquin River is characterized primarily by slow-moving glides and pools, is depositional in nature, and has limited water clarity and habitat diversity. Altered flow regimes, flood control, and bank protection efforts along much of the San Joaquin River have reduced riparian vegetation and associated shaded riverine aquatic (SRA) habitat, sediment transport, channel migration and avulsion, and large woody debris recruitment, and have isolated the San Joaquin River channel from its floodplain. SRA habitat is defined as the nearshore aquatic habitat occurring at the interface between a river and adjacent woody riparian habitat. The principal attributes of this cover type are: (1) an adjacent bank composed of natural, eroding substrates supporting riparian vegetation that either overhang or protrude into the water; and (2) water that contains variable amounts of woody debris, such as leaves, logs, branches, and roots and has variable depths, velocities, and currents. Riparian habitat provides structure (through SRA habitat) and food for fish species. Shade decreases water temperatures, while low overhanging branches can provide sources of food by attracting terrestrial insects. As riparian areas mature, the vegetation sloughs off into the rivers, creating structurally complex habitat that furnishes refugia from predators, creates variable water velocities, and provides habitat for aquatic invertebrates. For these reasons, many fish species are attracted to SRA habitat. This has resulted in a decline in habitat quality for fish species using the San Joaquin River near the project area. However, fish use this segment of the river, even if only as a migratory pathway to and from upstream spawning and rearing areas.

Fish Populations

The lower San Joaquin River serves as a migration corridor and/or provides other types of habitat (e.g., rearing, spawning) for Central Valley fall-/late fall-run Chinook salmon evolutionarily significant unit (ESU) (*Oncorhynchus tshawytscha*), Central Valley spring-run Chinook salmon ESU (*O. tshawytscha*), Sacramento River winter-run Chinook salmon ESU (*O. tshawytscha*), Central Valley steelhead distinct population segment (DPS) (*O. mykiss*), Delta smelt (*Hypomesus transpacificus*), Sacramento splittail (*Pogonichthys macrolepidotus*), white sturgeon (*Acipenser transmontanus*), green sturgeon (*Acipenser medirostris*), and numerous other resident native and nonnative species (see **Table 3.6-1**).

The small unnamed pond in elements IIab (**Figure 3.6-1a**) may contain fish and other aquatic species. It is expected that the isolated nature and size of this pond would only support nonnative warm water fish that were most likely introduced. Typical fish that are found in similar ponds include bluegill (*Lepomis macrochirus*), western mosquitofish (*Gambusia affinis*), and catfish (*Ameiurus* or *Ictalurus* spp.) among other nonnative warm water species.

Sensitive Biological Resources

Sensitive biological resources addressed in this section include those afforded special protection through the California Environmental Quality Act (CEQA), the California Fish and Game Code (including CESA), the ESA, the CWA, and the SJMSCP. Special-status species addressed in this section include plants and animals legally protected or otherwise considered sensitive by Federal, state, or local resource conservation agencies and organizations. The following list provides more specific descriptions of the categories for sensitive species and their habitats:

- plant and wildlife species listed by CESA and/or the ESA as rare, threatened, or endangered;
- plant and wildlife species considered by the ESA as candidates for listing or proposed for listing;

- species listed as fully protected under the California Fish and Game Code and wildlife species identified by CDFW as California species of special concern because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction; however, these species receive no formal protection under the California Fish and Game Code;

- plants considered by the California Native Plant Society to be rare, threatened, or endangered as listed in the CRPR Inventory; and

- critical habitat designated under the ESA and other sensitive habitats that include those that are of special concern to resource agencies or are afforded specific consideration under CEQA, Section 1602 of the California Fish and Game Code, Section 404 of the CWA, and the Porter-Cologne Water Quality Control Act.

Table 3.6-1. Fish Species Reported in the Vicinity of the Phase 3 Repair Project Area

Common Name	Scientific Name
Native Species	
Hitch	*Lavinia exilicauda*
Blackfish	*Orthodon microlepidotus*
San Joaquin roach	*Lavinia symmetricus* ssp.
Hardhead	*Mylopharodon conocephalus*
Sacramento splittail	*Pogonichthys macrolepidotus*
Pikeminnow	*Ptychocheilus grandis*
Sacramento sucker	*Catostomus occidentalis*
Delta smelt	*Hypomesus transpacificus*
Longfin smelt	*Spirinchus thaleichthys*
Steelhead/rainbow trout	*Oncorhynchus mykiss*
Chinook salmon	*Oncorhynchus tshawytscha*
Threespine stickleback	*Gasterosteus aculeatus*
Prickly sculpin	*Cottus asper*
Tule perch	*Hysterocarpus traski*
White sturgeon	*Acipenser transmontanus*
Green sturgeon	*Acipenser medirostris*
Introduced Species	
American shad	*Alosa sapidissima*
Threadfin shad	*Dorosoma petenense*
Goldfish	*Carassius auratus*
Red shiner	*Cyprinella lutrensis*
Carp	*Cyprinus carpio*
Golden shiner	*Notemigonus chrysoleucas*
Rosyface shiner	*Notropis rubellus*
Fathead minnow	*Pimephales promelas*

Table 3.6-1. Fish Species Reported in the Vicinity of the Phase 3 Repair Project Area

Common Name	Scientific Name
White catfish	*Ameiurus catus*
Black bullhead	*Ameiurus melas*
Channel catfish	*Ictalurus punctatus*
Wakasagi	*Hypomesus nipponensis*
Western mosquitofish	*Gambusia affinis*
Inland silverside	*Menidia beryllina*
Striped bass	*Morone saxatilis*
Bluegill	*Lepomis macrochirus*
Redear sunfish	*Lepomis microlophus*
Smallmouth bass	*Micropterus dolomieu*
Largemouth bass	*Micropterus salmoides*
White crappie	*Pomoxis annularis*
Black crappie	*Pomoxis nigromaculatus*
Bigscale logperch	*Percina macrolepida*
Yellowfin goby	*Acanthogobius flavimanus*
Shimofuri goby	*Tridentiger bifasciatus*
Chameleon goby	*Tridentiger trigonocephalus*

Source: Moyle 2002; data compiled by AECOM in 2010

Sensitive Woodland Habitat

Riparian and woodlands along the San Joaquin River adjacent to the Phase 3 Repair Project levee elements provide important cover, foraging, nesting, and roosting habitat for a variety of wildlife species (including special-status species such as Swainson's hawk and riparian brush rabbit) and serve as movement corridors for these species; as such, these woodlands are considered sensitive habitats. Riparian woodlands in particular are rich in biological fauna and flora and provide valuable resources and protection for aquatic habitats. They are considered sensitive habitats subject to CDFW jurisdiction California Fish and Game Code Section 1602. Other habitats considered sensitive by CDFW include those identified as "rare and worthy of consideration" in natural communities recognized by the CNDDB. These sensitive communities provide essential habitat to special-status species that are often restricted in distribution or decreasing throughout their range. Great Valley cottonwood riparian forest and Great Valley oak riparian forest are both present in the Phase 3 Repair Project area; both are listed as sensitive natural communities in the CNDDB. Woodlands located on the waterside of the levee can also provide important SRA habitat functions for fish species. Riparian woodlands and native oak trees are also considered sensitive and protected by county and city policies.

Sensitive Aquatic Habitat

Sensitive aquatic habitat includes those habitats that are of special concern to resource agencies or that are afforded specific consideration through ESA, CEQA, Section 1602 of the California Fish and Game Code, Sections 404 and 401 of the CWA, the Porter-Cologne Water Quality Control Act, or the Magnuson-Stevens Act (as amended). These habitats are of special concern because they may be of high value to plant, wildlife, and fish species and may have a higher potential to support special-status species. They also provide other important ecological functions, such as enhancing flood and erosion control and maintaining water quality. Coastal and valley freshwater marsh, which occurs in one small area at the north end of the Phase 3 Repair Project area, is listed as a sensitive natural community in the CNDDB. This freshwater marsh, several agricultural irrigation ditches, and one constructed pond in the Phase 3 Repair Project area are adjacent to or abutting the San Joaquin River, a jurisdictional water of the United States, and are therefore considered waters of the United States and subject to regulation under CWA Section 404 and Section 401. All waters of the United States are also considered waters of the state.

USACE verified a wetland delineation submitted for the Phase 3 Repair Project on November 3, 2009 (preliminary jurisdictional determination form was issued by USACE on November 10, 2009) (AECOM 2009), and a supplemental wetland delineation submitted on January 22, 2010 (preliminary jurisdictional determination form was issued by USACE on April 9, 2010, and reverified by USACE on October 21, 2010) (AECOM 2010a, AECOM 2010b). A fourth supplemental wetland delineation was prepared and submitted to USACE on April 4, 2014 (preliminary jurisdictional determination form was issued by USACE on April 7, 2014), to accommodate minor adjustments in the Phase 3 Repair Project footprint (AECOM 2014). The preliminary jurisdictional determinations are provided in **Appendix E**.

Delta Smelt Critical Habitat

On December 19, 1994 (59 Federal Register [FR] 65256), USWFS designated critical habitat to include most tidally influenced areas of the Delta. Critical habitat for Delta smelt consists of all water and all submerged lands below the ordinary high-water line and the entire water column bounded by and contained in Suisun Bay, including all contiguous water bodies contained within the statutory definition of the Delta (58 FR 65256), including the San Joaquin River. Critical habitat occurs within the San Joaquin River in the Phase 3 Repair Project area.

Delta smelt were listed as threatened under CESA in 1993.

Central Valley Steelhead Critical Habitat

NMFS originally designated critical habitat for Central Valley steelhead on February 16, 2000 (65 FR 7764) and reaffirmed it on September 2, 2005 (70 FR 52488). Critical habitat for Central Valley steelhead includes all accessible river reaches (i.e., the lateral extent as defined by the ordinary high-water line or bank-full elevation) in the Sacramento and San Joaquin Rivers, their tributaries, and the Delta. Critical habitat occurs in the Phase 3 Repair Project area within the San Joaquin River (70 FR 52621–52626).

North American Green Sturgeon Critical Habitat

NMFS designated critical habitat for the Southern distinct population of North American green sturgeon on October 9, 2009 (74 FR 52300). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins, including the segment of the San Joaquin River in the Phase 3 Repair Project area.

Special-Status Plant Species

A total of 18 special-status plant species were evaluated for their potential to occur in the Phase 3 Repair Project area. Three of these species were identified from documented CNDDB (2014) occurrences within a 2-mile radius of the Phase 3 Repair Project area (**Figures 3.6-2a and 3.6-2b**); an additional 12 species were identified from CRPR Inventory (CNPS 2014) occurrences within the Lathrop and

Stockton West USGS 7.5-minute quadrangles, which contain the entire Phase 3 Repair Project area. A search of the USFWS endangered species database for these two USGS quadrangles produced no additional special-status plant species (USFWS 2014). Three additional species were not detected in the CNDDB, CRPR Inventory, or USFWS database searches but were added to this section based on a review of existing environmental documents, and their potential to occur in habitats similar to those found within or adjacent to the Phase 3 Repair Project area.

Table 3.6-2 lists each special-status plant species along with its regulatory listing and CRPR status, its habitat requirements, and information related to each species' potential to occur in the Phase 3 Repair Project area.

Slough thistle (*Cirsium crassicaule*), Delta button celery (*Eryngium racemosum*), Suisun Marsh aster (*Symphyotrichum lentum*), and Wright's trichocoronis (*Trichocoronis wrightii* var. *wrightii*) were historically documented near the Phase 3 Repair Project area, close to where Interstate 5 (I-5) crosses the San Joaquin River and near elements Va–VIa.1. The CNDDB occurrence data are based on historic herbarium collection records from 1892 and 1933. Sanford's arrowhead (*Sagittaria sanfordii*) is listed in the CRPR Inventory with coordinates near the confluence of the San Joaquin River and Old River (elements Va–VIa.1), but no occurrence date exists in the record. All special-status species are unlikely to occur because of the low-quality habitat found within the Phase 3 Repair Project area; however, because the species could occur in freshwater marsh or riparian habitat along the San Joaquin River, their potential to occur in similar habitats within the Phase 3 Repair Project area cannot be completely ruled out.

Special-Status Wildlife Species

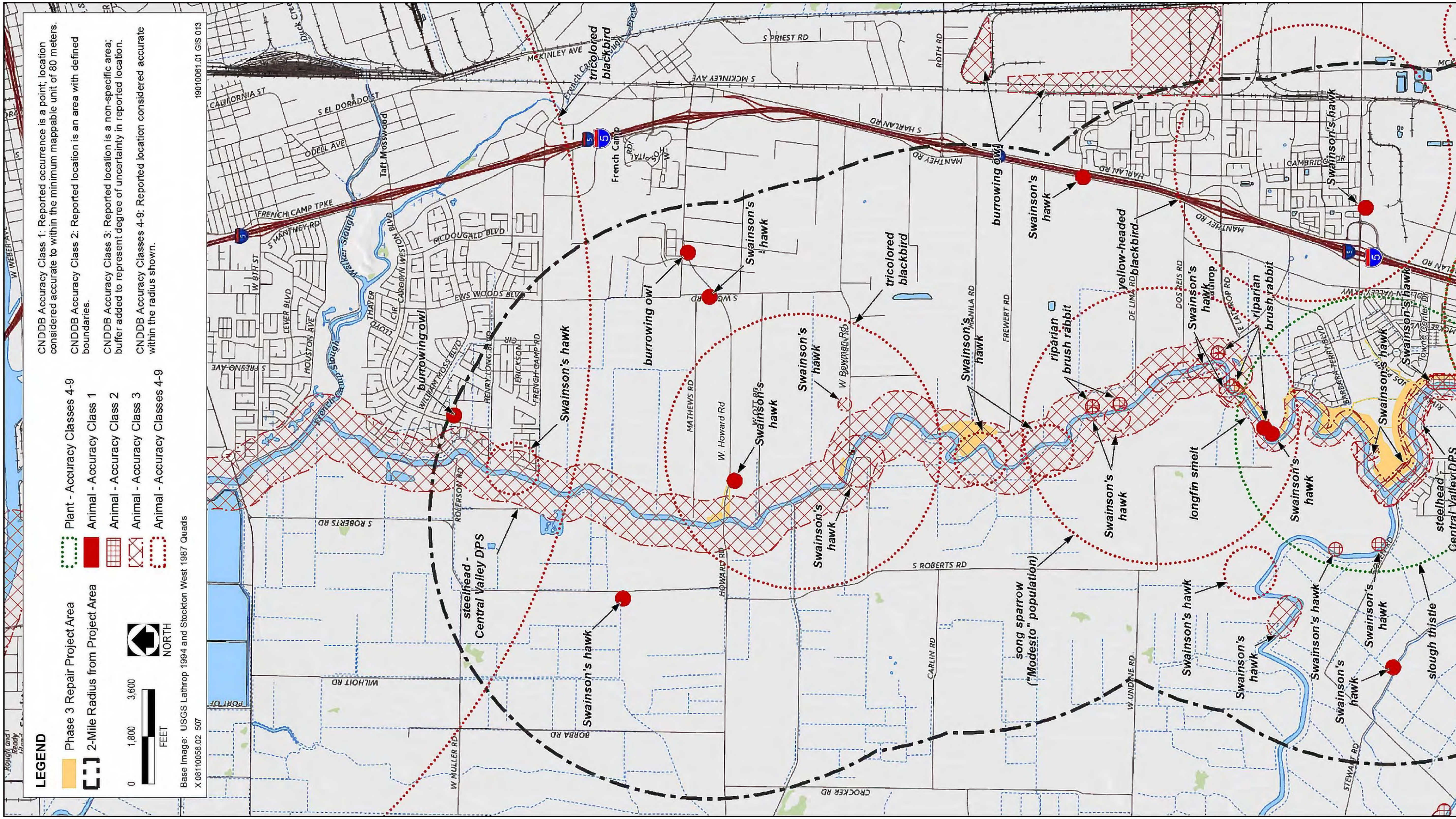
A total of 20 special-status wildlife species are known to occur or were evaluated for their potential to occur in the Phase 3 Repair Project area. Ten of these species were documented from the CNDDB (2014) occurrences within a 2-mile radius of the Phase 3 Repair Project area (**Figures 3.6-2a and 3.6-2b**) and from the CNDDB occurrences within the Lathrop and Stockton West USGS 7.5-minute quadrangles. A search of the USFWS endangered species database produced four additional special-status wildlife species (USFWS 2014). Six additional species were added based on a review of existing environmental documents, and their potential to occur in habitats similar to those found within or adjacent to the Phase 3 Repair Project area.

Four of these species are federally listed or state listed as threatened or endangered: valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), Swainson's hawk (*Buteo swainsoni*), California tiger salamander (*Ambystoma californiense*), and riparian brush rabbit (*Sylvilagus bachmani riparius*). These species are discussed in more detail below. The remaining species are California Species of Special Concern. **Table 3.6-3** summarizes the regulatory listing status, habitat requirements, and the potential for them to occur in the Phase 3 Repair Project area.

Valley Elderberry Longhorn Beetle

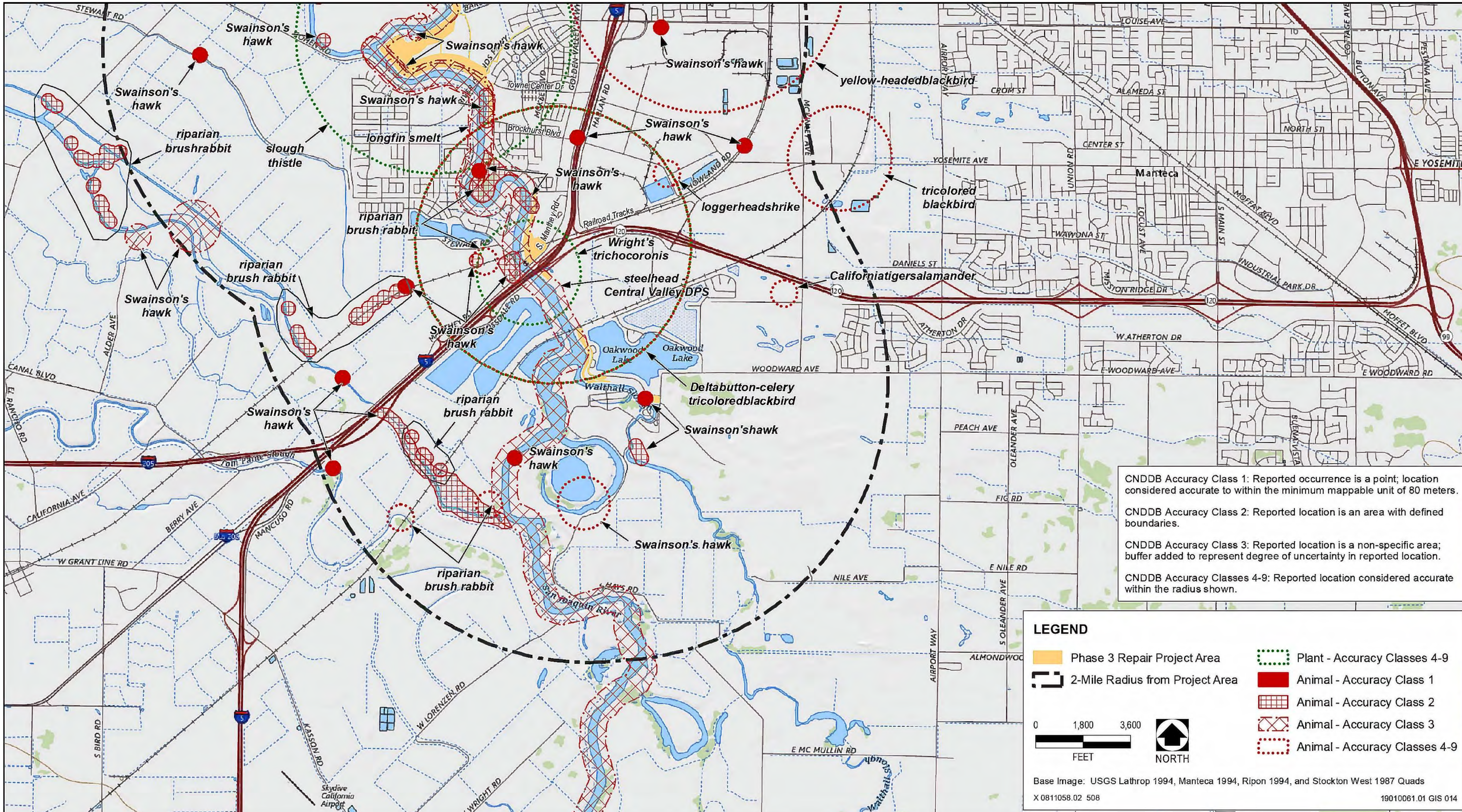
The valley elderberry longhorn beetle is federally listed as threatened. It requires elderberry shrubs and is generally associated with riparian habitats. The valley elderberry longhorn beetle is endemic to the Central Valley at elevations below about 3,000 feet. It is found only in association with its host plants, the elderberry shrub (*Sambucus* spp.). In the Central Valley, the elderberry shrub is found primarily in riparian vegetation. Adults feed on the foliage and possibly the flowers of elderberries from March to early June (USFWS 2006).

Figure 3.6-2a. CNDDB—Recorded Occurrences of Sensitive Biological Resources within 2 Miles of the Phase 3 Repair Project Area—North Half



Source: CNDDB 2014; data compiled by AECOM in 2014

Figure 3.6-2b CNDDB—Recorded Occurrences of Sensitive Biological Resources within 2 Miles of the Phase 3 Repair Project Area—South Half



Source: CNDDB 2014; data compiled by AECOM in 2014

Table 3.6-2. Special-Status Plant Species with Potential to Occur in the Phase 3 Repair Project Area

Species	Status[1]	Habitat	Potential for Occurrence[2]
Plants			
Alkali milk-vetch *Astragalus tener var. tener*	CRPR: 1B	Playas and vernal pools in valley and foothill grasslands	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; no occurrence data found during CNDDB or USFWS database searches
Heartscale *Atriplex cordulata var. cordulata*	CRPR: 1B	Meadows and seeps in valley and foothill scrub and grasslands	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; no occurrence data found during CNDDB or USFWS database searches
San Joaquin spearscale *Atriplex joaquinana*	CRPR: 1B	Playas, meadows and seeps in valley and foothill scrub and grasslands	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; no occurrence data found during CNDDB or USFWS database searches
Big tarplant *Blepharizonia plumosa*	CRPR: 1B	Valley and foothill grasslands	Unlikely to occur in low-quality ruderal habitat; no occurrence data found during CNDDB or USFWS database searches
Watershield *Brasenia schreberi*	CRPR: 2	Marshes and freshwater swamps	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; no occurrence data found during CNDDB or USFWS database searches
Round-leaved filaree *California macrophylla*	CRPR: 1B	Cismontane woodlands and valley and foothill grasslands	Unlikely to occur in low-quality ruderal habitat; no occurrence data found during CNDDB or USFWS database searches
Bristly sedge *Carex comosa*	CRPR: 2	Marshes and swamps, lake edges	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; no occurrence data found during CNDDB, CRPR, or USFWS database searches
Palmate-bracted bird's-beak *Chloropyron palmatum [Cordylanthus palmatus]*	CRPR: 1B Federal: E State: E	Seasonally flooded, saline-alkali soils in lowland plains and basins at elevations of less than 500 feet	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; no occurrence data found during CNDDB database searches
Slough thistle *Cirsium crassicaule*	CRPR: 2	Freshwater marsh, riparian scrub, chenopod scrub, along sloughs and riverbanks	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; last recorded in 1933 near San Joaquin River-Old River confluence, not confirmed in subsequent 1974 surveys; thought to be possibly extirpated
Delta button celery *Eryngium racemosum*	CRPR: 1B State: E	Freshwater and brackish marshes, riparian scrub, tidal zones in mud or silt soil	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; 1892 and 1913 herbarium records are only source of occurrences (near San Joaquin River and I-5 crossing); thought to be possibly extirpated
Rose mallow *Hibiscus lasiocarpus*	CRPR: 2	Freshwater marshes and swamps, moist river banks	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; no occurrence data found during CNDDB or USFWS database searches
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	CRPR: 1B	Freshwater and brackish marshes and sloughs, edges	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; no occurrence data found during CNDDB or USFWS database searches
Mason's lilaeopsis *Lilaeopsis masonii*	CRPR: 1B State: R	Freshwater and brackish marshes, riparian scrub, tidal zones in mud or silt soil	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; no occurrence data found during CNDDB, CRPR, or USFWS database searches
Delta mudwort *Limosella subulata*	CRPR: 2	Riparian scrub, freshwater and brackish marsh, usually on mud banks, often with Mason's lilaeopsis	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; no occurrence data found during CNDDB, CRPR, or USFWS database searches

Table 3.6-2. Special-Status Plant Species with Potential to Occur in the Phase 3 Repair Project Area

Species	Status[1]	Habitat	Potential for Occurrence[2]
Sanford's arrowhead *Sagittaria sanfordii*	CRPR: 1B	Freshwater ponds, marshes and ditches	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; last recorded in 1901 at an unknown location near the city of Stockton
Suisun marsh aster *Symphyotrichum lentum*	CRPR: 1B	Freshwater and brackish marshes and sloughs	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; 1892 (near the city of Lathrop) and 1920 (near the town of Banta) herbarium records are only source of occurrences
Saline clover *Trifolium hydrophilum*	CRPR: 1B	Marshes, swamps, and vernal pools in alkaline grasslands	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; no occurrence data found during CNDDB or USFWS database searches
Wright's trichocoronis *Trichocoronis wrightii* var. *wrightii*	CRPR: 2	Freshwater marshes and swamps, riparian woodlands	Unlikely to occur in low-quality irrigation ditch and freshwater marsh habitat; herbarium records from 1892 to 1914 are only source of occurrences (near San Joaquin River and I-5 crossing)

Notes:

1 Legal Status Definitions

Federal—U.S. Fish and Wildlife Service (USFWS)

E Endangered (legally protected)

California Department of Fish and Wildlife (CDFW) State Listing Categories

E Endangered (legally protected)

R Rare (legally protected)

California Rare Plant Ranking (CRPR) Categories

1B Plant species considered rare or endangered in California and elsewhere (but not legally protected under the Federal ESA or CESA)

2 Plant species considered rare or endangered in California but more common elsewhere (but not legally protected under the Federal ESA or CESA)

2 Potential for Occurrence Definitions

Unlikely to occur: Potentially suitable habitat present but species unlikely to be present on the project site because of current status of the species, poor quality of available habitat, and/or very restricted distribution

Could occur: Suitable habitat is available at the project site; however, there are few or no other indicators that the species may be present

Likely to occur: Habitat conditions, behavior of the species, known occurrences in the project vicinity, or other factors indicate a relatively high likelihood that the species would occur at the project site

Known to occur: The species, or evidence of its presence, was observed at the project site during reconnaissance-level surveys or was reported by others

Sources: CNPS 2014; CNDDB 2014; USFWS 2014; Hickman 1993; data compiled by AECOM in 2014

During this period, the beetles mate and lay eggs on the bark of elderberry shrubs. After the eggs hatch, the larvae bore into and feed on the pith of the stems (i.e., the soft tissue at the center of elderberry stems) and also may feed on the wood for up to 2 years. Valley elderberry longhorn beetle is threatened by loss and fragmentation of riparian habitat. Substantial amounts of riparian habitat containing the host plant for the valley elderberry longhorn beetle have been lost, and host plants in remaining habitat have been lost and damaged. Another identified threat to the valley elderberry longhorn beetle may be predation and displacement by the invasive Argentine ant (*Linepithema humile*) (Huxel 2000).

The closest documented occurrence in the CNDDB is approximately 4.0 miles west of the Phase 3 Repair Project area and 1.0 mile north of the Old River. Suitable habitat exists in the Phase 3 Repair Project area where elderberry shrubs are adjacent to the Phase 3 Repair Project levee. Elderberry shrubs are known to occur along the San Joaquin River, on both the waterside and landside of levees in the Phase 3 Repair Project area. Focused surveys for elderberry shrubs were conducted along all levee reaches on March 8, 2011; the area was resurveyed on January 29, 2014, and again on September 16 and 17, 2019. A total of 18 elderberry shrubs were observed within 100 feet of the Phase 3 Repair Project area: nine shrubs on the waterside of the levee and nine shrubs on the landside. None of the shrubs had evidence of beetle exit holes. One of the landside shrubs does not have stems greater than one inch in diameter at ground level; therefore, it is not considered suitable valley elderberry longhorn beetle habitat.

Table 3.6-3. Special-Status Wildlife Species with Potential to Occur in the Phase 3 Repair Project Area

Species	Status	Habitat	Potential for Occurrence
Invertebrates			
Vernal pool fairy shrimp *Branchinecta lynchii*	Federal: T	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present within the Phase 3 Repair Project area.
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	Federal: T	Inhabits elderberry shrubs, primarily in riparian woodland and scrub habitat	Could occur; elderberry shrubs present occasionally along San Joaquin River on the waterside and landside of the Phase 3 Repair Project levee.
Vernal pool tadpole shrimp *Lepidurus packardi*	Federal: E	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present within the Phase 3 Repair Project area.
Amphibians and Reptiles			
California tiger salamander *Ambystoma californiense*	Federal: T State: T	Winter: breeds in vernal pools and stock ponds that are fish-free and inundated for a minimum of 12 weeks; Summer: aestivates in rodent borrows in grassland habitat	Unlikely to occur; potential aquatic habitat in the Phase 3 Repair Project area is limited to one constructed pond, likely with predatory fish; a small area of freshwater marsh in element Ib; and agricultural ditches. A 1996 CNDDB record documents California tiger salamander adjacent to State Route 120 in roadside seasonal wetland, however, it is approximately two miles east of the San Joaquin River and geographically isolated.
Northwestern pond turtle *Actinemys marmorata*	State: SSC	Ponds, marshes, rivers, streams, sloughs; nest in nearby uplands with suitable soils	Could occur; suitable habitat is present in a constructed pond in elements IIab, in backwater areas of the adjacent San Joaquin River, and in agricultural ditches with permanent water.
California red-legged frog *Rana draytonii (=R. aurora draytonii)*	Federal: T State: SSC	Prefers semi-permanent and permanent stream pools, ponds, and creeks with emergent riparian vegetation and typically without predatory fish. Requires adequate hibernacula such as small-mammal burrows and moist leaf litter.	No potential to occur. Although potential aquatic habitat in the Phase 3 Repair Project area is limited to one constructed pond, likely with predatory fish, the action area is outside the species' extant range.
Reptiles			
Giant garter snake *Thamnophis gigas*	Federal: T State: T	Streams, sloughs, ponds, and irrigation/drainage ditches; also requires upland refugia not subject to flooding during the snake's inactive season.	Unlikely to occur. Potential aquatic habitat in the Phase 3 Repair Project area is limited to one constructed pond, likely with predatory fish; a small area of freshwater marsh in element Ib; and agricultural ditches. Adjacent upland habitat consists mainly of urban and agricultural land not suitable as potential upland habitat. No CNDDB records for this species are in the vicinity of the Phase 3 Repair Project area.
Birds			
Tricolored blackbird *Agelaius tricolor*	State: SSC	Nests in dense cattails and tules, riparian scrub, and other low, dense vegetation; forages in grasslands and agricultural fields	Unlikely to occur; foraging habitat present in small areas of freshwater marsh and riparian habitat, but nesting is not expected because of low-quality habitat; closest nesting colony is approximately 2.5 miles east along Yosemite Avenue in large area of giant reed with no water.

Table 3.6-3. Special-Status Wildlife Species with Potential to Occur in the Phase 3 Repair Project Area

Species	Status	Habitat	Potential for Occurrence
Burrowing owl *Athene cunicularia*	State: SSC	Nests and forages in grasslands, shrublands, and agricultural fields, especially where ground squirrel or other mammal burrows are present	Could occur; suitable foraging and nesting habitat present; but no occurrences are documented in the Phase 3 Repair Project area.
Swainson's hawk *Buteo swainsoni*	State: T	Nests in riparian woodlands and isolated trees; forages in grasslands, shrublands, and agricultural fields	Known to occur; suitable foraging habitat and nesting habitat present in and adjacent to the Phase 3 Repair Project area.
Northern harrier *Circus cyanus*	State: SSC	Nests and forages in a variety of open habitats, including marshes, grasslands, shrublands, and agricultural fields	Could occur; suitable foraging and nesting habitat present in and adjacent to the Phase 3 Repair Project area.
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	Federal: C/PT	Insect-feeder that forages in dense riparian oak forest canopy along major rivers. Species is considered extirpated from San Joaquin County.	Unlikely to occur. Although potential dispersal and foraging habitat is in the Phase 3 Repair Project area, the action area is outside of the species' extant range.
White-tailed kite *Elanus leucurus*	State: FP	Nests in woodlands and isolated trees; forages in grasslands, shrublands, and agricultural fields	Could occur; suitable foraging and nesting habitat present in and adjacent to the Phase 3 Repair Project area.
Song sparrow (Modesto population) *Melospiza melodia*	State: SSC	Nests in emergent freshwater marshes and riparian forests with dense understory	Could occur; suitable foraging and nesting habitat present; but no occurrences are documented in the Phase 3 Repair Project area.
Least Bell's vireo *Vireo bellii pusillus*	Federal: E	Nests in riparian habitat adjacent to riverine and freshwater marsh.	Unlikely to occur. Although suitable habitat is present, the last recorded observation of this species in the action area was in 1878, with no extant occurrences.
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	State: SSC	Nests in freshwater wetlands with dense vegetation and deep water, often along borders of lakes and ponds and where large insects are abundant	Unlikely to occur; one isolated area of freshwater marsh in element Ib provides low-quality habitat; 1894 museum collection record from Lathrop area is only occurrence data.
Mammals			
Riparian brush rabbit *Sylvilagus bachmani riparius*	Federal: E State: E	Inhabits riparian forest with dense understory	Known to occur; occupied riparian habitat is present on the waterside of elements IIIa and IIIb, and suitable habitat is present immediately adjacent to the project area in several elements; species is also known to occur between elements IIab and IIIa and on an oxbow between elements VIa.1 and VIa.4.
Western mastiff bat *Eumops perotis californicus*	State: SSC	Wide variety of habitats; roosts primarily in crevices on cliff faces and boulders but occasionally in old buildings	Could occur; suitable foraging habitat present, but no potential roost sites.
Red bat *Lasiurus blossevillii*	State: SSC	Wooded areas at lower elevations; typically roosts in snags and riparian trees with moderately dense canopies	Could occur; suitable foraging and roosting habitat present.

Table 3.6-3. Special-Status Wildlife Species with Potential to Occur in the Phase 3 Repair Project Area

Species	Status	Habitat	Potential for Occurrence
Yuma myotis bat *Myotis yumanensis*	State: SSC	Variety of habitats at low to mid elevations; roosts in buildings, trees, mines, caves, bridges, and rock crevices	Could occur; suitable foraging and roosting habitat present.

[1] Legal Status Definitions:
Federal—U.S. Fish and Wildlife Service (USFWS)
C Candidate (no formal protection)
E Endangered (legally protected)
PT Proposed threatened (no formal protection)
T Threatened (legally protected)
State—California Department of Fish and Wildlife (CDFW)
E Endangered (legally protected)
T Threatened (legally protected)
R Rare (legally protected)
FP Fully Protected (legally protected, no take allowed)
SSC California Species of Special Concern (no formal protection)

[2] Potential for Occurrence Definitions:
Unlikely to occur: Potentially suitable habitat present but species unlikely to be present on the project site because of current status of the species and very restricted distribution.
Could occur: Suitable habitat is available at the project site; however, there are few or no other indicators that the species may be present.
Likely to occur: Habitat conditions, behavior of the species, known occurrences in the project vicinity, or other factors indicate a relatively high likelihood that the species would occur at the project site.
Known to occur: The species, or evidence of its presence, was observed at the project site during reconnaissance-level surveys or was reported by others.

Sources: CNDDB 2014; USFWS 2014; data compiled by AECOM in 2014

Swainson's Hawk

Swainson's hawk is state listed as threatened and is protected under the MBTA. In the Central Valley, Swainson's hawks usually nest in large native trees, such as valley oak, cottonwood, walnut, and willow, and occasionally in nonnative trees, such as eucalyptus. Nests occur in riparian woodlands, roadside trees, trees along field borders, isolated trees, small groves, and on the edges of remnant oak woodlands. Narrow bands of remnant riparian forest along drainages contain most of the known nests in the Central Valley (Estep 1984; Schlorff and Bloom 1984; England et al. 1997). This appears to be a function of the availability of nest trees, however, instead of a dependence on riparian forest. Swainson's hawks are essentially plains or open-country hunters, requiring large areas of open landscape for foraging. With substantial conversion of grasslands to farming operations, Swainson's hawks have shifted their nesting and foraging into those agricultural lands that provide low, open vegetation and high rodent prey populations such as alfalfa fields. Threats to Swainson's hawk include loss and fragmentation of foraging habitat, loss of nesting habitat, disturbance of nests, and pesticide poisoning in wintering habitat (Anderson et al. 2007).

Because the Phase 3 Repair Project area is located within the primary Swainson's hawk breeding range in California, numerous nest locations have been documented along and adjacent to the San Joaquin River and within the Phase 3 Repair Project elements. Swainson's hawk nests have been documented along the entire length of the Phase 3 Repair Project area between 1979 and 2004. Suitable nest trees are present primarily along the San Joaquin River and in large landside trees within all elements, from element Ib in the north to elements VIcde in the south, where I-5 crosses the river. Nesting pairs have been documented within or adjacent to the Phase 3 Repair Project area as recently as 2015, and suitable trees are present and could be removed during project implementation. **Figures 3.6-2a and 3.6-2b** show the location of documented nesting locations within a 2-mile radius of the Phase 3 Repair Project area.

California Tiger Salamander

California tiger salamander is federally listed as threatened in the Central Valley and is state listed as threatened throughout its range. It requires vernal pools, ponds (natural or human-made), or semipermanent calm waters (where ponded water is present for at least 10–12 weeks) for breeding and larval maturation. It also requires adjacent upland areas that contain small-mammal burrows or other suitable refugia for aestivation (summer dormancy). Primary threats to California tiger salamander include the alteration of either breeding ponds or upland habitat through the introduction of exotic predators (e.g., bullfrogs and mosquitofish) or the construction of barriers that fragment habitat and reduce connectivity (e.g., roads, berms, and certain types of fences).

The closest documented occurrence is from a 1996 CNDDB record of California tiger salamander adjacent to State Route 120 in a roadside seasonal wetland that is approximately 2 miles east of the San Joaquin River and the Phase 3 Repair Project area, and it is geographically isolated by extensive surrounding agriculture and development. Potential aquatic habitat in the Phase 3 Repair Project area is limited to one constructed pond, likely containing predatory fish; a small area of freshwater marsh in element Ib; and agricultural ditches. These sites are not expected to support California tiger salamander.

Riparian Brush Rabbit

Riparian brush rabbit is federally listed and state listed as endangered. Riparian brush rabbit occupies relatively large patches in riparian forests with a dense understory shrub layer. This species is closely tied to brushy cover and rarely moves more than a meter from cover. They will not cross large, open areas, which limits their dispersal capabilities (USFWS 1998), and this inability to disperse beyond the dense brush makes them susceptible to mortality during flood events (USFWS 1998; Williams 1988). The primary threat to the survival of the riparian brush rabbit is the limited extent of its existing habitat, extremely low numbers of individual animals, and few extant populations. The species is known to occur in the project area and is also found in Caswell Memorial State Park, near Manteca in San Joaquin County; along the Stanislaus River; on private lands adjacent to the San Joaquin River National Wildlife Refuge (Williams 1993; Williams and Basey 1986); along Paradise Cut, a channel of the San Joaquin River; on an oxbow along the San Joaquin River that is between Phase 3 Repair Project elements VIa.1 and VIa.4; and on the waterside of the levee in elements IIIa and IIIb and between elements IIab and IIIa (Williams and Hamilton 2002; Williams et al. 2002; Lloyd and Williams 2003; Vincent-Williams et al. 2004; CNDDB 2014).

Occurrences of riparian brush rabbit in the Phase 3 Repair Project area were documented along elements IIIa and IIIb, between elements VIa.1 and VIa.4, and between elements IIab and IIIa; these occurrences were documented from trapping conducted in February 2003 and 2004 (CNDDB 2014; Vincent-Williams et al. 2004). The specific locations are on an oxbow with dense riparian vegetation between elements VIa.1 and VIa.4, and in willow and blackberry in elements IIIa and IIIb; similar riparian habitat is present adjacent to the waterside of Phase 3 Repair Project elements Ie, IIab, IVc, and Va.

Special-Status Fish Species

A total of ten special-status fish species occur or have the potential to occur in the San Joaquin River near the Phase 3 Repair Project area. Of the 10 species, Central Valley steelhead DPS, Central Valley spring-run Chinook salmon ESU, Sacramento River winter-run Chinook salmon ESU, southern DPS of North American green sturgeon, and Delta smelt are federally listed as threatened or endangered species. The USFWS delisted Sacramento splittail from its federally threatened status on September 22, 2003; after a review of its listing status in 2010, USFWS found that the species was not warranted for listing. Longfin smelt (*Spirinchus thaleichthys*) is listed as threatened under California ESA. The NMFS determined that listing is not warranted for Central Valley fall-/late fall-run Chinook salmon ESU; however, it is still designated as a species of concern because of concerns over specific risk factors. The two remaining species, San Joaquin roach (*Lavinia symmetricus* sp.) and hardhead (*Mylopharodon conocephalus*), are considered Species of Special Concern by CDFW. **Table 3.6-4** summarizes the

Table 3.6-4. Special-Status Fish Species Potentially Occurring in the San Joaquin River

Species	Status[1]		Habitat	Potential to Occur in the lower San Joaquin River
	USFWS/NMFS	CDFW		
Central Valley steelhead *Oncorhynchus mykiss*	T	--	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento and San Joaquin Rivers, tributaries, and Delta. Occurs seasonally in the San Joaquin River in the project vicinity.
Central Valley fall-/late fall–run Chinook salmon *Oncorhynchus tshawytscha*	SC	SSC	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento and San Joaquin Rivers, tributaries, and Delta. Occurs seasonally in the San Joaquin River in the project vicinity.
Sacramento River winter-run Chinook salmon *Oncorhynchus tshawytscha*	E	E	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento River, tributaries, and Delta. Unlikely to occur in the San Joaquin River in the project vicinity; however, occasional adult and/or juvenile strays may be present.
Central Valley spring-run Chinook salmon *Oncorhynchus tshawytscha*	T	T	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento River, tributaries, and Delta. Unlikely to occur in the San Joaquin River in the project vicinity; however, occasional adult and/or juvenile strays may be present.
Green sturgeon *Acipenser medirostris*	T	--	Rears seasonally inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento and San Joaquin Rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
Delta smelt *Hypomesus transpacificus*	T	T	Spawns in tidally influenced freshwater wetlands and seasonally submerged uplands; rears seasonally inundated floodplains, tidal marsh, and Delta.	Occurs in tidally influenced segments of the Sacramento and San Joaquin Rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
Longfin smelt *Spirinchus thaleichthys*	C/PT	T	Spawns in tidally influenced freshwater wetlands and seasonally submerged uplands; rears seasonally inundated floodplains, tidal marsh, and Delta.	Occurs in tidally influenced segments of the Sacramento and San Joaquin Rivers, tributaries, and Delta downstream from the project area. Unlikely to occur in the San Joaquin River in the project vicinity.
Sacramento splittail *Pogonichthys macrolepidotus*	DT	SSC	Spawning and juvenile rearing from winter to early summer in shallow weedy areas inundated during seasonal flooding in the lower reaches and flood bypasses of the Sacramento River including the Yolo Bypass.	Occurs in the Sacramento and San Joaquin Rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
Hardhead *Mylopharodon conocephalus*	--	SSC	Spawning occurs in pools and side pools of rivers and creeks; juveniles rear in pools of rivers and creeks, and shallow to deeper water of lakes and reservoirs.	Occurs in the Sacramento and San Joaquin Rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
San Joaquin roach *Lavinia symmetricus* sp.	--	SSC	Spawning occurs in pools and side pools of small rivers and creeks; juveniles rear in pools of small rivers and creeks.	Occurs in tributaries to the Sacramento and San Joaquin Rivers. Not likely to occur in the San Joaquin River in the project vicinity.

Table 3.6-4. Special-Status Fish Species Potentially Occurring in the San Joaquin River

Species	Status [1] USFWS/NMFS	Status [1] CDFW	Habitat	Potential to Occur in the lower San Joaquin River

Legal Status Definitions

Federal Listing Categories (USFWS & NMFS)
- C Candidate (no formal protection)
- E Endangered (legally protected)
- PT Proposed threatened
- T Threatened (legally protected)
- DT Delisted from threatened status (potential to be relisted)
- SC Species of Concern

State Listing Categories (CDFW)
- E Endangered (legally protected)
- T Threatened (legally protected)
- SSC California Species of Special Concern (no formal protection)

Source: Moyle 2002; data compiled by AECOM in 2010

regulatory listing status, habitat requirements, and the potential for occurrence for special-status fish species. Summary species accounts are provided below for those fish species that are expected to occur in the project vicinity.

Central Valley Fall-/Late Fall-run Chinook Salmon ESU

On September 16, 1999 (64 FR 50393), NMFS determined that listing was not warranted for the Central Valley fall-/late fall-run Chinook salmon ESU; however, the ESU was designated as a candidate for listing because of concerns about specific risk factors. On April 14, 2004 (69 FR 19975) the ESU was reclassified as a species of concern. The ESU includes all naturally spawned populations of fall-run Chinook salmon in the Sacramento and San Joaquin River Basins and their tributaries, east of the Carquinez Strait. The Central Valley fall-/late fall-run Chinook salmon ESU is currently the largest run of Chinook salmon in the San Joaquin River system. Because fall-/late fall-run Chinook salmon represent the greatest proportion of all four runs in the Central Valley, they continue to support commercial and recreational fisheries of significant economic importance.

Fall-run Chinook salmon adults would primarily pass through the Phase 3 Repair Project area on their way to spawn in tributaries of the San Joaquin (Moyle 2002). Juvenile fall-run Chinook salmon emigrate from San Joaquin River tributaries (e.g., Stanislaus, Merced, and Tuolumne rivers) and other river tributaries through the San Joaquin River during the late winter and spring (February through mid-June) (San Joaquin River Group Authority 2009). Juvenile Chinook salmon use the edges of rivers and sloughs for rearing as they emigrate downstream (Moyle 2002).

Central Valley Spring-Run Chinook Salmon ESU

Spring-run Chinook salmon once was the most abundant of Central Valley Chinook salmon (Mills and Fisher 1994), historically occupying the upstream reaches of all major river systems in the Central Valley where no natural barriers existed. However, by the 1950s, populations in the San Joaquin system had been extirpated (Yoshiyama et al. 1998) and Sacramento River populations began to decline. Loss of access to upstream spawning and holding areas because of the construction of small and large dams was a major factor in its extirpation from the San Joaquin River system and the cause of major reductions to runs in the Sacramento River system (Fisher 1994).

Historically, adults migrated farther upstream to spawn than other Chinook salmon (Moyle 2002). Juvenile rearing took place in the species' natal streams (primarily in only a few Sacramento River tributaries), the mainstem of the Sacramento River, inundated floodplains (including the Sutter and Yolo bypasses), and the Delta. However, only stray juveniles and adult individuals would occur in the Phase 3 Repair Project area during migratory periods.

Sacramento River Winter-Run Chinook Salmon ESU

Winter-run Chinook salmon historically spawned in the upper Sacramento River system and in Battle Creek; the unique life history timing pattern of this ESU, requiring cold summer flows, argues against this run occurring elsewhere (NMFS 2009). Currently, winter-run is known to occur only in the mainstem Sacramento River. The Sacramento River channel (and Yolo Bypass during high flow events) is the main migration route through the Delta. However, juveniles occasionally may stray into the central Delta and lower San Joaquin River system, possibly occurring in the Phase 3 Repair Project area, during outmigration because of entrainment into diversionary water channels (e.g., Threemile Slough). Although highly unlikely, Sacramento River winter-run Chinook salmon potentially could occur in the Phase 3 Repair Project area as strays during migration.

Central Valley Steelhead DPS

On March 19, 1998, NMFS listed the Central Valley steelhead DPS as threatened (63 FR 13347). Central Valley steelhead DPS are all considered to be winter-run steelhead (McEwan and Jackson 1996). Similar to other anadromous salmonid species, these fish mature in the ocean before entering freshwater on their spawning migrations. The project site is located within designated critical habitat for the Central Valley DPS. The major factor influencing steelhead populations in the San Joaquin River system is loss of habitat because of construction of impassable dams on the major tributaries.

Adult steelhead migrates to upstream spawning habitats during the winter and early spring. Juvenile steelhead reside in nursery streams for 1–2 years before migrating to the ocean in the spring. The San Joaquin River near the project site would be used by adult and juvenile steelhead primarily as a migration corridor between the ocean and cold water habitat in the upstream tributaries. Similar to Chinook salmon, juvenile steelhead would likely use the edges of rivers and sloughs for rearing as they emigrate (Moyle 2002).

Green Sturgeon

On April 6, 2005, NMFS proposed a threatened status listing for the southern DPS of North American green sturgeon (70 FR 17386). Critical habitat for green sturgeon was designated on October 9, 2009 (74 FR 52300). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins, including the segment of the San Joaquin River in the Phase 3 Repair Project area. In North America, green sturgeon is found from Ensenada, Mexico, to Southeast Alaska. Like all sturgeon species it is anadromous, but it is also the most marine-oriented of the sturgeon species (NMFS 2005).

Green sturgeon spawning has only been documented in the Klamath, Sacramento, and Rogue rivers during recent times (NMFS 2005). Historic green sturgeon spawning in the San Joaquin River is not well documented.

Delta Smelt

Delta smelt was listed as threatened under the ESA on March 5, 1993 (59 FR 440). On December 19, 1994 (59 FR 65256), USWFS designated critical habitat to include most tidally influenced areas of the Delta. Delta smelt also was listed as threatened under CESA in 1993. Delta smelt is endemic to the Delta and occurs primarily in open surface waters of Suisun Bay, in the Sacramento River downstream from Isleton, and in the San Joaquin River downstream from Mossdale, a county park located in elements VIcde (Bennett 2005:7). Historically, it was one of the most common pelagic (i.e., living in open water in the middle to upper water column) fish in the Delta (USFWS 2004). Delta outflow determines the location of the salinity gradient and may strongly influence Delta smelt distribution. USFWS data indicate that Delta smelt is found in the Bay-Delta estuary where salinity generally is less than 2 parts per thousand (ppt). Except when spawning in fresh water, Delta smelt are most frequently distributed in, or slightly upstream from, the entrapment zone, where riverine freshwater flow in the estuary mixes with seawater and the salinity is between 0.5 ppt and 5.2 ppt (USFWS 2004). Since the early 1980s, Delta smelt has been most abundant in the northwestern Delta in the lower Sacramento River (Bennett 2005:7).

Delta smelt disperses widely into fresh water in late fall and winter as the spawning period approaches and may move as far upstream as Mossdale on the San Joaquin River, approximately 20 miles downstream from the Phase 3 Repair Project area. It spawns in shallow, fresh or slightly brackish water upstream from the mixing zone. Most spawning happens in tidally influenced backwater sloughs (Moyle 2002; USFWS 2004).

Sacramento Splittail

On September 22, 2003 the USFWS removed Sacramento splittail from the list of threatened species. At the time of delisting, the USFWS determined that threats to Sacramento splittail were being addressed through habitat restoration actions such as the CALFED Bay-Delta Program and the Central Valley Project Improvement Act. After a review of its listing status in 2010, USFWS found that the species was not warranted for listing. Sacramento splittail are endemic to California. Except for very wet years, they are mostly confined to the Delta, Suisun Bay, Suisun Marsh, and Napa Marsh (USFWS 1996). Overall, the species distribution has been reduced to less than one-third of its original range.

Splittail spawns in late April and May in Suisun Marsh and between early March and May in the upper Delta and lower reaches of the Sacramento and San Joaquin Rivers. Spawning in the tidal freshwater habitats of the Delta has been observed as early as January and as late as July (Sommer et al. 2002). Spawning occurs primarily in the lower reaches of rivers, flood bypasses, and dead-end sloughs. Little information is available as to how far upstream splittail occur in the San Joaquin River (Wang 1986), but adults and juveniles have been reported upstream from Modesto (USFWS 1996). Juvenile emigration into the Delta begins in late winter (e.g., February) and continues throughout the summer. In general, juvenile splittail are most abundant in water less than 6 feet deep, but show considerable capacity to swim against strong river and tidal currents (Moyle 2002).

Longfin Smelt

Longfin smelt is a candidate species proposed for Federal status as threatened and listed as a threatened species under CESA. Distribution of longfin smelt is centered in the west Delta, Suisun Bay, and San Pablo Bay. In wet years, they are distributed more toward San Pablo Bay and in dry years more toward the west Delta. Peak spawning occurs between February and April in upper Suisun Bay and the lower and middle Delta. Spawning rarely occurs upstream from Medford Island in the San Joaquin River (Moyle et al. 1995). The Phase 3 Repair Project area is well upstream from Medford Island and longfin smelt eggs and larvae are not expected to occur near the project.

Hardhead

Hardhead, a relatively large cyprinid species, is listed as a California Species of Special Concern; no Federal designation has been made. Although this species is widespread and abundant throughout the Sacramento River and San Joaquin River systems, recent declines in numbers have raised concern. Hardhead are typically found in low- to mid-elevation streams and reservoirs; however, a small chance exists that they could occur in the San Joaquin River near the Phase 3 Repair Project area. In streams, adult hardhead tend to utilize the deepest portions of the water column, rarely moving into the upper water column, while juveniles demonstrate a preference for shallow water close to the stream banks (Moyle et al. 1995).

3.6.3 Methodology and Thresholds of Significance

Methodology

This section presents the methodology used to assess the potential effects of the RD 17 Phase 3 Repair Project on biological resources, including sensitive habitats, terrestrial special-status species, and fisheries and aquatic resources. Effects on biological resources resulting from implementation of the Phase 3 Repair Project were analyzed based on data collected during biological field surveys and review of existing documentation that addresses biological resources on or near the Phase 3 Repair Project area, described in the introduction to this section.

Effects resulting from Alternative 1, Alternative 2, and the Requester's Preferred Alternative of the Phase 3 Repair Project are analyzed below. No biological resources would be directly disturbed on the waterside of the levee.

Thresholds of Significance

The basis for determining the significance of effects for this analysis is based on professional standards and on project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to biological resources if they would do any of the following:

- have a substantial adverse effect, either directly or through habitat modifications, on any species identified as candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS;
- have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by CDFW or USFWS;
- have a substantial adverse effect on state or federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
- interfere substantially with the movement of any native resident or migratory fish or wildlife species, or with established native fish or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

3.6.4 Effects and Mitigation Measures

Effect 3.6-a: Loss or Degradation of Fish and Other Aquatic Habitats during Construction.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions and no adverse effects on fish and aquatic habitats would result. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The number, species, and life stages of fish and wildlife species that could be affected under this scenario would vary significantly depending on the time of year when a flood event occurred and intensity of the flood event. Flooding from a levee failure along the RD 17 levee system could introduce sediments and contaminants into waterways, including the San Joaquin River, potentially resulting in the loss or degradation of aquatic habitats. Flooding and sedimentation could also substantially degrade terrestrial habitats. A levee breach could also result in drowning of terrestrial species and mortality to fish and wildlife as individuals are pulled by the current into agricultural and urbanized areas where they could become stranded as flood waters recede. For these reasons, this adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2—Maximum Footprint Alternative, and the Requester's Preferred Alternative

Implementing cutoff walls as part of the Phase 3 Repair Project under Alternative 1, Alternative 2 and the Requester's Preferred Alternative would disturb soils along the top of the levee, which, through wind and water erosion, could enter the San Joaquin River. Construction of the setback levee under the Requester's Preferred Alternative would involve degradation of a small portion of the existing levee to facilitate backwater flooding and drainage of the setback area. Setback levee construction also would involve removal of ruderal and grassland vegetation on the upper waterside levee slope of a portion of the existing levee for placement of rock slope protection. Soil disturbed during construction of seepage berms, setback levees, and other features on the landside of the levee could enter drainage ditches and other drainage features and ultimately be pumped into the San Joaquin River. Therefore, any erosion could temporarily increase turbidity and sedimentation in nearby waterways if soils are transported in river flows or stormwater runoff. (See Effect 3.4-a in Section 3.4, "Geology, Soils, Minerals, and Paleontological Resources," for additional discussion of this issue.)

Fish population levels and survival have been linked to levels of turbidity and siltation in waterways. Prolonged exposure to high levels of suspended sediment could create a loss of visual capability in fish, leading to a reduction in feeding and growth rates; a thickening of the gill epithelia, potentially causing the loss of respiratory function; clogging and abrasion of gill filaments; and increases in stress levels, reducing the tolerance of fish to disease and toxicants (Waters 1995). Also, high levels of suspended sediments would cause the movement and redistribution of fish populations or other aquatic organisms, and could affect physical habitat (Waters 1995). Sediment loading could interfere with photosynthesis of aquatic flora and displace aquatic fauna. Many fish and other aquatic species are sight feeders, and turbid waters reduce the ability of these fish to locate and feed on prey. Some fish, particularly juveniles, could become disoriented and leave areas where their main food sources are located, ultimately reducing their growth rates. Avoidance is the most common result of increases in turbidity and sedimentation.

Fish will not occupy areas unsuitable for survival unless they have no other option. Therefore, Alternative 1, Alternative 2, and the Requester's Preferred Alternative could cause fish habitat to become limited if high turbidity resulting from construction-related erosion were to preclude a species from occupying habitat required for specific life stages.

In addition, the potential exists for contaminants such as bentonite slurry, fuels, oils, and other products used in construction activities to be introduced into the waterway directly or through surface runoff. Contaminants may be toxic to fish or may alter oxygen diffusion rates and cause acute and chronic toxicity to aquatic organisms, thereby reducing growth and survival.

Designated critical habitat in the Phase 3 Repair Project area has been designated for Delta smelt, Central Valley steelhead, and green sturgeon; however, none would be adversely modified or destroyed. However, because increased sedimentation and turbidity and/or release of contaminants could degrade water quality and adversely affect fish or other aquatic habitats and aquatic communities, this adverse effect would be **potentially significant**.

Mitigation Measure 3.6-a: Implement Mitigation Measure 3.4-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions."

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

RD 17 will implement the following measure to reduce adverse effects on fish habitats related to temporary and short-term construction-related increases in sediments and turbidity and release of contaminants to a less-than-significant level. This measure will be included in construction specifications along with any additional measures identified in necessary permits.

RD 17 will implement Mitigation Measure 3.4-a, as described in Section 3.4, "Geology, Soils, Minerals, and Paleontological Resources." This measure will require filing a Notice of Intent with the Central Valley RWQCB; implementing standard erosion and siltation measures and best management practices; preparing and implementing a storm water pollution prevention plan; preparing and implementing a spill containment plan; and complying with the conditions of the National Pollutant Discharge Elimination System general stormwater permit for construction activity.

Responsibility: RD 17.

Timing: Before and during construction.

Implementing this mitigation measure would reduce the potential temporary and short-term construction-related adverse effects of increased sedimentation or turbidity, and/or release of contaminants on fish and other aquatic organisms to a **less-than-significant** level for Alternative 1, Alternative 2, and the Requester's Preferred Alternative because the use of best management practices (e.g., source control, detention basins, revegetation, and spill containment plan) would maintain surface water quality conditions in receiving waters and minimize disturbance to fish and other aquatic habitats. The Requester's Preferred Alternative would not remove any SRA habitat, which would further reduce effects on fish.

Effect 3.6-b: Loss of Woodlands and Shaded Riverine Aquatic Habitats.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions and no adverse effects on woodlands and SRA habitats would result. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could result in flooding that could beneficially affect woodlands and SRA habitat by depositing soil nutrients at landside woodlands. On the other hand, flooding caused by a levee failure along the RD 17 levee system could also adversely affect woodlands and SRA habitat by uprooting and washing away trees. The effects would depend on the timing, location, duration, and magnitude of the flooding. However, because a levee failure could result in adverse effects on woodlands and SRA habitat, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Under Alternative 1, woodlands, including sensitive Great Valley cottonwood and Great Valley oak riparian forest communities, within the Phase 3 Repair Project area could be lost because of installing seepage remediation measures. Estimated acreages of woodland losses are shown in **Table 3.6-5**. The vegetation communities included in this effect are located on the landside of the levee only, with the majority located in elements Ia, Ib, IIIb, and IVa as isolated patches of large valley oak trees or a mix of willow and/or Fremont cottonwood trees. Additional landside areas in these and several other elements are mapped as riparian forest (**Figures 3.6-1a through 3.6-1c**) and include occasional small patches or single native shrubs or trees, including elderberry, blackberry, and various willow species. Two substantial oak groves of large valley oak trees on the landside of the levee, which have not been measured but are estimated to have several trees with trunks approximately 100 inches dbh, would be lost because of the construction of seepage berms in elements IIIb and IVa. SRA habitat would not be adversely affected under Alternative 1 because no waterside woodlands would be removed. The effect of loss of landside woodlands, including sensitive Great Valley cottonwood and Great Valley oak riparian forest communities, including significant oak groves and heritage trees, would be **significant**.

Table 3.6-5. Estimated Effects of the Phase 3 Repair Project on Landside and Waterside Woodlands and Shaded Riverine Aquatic Habitat

Woodlands	Alternative 1 (acres)	Alternative 2 (acres)	Requester's Preferred Alternative
Landside			
Great Valley Cottonwood Riparian Forest	3.21	1.42	2.05
Great Valley Oak Riparian Forest	2.23	2.14	0.16
Total Landside (approximate)	**5.44**	**3.56**	**2.21**
Waterside (including SRA[1] Habitat)			
Great Valley Cottonwood Riparian Forest	0.00 (0.00)[1]	0.84 (0.84)[1]	0.00
Great Valley Oak Riparian Forest	0.00 (0.00)[1]	0.03 (0.03)[1]	0.00

Table 3.6-5. Estimated Effects of the Phase 3 Repair Project on Landside and Waterside Woodlands and Shaded Riverine Aquatic Habitat

Woodlands	Alternative 1 (acres)	Alternative 2 (acres)	Requester's Preferred Alternative
Total Waterside (approximate)	**0.00 (0.00)[1]**	**0.87 (0.87)[1]**	**0.00**
Total (approximate)	**5.44**	**4.43**	**2.21**

Notes: SRA = shaded riverine aquatic.

[1] Waterside woodlands along the San Joaquin River are assumed to also provide SRA habitat functions. Numbers in parentheses indicate the portion of waterside woodlands that provide SRA habitat functions. Woody vegetation along the waterside of the southeastern portion of element VIIe and the entire length of element VIIg does not qualify as SRA habitat because it does not support special-status fish species (i.e., anadromous salmonids). These two elements are located in a backwater slough off the main river channel or behind an impassable fish barrier.

Source: Data compiled by AECOM in 2010 and 2014; Updated by GEI Consultants, Inc. 2019

Alternative 2: Maximum Footprint Alternative

In addition to potential losses of landside woodlands under Alternative 1, two possible seepage berms and three possible setback levees implemented under Alternative 2 would create woodland losses in elements IIab, IVc, Va–VIa.1, and VIcde and would potentially affect a small amount of riparian woodlands along the slopes of the levee in the Phase 3 Repair Project area because of grading activity associated with removal of existing levees in the elements where new setback levees would be constructed (**Table 3.6-5**). No woodland removal would occur beyond the toe on the waterside of the existing levees in elements with setback levees. Some of the woodland effects associated with Alternative 2 are the result of the larger disturbance footprint associated with construction of setback levees and removal of the original levees; however, the total affected acreages for Alternative 2 would be less than Alternative 1 because the setback levees would be constructed farther inland than the existing levee, which would be graded down to ground elevation, and the riparian vegetation between the existing and new setback levee would be preserved in these elements. The construction of the setback levee and removal of the existing levee would expand the San Joaquin River floodway and create additional floodplain habitat. It is reasonable to expect that some degree of riparian woodland would colonize the floodplain over time and provide SRA functions during high water events. Floodplains that become inundated by high flow events provide important habitat for native fish species during the winter and spring flood periods. Numerous studies have shown that shallow water and vegetation in these areas provide highly productive rearing areas for numerous species, including Chinook salmon and splittail. Seasonally flooded habitat provides rearing habitat for Chinook salmon and spawning, rearing, and foraging habitat for splittail (Sommer et al. 1997, 2001, 2002). Removing the existing levee could result in small losses of riparian vegetation on the waterside portion of the levee prisms that could provide SRA habitat functions for fish; however, the losses would be minor (as shown in the effects estimates in **Table 3.6-5**) and entirely offset by the increase in active floodplain and riparian habitat within the levee setback areas. However, the effect of loss of landside woodlands, including sensitive Great Valley cottonwood and Great Valley oak riparian forest communities, including significant oak groves and heritage trees, would be **significant**.

Requester's Preferred Alternative

The total acreage of landside woodlands affected under the Requester's Preferred Alternative would be less than under Alternative 1 or 2. The Requester's Preferred Alternative would result in less effect on Great Valley cottonwood riparian and Great Valley oak riparian compared to Alternatives 1 and 2. Because only a small portion of the existing levee would be removed in element IVc under the Requester's Preferred Alternative, rather than the entire existing levee at this element as under

Alternative 2, the Requester's Preferred Alternative would not result in the removal of any shrubs or trees, including SRA habitat. As shown in **Table 3.6-5**, the total vegetation anticipated to be removed for the Requester's Preferred Alternative is less than for Alternative 1 and Alternative 2. Nonetheless, the effect of loss of landside woodlands, including sensitive Great Valley cottonwood and Great Valley oak riparian forest communities, including significant oak groves and heritage trees, would be **significant**.

Mitigation Measure 3.6-b: Reduce Loss of Woodlands and Shaded Riverine Aquatic Habitat by Implementing Minimization Measures.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

To reduce adverse effects on woodland habitat, RD 17 will implement the following measures:

- Native woodland areas will be identified, and the primary engineering and construction contractors will ensure, through coordination with a qualified biologist retained by RD 17, that construction is implemented in a manner that minimizes disturbance of such areas to the extent feasible. Temporary fencing will be used during construction to prevent disturbance of native trees that are located adjacent to construction areas that can be avoided.

- To compensate for the removal of riparian and other woodland habitat, RD 17 will restore riparian habitat in the proposed setback levee area in element IVc. After the new setback levee is constructed and certified in element IVc, approximately 400 feet of the existing levee then will be partially degraded. Approximately 5.0 acres of riparian woodland and 6.1 acres of riparian scrub habitat will be restored. Riparian plantings will be established within the setback and on the waterside of the existing levee.

- A Section 1602 Streambed Alteration Agreement from CDFW will be obtained before any trees within a stream zone under CDFW jurisdiction are removed.[1] RD 17 will comply with all terms and conditions of the streambed alteration agreement including measures to protect fish habitat or to restore, replace, or rehabilitate any habitat.

- If Alternative 2 is selected, RD 17 will consult or coordinate with USFWS and NMFS under the Federal ESA, and CDFW under CESA regarding potential effects of the loss of SRA habitat on federally listed fish species and state-listed fish species, respectively. RD 17 will implement any additional measures developed through the ESA and CESA consultation processes, including Section 2081 permit conditions, so that no-net-loss of SRA habitat functions occurs.

    - Any additional acreage of riparian habitat that will be required to compensate for loss of SRA habitat removed will be replaced or restored/enhanced in accordance with USFWS, NMFS, CDFW, and the Central Valley Flood Protection Board (CVFPB) regulations. Habitat restoration, enhancement, and/or replacement will be at a location (on-site, off-site, or at an approved mitigation bank) and by methods agreeable to USFWS, NMFS, CDFW, and CVFPB as determined during the permitting processes for Federal and California ESA, California Fish and Game Code Section 1602 (as necessary), compliance with Title 23, CCR Section 131(c). Replacement acreage will be determined based on functional values of the area being affected, the temporal loss of habitat that will occur, as well as an adequate margin to reflect the expected

[1] RD 17 obtained its Section 1602 Streambed Alteration Agreement for the Phase 3 Repair Project from CDFW in 2014 (file no. 1600-2014-0424-R3) and a permit extension in 2019.

degree of success associated with the mitigation plan. Restoration plantings also will not be implemented in locations or in a manner that will result in a significant increase in flood-stage elevations.

The criteria for measuring performance will be used to determine if the habitat improvement is trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in design or maintenance revisions). These criteria will be met for the habitat improvement to be declared successful, both during a particular monitoring year and at the end of the establishment period. These performance criteria will be developed in consultation with USFWS, NMFS, CDFW, and CVFPB, and will include:

– percent survival of planted trees (ranging from 65–85 percent),
– percent survival of transplanted trees (ranging from 60–85 percent), and
– percent relative canopy cover (ranging from 5–35 percent).

- If additional SRA mitigation requirements cannot be met through restoration on-site or off-site, credits will be purchased at a mitigation bank approved by the resource agencies (e.g., USFWS, NMFS, and CDFW).

Responsibility: RD 17.

Timing: Before and during construction.

Implementing this mitigation measure would reduce the adverse effects on woodland habitat for Alternative 1, Alternative 2, and the Requester’s Preferred Alternative because woodlands would be replaced or restored/enhanced on a “no-net-loss” basis in accordance with USFWS, NMFS, and CDFW regulations. The habitat improvements from implementing this mitigation measure would reduce long-term effects on woodland habitats loss to **less than significant**.

Effect 3.6-c: Potential Adverse Effects on Wetlands and Other Jurisdictional Waters of the United States and Waters of the State.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17’s existing practice (see the “Management of Vegetation Encroachments” discussion in Section 1.6.2, “Flood Problems and Needs”) and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions, and no adverse effects on wetlands and other jurisdictional waters of the United States would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along any portion of the RD 17 levee system could result in flooding that could beneficially affect wetlands and other jurisdictional waters of the United States or waters of the state by creating scour depressions that ultimately function as wetlands. On the other hand, flooding caused by a levee failure along the RD 17 levee system could also adversely affect wetlands and other aquatic habitats by filling existing wetlands with sediment or washing away wetland vegetation. The affects would depend on the timing, location, severity, and duration of flooding. However, because a levee failure would have the potential to result in adverse effects on wetlands and other aquatic habitats, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, “Section Contents.”)

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Under Alternative 1, one area of freshwater marsh and two agricultural ditches would be lost because of the construction of seepage berms on the east side of three elements of the Phase 3 Repair Project levee (**Table 3.6-6**). The freshwater marsh is isolated in a depression on the landside of the levee in element Ib between Howard Road to the north and a dirt farm road on the south. The agricultural ditches are located in elements Ia and IVa. These aquatic features qualify as waters of the United States and are subject to USACE jurisdiction under Section 404 of the CWA.

Table 3.6-6. Estimated Effects of the Phase 3 Repair Project on Jurisdictional Waters of the United States and Waters of the State

Sensitive Habitat/Community	Alternative 1: Minimum Disturbance Permanent Effect (acres)	Alternative 2: Maximum Disturbance Permanent Effect (acres)	Requester's Preferred Alternative Permanent Effect (acres)
Waters of the United States			
Freshwater wetland	0.66	0.66	0.00
Agricultural/Drainage Ditches	0.19	0.22	0.00
Pond (constructed)	0.00	4.31	0.00
Total (approximate)	**0.85**	**5.19**	**0.00**

Source: Data compiled by AECOM in 2014; updated by GEI Consultants in 2019

In addition to potential losses to jurisdictional waters of the United States and waters of the state under Alternative 1, the construction of new seepage berms or setback levees under Alternative 2 would result in the fill of a constructed pond in elements IIab and two agricultural ditches in elements IVc and Va–VIa.1. These new affected areas introduced under Alternative 2 would increase losses to jurisdictional waters of the United States (**Table 3.6-6**). The additional areas of waters of the United States are subject to USACE jurisdiction under Section 404 of the CWA.

The Requester's Preferred Alternative would result in the temporary disturbance of approximately 0.07 acre of agricultural ditches at elements Va–IVa.1 because of cutoff wall installation and regrading of the existing levee. These areas, which are considered to be waters of the United States, are less than under Alternative 1 and Alternative 2, as shown in **Table 3.6-6**. Because Alternative 1, Alternative 2, and the Requester's Preferred Alternative would result in the fill of jurisdictional waters of the United States, the effect would be adverse and **significant**.

Mitigation Measure 3.6-c: Minimize Effects on Jurisdictional Waters of the United States by Securing Permits and Implementing Permit Conditions for Mitigation.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

RD 17 will implement the following measures, which are designed to minimize and mitigate effects on jurisdictional waters of the United States and waters of the state within the Phase 3 Repair Project area:

- Authorization for fill of waters of the Unites States and waters of the state will be secured through permitting processes under Sections 401 and 404 of the CWA or the state's Porter-Cologne Water Quality Control Act before beginning ground-disturbing activities on any project element that contains waters of the Unites States or waters of the state.[2] RD 17 will provide a written statement with permit applications explaining how the project has been designed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States and waters of the state. RD 17 will provide compensatory mitigation for unavoidable adverse effects on waters of the United States and waters of the state, including wetlands, so that no-net-loss of aquatic resource functions and values occurs. Mitigation will occur on-site, off-site, or at an approved wetland mitigation bank servicing the area of the project. Any compensatory mitigation will take into account temporal losses of wetland functions and values between the times waters of the United States and waters of the state are filled and restored wetlands are in place and fully functional. Mitigation ratios will be increased as appropriate (and where applicable) to compensate for temporal losses.

- RD 17 will prepare mitigation and monitoring plan consistent with the USACE's Mitigation and Monitoring Proposal Guidelines (USACE 2004). The plan will include on-site restoration for temporary effects and off-site compensation for permanent effects, and will follow recommendations set forth in the guidelines for mitigation planning, design, implementation, maintenance, and monitoring.

Responsibility: RD 17.

Timing: Before construction.

Implementation of Mitigation Measure 3.6-c would reduce adverse effects on wetlands and other jurisdictional waters of the United States and waters of the state to **less than significant** or Alternative 1, Alternative 2, and the Requester's Preferred Alternative because compensatory mitigation would ensure no-net-loss of aquatic functions and values.

Effect 3.6-d: Potential Loss of or Disturbance to Special-Status Plants and Their Habitats.

<u>No-Action Alternative</u>

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions and no adverse effects on special-status plants and their habitats would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along any portion of the RD 17 levee system could beneficially affect special-status plants and their habitats by creating opportunities for new riparian habitats. On the other hand, flooding caused by a levee failure along the RD 17 levee system could also result in adverse effects on special-status plants and their habitats by destroying existing marsh habitats. The effects would depend on timing, location, and the duration and magnitude of flooding. However, because a levee failure would have the potential to result in adverse effects on special-status plants and their habitats, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.)

[2] RD 17 obtained its Section 401 Water Quality Certification from the Central Valley RWQCB in 2014. A Section 404 permit is pending.

Alternative 1: Minimum Footprint Alternative

Ten special-status plant species have potential to occur in aquatic and riparian habitats associated with the San Joaquin River and agricultural ditches in the Phase 3 Repair Project area. These species consist of bristly sedge, slough thistle, Delta button celery, rose mallow, Delta tule pea, Mason's lilaeopsis, Delta mudwort, Sanford's arrowhead, Suisun marsh aster, and Wright's trichocoronis.

As stated above, potential effects in the Phase 3 Repair Project area under Alternative 1 are limited to the levee prism and the landside of the levee; no effects on the waterside of the levee would occur. Under Alternative 1, one area of freshwater marsh in element Ib and two small sections of agricultural ditch in elements Ia and IVa would be lost because of the construction of seepage berms (**Table 3.6-6**). Habitat associated with Great Valley cottonwood riparian forest and Great Valley oak riparian forest is isolated, patchy, and limited to the edges of the freshwater marsh, along agricultural ditches, or in areas that were once part of the historical floodplain. This is evident in two substantial oak groves of very large valley oak trees, but they lack understory vegetation, other than annual grasses and ruderal vegetation, and conditions that would provide suitable habitat for special-status plants.

The habitat in these landside plant communities is considered low-quality and unlikely to support any of the ten special-status plant species; however, because these special-status plants could occur in freshwater marsh or riparian habitat along the San Joaquin River, their potential to occur in similar habitats within the Phase 3 Repair Project area cannot be completely ruled out.

While the aquatic and riparian habitats within the Phase 3 Repair Project area are limited and considered low-quality, the potential for the listed special-status species to occur cannot be dismissed because protocol-level surveys have not been conducted and areas of potentially suitable habitat are present. Installing cutoff walls, constructing seepage berms, and conducting other construction-related activities under Alternative 1 could result in the loss of suitable habitat for the ten special-status plants that have the potential to occur in the Phase 3 Repair Project area. Because the loss of these habitats could potentially result in the loss of special-status plants, including the state-listed Delta button-celery and Mason's lilaeopsis, this adverse effect would be **potentially significant**.

Alternative 2: Maximum Footprint Alternative

In addition to the losses of potentially suitable habitat for special-status plants under Alternative 1, the construction of new seepage berms or setback levees under Alternative 2 would result in the fill of a constructed pond in elements IIab, three agricultural ditches in elements IVa, IVc, and Va–VIa.1, and the loss of additional isolated areas of Great Valley cottonwood and Great Valley oak riparian forest. The losses to riparian habitats would occur in Phase 3 Repair Project elements IIab, IVc, Va–VIa.1, and VIcde and would potentially remove a small amount of riparian habitat present on the slopes of these existing levees when they are removed following possible construction of setback levees at these elements IIab, IVc, and VIcde (**Table 3.6-5**). No woodland removal would occur beyond the toe of the levee. **Tables 3.6-5** and **3.6-6** present the losses of these potentially suitable habitats for each alternative. Because protocol-level special-status plant surveys have not been conducted and areas of potentially suitable habitat are present in the Phase 3 Repair Project area, construction-related activities under Alternative 2 could result in the loss of suitable habitat for the ten special-status plants that have the potential to occur. As stated under Alternative 1, because the loss of these habitats could result in the loss of special-status plants, including the state-listed Delta button-celery and Mason's lilaeopsis, this adverse effect would be **potentially significant**.

Requester's Preferred Alternative

The Requester's Preferred Alternative would affect a drainage ditch in elements Va–VIa.1 that is considered low-quality habitat; however, the potential for the listed special-status species to occur cannot be dismissed because protocol-level surveys have not been conducted and areas of potentially suitable habitat are present. Installing cutoff walls, constructing seepage berms, and conducting other construction-related activities under the Requester's Preferred Alternative could result in the loss of suitable habitat for the 10 special-status plants that have the potential to occur in the Phase 3 Repair Project area. As stated under Alternative 1 and Alternative 2, because the loss of these habitats could result in the loss of special-status plants, including the state-listed Delta button-celery and Mason's lilaeopsis, this adverse effect would be **potentially significant**.

Mitigation Measure 3.6-d: Reduce Potential Loss of or Disturbance to Special-Status Plants and Their Habitats by Implementing Avoidance and Minimization Measures.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

The following is a summary and clarification of the SJMSCP incidental take minimization measures for special-status plants; RD 17 will implement the following measures to offset impacts and conserve special-status plants:

- Before project construction, surveys for the special-status plants listed in **Table 3.6-2** will be conducted by a qualified botanist at the appropriate time of year when the target species will be in flower or otherwise will be clearly identifiable. Surveys will be conducted in accordance with specific methodologies described in Section 5.2.2.5 of the SJMSCP.

- If special-status plants are found, the following measures will be implemented:

  - Slough thistle, Delta button-celery, and Sanford's arrowhead: The SJMSCP requires complete avoidance for these species; therefore, potential effects on these species cannot be covered through participation in the plan. If these species are present in the Phase 3 Repair Project area and cannot be avoided, a mitigation plan will be developed, with review and input from the regulatory agencies (e.g., CDFW). The mitigation plan will identify mitigation measures for any populations affected by the project, such as creation of off-site populations through seed collection or transplanting, preserving and enhancing existing populations, or restoring or creating suitable habitat in sufficient quantities to compensate for the effect. All mitigation measures that RD 17 and resource agencies determine through this consultation to be necessary will be implemented by RD 17. These measures will be designed so that the Phase 3 Repair Project does not result in a net reduction in the population size or range of Slough thistle, Delta button-celery, and Sanford's arrowhead.

  - Bristly sedge, rose mallow, Delta tule pea, Mason's lilaeopsis, Delta mudwort, and Suisun Marsh aster: These species are considered widely distributed species by the SJMSCP, and dedication of conservation easements is the preferred option for mitigation. If these species are found in the Phase 3 P Area, the possibility of establishing a conservation easement will be evaluated. If dedication of a conservation easement is not a feasible option, payment of SJMSCP development fees may be used to mitigate adverse effects on these species. Use of conservation easements or development fees for establishment of habitat preserves, or a combination of the two mechanisms, will be sufficient to avoid an overall net reduction in the population size or range of

Bristly sedge, rose mallow, Delta tule pea, Mason's lilaeopsis, Delta mudwort, and Suisun Marsh aster.

- Wright's trichocoronis: This species is considered a narrowly distributed species by the SJMSCP, and dedication of conservation easements is the preferred option for mitigation. If this species is found in the Phase 3 Repair Project area, the possibility of establishing a conservation easement will be evaluated. If dedication of a conservation easement is not an option, the SJMSCP requires a consultation with the permitting agency representatives on the Technical Advisory Committee to determine the appropriate mitigation measures. These may include seed collection or other measures and will be determined on a population basis, taking into account the species type, relative health, and abundance. After the appropriate mitigation has been determined, it will be implemented by RD 17.

Responsibility: RD 17.

Timing: Before construction.

Implementation of Mitigation Measure 3.6-d would reduce adverse effects on potential special-status plant species that may be encountered in the Phase 3 Repair Project area to **less than significant** because protocol-level focused special-status plant surveys would be conducted to determine presence/absence and appropriate measures, as determined by the CDFW and USFWS and expressed in the SJMSCP's effects reduction measures, would be implemented.

Effect 3.6-e: Potential Loss of or Disturbance to Valley Elderberry Longhorn Beetle and Their Habitats.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions and no adverse effects on valley elderberry longhorn beetles and their habitats would result. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along any portion of the RD 17 levee system could adversely or beneficially affect valley elderberry longhorn beetle and their habitats, depending on timing, location, duration, and magnitude of the flooding. For example, flooding could destroy existing riparian habitats but at the same time create opportunities for new riparian habitats. Because a levee failure would have the potential to result in adverse effects on valley elderberry longhorn beetles and their habitats, this adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Elderberry shrubs provide habitat for the valley elderberry longhorn beetle (federally listed as threatened). Elderberry shrubs are known to occur along the San Joaquin River on both the waterside and landside of levees in the Phase 3 Repair Project area. A total of 18 elderberry shrubs were observed within 100 feet of the Phase 3 Repair Project area during the focused surveys in January 2014 (updated September 2019). Construction of seepage berms under Alternative 1 would result in the removal of elderberry shrubs on the landside of Phase 3 Repair Project levee elements. Shrubs that are not removed could otherwise be affected by nearby grading and other construction activities if such activities alter the environment (e.g., soil compaction, change in drainage patterns) immediately surrounding the shrubs in a manner that threatens their health and/or survival. Elderberry shrubs between the levee and the river would not be removed or affected under Alternative 1. Valley elderberry longhorn beetle occur in various locations throughout the Sacramento and San Joaquin Valleys and removal of elderberry shrubs in the Phase 3 Repair Project area would not reduce the range of the species. However, loss of elderberry shrubs could result in a reduction in the number of valley elderberry longhorn beetles. Therefore, this adverse effect would be **significant**.

Alternative 2: Maximum Footprint Alternative

Seepage berms instead of cutoff walls in elements Va–VIa.1, and possibly in element IVc, would result in the removal of several elderberry shrubs that would be avoided under Alternative 1. Removing additional elderberry shrubs could reduce the number of valley elderberry longhorn beetles. The effect would be adverse and **significant**.

Requester's Preferred Alternative

Construction activities for the Requester's Preferred Alternative may result in the removal of elderberry shrubs that also would be affected under Alternative 1 plus shrubs identified in element IVc that would also be affected under Alternative 2. Of the shrubs identified during focused surveys in January 2014, the shrubs on the waterside of the levee would be avoided and protected during construction, and eight elderberry shrubs on the landside of the levee would be removed. Removing elderberry shrubs could reduce the number of valley elderberry longhorn beetles. The effect would be **significant**.

Mitigation Measure 3.6-e: Reduce Potential Loss of or Disturbance to Valley Elderberry Longhorn Beetle by Implementing Avoidance and Minimization Measures.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

The following is a summary and clarification of avoidance and minimization measures for valley elderberry longhorn beetle; RD 17 will implement the following measures to offset impacts and conserve valley elderberry longhorn beetle:

- The avoidance and minimization measures described in the Framework for Assessing Impact to the Valley Elderberry Longhorn Beetle (USFWS 2017) will be implemented. These measures include preconstruction surveys, protective measures (e.g., restriction on insecticide and herbicide use), and compensation measures.

- For all shrubs that are to be retained on the project site, a setback of 20 feet from the dripline of each elderberry shrub found during the survey will be established. Brightly colored flags and fencing will be used to demarcate the 20-foot setback area and will be maintained until project construction in the vicinity is complete. No construction activities will occur within the setback area. In cases where the elderberry dripline is less than 20 feet from the work area, k-rails will be placed at the shrub's dripline to provide additional protection to the shrubs from construction equipment and activities. Temporary fences around the elderberry shrubs and k-rails at shrub drip lines will be installed as the first order of work. Buffer area fences around elderberry shrubs will be inspected weekly by a qualified biologist during ground-disturbing activities until project construction is complete or the fences are removed on approval by the qualified biologist and resident engineer.

- All elderberry shrubs with one or more stems measuring 1.0 inch or greater in diameter at ground level that cannot be retained in the project area will be transplanted to a valley elderberry longhorn beetle mitigation site (likely the French Camp Conservation Bank) during the dormant period for elderberry shrubs (November 1 to February 15) and in accordance with the requirements of the VELB Framework (USFWS 2017).

- For all elderberry shrubs that cannot be retained on the project site and will be transplanted, all stems of 1 inch or greater in diameter at ground level will be counted. Compensation for removal of these stems will be provided in accordance with the VELB Framework (USFWS 2017) and through the purchase of habitat conservation credits from the French Camp Conservation Bank to offset the adverse effects of transplanting elderberry shrubs.

Responsibility: RD 17.

Timing: Before and during construction.

Implementation of Mitigation Measure 3.6-e would reduce effects on valley elderberry longhorn beetle to **less than significant** because protocol-level surveys would be conducted and appropriate avoidance and/or compensatory mitigation measures would be implemented.

Effect 3.6-f: Potential Loss of or Disturbance to Northwestern Pond Turtle and Their Habitats.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions and no adverse effects on northwestern pond turtle and their habitats would result. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. While the magnitude of the effects would depend on the flooding duration, depth, rate, timing, and location, a levee failure along any portion of the RD 17 levee system could adversely or beneficially affect northwestern pond turtle and their habitats. For example, flooding could cause destruction of northwestern pond turtle habitat or even mortality, but it could also improve existing habitat (e.g., deposit downed trees in aquatic habitats that could act as basking sites) and create opportunities for new habitat which could lead to increased population numbers. Because a levee failure would have the potential to result in adverse effects to northwestern pond turtle and their habitats, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Northwestern pond turtle (a California species of special concern) is known to occur in the San Joaquin River. No conversion of habitat provided by the river would result from implementation of the Phase 3 Repair Project, and if turtles are present near construction areas along the river, they are anticipated to move away from areas of disturbance. Agricultural ditches are unlikely to support pond turtles because aquatic and basking habitat is very limited. Levees along the San Joaquin River could provide suitable nesting sites, but regular maintenance activities make it very unlikely that pond turtles would nest on the levees. However, element Ib includes an area of freshwater marsh, and elements IIab includes a constructed pond on a private ranch that could potentially support northwestern pond turtle. The pond is used for recreation by the residents and the surrounding property is landscaped, regularly mowed and maintained, and operates as an equestrian center. Beyond the ranch property, the area is used for agriculture. The freshwater marsh and pond are considered disturbed and low-quality, but because of their proximity to the San Joaquin River and because no focused wildlife surveys have been conducted, the potential exists for northwestern pond turtle to occur, and breed, in these locations within the Phase 3 Repair Project area.

While Alternative 1 would place a cutoff wall in the levee at elements IIab and would avoid any adverse effect on the pond, a seepage berm is proposed in element Ib that would fill the area of freshwater marsh in this element. Alternative 2 would affect the freshwater marsh in element Ib. In addition, a proposed setback levee for Alternative 2 in elements IIab would result in the fill and destruction of the constructed pond that could potentially support northwestern pond turtle in this location (**Table 3.6-6**). The Requester's Preferred Alternative may occur within the vicinity of wetland features that are outside of the construction footprint but within distribution distance for pond turtles. Therefore, because the presence of northwestern pond turtle cannot be ruled out at these locations within the Phase 3 Repair Project area, and turtle nests could be destroyed, this adverse effect would be **potentially significant**.

Mitigation Measure 3.6-f: Reduce Potential Loss of or Disturbance to Northwestern Pond Turtle and Their Habitats and Implement Avoidance and Minimization Measures.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

The following is a summary and clarification of SJMSCP incidental take minimization measures for northwestern pond turtle; RD 17 will implement the following measures to offset impacts and conserve northwestern pond turtle:

- Preconstruction surveys for the northwestern pond turtle will be conducted by a qualified biologist within 24 hours before ground disturbance.

- If nesting areas for pond turtles are identified, a buffer area of 300 feet will be established between the nesting site (which may be immediately adjacent to wetlands or extend up to 400 feet away from wetland areas in uplands) and the wetland located near the nesting site. These buffers will be indicated by temporary fencing if construction has or will begin before nesting periods are ended (the period from egg laying to emergence of hatchlings is normally April to November).

In addition to these SJMSCP measures, if dewatering of the elements IIab is conducted, or if fill is simply placed into the pond while it still holds water, a qualified biologist will be present during these activities to search for western pond turtles. If pond turtles are found, they will be relocated by the biologist to the San Joaquin River on the opposite side of the elements IIab levee.

Responsibility: RD 17.

Timing: Before and during construction.

Implementation of Mitigation Measure 3.6-f would reduce adverse effects on northwestern pond turtle nests and individuals to a **less-than-significant** level for Alternative 1, Alternative 2, and the Requester's Preferred Alternative because recommended surveys would be conducted and appropriate avoidance and/or compensatory mitigation measures would be implemented.

Effect 3.6-g: Potential Loss of or Disturbance to Burrowing Owl and Their Habitats.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions and no adverse effects on burrowing owl and their habitats would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. While the magnitude of the effects would depend on the flooding duration, depth, rate, timing, and location, a levee failure along any portion of the RD 17 levee system could cause loss of burrows, mortality to individuals, and general destruction/degradation of burrowing owl habitat. The magnitude of the effects would depend on this reason; therefore, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Burrowing owl (a California species of special concern) is not known to nest in the Phase 3 Repair Project area and none were observed during various surveys in the area. However, focused surveys have not been conducted, and ground squirrel burrows were observed during reconnaissance-level biological surveys. At present, burrowing owl habitat in the Phase 3 Repair Project area is limited to agricultural field edges, mainly along ditches, levees, and fallow fields. Suitable burrows are expected to be limited however, because of the intensive agricultural activity, ground squirrel control measures implemented by landowners and various agencies, and low numbers of California ground squirrels observed in the area. Under Alternative 1, construction of seepage berms and/or installation of chimney and blanket drains and related construction activities in elements Ia, Ib, Ie, IIIa, IIIb, IVa, VIa.4, VIb, VIcde, VIIb, and VIIg could result in the destruction of occupied burrows or disturbance of nesting owls, potentially resulting in nest abandonment and mortality of chicks and eggs at one or more of these locations.

Under Alternative 2, the potential affected area would be larger in elements IIab, IVc, Va–VIa.1, and VIcde compared to Alternative 1, because of possible construction of seepage berms at elements VIc and Va–VIa.1 and possible setback levees at elements IIab, IVc, and VIcde. Like Alternative 1, implementation of Alternative 2 could have a substantial adverse effect on burrowing owl if present because of loss of active nest burrows or individual owls. Because Alternative 1 and Alternative 2 could result in the loss of active nest burrows or individual owls, this effect would be **potentially significant**.

Under the Requester's Preferred Alternative, construction of seepage berms and/or installation of chimney drains and related construction activities in the Phase 3 Repair Project area could result in the destruction of occupied burrows or disturbance of nesting owls, potentially resulting in nest abandonment and mortality of chicks and eggs at one or more of these locations. Under the Requester's Preferred Alternative, the potentially affected area would be less than Alternative 1 and less than Alternative 2 because eight elements included in Alternatives 1 and 2 (Ib, Ie, IIIa, IIIb, VIc, VIe, VIIb, and VIg) would not be included in the Requester's Preferred Alternative. Like Alternatives 1 and 2, implementation of the Requester's Preferred Alterative could have a substantial adverse effect on burrowing owl if present because of loss of active nest burrows or individual owls; therefore, this adverse effect would be **potentially significant**.

Mitigation Measure 3.6-g: Reduce Loss of or Disturbance to Burrowing Owl and Their Habitats by Implementing Avoidance and Minimization Measures.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

The following is a summary and clarification of SJMSCP incidental take minimization measures for burrowing owl; RD 17 will implement the following measures to offset impacts and conserve burrowing owl:

- Burrowing owls may be discouraged from entering or occupying construction areas by discouraging the presence of ground squirrels. To accomplish this, RD 17 will prevent ground squirrels from occupying the project site by employing one of several methods outlined in Section 5.2.4.15 of the SJMSCP. These will include retention of tall vegetation, regular disking of the site, or use of chemicals or traps to kill ground squirrels.

- Preconstruction surveys for burrowing owls will be conducted by a qualified biologist within 75 meters of areas of project activity in locations with potential burrowing owl habitat, including field edges, roadsides, levees, and fallow fields. Actively farmed agricultural fields and regularly disked or graded fields do not provide suitable burrow sites and need not be surveyed. The survey will be conducted within 1 week before beginning construction. If burrowing owls are found, the following measures will be implemented:

    - During the nonbreeding season (September 1 through January 31), burrowing owls occupying the project site will be evicted from the project site by passive relocation as described in the CDFW's Staff Report on Burrowing Owls (CDFG 1995).

    - During the breeding season (February 1 through August 31), occupied burrows will not be disturbed and will be provided with a 75-meter protective buffer until and unless the SJMSCP Technical Advisory Committee, with the concurrence of the permitting agencies' representatives on the Technical Advisory Committee, or a qualified biologist approved by the permitting agencies, verifies through noninvasive means that either (1) the birds have not begun egg laying or (2) juveniles from the occupied burrows are foraging independently and are capable of independent survival. After the fledglings are capable of independent survival, the burrow can be destroyed.

Responsibility: RD 17.

Timing: Before construction.

Implementation of Mitigation Measure 3.6-g would reduce adverse effects on burrowing owl to **less than significant** for Alternative 1, Alternative 2, and the Requester's Preferred Alternative because protocol-level surveys would be conducted and appropriate avoidance mitigation measures would be implemented.

Effect 3.6-h: Potential Adverse Effects on Swainson's Hawk and White-Tailed Kite.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section

1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions and no adverse effects on Swainson's hawk and white-tailed kite would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. While the magnitude of the effects would depend on the flooding duration, depth, rate, timing, and location, a levee failure along any portion of the RD 17 levee system could adversely affect Swainson's hawk and white-tailed kite habitat via mechanisms such as loss of foraging habitat caused by inundation and mortality of prey species and nest trees being knocked down by flood flows. For this reason, this adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Agricultural fields and open areas with ruderal vegetation in the Phase 3 Repair Project area provide suitable foraging habitat for Swainson's hawk (state listed as threatened) and white-tailed kite (state listed as fully protected). Under Alternative 1, foraging habitat for these species would be permanently lost from the construction of seepage berms in elements Ia, Ib, Ie, IIIb, IVa, VIa.4, VIIb, and VIIg (**Table 3.6-7**). Temporary effects would occur where construction of haul roads crosses these habitats, or where temporary batch plants or slurry ponds are placed in these habitats. The destruction of foraging habitat near nest sites could adversely affect the success of nests that are active at the time of construction and the future suitability of those nest sites. Because the Phase 3 Repair Project area resides within the primary Swainson's hawk breeding area in California, such a loss of foraging habitat could have a substantial adverse effect on the species.

Table 3.6-7. Estimated Potential Effects of the Phase 3 Repair Project on Foraging Habitat for Swainson's Hawk and White-Tailed Kite

	Alternative 1: Minimum Disturbance	Alternative 2: Maximum Disturbance	Requester's Preferred Alternative
Habitat/Land Cover Type	Permanent Effect (acres)	Permanent Effect (acres)	Permanent Effect (acres)
Agricultural Land (alfalfa, crops, orchards)	14.20	85.69	10.85
Ruderal (fallow fields, openings)	27.14	35.76	21.44
Total (approximate)	**41.34**	**121.45**	**32.29**

Source: Data compiled by AECOM in 2014

Swainson's hawk nests have been documented along the entire length of the Phase 3 Repair Project area, primarily along the San Joaquin River and in large landside trees in all elements from element Ib in the north to elements VIcde in the south, where I-5 crosses the river. Nesting pairs have been documented within or adjacent to the Phase 3 Repair Project area as recently as 2015 (**Figures 3.6-2a and 3.6-2b**), and suitable trees are present and could be removed during project implementation. White-tailed kite nests have not been documented in the Phase 3 Repair Project area, but because they use similar trees for nesting as Swainson's hawks, the potential for them to occur also exists. For both species, direct nest loss could result from tree removal, and nesting pairs near any construction activities could be disturbed, potentially resulting in nest abandonment and mortality of chicks and eggs.

Swainson's hawks and white-tailed kite occur throughout much of the western United States and effects of the Phase 3 Repair Project would not reduce the range of the species. However, the loss of active

Swainson's hawk or white-tailed kite nests, loss of known or suitable nest trees, and conversion of suitable foraging habitat near active nest sites could reduce the number of both species. Therefore, this adverse effect would be **potentially significant**.

Alternative 2: Maximum Footprint Alternative

The potential loss of landside agricultural and ruderal habitats under Alternative 2 would be larger in elements IIab, IVc, Va–VIa.1, and VIcde compared to Alternative 1 because of the addition of a setback levee in place of a cutoff wall at elements IIab, either a seepage berm or setback levee in place of a cutoff wall at element IVc, a seepage berm in place of a cutoff wall at elements Va–VIa.1, and a setback levee in place of a seepage berm at elements VIcde. Therefore, losses of potential foraging habitat would also be larger (**Table 3.6-7**). The destruction of foraging habitat near nest sites in these elements could adversely affect the success of nests that are active at the time of construction and the future suitability of those nest sites. Like under Alternative 1, for both species, direct nest loss could result from tree removal, and nesting pairs near any construction activities could be disturbed, potentially resulting in nest abandonment and mortality of chicks and eggs.

Setback levees, which would be installed in elements IIab and VIcde and are an option in element IVc under Alternative 2, would be constructed farther inland than the existing levee and the existing levee would be removed. As the exposed footprint of the existing levee returns to more natural conditions as part of the San Joaquin River floodway, this acreage could ultimately serve as foraging habitat for Swainson's hawk and white-tailed kite, offsetting habitat losses resulting from setback levee construction. Other lands placed in the floodway after setback levee construction could also ultimately serve as foraging and/or nesting habitat, depending on the type and extent of vegetation that ultimately colonizes the area. The loss of active Swainson's hawk or white-tailed kite nests, loss of known or suitable nest trees, and conversion of suitable foraging habitat near active nest sites under Alternative 2 could reduce the number of both species. Therefore, this adverse effect would be **potentially significant**.

Requester's Preferred Alternative

The potential loss of landside agricultural and ruderal habitats under the Requester's Preferred Alternative would be less compared to Alternatives 1 and 2 because eight elements included in Alternatives 1 and 2 (Ib, Ie, IIIa, IIIb, VIc, VIe, VIIb, and VIg) would not be included in the Requester's Preferred Alternative. Thus, overall losses of potential foraging habitat would be smaller (**Table 3.6-7**). The destruction of foraging habitat near nest sites could adversely affect the success of nests that are active at the time of construction and the future suitability of those nest sites. As under Alternative 1, direct nest loss of Swainson's hawk and white-tailed kite could result from tree removal, and nesting pairs near any construction activities could be disturbed, potentially resulting in nest abandonment and mortality of chicks and eggs.

The setback levee that would be installed in element IVc under the Requester's Preferred Alternative would be constructed farther inland than the existing levee and a small portion of the existing levee would be removed. As the exposed footprint of the remnant levee returns to more natural conditions as part of the San Joaquin River floodway, this acreage ultimately could serve as foraging habitat for Swainson's hawk and white-tailed kite, offsetting habitat losses resulting from setback levee construction. Other lands in the setback area that are placed in the floodway as a result of setback levee construction also ultimately could serve as foraging and/or nesting habitat, depending on the type and extent of vegetation that ultimately colonizes the area. The loss of active Swainson's hawk or white-tailed kite nests, loss of known or suitable nest trees, and conversion of suitable foraging habitat near active nest sites under the Requester's Preferred Alternative could reduce the number of both species. Therefore, this adverse effect would be **potentially significant**.

Mitigation Measure 3.6-h: Reduce Potential Effects on Swainson's Hawk and White-Tailed Kite by Implementing Avoidance and Minimization Measures.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

- The following is a summary and clarification of SJMSCP measures to minimize incidental take of Swainson's hawk and white-tailed kite. RD 17 will implement the following measures to offset impacts and conserve these species:

- If RD 17 elects to remove trees suitable for nesting, trees will be removed between September 1 and February 15, when any nests would be unoccupied.

- If RD 17 elects to retain a potential Swainson's hawk nest tree, all construction activities will remain a distance of two times the diameter of the dripline of the tree, measured from the nest.

- For white-tailed kites, preconstruction surveys will investigate all potential nesting trees on the project site (e.g., especially tree tops that are 15–59 feet aboveground in oak, willow, eucalyptus, cottonwood, or other deciduous trees) or within 0.25 mile of the project site, during the nesting season (February 15 to September 15) whenever white-tailed kites are noted on-site or in the vicinity of the project site during the nesting season.

- For white-tailed kite, a setback of 100 feet from nesting areas will be established and maintained during the nesting season for the period encompassing nest building and continuing until fledglings leave nests. This setback will apply whenever construction or other ground-disturbing activities begin during the nesting season in the presence of nests which are known to be occupied. Setbacks will be marked by brightly colored temporary fencing.

In addition to the above measures, protocol level surveys will be conducted to establish nesting territories and nest locations before the construction season. Qualified biologists would perform preconstruction surveys.

These measures will be performed to prevent direct reduction in the number of Swainson's hawk and white-tailed kite.

Responsibility: RD 17.

Timing: Before and during construction.

Implementation of Mitigation Measure 3.6-h would reduce adverse effects on Swainson's hawk and white tailed kite to **less than significant** for Alternative 1, Alternative 2, and the Requester's Preferred Alternative because avoidance and/or setback measures and compensatory mitigation would be implemented to prevent effects on Swainson's Hawk and white-tailed kite and their habitat.

Effect 3.6-i: Potential Adverse Effects on Northern Harrier and Their Habitat.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions and no adverse effects on northern harrier and their habitat would result. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along any portion of the RD 17 levee system could adversely affect northern harrier and other ground nesting birds and their habitat. The magnitude of the effects would depend on the flooding duration, depth, rate, timing, and location. For example, a flood event during the nesting season, when ground nests are present, would have a greater adverse effect than a flood event outside the nesting season. This adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Agricultural and fallow fields and ruderal habitats in the Phase 3 Repair Project area provide suitable foraging habitat for northern harrier (California species of special concern), and certain field crops (e.g., wheat) and level ruderal areas provide suitable nesting habitat for this ground-nesting species. Agricultural and ruderal land that could provide suitable nesting and foraging habitat could be lost from the construction of seepage berms and other seepage remediation measures under Alternative 1. Losses of foraging habitat shown in **Table 3.6-7** for Swainson's hawk and white-tailed kite also express potential losses of foraging habitat for northern harrier. Because northern harrier nesting habitat is dependent on multiple factors, such as slope and timing and level of disturbance, this table cannot also reflect acreages of nesting habitat removed. If active nests are present within the Phase 3 Repair Project area, they could be directly destroyed by construction activities, and harriers nesting near any construction activities could be disturbed, potentially resulting in nest abandonment and mortality of chicks and eggs.

Suitable foraging and nesting habitat is locally and regionally abundant, and harriers could relocate to nearby areas of suitable habitat. However, the effect of potential loss of an active harrier nest would be **potentially significant**.

Alternative 2: Maximum Footprint Alternative

The potential loss of landside agricultural and ruderal habitats under Alternative 2 would be larger in elements IIab, IVc, Va–VIa.1, and VIcde compared to Alternative 1 because of the addition of one or two possible seepage berms and two or three possible setback levees (**Table 3.6-7**). Therefore, implementation of Alternative 2 could result in the destruction of nesting and foraging habitat for northern harrier. If active northern harrier nests are present within the Phase 3 Repair Project area, they could be directly destroyed by construction activities, and harriers nesting near any construction activities could be disturbed, potentially resulting in nest abandonment and mortality of chicks and eggs.

Suitable foraging and nesting habitat is locally and regionally abundant, and harriers could relocate to nearby areas of suitable habitat. However, the effect of potential loss of an active harrier nest would be **potentially significant**.

Requester's Preferred Alternative

The potential loss of landside agricultural and ruderal habitats under the Requester's Preferred Alternative would be less compared to Alternatives 1 and 2 because eight elements included in Alternatives 1 and 2 (Ib, Ie, IIIa, IIIb, VIc, VIe, VIIb, and VIg) would not be included in the Requester's Preferred Alternative (**Table 3.6-7**). Nonetheless, implementation of the Requester's Preferred Alternative could result in the destruction of nesting and foraging habitat for northern harrier. If active northern harrier nests are present in the Phase 3 Repair Project area, they could be directly destroyed by construction activities, and harriers nesting near any construction activities could be disturbed, potentially resulting in nest abandonment and mortality of chicks and eggs.

Suitable foraging and nesting habitat is locally and regionally abundant, and harriers could relocate to nearby areas of suitable habitat. However, the effect of potential loss of an active harrier nest would be **potentially significant**.

Mitigation Measure 3.6-i: Reduce Potential Effects on Northern Harrier and Their Habitat by Implementing Avoidance and Minimization Measures.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

The following is a summary and clarification of SJMSCP incidental take minimization measures for northern harrier. RD 17 will implement the following measures to offset impacts and conserve this species:

- If project activity occurs during the northern harrier nesting season (March 15 through September 15), preconstruction surveys will be conducted during the nesting season in suitable nesting habitat within 500 feet of project activity. The survey will be conducted by a qualified biologist within 1 week before the beginning of construction.

- A setback of 500 feet from northern harrier nesting areas will be established and maintained during the nesting season for the period encompassing nest building and continuing until fledglings leave nests. This setback will apply whenever construction or other ground-disturbing activities begin during the nesting season in the presence of nests that are known to be occupied. Setbacks will be marked by brightly colored temporary fencing.

Responsibility: RD 17.

Timing: Before and potentially during construction.

Implementation of Mitigation Measure 3.6-i would reduce adverse effects on northern harrier to **less than significant** for Alternative 1, Alternative 2, and the Requester's Preferred Alternative because preconstruction surveys and avoidance and/or setback measures would be implemented to prevent adverse effects on nesting northern harrier.

Effect 3.6-j: Potential Loss of or Disturbance to Riparian Brush Rabbit and Their Habitats.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions and no adverse effects on riparian brush rabbit and their habitats would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along any portion of the RD 17 levee system could adversely affect riparian brush rabbit and their habitats. Although the magnitude of the effect would vary depending on the location of levee breaks, flooding duration, depth, rate, timing, and location, flooding could result in scouring that could cause mortality and short-term destruction of riparian brush rabbit habitat. For this reason, this adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, “Section Contents.”)

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester’s Preferred Alternative

Patches of riparian vegetation along the San Joaquin River and adjacent to Phase 3 Repair Project levees provide potentially suitable habitat for riparian brush rabbit (federally listed and state listed as endangered). In addition, occupied habitat for riparian brush rabbit is documented within the boundaries of the Phase 3 Repair Project area in elements IIIa and IIIb. In February 2004, three riparian brush rabbits (one in each of three different locations) were trapped in lower-quality riparian habitat on the waterside of elements IIIa and IIIb (Vincent-Williams et al. 2004). Other small areas of similar low-quality riparian habitat are present on the waterside of Phase 3 Repair Project elements IIab, IVc, and Va–VIa.1. In February 2003, riparian brush rabbits were documented on an oxbow with dense riparian vegetation approximately 1,000 feet south of Phase 3 Repair Project elements Va–VIa.1 and 1,200 feet north of Phase 3 Repair Project element VIa.4 (CNDDB 2014).

No ground disturbance, and therefore no removal of riparian brush rabbit habitat, would occur on the waterside of the Phase 3 Repair Project levee under any alternative. The construction of seepage berms and other seepage remediation measures under Alternative 1 would result in losses of riparian habitat on the landside of the levee in the Phase 3 Repair Project area. See **Table 3.6-5** for acreages of riparian habitat losses. However, the vegetation in these areas is relatively open, patchy, and would be low quality for riparian brush rabbit.

Under Alternative 2, instead of cutoff walls in elements IIab, IVc, and Va–VIa.1 and fill in elements VIcde, a seepage berm would be constructed at elements Va–VIa.1, a setback levee would be constructed at elements IIab, and either a seepage berm or a setback levee would be implemented at element IVc. These proposed actions would increase losses of landside riparian where seepage berms were constructed and potentially remove a small amount of riparian habitat on the slopes of the Phase 3 Repair Project levee because of grading activity to remove the levee in elements where new setback levees would be constructed (**Table 3.6-5**). Areas of landside riparian habitat would be low quality because they consist either of isolated patches of blackberry and shrubs only; isolated small trees and shrubs; or isolated groves of large valley oak trees that lack understory vegetation, other than grasses and ruderal vegetation, which would act as cover for riparian brush rabbit. The setback levees proposed under Alternative 2 would increase areas of active floodplain along the San Joaquin River, which could result in the creation of new habitat that could benefit the riparian brush rabbit. Although landside riparian habitat is low quality, some potential exists for it to be occupied by riparian brush rabbit. Because the potential exists for loss of potentially occupied riparian brush rabbit habitat, or disturbance to this species if present in the Phase 3 Repair Project area, this adverse effect would be **potentially significant**.

The adverse effects on landside riparian habitat under the Requester's Preferred Alternative would be less than under Alternatives 1 and 2. See **Table 3.6-5** for acreages of riparian habitat losses. However, the vegetation in these areas is relatively open, patchy, and would be low quality for riparian brush rabbit. Although a portion of the existing levee would be removed in element IVc, the Requester's Preferred Alternative would not result in the removal of waterside riparian habitat, unlike Alternative 2. The setback levee would increase areas of active floodplain along the San Joaquin River, which could result in the creation of new habitat that could benefit the riparian brush rabbit. Although landside riparian habitat is low quality, some potential exists for it to be occupied by riparian brush rabbit. Because the potential exists for loss of potentially occupied riparian brush rabbit habitat, or disturbance to this species if present in the Phase 3 Repair Project area, this effect would be **potentially significant**.

Mitigation Measure 3.6-j: Reduce Potential Loss of or Disturbance to Riparian Brush Rabbit and Their Habitats by Implementing Avoidance and Minimization Measures.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Because the Phase 3 Repair Project area is adjacent to habitat that is known to be occupied by the riparian brush rabbit, this species is likely to occur in suitable habitat in the project footprint. Consultation with USFWS under the Federal ESA and with CDFW under CESA will be conducted. Specific conservation measures will be developed during the consultation process, including the following:

- Having a qualified biologist conduct preconstruction surveys;
- Conducting daily surveys of construction areas;
- Installing exclusion fencing to prevent brush rabbits from entering construction areas;
- Where suitable habitat for riparian brush rabbit must be removed, removing vegetation by hand 2 weeks before construction;
- Allowing trapping of riparian brush rabbits at the project site in support of the USFWS captive breeding program to establish new populations in appropriate habitat; and
- Providing on- or off-site compensatory mitigation for habitat losses. On-site compensation would consist of restoring riparian habitat within the new setback levee area in element IVc. Between 25 feet from the landside toe of the existing levee and 25 feet from the waterside toe of the new setback levee, approximately 4.52 acres of ruderal grassland would be restored as riparian habitat. Additional off-site compensatory habitats could include preserving existing waterside riparian habitats and/or restoring natural riparian habitats.

These measures to minimize direct take in conjunction with compensation for adverse effects will be performed to avoid a net reduction in the number of riparian brush rabbits. However, the potential loss of riparian brush rabbit population in the Phase 3 Repair Project area can restrict the range of this species because the RD 17 area currently contains the northernmost known extent of the population on the San Joaquin River.

Responsibility: RD 17.

Timing: Before construction.

Implementation of Mitigation Measure 3.6-j is expected to offset impacts and conserve riparian brush rabbit through preconstruction surveys, avoidance, and/or trapping, combined with compensatory mitigation that would be implemented for any potential habitat loss, but not to a less-than-significant level. Furthermore, no additional feasible mitigation measures are available to reduce this adverse effect to a less-than-significant level. Even with implementation of this mitigation measure, the Phase 3 Repair Project could restrict the range of this endangered species; therefore, the adverse effect would remain **potentially significant and unavoidable**.

Effect 3.6-k: Potential Loss of and/or Direct Effects on Bat Species and Their Habitats.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions and no adverse effects on bat species and their habitats would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along any portion of the RD 17 levee system could result in flooding that could beneficially affect conditions for bat species and their habitat because standing water after a flood event could temporarily increase populations of mosquitoes and other bat prey species. On the other hand, a flood event could cause adverse effects to bat species and their habitats by washing away trees used by bats for roosting. For this reason, this adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Western mastiff bat, red bat, and *Yuma myotis*, all California species of special concern, could forage and roost in small numbers in the Phase 3 Repair Project area. Implementation of Alternative 1 could result in a reduction of foraging habitat quality where seepage berms and other seepage remediation measures are proposed over agricultural land, and freshwater marsh habitats. However, the grassland and ruderal vegetation that normally covers seepage berms and similar areas could continue to provide some foraging habitat if Alternative 1 is implemented. Potential roosting habitat exists in two substantial oak groves with very large oak trees in elements IIIb and IVa (**Tables 3.6-5 through 3.6-7**) that could contain large cavities. These and other smaller trees in the Phase 3 Repair Project area could potentially provide additional roost sites for a small number of bats but are not expected to support large numbers or provide important maternity roost sites. Bat foraging habitat is locally and regionally abundant, and no important roosting sites are known to exist within the Phase 3 Repair Project area. However, focused bat surveys have not been conducted in the project area. If a large night roost or a maternity roost occurs in the project area and would be removed during project construction, this could result in a reduction in populations of these bat species, if present. Therefore, this adverse effect would be **potentially significant**.

Alternative 2: Maximum Footprint Alternative

In addition to potential losses of landside riparian habitat under Alternative 1, one or two possible seepage berms and two or three possible setback levees implemented under Alternative 2 would increase losses of potential foraging and roosting habitat for bats (**Tables 3.6-5 through 3.6-7**). While construction of setback levees would increase areas of active floodplain along the San Joaquin River that could create new foraging and roosting habitat for bats, other activities under Alternative 2 would still affect potentially suitable foraging and roosting habitat. Loss of occupied roosting sites could result in a reduction of these bat species. Therefore, under Alternative 2, this adverse effect would be **potentially significant**.

Requester's Preferred Alternative

The loss of potential foraging habitat under the Requester's Preferred Alternative would be less compared to Alternatives 1 and 2 because eight elements included in Alternatives 1 and 2 (Ib, Ie, IIIa, IIIb, VIc, VIe, VIIb, and VIg) would not be included in the Requester's Preferred Alternative (**Table 3.6-7**). The adverse effects on potential roosting habitat under the Requester's Preferred Alternative would be less than Alternative 1 and slightly more than Alternative 2 (**Table 3.6-5**). Although construction of setback levees would increase areas of active floodplain along the San Joaquin River that could create new foraging and roosting habitat for bats, other activities under the Requester's Preferred Alternative still would affect potentially suitable foraging and roosting habitat. Loss of occupied roosting sites could result in a reduction of these bat species. Therefore, under the Requester's Preferred Alternative, this adverse effect would be **potentially significant**.

Mitigation Measure 3.6-k: Reduce Potential Loss and/or Direct Effects on Bat Species and Their Habitats by Implementing Avoidance and Minimization Measures.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

The following is a summary of SJMSCP measures to minimize incidental take of bat species. RD 17 will implement the following measures to offset impacts and conserve these species:

- Preconstruction surveys will be conducted by a qualified biologist before ground-disturbing activities to determine whether bat roosting sites are present.
- If colonial roosting sites that are located in trees or structures need to be removed, removal will occur outside the nursery and/or hibernation seasons and will take place during dusk and/or evening hours, after the bats have left the roosting site, unless otherwise approved pursuant to the SJMSCP.
- Nursery and hibernation sites will be sealed before the hibernation season (November through March) when hibernation sites are identified on the project site.

In addition to the above measures, protocol level surveys will be conducted to determine roosting sites before the construction season.

Responsibility: RD 17.

Timing: Before construction.

Implementation of Mitigation Measure 3.6-k would reduce effects on bat species to **less than significant** for Alternative 1, Alternative 2, and the Requester's Preferred Alternative because preconstruction surveys would be conducted and measures would be implemented to minimize adverse effects on roost sites and individual bats.

Effect 3.6-l: Disruption to and Loss of Existing Wildlife Corridors or Nursery Sites.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions and no adverse effects on wildlife corridors or nursery sites would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The effect of flood waters on wildlife corridors and nursery sites would depend on the timing, location, and duration of flooding. A levee failure could result in beneficial effects to wildlife corridors or nursery sites by increasing debris piles which may provide forage or resting locations for some species. However, a levee failure along any portion of the RD 17 levee system could also adversely affect wildlife by direct mortality or by the destruction of rearing/nursery locations, including den and nest sites. For this reason, this adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Riparian habitats can be important movement corridors for terrestrial wildlife species because riparian habitats are long, often wide, unbroken stretches of dense vegetation that provide good foraging opportunities and cover. The riparian cover in the Phase 3 Repair Project corridor, however, is limited by its often narrow width, a lack of contiguous tree and shrub cover, an absence of a natural floodplain, and disturbance from ongoing maintenance (e.g., vegetation removal, erosion repair) to preserve the integrity of the levee. As shown in **Figures 3.6-1a through 3.6-1c**, the riparian vegetation grows in small patches. Long sections of riverbank lack any trees or shrubs, where the vegetation would not provide better wildlife movement opportunities than the landside vegetation would. As a result, the riparian habitat adjacent to levees in the Phase 3 Repair Project area is not expected to provide unique or important wildlife movement habitat and it is not known to support wildlife nursery sites (e.g., heron or egret nesting colonies). The Phase 3 Repair Project therefore would not impede wildlife movement or the use of native wildlife nursery sites.

Under Alternative 1, landside seepage berms would remove occasional isolated patches of small riparian trees, shrubs, agriculture ditches and fields, and two substantial oak groves with extremely large valley oak trees in elements IIIa and IVc (**Tables 3.6-5 and 3.6-7**). The ability of landside portions of the levees in the Phase 3 Repair Project area to function as wildlife movement corridors is limited because areas of new and old residential development and a few large private estates obstruct and interfere with movement and the landside areas lack native vegetation overall. Although the occasional undeveloped areas along the landside of the levee could supplement the habitat along the river corridor, in terms of providing wildlife movement values, the removal of the landside woody vegetation in the project area would not substantially interfere with the movement of native resident or migratory fish or wildlife species. Habitat losses and conversions along the landside portions of the levees in the Phase 3 Repair Project area would not result in a substantial adverse effect on wildlife movement and survival within this corridor, nor would they impede native wildlife nursery sites. Therefore, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Alternative 2: Maximum Footprint Alternative

Potential effects on wildlife corridors under Alternative 2 are expected to be similar to those described under Alternative 1. Possible construction of one or two additional seepage berms and two or three setback levees proposed under Alternative 2 would increase losses of landside riparian where seepage berms are proposed to be constructed, and of agricultural, and drainage ditch habitat compared to losses of similar habitat under Alternative 1. However, this removal of additional landside vegetation still would not adversely affect the use of native wildlife nursery sites or interfere substantially with the movement of native resident or migratory fish or wildlife species for the same reasons as described for Alternative 1.

It should be noted that because setback levees are proposed to be constructed farther inland than the existing levee, which would be graded to ground elevation, the expansion of the San Joaquin River floodway could ultimately increase the movement corridor value on the waterside of the levee. Therefore, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Requester's Preferred Alternative

Potential effects on wildlife corridors under the Requester's Preferred Alternative would be similar to those described under Alternatives 1 and 2. Construction of seepage berms and a setback levee are expected to result in slightly less loss of landside riparian habitat compared to losses of similar habitat proposed under Alternative 1 and slightly more loss of landside riparian habitat compared to losses of similar habitat under Alternative 2. However, removal of additional landside vegetation still would not adversely affect the use of native wildlife nursery sites or interfere substantially with movement of native resident or migratory fish or wildlife species for the same reasons as described for Alternative 1.

Only a portion of the existing levee would be removed in element IVc under the Requester's Preferred Alternative. However, this still would increase the area of active floodplain along the San Joaquin River, which ultimately could increase the movement corridor value on the waterside of the setback levee. Therefore, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Effect 3.6-m: Potential Adverse Effects on Local Plans and Policies, Including Successful Implementation of the SJMSCP.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, there would be a continuation of existing conditions and no adverse effects related to plans and policies intended to protect vegetation, wildlife, and fishery resources would result. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. While a levee failure along any portion of the RD 17 levee system could result in flooding that could benefit habitat conditions through mechanisms such as deposition of soil nutrients and providing opportunities for habitat restoration, a flood event could also result in scouring of some areas adversely affecting native habitats and agricultural lands that provide habitat values that play a part in implementing local plans and policies intended to protect vegetation, wildlife, and fishery resources. The extent of any damage or benefits is uncertain and would depend on the location, timing, intensity, and duration of flood events. However, because a levee failure would have the potential to result in adverse effects on habitat conditions, the adverse effect related to plans and policies intended to protect vegetation, wildlife, and fishery resources would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1; Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Implementing Alternative 1, Alternative 2, or the Requester's Preferred Alternative would not develop land within SJMSCP permit areas except for purposes of upgrading Phase 3 Repair Project levees within the RD 17 levee system. These upgrades would include repairs to levees, placing fill material for seepage berms and potentially setback levees. No seepage remediation measures being considered as part of the Phase 3 Repair Project would intersect with lands considered for preservation under the SJMSCP. Therefore, implementation of Alternative 1, Alternative 2, or the Requester's Preferred Alternative would not directly conflict with the implementation of, or any provisions within the SJMSCP.

The construction of Alternative 1, Alternative 2, or the Requester's Preferred Alternative could conflict with strategies, goals, policies, or specific ordinances applicable to San Joaquin County or the city of Lathrop that are intended to protect unique biological resources and habitats because, even though the project is designed to minimize effects on biological resources to the extent feasible and to mitigate unavoidable effects, under either alternative, unique biological resources and habitats could be affected. Therefore, this adverse effect would be **potentially significant**.

Mitigation Measure 3.6-m: Reduce Potential Effects on Local Plans and Policies, Including Successful Implementation of the SJMSCP by Implementing Avoidance and Minimization Measures for Sensitive Biological Resources and Habitats.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Mitigation Measures 3.6-a through 3.6-k will be implemented.

Responsibility: RD 17.

Timing: Before and during construction.

Implementation of Mitigation Measures 3.6-a through 3.6-k would reduce adverse effects on sensitive biological resources and habitats sufficiently to achieve compliance with the intent of adopted local plans and policies intended to minimize effects on these resources. Therefore, after mitigation, this potential adverse effect would be reduced to **less than significant**.

3.6.5 Residual Significant Effects

Because mitigation would not be required for the No-Action Alternative, all adverse effects under this alternative would remain significant and unavoidable.

Implementation of Mitigation Measures 3.6-a through 3.6-i and 3.6-k through 3.6-m would reduce significant and potentially significant adverse effects related to terrestrial and aquatic biological resources under Alternatives 1 and 2 and the Requester's Preferred Alternative to a less-than-significant level.

Implementation of Mitigation Measure 3.6-j, "Reduce Potential Loss of or Disturbance to Riparian Brush Rabbit and Their Habitats," would reduce adverse effects on riparian brush rabbit under Alternatives 1 and 2 and the Requester's Preferred Alternative through preconstruction surveys, avoidance, and/or trapping, combined with compensatory mitigation that would be implemented for any potential habitat loss, but not to a less-than-significant level. The Phase 3 Repair Project could restrict the range of this endangered species; therefore, the adverse effect would remain potentially significant and unavoidable.

3.7 Cultural Resources

This section discusses existing cultural resources within the Phase 3 Repair Project area and surrounding areas, identifies applicable Federal and state laws and regulations, and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to cultural resources. A discussion of cumulative effects related to cultural resources is provided in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements," of this FEIS.

3.7.1 Regulatory Setting

As required under NEPA, applicable Federal laws and regulations are identified in this section. State laws and regulations applicable to implementation of the Phase 3 Repair Project by RD 17 are described for informational purposes and to assist with NEPA review. RD 17 also has considered regional and local plans and ordinances as a part of the environmental review process for this FEIS, where applicable to the Phase 3 Repair Project.

Federal

Americans Indian Religious Freedom Act of 1978

The American Indian Religious Freedom Act of 1978 established "the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions…including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites" (Public Law [PL] 95-431). Consultations with Native Americans to determine concerns regarding the Phase 3 Repair Project are discussed in the "Methodology" section in Section 3.7.3 and Chapter 6, "Consultation and Coordination."

Native American Graves Protection and Repatriation Act

If human remains are found on lands owned by the Federal government within the project Area of Potential Effects (APE) as a result of project-related ground-disturbing activities, they must be treated in accordance with the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S. Code [USC] 3001 et seq.). NAGPRA requires Federal agencies and certain recipients of Federal funds to document Native American human remains and cultural items within their collections, notify native groups of their holdings, and provide an opportunity for repatriation of these materials. NAGPRA also requires planning to deal with potential future collections of Native American human remains and associated funerary objects, sacred objects, and objects of cultural patrimony.

NAGPRA regulations (PL 101-60125 USC 3001–3013) follow a systematic process to determine the rights of lineal descendants, Indian tribes, and Native Hawaiian organizations to certain Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony with which they are affiliated. These regulations pertain to the identification and appropriate disposition of human remains, funerary objects, sacred objects, or objects of cultural patrimony that are:

(i) In Federal possession or control; or

(ii) In the possession or control of any institution or State or local government receiving Federal funds; or

(iii) Excavated intentionally or discovered inadvertently on Federal or tribal lands.

These regulations apply to human remains, funerary objects, sacred objects, or objects of cultural patrimony that are indigenous to Alaska, Hawaii, and the continental United States, but not to territories of the United States. Throughout these regulations are decision points that determine their applicability in particular circumstances (e.g., a decision as to whether a museum "controls" human remains and cultural objects within the meaning of the regulations or a decision as to whether an object is a "human remain," "funerary object," "sacred object," or "object of cultural patrimony" within the meaning of the regulations). Any final determination making the act or these regulations inapplicable is subject to review, pursuant to Section 15 of NAGPRA.

No Federal land is present within the project footprint, so NAGPRA would not apply to the Phase 3 Repair Project.

Archaeological Resources Protection Act

The Archaeological Resources Protection Act (ARPA) of 1979, as amended, and its implementing regulations (43 Code of Federal Regulations [CFR] Part 7) established uniform definitions, standards, and procedures to be followed by all Federal land managers to provide protection for archaeological resources located on public lands and Indian lands in the United States. ARPA requires a permit for lawful excavation and artifact collection, penalties for violations, and coordination with other laws governing cultural resources on public lands. No archaeological excavations on Federal land are expected to be necessary for the Phase 3 Repair Project, and therefore ARPA would not be likely to be applicable. No action is required for compliance with ARPA unless archaeological excavation on public land becomes necessary.

Executive Order 13175

Executive Order 13175 was enacted in November 2000. It states that when formulating or implementing policies that have tribal implications, Federal agencies are to respect Indian tribal self-government, honor tribal treaties and other rights, and in respect to Federal statutes and regulations administered by Indian governments, give Indian tribal governments the maximum administrative discretion possible. When formulating and implementing policies that have tribal implications, Federal agencies are to encourage Indian tribes to develop their own policies, defer to Indian tribes to establish standards where possible, and consult with tribal officials regarding the need for Federal standards and any alternatives that would limit the scope of Federal standards or otherwise preserve the prerogatives and authority of Indian tribes. Federal agencies are to have an accountability process to achieve meaningful and timely input from tribal officials.

National Historic Preservation Act of 1966, as Amended

Section 106 of the National Historic Preservation Act and its implementing regulations (36 CFR Part 800, as amended in 2004) require Federal agencies to consider the potential effects of their proposed undertakings on historic properties. Historic properties are cultural resources that are listed in, or are eligible for listing in, the National Register of Historic Places (NRHP) (36 CFR Section 800.16[l]). Undertakings that must be considered include activities directly carried out, funded, or permitted by Federal agencies. Federal agencies also must allow the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation an opportunity to comment on the proposed undertaking and its potential effects on historic properties.

Federal agencies typically comply with Section 106 by performing the following actions:

- initiating the Section 106 process (36 CFR Section 800.3) by identifying the undertaking (Federal action that could affect historic properties) and consulting parties such as the SHPO, Native American tribes, interested members of the public, and state and local agencies;
- defining an area of potential effects (APE), the geographic area in which the undertaking could affect historic properties in consultation with the SHPO;
- identifying historic properties, resources eligible for inclusion in the NRHP (36 CFR Section 800.4) within the APE;
- assessing the effects of the undertaking on historic properties within the APE (36 CFR Section 800.5); and
- resolving adverse effects on historic properties, if any (36 CFR Section 800.6).

Adverse effects are resolved by identifying ways to minimize or avoid effects on historic properties. Typical actions taken to resolve adverse effects include excavation of archaeological sites to retrieve materials before damage occurs, documentation (in photographic form) for historic buildings before they are altered, or preservation of such resources in place when possible.

California Law Governing Discoveries of Human Remains

California Health and Safety Code Section 7050.5(b) governs discoveries of human remains (including remains found in historic or prehistoric archaeological sites). In the event of a discovery, the relevant county coroner is notified. The coroner determines if an investigation of the cause of death is required. If the discovered remains consist of a prehistoric Native American burial, the coroner shall contact the Native American Heritage Commission (NAHC) within 24 hours after determining that the remains are subject to the jurisdiction of the NAHC (California Health and Safety Code Section 7050.5[c]).

Within 48 hours of notification of a discovery, the NAHC is required to identify a most likely descendant (MLD) to provide the MLD with the opportunity to reinter the remains with appropriate dignity (PRC Section 5097.98[a]).

3.7.2 Environmental Setting

Natural Setting

The Phase 3 Repair Project area is situated in the Great Valley geomorphic province, which contains the Central Valley and the Delta. The northern portion of the valley is drained by the Sacramento River, while the southern portion is drained by the San Joaquin River. The two rivers merge and form the system of channels and marshes that make up the Delta. Prehistoric populations were concentrated along the river channels and in the vicinity of the Delta, as these were the areas with the richest available natural resources. The dominant native vegetative communities in this area are prairie grasslands and tule marshes, with some areas of riparian woodland (Kuchler 1977). Vegetation tended to be sparse within the prairie grasslands, limited to grasses and flowering herbs. However, a single valley oak could produce 300–500 pounds of acorns each year (Baumhoff 1963), and tule roots could be ground into meal to supplement the abundant faunal resources (Wallace 1978). Native Americans burned off the grasslands annually to increase the following year's seed crop (Cook 1960). In addition, tule supplied reeds for housing, clothing, rafts, and baskets.

With the coming of Euro-American settlement, the natural character of the region changed considerably. Although the region is still dominated by river channels and riparian and wetland settings, seasonal flooding has been largely eliminated by the construction of extensive levee systems, and much of the natural vegetation and many landforms have been eliminated by large-scale agricultural pursuits.

Prehistoric Setting

The earliest well-documented human expansion into California occurred at the beginning of the Paleo-Indian Period (10,000–6,000 Before Present [B.P.]). Social units are thought to have been small and highly mobile. Known sites have been identified within the contexts of ancient pluvial lake shores and coast lines, as evidenced by such characteristic hunting implements as fluted projectile points and chipped stone crescent forms. Prehistoric adaptations over the ensuing centuries have been identified in the archaeological record by numerous researchers working in the area since the early 1900s, as summarized by Fredrickson (1974) and Moratto (1984).

Beardsley (1948), Lillard et al. (1939), and others conducted numerous studies that form the core of our early understanding of upper Central Valley archaeology. Little has been found archaeologically that dates to the Paleo-Indian or the Lower Archaic (6,000–3,000 B.P.) time periods; however, archaeologists have recovered a great deal of data from sites occupied by the Middle Archaic period (3,000–1,000 B.P.). The lack of sites from earlier periods may result from high sedimentation rates, leaving the earliest sites deeply buried and inaccessible. During the Middle Archaic Period, the broad regional patterns of foraging subsistence strategies gave way to more intensive procurement practices. Subsistence economies were more diversified, possibly including the introduction of acorn-processing technology. Human populations were growing and occupying more diverse settings. Permanent villages that were occupied throughout the year were established, primarily along major waterways. The onset of status distinctions and other indicators of growing sociopolitical complexity mark the Upper Archaic Period (1,000 B.C. to A.D. 500). Exchange systems became more complex and formalized, and evidence of regular, sustained trade between groups was seen for the first time.

Several technological and social changes characterized the Emergent Period (A.D. 500–1800). The bow and arrow were introduced, ultimately replacing the dart and atlatl (dart-throwing tool). Territorial boundaries between groups became well established. It became increasingly common that distinctions in an individual's social status could be linked to acquired wealth. Exchange of goods between groups became more regularized with more goods, including raw materials, entering into the exchange networks. In the latter portion of this period (A.D. 1500–1800), exchange relations were highly regularized and sophisticated. The clamshell disk bead was a monetary unit for exchange, and increasing quantities of goods moved greater distances. Specialists arose to govern various aspects of production and exchange.

Three time periods are well represented in archaeological assemblages in the general vicinity of the Victoria Island/Byron Tract area. These assemblages are discussed in detail in Moratto (1984) and summarized here. The Windmiller Pattern (3,000–1,000 B.C.) of archaeological assemblages included an increased emphasis on acorn use, as well as a continuation of hunting and fishing activities. Ground and polished charmstones, twined basketry, baked-clay artifacts, and worked shell and bone were hallmarks of Windmiller culture. Widely ranging trade patterns brought goods in from the Coast Ranges and trans-Sierran sources, as well as closer trading partners. The Berkeley Pattern (1,000 B.C. to A.D.

500) represented a greater reliance on acorns as a food source than was previously seen. Distinctive stone and shell artifacts distinguished it from earlier or later cultural expressions. The Berkeley Pattern appears to have developed in the San Francisco Bay Area and was spread via the migration of Plains Miwok Indians. The Augustine Pattern (A.D. 500 to the Historic era) is characterized by an increase in populations resulting from more intensive food procurement strategies, as well as a marked change in burial practices and increased trade activities.

Ethnographic Context

The Northern Valley Yokuts occupied the RD 17 area and surrounding region—that is, the land on each side of the San Joaquin River from the Delta to south of Mendota. The Diablo range probably marked the Yokuts' western boundary (Wallace 1978) and the eastern edge would have lain along the Sierra foothills. Yokuts' occupation of the northern parts of the range may be relatively recent, as linguistic evidence points toward an earlier Miwok occupation. The Yokuts gradually expanded their range northward, and clearly occupied the area during the Spanish Colonial period, as evidenced by mixed historic and prehistoric artifact assemblages. The late prehistoric Yokuts may have been the largest ethnic group in precontact California.

Euro-American contact with the Northern Valley Yokuts began with infrequent excursions by Spanish explorers traveling through the Sacramento–San Joaquin Valley in the late 1700s and early 1800s. Many Yokuts were lured or captured by missionaries and scattered among the various missions, although many escaped and returned to the valley. Yokut raiding parties taking animals from Spanish (and later Mexican) livestock herds became prevalent, leading to retaliatory action by the Euro-American settlers, which often led to the deaths of numerous Yokut individuals. However, major effects on the native peoples of the region came with the malaria epidemic of 1833 that decimated the population, killing thousands of Yokuts and people of surrounding groups. The influx of Europeans during the Gold Rush era further reduced the population through disease and violent relations with the miners. Although there was no gold within the Yokuts territory, miners passing through on their way to the diggings caused some upheaval. Former miners, who had seen the richness of the San Joaquin Valley on their way east, later returned to settle and farm the area (Wallace 1978), further displacing the remaining native populations.

Historic-Era Context

The Delta is a region that has been heavily modified by flood-damage reduction and agricultural activities since the mid-19th century. The "islands," canals, river channels, and general topography seen today bear little resemblance to how the region appeared when it was first seen by Euro-Americans in the early 1800s. For the purposes of this project, the westernmost RD 17 levees, one of the most prominent historic-era landscape modifications in the immediate area, is of special interest because this structure would be affected by the construction of the Phase 3 Repair Project.

Early Exploration and Settlement

The earliest recorded European explorations of the area around present-day RD 17 occurred in 1806 and 1808. Two expeditions led by Alferez Gabriel Moraga and Father Pedro Muñoz passed through the general region in search of suitable mission sites (Beck and Haas 1974). In general, these earliest expeditions to the interior lands were peaceful in nature and the contemplated missions never materialized, although by 1813 some explorations took on a more belligerent course, in part, through their pursuit and capture of neophytes escaped from the coastal missions. Other early Euro-American contact with the native populations began in the late 1820s, when trapper Jedediah Smith traveled into the San Joaquin Valley and Peter Ogden of the Hudson's Bay Company scouted the Sacramento Valley as far south as Stockton. Substantial Euro-American settlement and development did not occur, however, in the RD 17 area until Antonio M. Pico was granted the 35,546-acre Rancho El Pescador in 1843. Long after the change from Mexican to U.S. control in 1846, the land was patented on March 10, 1865, to Pico and Henry M. Naglee, who was one of the earliest area property holders to reclaim land in the Delta region (Beck and Haase 1974; Thompson 1958; West 1994).

Settlements in the Delta, initially situated on naturally formed levees created by the merging of floodplains and tidal environments, consisted of single-family farms and farm labor camps. However, in the central Delta, sediments consisted primarily of peat, and the natural levees were poorly developed. The earliest attempt at reclamation and levee construction in the Delta occurred in 1852 on Merritt Island and the east bank of the Mokelumne River (Thompson 1958:211). Most early levees, including the 1852 Merritt Island levees, were referred to as "shoestring" levees, a term that expressed their hasty and often inadequate construction, which offered little protection beyond periodic high tides. The early shoestring levees and even later structures built in the 1860s and 1870s rarely remained intact for more than 1 or 2 years and required frequent repairs and upgrades.

Apart from difficulties, such as substandard materials and often inadequate engineering, the early years of levee construction in the Delta were disorganized. Higher levees on one tract would lead to flooding on a neighboring tract with lower levees. For example, the levees constructed on Union Island (located several miles west of RD 17) in the 1870s were very different from others in the area, as they started out as fairly large structures, averaging 50 feet in width at the base, 8 feet in height, and were set back 200 feet from the rivers. Most early levees in the Delta, on the other hand, were initially much smaller and were only expanded and enhanced as the need arose on a virtually seasonal basis (Thompson 1958).

Delta Land Reclamation: Overview

As economic investment in the Delta increased, a great period of land reclamation began in the late 1860s and peaked during the 1870–1880 period, when some 92,000 acres of Delta land were leveed and reclaimed (see **Table 3.7-1**).

Table 3.7-1. Delta Land Reclamation Growth by Acres (1860–1930)

Decade	Area Reclaimed (acres)	Cumulative Area (acres)
1860–1870	15,000	15,000
1870–1880	92,000	107,000
1880–1890	70,000	177,000
1890–1900	58,000	235,000
1900–1910	88,000	323,000
1910–1920	94,000	417,000
1920–1930	24,000	441,000

Source: Thompson 1958

This number was not surpassed until the 1910–1920 period, when an additional 94,000 acres were reclaimed. Key factors that led to the 1870s being such an active period of reclamation were the establishment of large reclamation companies and technological advances in pumping and dredging.

Two large firms, the Tide Land Reclamation Company, directed by George Roberts, and the Glasgow-California Land and Reclamation Company, directed and predominately owned by Morton Fischer, were formed in the 1860s and dominated reclamation activities in the Delta well into the 1880s. Roberts believed that the higher land values associated with reclamation would bring higher returns on investment than could be attained from mining property (Thompson 1958:227). His first venture was at Twitchell Island. In all, Roberts accumulated 250,000 acres of Delta land by acquiring swampland claims from 50 cents to $3 per acre plus fees. To finance part of these purchases, he relied on the backing of Oakland and San Francisco capitalists who invested in his newly formed Tide Land Reclamation Company. The total value of the capitalization was set at $12 million and consisted of 120,000 acres of property located in the Yolo Basin; the back swamps to the south of Courtland, Grand, Brannan, Twitchell, Andrus, Tyler, Staten, Roberts, and Union Islands; and the east central Delta.

Levee Construction

In the early days of reclamation (before circa 1870), the use of locally obtained tule sod and fill excavated from borrow ditches dug outside new levees were the primary sources of levee construction materials (Thompson 1958:240). However, tule sod was found to be inferior in that cracks and surface irregularities developed as the material dried, resulting in the levee losing one-third to one-half of its original volume (Thompson 1958:240). At first, borrow trenches were placed just outside the toe of the levee. However, this produced a weak point at the base of the levee and often resulted in the failure of the structure, particularly at river and channel bends. Once this deficiency became apparent, the borrow ditches were set back from the base of the new levee. This method, while reducing the amount of reclaimed land available for agriculture or other developments, resulted in reduced flood risks associated with building around river and channel bends. The strength of the levees was increased further by planting willows, cottonwoods, and tules that decreased damage caused by wave action (Thompson 1958:241–242). Levees constructed in peat areas necessitated constant maintenance. In the early 1900s, when peat island reclamation in the southern Delta was booming, it was necessary to maintain shrinking levees every 1–3 years, so that they retained some degree of stability (Thompson 1958:253).

By 1870, innovative dredges were being widely employed in the construction of levees. These enabled the use of a wider variety of fill materials, such as fluid and compacted clays from channel floors underlying the peat. For some levees, clay was used to build the entire embankment; and for others, clay was used as a core material with a covering of less pervious materials. However, during the late 1870s, levees were still being built primarily with peat blocks. For example, at nearby Union Island, these blocks were fitted into a wall that rose 10 feet from a 9-foot-wide base to a 3-foot-wide crown, and a duplicated wall was erected 8 feet to 12 feet inside the first, with the space between the walls filled with dredged sand.

One of the Tide Land Reclamation Company's more advanced dredges, in use by October 1876, was designed by A. A. von Schmidt. This dredge employed an auger to loosen river bottom sediments and a massive suction hose to relocate the spoils for use in levee construction. Later designs, such as the Ferris-Smith dredge, could move up to 125 cubic yards of soil an hour. Fischer's Glasgow-California company had 13 such dredges in constant operation in the Delta in 1880. At their peak, this machinery moved 25,000 cubic yards per day—amounts surpassed in their era only during the construction of the Suez and Panama Canals (Thompson 1958:270).

Despite their efficiency in the excavation and placement of levee-building materials, the use of dredgers did not reduce the risk of levee failure. From around 1900 to 1957, every levee break that occurred in the Delta was attributed to compression and the displacement of levee foundations. At first, the ruptures occurred on the channel side, as plastic clays oozed from under the levee into dredger cuts. However, as the subsidence of the Delta islands reduced the interior elevation of reclaimed tracts, the rupture of levee foundations became more common on the inward side of the levee. This potential for failure was eventually forestalled by covering the land side of the levee toe for about 50 feet with a blanket of sand or clay (Thompson 1958:247).

Reclamation District 17

According to Thompson (1958:482–484), in the southern Delta, only Grand Island (RD 3) and RD 17 have maintained their organizational and areal integrity since the 1860s, with other districts having been reorganized several times. RD 17 was completely leveed along the San Joaquin River by early 1864, but, as with most Delta levees, they periodically required seasonal repairs. At RD 17, such repairs were necessary in response to the winters of 1868 and 1875, but by 1877 the entire levee system was strengthened and enlarged, and the entire district had been reclaimed for agricultural purposes. RD 17's newly strengthened levees held up against the winter and spring floods of 1878, although levee breaks were documented in 1901 and 1911. Since that time, the district's levees have been continually upgraded and modified to a point where, in terms of size and overall configuration, they bear little resemblance to their 19th century counterparts.

Farming in the Sacramento–San Joaquin Delta

Rich fertile soils coupled with a favorable climate have historically resulted in high productivity within the lower Delta regions. In addition, the land is basically flat and easy to grade, excavate, irrigate, and otherwise manipulate with mechanized equipment given the lack of hardpan, gravels, or rock. Furthermore, the soils are rich in nitrogen, and initially the application of fertilizer was not required (Thompson 1958:307). The following sections provide an overview of historical farming practices within the Delta.

The Early Period (1849–1900)

Early farming consisted primarily of subsistence gardening during and following the Gold Rush, and was fostered by the proximity of the region to the markets located in San Francisco and the goldfields of the Sierra Nevada foothills. At first, the primary crops were tended by people of various nationalities on higher lands (natural levees and rises) and consisted primarily of potatoes, onions, and beans, among other perishable crops. Beef cattle were grazed during the summer months in the tule swamps. Later in the 1870s, fruits, grains, and dairy products were also profitable commodities originating in the Delta (Thompson 1958:309).

The growth of the agricultural industry in the Delta was steady, and by 1852 the banks of the San Joaquin River were entirely occupied by relatively small-scale farming operations. In the late 1870s, market gardens near Stockton were developing into formidable competitors for the San Francisco produce trade, which had been dominated by Santa Clara Valley and other areas peripheral to the bay. By 1883, large tonnages of garden vegetables were moving to San Francisco, with a day's harvest picked up by river steam ships that landed at San Francisco the morning after harvest. Other short-lived markets were located at the coal-mining towns of Nortonville, Sommersville, and Judsonville near Mount Diablo. Produce prices were relatively high and were reflected in the price of the land paid by tenant farmers. For example, Chinese and Italian gardeners leased land to the east of Antioch and along Old River for $10 to $20 per acre per year in the 1870s and 1880s (Thompson 1958).

By the 1870s, when reclamation efforts by land development companies were well underway, the region was flourishing, and various farming endeavors became associated with various ethnic groups. Chinese, Italian, and Portuguese tenant farmers were identified with garden or truck farming, with the Chinese becoming specialists in row crops such as potatoes. American-born settlers of European descent tended to be engaged in grain, orchard, and livestock husbandry. These European lessees were mainland residents and “island” settlers who typically lived within 1 mile of the river. Their houses occupied slight alluvial prominences amid the grain fields. Some of the farm structures had been built by land developers as base camps for the reclamation and land clearing crews.

It was also at this time that large-scale irrigation began to be developed and employed. Initially, water was delivered through tidal gates and drainage ditches. Filled mains backed water into field ditches to a depth of 2–4 feet, which fed spreader ditches from 6 inches to 2 feet in depth and spaced at intervals of 65–85 feet. Maintenance of these irrigation systems was the responsibility of the tenant farmer, while the drainage system was the responsibility of the reclamation district. Although water wheels, windmills, and low-head pumps were used on higher alluvial tracts, those of the lower Delta relied on siphons and gravity flow. However, the majority of the land in the area was without irrigation as late as 1898, when to save grain crops, the Moss Tract levee was breached to admit water, and a steamer was used to pump water onto Rough and Ready Island (Thompson 1958:312–315).

The Growth Period (1900–1924)

Thompson (1958:312) indicates that the transition of the Delta region from garden to field agriculture is primarily a 20th century phenomenon. While large acreage continued to be reclaimed, the impetus for the expansion in production appears to be the introduction of electric pumps, which were in wide use by 1905 and 1906, replacing the previously used steam- and horse-powered devices. Electricity was provided by a network of transmission and distribution lines, the construction of which peaked between 1911 and 1915.

In the early part of the 20th century, the majority of Delta acreage was planted in barley, with potatoes being the most valuable crop, followed by beans and then asparagus. Other crops included onions, field corn, celery, sugar beets, sweet potatoes, flax and flaxseed, wheat, alfalfa, and rye. In the 1900–1901 season, reclamation districts with large acreages of potatoes included Union Island (present-day Victoria and Woodward Islands), Roberts Island, and much of the land in RD 17 and elsewhere in the southern Delta region. The following year, the total acreage in potato cultivation in this area was approximately 18,000 acres and yielded a total harvest of 2 million sacks at a price of $1.00 each. Therefore, potatoes were considered a highly profitable crop and many people were employed in the harvesting of this crop. It should be noted that for “virgin” land and land which had recently been flooded, potato was the preferred crop because of its ability to effectively compete with weeds and because of its high profitability. In 1902, 28,000 acres of potatoes were planted in San Joaquin County on newly reclaimed land, as the older potato districts of the Sacramento River region declined as a result of disease and floods in the middle of the planting season.

It was during this time that potato wholesalers, such as George Shima, established themselves. He was the first to use a trademark—a red bag—and was the first to wash and grade potatoes for market. He was interested in developing virgin peat soils, and by 1906 or 1907 he had cornered much of the local crop, earning him the title of the “potato king” (Thompson 1958:334–335).

By 1916, barley appears to have been the most important Delta crop in terms of acreage, with 120,000 acres in the Delta region east of the Old River, including Victoria Island (part of Union Island) and the

Mokelumne North Fork. Beans and potatoes were second with 30,000 acres each, with far less acreage planted in onions, sugar beets, field corn, and celery. While figures are not available for other areas, Thompson believed that similar trends were represented in the remainder of the Delta region (Thompson 1958:314).

A change in earlier farming practices occurred after World War I, when small family operations quickly gave way to heavily industrialized farms. Industrial farming came about with an increase in mechanization, the use of contract day labor rather than sharecropping, increased use of fertilizer, and a move away from a traditional potato-barley-beans rotation. Gains in planted acreage were associated with field corn, sugar beets, celery, and onions within the San Joaquin region, while asparagus and sugar beets became more prevalent in the Sacramento River districts.

Large-Scale Agriculture (1924–1957)

During the period from roughly 1924 to 1957, winter grain and asparagus ranked first and second among Delta crops in terms of acreage, followed by corn and alfalfa. Large concentrations of beans also continued to be grown on Union Island in 1924 but declined gradually after that year. By 1945, there were 62,300 acres of asparagus planted in the Delta, which became the major producing area for this crop. Union, Victoria, and Lower Roberts Islands, and the Fabian, Clifton Court, Byron, Wright, and Shima tracts had concentrations of acreage planted in asparagus. By 1952, the total acreage of asparagus increased to 75,800 acres, 95 percent of which were located in the San Joaquin River districts, compared to 1916 when only 16 percent of the Delta was planted in asparagus (Thompson 1958:343–344). By 1957, asparagus had a value of $11 million, with the Delta crop representing approximately one-half of the nation's production (Thompson 1958:350).

Mechanization, including irrigation systems, continued to increase in popularity and, coupled with the increased use of fertilizer, led to increased agricultural production. While markets expanded in volume, the same basic crops continued to be grown in the Delta for the past 150 years. Asparagus has remained one of the most important crops in spite of its labor-intensive harvest; requiring up to one worker per acre at harvest time. Prior to World War I, laborers were usually of Japanese, Chinese, and Native American descent, with Filipino and Mexican nationals dominating the workforce after the war (Thompson 1958:339). This pattern of shifting immigrant groups working in the Delta mirrors the trends seen during the 1880s, when various ethnic groups worked on constructing the canals and levees that made the Delta region one of the most important agricultural centers in the United States.

3.7.3 Methodology and Thresholds of Significance

Methodology

This section describes the methods used to identify and evaluate potential effects on cultural resources that may be affected by the Phase 3 Repair Project. To identify resources within the project footprint, AECOM consulted with NAHC, local Native American individuals and organizations in San Joaquin County, the California Historical Resources Information System, existing cultural resources inventory reports, and the California State Land Commission's shipwreck database.

Native American Tribal Consultation

NAHC maintains a database of sacred lands and places of significance to California Native Americans, as well as contact lists for Native Americans individuals and organizations by county. To identify sacred lands and individuals and organizations that could have information about the project, AECOM contacted the NAHC by e-mail on April 8, 2010. The NAHC responded by letter on May 24, 2010, indicating that there were no identified resources in or near the Phase 3 Repair Project area in the Sacred Lands File, and supplying a list of Native American individuals and organizations within San Joaquin County. AECOM then contacted each individual or organization by letter, requesting any information regarding known resources within the Phase 3 Repair Project area. In compliance with Executive Order 13175, USACE conducted government to government consultation with potentially affected Tribes. On May 16, 2011, and May 28, 2014, USACE sent letters to affected tribes requesting additional information about locations or archaeological sites and areas of traditional cultural value or concern within the described Phase 3 Repair Project area. Because of changes to the project footprint, AECOM sent letters to the affected tribes informing them of the changes on May 28, 2014. To date, no additional information concerning these types of resources have been received by USACE or AECOM (**Appendix F**).

Information Center Records Search

A record search was requested for the entire Phase 3 Repair Project footprint at the Central California Information Center (CCIC) of the California Historical Resources Information System on June 4, 2010. The CCIC responded the same day as the request, June 4, 2010. Their response included a list of all identified cultural resources within a 0.25-mile radius of the Phase 3 Repair Project area (listed in **Table 3.7-2**), as well as a search of the following lists, registers, and maps:

- California Office of Historic Preservation’s Historic Property Directory and Determination of Eligibility (2006),
- the NRHP and the California Register of Historical Resources (CRHR) (2006),
- California Inventory of Historic Resources (1976 and updates),
- Historic Properties Directory (2006),
- California Historical Landmarks (1996 and updates),
- California Points of Historical Interest (1992 and updates),
- California Department of Transportation Local Bridge Survey (1987), and
- various historic maps.

Because of changes to the Phase 3 Repair Project footprint, AECOM conducted an update to the records search at CCIC on June 3, 2014.

The CCIC also provided records and mapped locations for previously identified resources in the Alternative 2 project footprint. Because of the sensitive nature of many cultural resources and the potential for looting and damage, specific location information is not provided for any resources identified in this section, although items such as bridges and historic landmarks are easily identifiable.

Previous Inventory and Management of Resources in the Phase 3 Repair Project Area

The CCIC indicated that 36 investigations had been performed previously on and within 0.25 mile of the project features, covering the majority of the Phase 3 Repair Project area. These investigations are listed in **Table 3.7-3**.

The degree of previous survey coverage and the nature of recorded resources in and near the Phase 3 Repair Project area indicate that the nature and density of resources identified in and near the Phase 3 Repair Project area offer a good sample of the kinds of resources that may be encountered during reconnaissance surveys to reach 100 percent survey coverage, as well as the overall sensitivity of the vicinity for cultural resources.

California State Lands Commission Shipwreck Database

On December 12, 2011, an AECOM cultural resources specialist searched the California State Land Commission's shipwrecks database. As a result of this database search, no recorded shipwrecks were identified directly within the Phase 3 Repair Project area or within the river along the levees near the project sites.

Cultural Resources Inventory

A cultural resources inventory was conducted for the Phase 3 Repair Project Area (AECOM 2011) and includes a description of the methods and results of the investigation. This report describes the results of a cultural resource inventory that identifies cultural resources within the APE, evaluates those resources for listing in the NRHP, and makes a finding of effect, as required in Section 106 of the National Historic Preservation Act (36 CFR Part 800).

All aspects of the cultural resources inventory were conducted in accordance with the *Secretary of the Interior's Standards and Guidelines for Identification of Cultural Resources* (48 CFR 44720–44723). AECOM's Cultural Resources Inventory Report for the RD 17 Phase 3 Repair Project (AECOM 2011) documentation followed the guidance outlined in *Instructions for Recording Historical Resources* (OHP 1995). Because archival research and review indicated that the entire APE had been surveyed for previous investigations conducted primarily by EDAW (now AECOM) and ECORP, it was not deemed necessary to repeat these intensive surveys.

Consequently, AECOM cultural resources specialists conducted a reconnaissance-level survey intended to review the accuracy of previous studies and revisit any documented cultural resources to update existing records if necessary. This reconnaissance survey was conducted along the levee and included a pedestrian examination of the levee and adjacent portions of the APE where ground-disturbing work would take place. These regions were examined on foot, with an archaeologist walking at approximately 20-meter intervals on May 12 and 13, 2008, and July 14, 2010. Some of the sections that previously were surveyed now are covered with mixed commercial, residential, and agricultural development. Two resources were identified within the APE: the Silviera Ranch Complex (P-39-004602) and the levee that forms the western boundary of the basin protected by the Silviera Ranch Complex, were previously determined to be ineligible for listing in the NRHP by the California Office of Historic Preservation (OHP 2007). This report recommends them also as ineligible for listing in the CRHR. Accordingly, the confidential cultural resources inventory report made a finding of no historic properties affected as per 36 CFR Part 800.4(d)(1). This report was submitted to USACE for review. USACE provided this report

Table 3.7-2. Identified Cultural Resources in and Near the Phase 3 Repair Project Area

Resource Identifier	Description	Eligibility Status
Cultural Resources Identified in the Phase 3 Repair Project Area (Maximum Footprint Alternative)		
P-39-000002/ CA-SJO-250H*	Segment of the Union Pacific Railroad	Listed on the CRHR (assumed NRHP-eligible for the purposes of this project)
P-39-04345*	Isolated chert flake	Ineligible
P-39-4346*	Bottle glass fragment	Ineligible
P-39-04602*	Silviera Ranch Complex	Recommended NRHP-ineligible (site record form)
Cultural Resources Identified near the Phase 3 Repair Project Area (Maximum Footprint Alternative)		
P-39-000006/ CA-SJO-254	Shell scatter	Unknown
P-39-000012	Green chert flaked tool (isolated find)	Ineligible
P-39-000014/ CA-SJO-19/H	Prehistoric midden site with lithics and burials, as well as an historic residence, possibly associated artifacts found 457 meters to the north	Unknown; available data suggests NRHP-/CRHR-eligible.
P-39-000141/ CA-SJO-3	Prehistoric midden site with burials	Recommended NRHP-eligible
P-39-000225/ CA-SJO-89	Prehistoric burial	Unknown
P-39-000282/ CA-SJO-165/H	Prehistoric village site with historic residence	Site record form indicates “major Yokuts village.”
P-39-4234/ CA-SJO-274-H	Pylons	Ineligible
P-39-004235	Isolated pestle (prehistoric milling tool)	Ineligible
P-39-004336	Isolated obsidian biface fragment (prehistoric flaked stone blade)	Ineligible
P-39-004339/ CA-SJO-300-H	Historic debris scatter	Unknown
P-39-000531	Comet Landing (landing site of the first sail ship to ascend the San Joaquin River, California Historical Landmark No. 437)	Listed as a California Historical Landmark, potentially CRHR-eligible
P-39-000548*	Site of the Completion of the Pacific Railroad, and drawbridge (California Historical Landmark No. 780-7, listed on the CRHR)	CRHR listed
P-39-4340/ CA-SJO-281-H	Historic homestead; structure occurs on a raised knoll, suggesting potential for prehistoric remains, as well.	Unknown
P-39-004341	Isolated handstone (prehistoric milling tool)	Ineligible
P-39-04342	Isolated Prosser button (clay historic button)	Ineligible
P-39-4347	Isolated Pestle	Ineligible
P-39-4357	1926 Bascule Bridge Complex (draw bridge)	Determined ineligible for NRHP
P-39-004510	Bascule bridge (draw bridge)	Determined eligible for NRHP

Table 3.7-2. Identified Cultural Resources in and Near the Phase 3 Repair Project Area

Resource Identifier	Description	Eligibility Status
P-39-4547/ CA-SJO-304H	Historic farm/ranch	Unknown
P-39-004548/ CA-SJO-305H	Historic farm/ranch	Unknown
P-39-004603/ CA-SJO-313H	Historic refuse scatter	Unknown
P-39-004604/ CA-SJO-314-H	Water conveyance system (historic)	Unknown

Notes: CRHR = California Register of Historical Resources; NRHP = National Register of Historic Places.
* Also in the effects area of Alternative 1.
Source: Data compiled by AECOM based on a records search conducted at the Central California Information Center in 2010

Table 3.7-3. Previous Cultural Resources Studies in the Phase 3 Repair Project Area

Citation	CCIC Report #	Citation	CCIC Report #
Chavez 1981	729	Onken 2002	5623
Napton 1988	786	Tanksley 2003b	5624
Napton 1993	1900	Adamson 2001	5625
Donero	1993	Brady 2003	5626
West 1994	2391	EDAW 2005	5803
Peak and Associates 1997	3247	McMorris and Hope 2004	5985
Deitz 1998	3294	Green 2006	6029
William Self Associates 1999	3611	Tinsley 2006	6039
Jensen 2001	4311	Busby 2005	6122
Wohlgemuth and Mears 1994	4383	URS 2007	6447
Windmiller and Napoli 2002	4786	Beard 2007	6472
Gross 2002	4807	Dolan 2004	6579
Gross 2003	5003	ASI 1996	6625
ESA 2003	5033	URS 2008a	6643
Jensen 2004a	5459	URS 2008b	6723
Jensen 2004b	5460	URS 2008c	6724
Becker 2004	5540	Rosenthal and Whitaker 2009	7245
Tanksley 2003a	5622	Broyles 2010	7469

Source: Data compiled by AECOM based on a records search conducted at the Central California Information Center in 2010

to the SHPO and in a letter dated April 6, 2011, the SHPO concurred with the findings documented in the report (OHP 2011, **Appendix F**). This report also was submitted to the CCIC. Because of previous findings of ineligibility for the Silviera Ranch Complex (P-39-004602), it is not discussed further in this section.

After SHPO concurrence in 2011, the project design changed. Most of the changes consisted of reductions in the project footprint but also included a total of approximately 10.7 acres of additional APE in three locations: elements IIIa, VIa.4–VIIb, and VIIe. An intense survey of the expanded APE areas was conducted on March 3, March 11, and April 23, 2014. No previously unreported cultural resources were identified during the survey. The confidential addendum cultural resources report for the expanded portions of the project APE included a finding of no historic properties affected (AECOM 2014). USACE provided this addendum report to the SHPO and in a letter dated April 1, 2015, the SHPO concurred with the findings documented in the addendum report (OHP 2015, **Appendix F**). The addendum report also was submitted to the CCIC.

Thresholds of Significance

The significance determinations for impacts in this analysis are based on professional standards and on project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects.

According to 36 CFR 800.5, an undertaking would have an adverse effect on historic properties if the effect alters the characteristics that make a property eligible for inclusion in the NRHP. Such effects also would be considered adverse under NEPA. Adverse effects can occur when prehistoric or historic archaeological sites, structures, or objects listed in or eligible for listing in the NRHP are subjected to the following phenomena:

- physical destruction of or damage to all or part of the property;
- alteration of the property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties 22 (36 CFR 68) and applicable guidelines;
- removal of the property from its historic location;
- change in the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
- neglect of the property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; or
- transfer, lease, or sale of the property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

None of the property is in Federal ownership; therefore, the property transfer criteria do not apply.

3.7.4 Effects and Mitigation Measures

Effect 3.7-a: Potential Damage or Disturbance to Identified Cultural Resources from Ground-Disturbance or Other Construction-Related Activities.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, no adverse effects on identified cultural resources would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The magnitude of such effects on cultural resources would depend on the location of the levee breach relative to identified and currently undiscovered resources (e.g., buried cultural sites), severity of the storm, and river flows at the time. A levee failure along the RD 17 levee system could result in inundation of identified resources in or adjacent to the project APE, such as CA-SJO-19/H (a prehistoric site that likely is NRHP eligible), or scour at the location of a levee break. Before construction of the levee system, these resources were subject to the effects of periodic flooding over several centuries and are unlikely to be adversely affected by additional episodes of inundation alone. However, substantial flooding at the location of one or more prehistoric sites, resulting either from a localized levee failure or simultaneous levee failures in more than one location in the levee system, could result in a resource being obliterated by a scour hole (potentially hundreds of feet wide and tens of feet deep) that could be created at the levee break. For this reason, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

The Minimum Footprint Alternative would require construction of seepage berms, cutoff walls, chimney and blanket drains, as well as the placement of fill. These activities would require ground-disturbing construction and compaction, both of which could potentially have an effect on identified and significant resources.

Identified and significant or potentially significant cultural resources within the Minimum Footprint Alternative include CA-SJO-250H (a segment of the Union Pacific Railroad, which is listed in the CRHR and is assumed eligible for the NRHP for the purposes of this project). Ground-disturbing work would leave the railroad features intact; thus, CA-SJO-250H would not be directly affected. There would also be no physical destruction; alteration; removal; change in character; introduction of visual, atmospheric, or audible elements; or neglect of the property. The resource is not on Federal property, so the transfer criteria do not apply. In addition, the changes to the setting around the resource would be consistent with the agricultural landscape (consisting of reclaimed land), in which flood control features are currently prominent features. Because the setting would remain substantially similar to existing conditions, the direct and indirect effects on CA-SJO-250H would be **less than significant**.

Mitigation Measure: No mitigation is required.

Alternative 2: Maximum Footprint Alternative

Alternative 2 would require construction of seepage berms, chimney, toe and blanket drains, setback levees, cutoff walls, and placement of fill. This work would require ground-disturbing construction that could result in direct excavation within the boundaries of identified resources or compaction of such resources in a manner that would damage their integrity.

Identified significant cultural resources within Alternative 2 consist of CA-SJO-250H (a segment of the Union Pacific Railroad). The railroad transportation feature (CA-SJO-250H) would not be directly affected. There would also be no physical destruction; alteration; removal; change in character; introduction of visual, atmospheric, or audible elements; or neglect of the property. The resource is not on Federal property, so the transfer criteria do not apply. In addition, changes to the setting would not substantially alter the overall feeling or association because flood control features are already prominent aspects of the landscape. Therefore, direct and indirect effects on this resource would be **less than significant**.

Mitigation Measure: No mitigation is required.

Requester's Preferred Alternative

Because there are no NRHP-eligible properties located in the project footprint under this alternative, there would be **no impact**.

Mitigation Measure: No mitigation is required.

Effect 3.7-b: Potential Damage to or Destruction of Previously Undiscovered Cultural Resources from Ground-Disturbance or Other Construction-Related Activities.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, no adverse effects on previously undiscovered cultural resources would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The magnitude of the effect on previously unidentified cultural resources would depend on the location of the levee breach relative to currently undiscovered resources (e.g., buried cultural sites), severity of the storm, river flows at the time, and the significance of the currently unknown resource that may be affected. A levee failure along the RD 17 levee system could result in inundation of unknown subsurface cultural resources or scour at the location of a levee break. Before construction of the levee system, such resources were subject to the effects of periodic flooding over several centuries and are unlikely to be adversely affected by additional episodes of inundation alone. However, substantial flooding at the location of one or more previously unidentified cultural resources, resulting either from a localized levee failure or simultaneous levee failures in more than one location in the levee system, could result in a resource being obliterated by a scour hole (potentially hundreds of feet wide and tens of feet deep) that could be created at the levee break. For this reason, the effects on previously undiscovered cultural resources would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Alternative 1 would include construction of seepage berms, chimney drains, blanket drains, and cutoff walls. These construction activities would include ground disturbance and excavation that could damage or destroy previously undiscovered cultural resources. Previously undiscovered archaeological sites within Alternative 1 could be directly affected by physical destruction of or damage to all or part of the property. Discovered archaeological properties would likely not be affected by alteration; removal; change in character; introduction of visual, atmospheric, or audible elements; or neglect of the property. The transfer criteria would not apply because none of the affected properties under this alternative are Federally owned.

San Joaquin Valley floodplains and riverbanks were extensively occupied and used by prehistoric and historic inhabitants. Prehistoric occupation sites frequently took the form of mounds that were constructed above the natural ground surface by prehistoric human populations, but the upper portions of many of these sites have been destroyed by modern agricultural cultivation and leveling of fields, and thus the remains of these sites no longer are easily visible above ground. Moreover, intermittent flooding has deposited layers of alluvium over prehistoric deposits, leaving these resources intact below grade with no surface manifestations. Areas within the Minimum Footprint Alternative also are commonly covered with agricultural crops or constructed features. These conditions may obscure both prehistoric and historic archaeological deposits.

Because the technical work necessary to identify additional resources in the Minimum Footprint Alternative is ongoing (i.e., access has not been available to complete pedestrian cultural resources surveys in all areas), significant resources may be identified after certification and approval of this FEIS that would be adversely affected by construction-related and other ground-disturbing activities. It is possible that effects on yet unidentified resources could not be avoided through project design options identified in Chapter 2, "Alternatives." Therefore, this effect would be **potentially significant**.

In addition to resources that may be identified during future surveys, the possibility always remains that resources would not be discovered until construction occurs or would be damaged by work without discovery. Where cultural resources are buried below sterile soils, or where mounds have been truncated with no surface manifestation, discovery before construction or other ground-disturbing activities would not always be possible. Furthermore, proposed repairs, such as cutoff walls, would require construction methods that would allow little possibility of discovering resources in place before damage could occur. Extensive preconstruction subsurface inventories that would identify all buried sites would not be feasible because the level of excavation required to conduct them would be extremely costly and labor intensive. For example, to conduct subsurface inventories in the path of a cutoff wall would require excavations below the existing levee. Therefore, this effect would be **potentially significant**.

Alternative 2: Maximum Footprint Alternative

Alternative 2 is substantially similar to Alternative 1 with respect to the kinds of effects that could occur on previously unidentified cultural resources because this alternative would require construction of substantially similar kinds of repairs. The transfer criteria would not apply because none of the affected properties under this alternative are Federally owned. This alternative would require construction of seepage berms, setback levees, chimney drains, toe drains, blanket drains, cutoff walls, and fill. Because the overall footprint would be larger, the potential to encounter previously unidentified resources would be greater, although the mechanisms causing the effects would be similar to Alternative 1. Effects may occur on both significant resources discovered during technical work and on resources that would not be discovered until construction occurs. In addition, the possibility remains that significant cultural resources would be damaged without discovery. These effects would be **potentially significant**.

Requester's Preferred Alternative

The Requester's Preferred Alternative is substantially similar to both Alternatives 1 and 2 with respect to the kinds of effects that could occur on previously unidentified cultural resources because this alternative would require construction of substantially similar kinds of repairs. The transfer criteria would not apply because none of the affected properties under this alternative are Federally owned. This alternative would require construction of seepage berms, setback levees, chimney drains, toe drains, and cutoff walls. Because the overall footprint size for the Requester's Preferred Alternative is less than the Alternative 1 and 2 footprint sizes, the potential to encounter previously unidentified resources would be less than both Alternatives 1 and 2, although the mechanisms causing the effects would be similar to these alternatives. Adverse effects may occur on both significant resources previously discovered during technical work and on resources that would not be discovered until construction occurred. In addition, the possibility remains that significant cultural resources could be damaged without discovery. These adverse effects would be **potentially significant**.

Mitigation Measure 3.7-b: Complete Surveys, Train Construction Workers before Construction Begins, Monitor Construction Activities, Stop Potentially Damaging Activities, Evaluate Discovery(ies), and Resolve Adverse Effects on Significant Resources.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative and the Requester's Preferred Alternative

RD 17 will implement the following measures to minimize potential adverse effects on previously undiscovered cultural resources:

- Before construction begins, a qualified professional archaeologist retained by USACE or RD 17 will give a presentation and training session on how to identify cultural resources to all construction personnel performing work in areas sensitive for previously unidentified resource so that they can assist with identifying undiscovered cultural resource materials and avoid them where possible.

- RD 17 will retain a qualified archaeologist and invite interested Native American parties, where appropriate, to monitor all ground-disturbing construction activities in native soils (e.g., not imported fill) at locations determined to be particularly sensitive for unidentified cultural resources. If a previously unidentified historic or prehistoric archaeological resource is uncovered during construction, construction activities will be halted in the vicinity of the find and USACE, RD 17, and other appropriate parties, will be notified regarding the discovery.

- If a previously unidentified cultural resource is discovered, RD 17 will then consult with USACE and the SHPO to determine the eligibility of the resource for listing in the NRHP. If RD 17 and USACE, in consultation with the SHPO, concur that the resource is eligible for the NRHP and the project may result in adverse effects or significant effects on the resource, RD 17 or USACE, as appropriate, will develop and implement treatment or avoidance measures. Treatment will consist of documentation (e.g., narrative, photographic, or data recovery excavations) that retrieves and preserves the qualities of significance associated with the resource to the extent feasible. Avoidance measures will consist of physical alterations to the project design or implementation that will avoid either direct effects on the resource or changes to the setting that diminish the resource's significance.

- Work will resume only when either all necessary treatment has been performed under the treatment method selected or construction in the vicinity of the resource will not result in adverse effects or encroach within an appropriate distance from the known boundaries of the resource or the boundaries of the resource.

Responsibility: RD 17 and/or USACE.

Timing: Before and during construction.

It may be possible to avoid resources or recover and preserve them through the measures stipulated in treatment protocols. However, because the project would require ground-disturbing construction and because of the potential for encountering buried resources with little surface manifestation, the possibility would remain that the implementation of the Phase 3 Repair Project would result in adverse effects on previously unidentified cultural resources eligible for listing in the NRHP before the resource can be identified and avoided. Therefore, implementation of this mitigation measure would not fully reduce the adverse effect to a less-than-significant level. Because no additional feasible mitigation measures exist to reduce the potential damage to previously undiscovered cultural resources from ground-disturbing activities, this adverse effect would remain **potentially significant and unavoidable**.

Effect 3.7-c: Effects on Previously Unidentified Human Remains.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, no adverse effects on any interred and previously unidentified buried human remains would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The magnitude of the effect on buried human remains would depend on the location of the levee breach relative to burial sites, severity of the storm, river flows at the time, and the significance of any interred and previously unidentified burials that may be affected. A levee failure along the RD 17 levee system could result in inundation of unknown burial sites, or scour at the location of a levee break. Before construction of the levee system, these resources were subject to the effects of periodic flooding over several centuries and are unlikely to be adversely affected by additional episodes of inundation alone. However, substantial flooding at the location of buried human remains, resulting either from a localized levee failure or simultaneous levee failures in more than one location in the levee system, could result in a resource being obliterated by a scour hole (potentially hundreds of feet wide and tens of feet deep) that could be created at the levee break. For this reason, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Alternative 1 would require construction of seepage berms, cutoff walls, chimney and blanket drains, as well as the placement of fill. These activities would require ground-disturbing construction and compaction. Prehistoric archaeological deposits that occur along waterways often contain interred human remains. Therefore, Phase 3 Repair Project activities could affect unidentified human remains because construction of levee repairs would require excavation into native soils where such remains may occur. Human remains within Alternative 1 could be directly affected by physical destruction of or damage to all or part of the burial. Discovered archaeological properties would likely not be affected by alteration; removal; change in character; introduction of visual, atmospheric, or audible elements; or neglect of the property. The transfer criteria would not apply because none of the affected properties under this alternative are Federally owned.

This effect would be **potentially significant**.

Alternative 2: Maximum Footprint Alternative

Alternative 2 would require construction of seepage berms, chimney, toe and blanket drains, setback levees, cutoff walls, and placement of fill. This work would require ground-disturbing construction that could result in direct excavation into the location of interred human remains without prior discovery. Because the spatial extent of Alternative 2 is greater than Alternative 1, the potential for encountering previously undiscovered human remains would be greater, even though the nature of the effect would be the same. The transfer criteria would not apply because none of the affected properties under this alternative are Federally owned.

This adverse effect would be **potentially significant**.

Requester's Preferred Alternative

The Requester's Preferred Alternative would require construction of seepage berms, chimney and toe drains, a setback levee, cutoff walls, and placement of fill. This work would require ground-disturbing construction that could result in direct excavation into the location of interred human remains without prior discovery. Because the spatial extent of the Requester's Preferred Alternative is greater than Alternative 1, the potential for encountering previously undiscovered human remains would be greater, although the nature of the effect would be the same. The transfer criteria would not apply because none of the affected properties under this alternative are Federally owned.

This adverse effect would be **potentially significant**.

Mitigation Measure 3.7-c: Stop Work in the Event of a Discovery of Human Remains, Notify the Applicable County Coroner and MLD, and Treat Remains in Accordance with State Law and Measures Developed in Consultation between USACE, the SHPO, RD 17, and the MLD.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative and the Requester's Preferred Alternative

Because there is no Federal land in the project area, NAGPRA does not apply. However, California state law addressing the discovery of human remains is applicable. RD 17 and USACE will ensure that the following measures are implemented to address the potential discovery of human remains during construction:

- If human remains are uncovered during ground-disturbing activities, all ground-disturbing activities will cease within 100 feet of the find. RD 17 or USACE will notify the San Joaquin County coroner and a professional archaeologist to determine the nature of the remains. The coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (Health and Safety Code Section 7050.5[b]). If the coroner determines that the remains are those of a Native American, he or she will contact the NAHC by phone within 24 hours of making that determination (Health and Safety Code Section 7050[c]). The NAHC will designate an MLD to reinter the remains with appropriate dignity (Public Resources Code [PRC] Section 5097.98).

- After a determination that the remains are of prehistoric Native American origin and an MLD is designated, RD 17 and USACE will coordinate with the MLD for reburial of the remains and associated grave goods in an appropriate location. If the MLD fails to make a recommendation or reinter the remains, RD 17 and USACE will coordinate with the landowner to reinter the remains in a location not subject to further disturbance, as provided for in PRC Section 5097.98.

The discovery of prehistoric burials often reveals locations sensitive for the occurrence of additional archaeological material. After the initial discovery and management of human remains, a professional archaeologist working on behalf of RD 17 and USACE will record the site with the NAHC and the appropriate information center and, if possible, use project features to protect the site from future disturbance (such as capping the site in place underneath proposed repairs). Also, in the event that the remains consist of an historic burial that qualifies as an archaeological resource—but is not subject to the jurisdiction of the MLD—RD 17 and USACE will treat the remains as required under Mitigation Measure 3.7-b, above.

Responsibility: RD 17 and USACE.

Timing: During construction.

These measures represent the feasible actions to protect inadvertently discovered human remains. Because the Phase 3 Repair Project would require ground-disturbing construction, such as placement of improvements that could inadvertently damage such remains before they are discovered and protected, the possibility exists that the Phase 3 Repair Project would result in adverse effects to human interments that would be reduced but may not be completely avoided under this mitigation measure. Therefore, implementation of this mitigation measures would not fully reduce this adverse effect to a less-than-significant level. No further mitigation is available to reduce the risk of this effect because no monitoring or preconstruction inventory effort could guarantee that all such subsurface resources would be discovered before they are disturbed. Therefore, this adverse effect would remain **potentially significant and unavoidable**.

3.7.5 Residual Significant Effects

Because mitigation would not be required for the No-Action Alternative, effects under this alternative would be significant and unavoidable.

Effects 3.7-b and 3.7-c would be potentially significant and unavoidable under Alternative 1, Alternative 2, and the Requester's Preferred Alternative because, despite mitigation, the risk of disturbance to significant, previously unidentified cultural resources and buried human remains would be present. Although implementation of Mitigation Measures 3.7-b and 3.7-c would somewhat reduce the risk of these potential adverse effects and the severity of these effects if they occurred, the risk of adverse effects would not be avoided entirely. Inventory, treatment, monitoring, and post-discovery mitigation could not completely avoid the possibility of inadvertent damage to cultural resources because discoveries could not be predicted in advance and project constraints may dictate that identified resources could not be avoided. For these reasons, Effects 3.7-b and 3.7-c would remain potentially significant and unavoidable.

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3.8 Transportation and Circulation

This section discusses existing transportation and circulation patterns within the Phase 3 Repair Project area and surrounding areas, identifies applicable Federal and state laws and regulations, and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to transportation and circulation. A discussion of cumulative effects related to transportation and circulation is provided in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements," of this FEIS. See Section 3.15, "Hazards and Hazardous Materials," for a discussion of impacts related to airports and airstrips in the action area.

3.8.1 Regulatory Setting

As required under NEPA, applicable Federal laws and regulations are identified in this section. State laws and regulations applicable to implementation of the Phase 3 Repair Project by RD 17 are described for informational purposes and to assist with NEPA review. RD 17 also has considered regional and local plans and ordinances as a part of the environmental review process for this FEIS, where applicable to the Phase 3 Repair Project.

Federal

Federal laws related to transportation and circulation are relevant to this analysis and are described next.

Federal Transportation Laws

A number of statutes and regulations exist that include provisions specific to the interstate system in California and transportation projects in general; 23 United States Code (USC) and 23 Code of Federal Regulations (CFR) are the laws governing highways, and 23 USC and 49 CFR are the laws governing transportation.

Federal statutes specify the procedures that the U.S. Department of Transportation must follow in setting policy regarding the placement of utility facilities within the rights-of-way of roadways that have received Federal funding. These roadways include expressways, most state highways, and certain local roads. Federal Highway Administration (FHWA) regulations require that each state develop its own policy regarding the accommodation of utility facilities within the rights-of-way of such roads. After FHWA has approved a state's policy, the state can approve any proposed utility installation without referral to FHWA, unless utility installation does not conform to the policy.

Federal law does not directly control how states accommodate utilities within highway rights-of-way; however, in determining whether a right-of-way on a federally funded highway should be used for accommodating a utility facility, the Secretary of Transportation must do the following (23 USC Section 109[l]):

1. ascertain the effect that accommodating utilities would have on highway and traffic safety because no use may be authorized or permitted that would adversely affect safety,

2. evaluate the direct and indirect environmental and economic effects of any loss of productive agricultural land or any impairment of its productivity that would result from disapproving accommodation of the utility facility, and

3. consider the environmental and economic effects together with any interference with or impairment of the use of the highway that would result from accommodation of the utility facility.

In addition, 23 USC 116 requires state highway agencies to ensure proper maintenance of highway facilities, which implies adequate control over nonhighway facilities, such as utility facilities. Furthermore, 23 USC 123 specifies when Federal funds can be used to pay the costs of relocating utility facilities in connection with highway construction projects.

State

California Streets and Highways Code

The California Streets and Highways Code authorizes the California Department of Transportation (Caltrans), to control encroachment within the state highway right-of-way. Encroachment is defined in Section 660 of the Streets and Highways Code as any tower, pole, pole line, pipe, pipeline, fence, billboard, stand, or building, or any structure or object of any kind or character that is within the right-of-way but not a part of the Caltrans facility. Encroachments allow temporary or permanent use of a highway right-of-way by a utility, a public entity, or a private party. Encroachments include all public and private utilities within state rights-of-way, such as communication, electric power, water, gas, oil, petroleum products, steam, sewer, drainage, irrigation, and similar facilities. Encroachments also include any temporary or permanent break in access or use of a highway right-of-way for grading, excavating, or filling or removal of materials by public agencies, developers, or private individuals.

The Caltrans Right-of-Way and Asset Management Program, through district offices, is responsible primarily for acquisition and management of property required for state transportation purposes. Transportation purposes may include highways, mass transit guideways and related facilities, material sites, and any other purpose that may be necessary for Caltrans operations. The responsibilities of the Right of Way and Asset Management Program include managing Caltrans' real property for transportation purposes, reducing the costs of operations, disposing property that is no longer needed, and monitoring right-of-way activities on federally assisted local facilities (including Interstate 5 [I-5] and State Route [SR] 120 in the Phase 3 Repair Project area). A discussion of Caltrans's Federal authorization to issue encroachment permits for federally assisted facilities is included in Chapter 5, "Compliance with Federal Environmental Laws and Regulations."

Local

San Joaquin Council of Governments

The San Joaquin Council of Governments (SJCOG) is a joint powers authority composed of San Joaquin County and the Cities of Stockton, Lodi, Manteca, Tracy, Ripon, Escalon, and Lathrop. SJCOG serves as the Regional Transportation Planning Agency (RTPA), which provides a forum for regional decision making on issues such as growth, transportation, environmental management, housing, open space, air quality, fiscal management, and economic development. SJCOG, as the RTPA for the San Joaquin region, is responsible for developing the region's funding priorities for the State Transportation Improvement Program and for submitting the projects to the California Transportation Commission by way of the Regional Transportation Improvement Program (RTIP). The primary purpose of the RTIP is to help implement the San Joaquin region's adopted long-range Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS).

The 2018 RTP/SCS serves as the County's long-range transportation plan and provides guidance for decisions about transportation spending priorities. The SJCOG Board voted to adopt the 2018 RTP/SCS at its meeting on June 28, 2018.

3.8.2 Environmental Setting

This section describes the environmental setting related to traffic and transportation infrastructure. The Phase 3 Repair Project area is on the east side of the San Joaquin River, from the north side of West Bowman Road north of the Lathrop city limits to upstream from the river on the north side of South Airport Road, southwest of the Manteca city limits. This section discusses I-5, SR 120, and local roads in the vicinity of the Phase 3 Repair Project area, as well as the Union Pacific Railroad crossing at the San Joaquin River parallel to I-5. Because the Phase 3 Repair Project would have no effect on air traffic and would not change navigation on the river, airports and river navigation are not discussed further in this FEIS.

Functional Classification

Roads can be classified and defined in several different ways. For the purposes of this analysis, roads are characterized by their function (i.e., how they are used), as follows:

- **Freeways**: Operated and maintained by Caltrans, these facilities are designed as high-volume, high-speed facilities for intercity and regional traffic. Access to these facilities is limited, and in some cases on- and off-ramps are metered during peak-hour periods to reduce congestion caused by merging cars and trucks.

- **Arterials**: These facilities—Major Arterials (four to six lanes) and Minor Arterials (four lanes)—are the principal network for through-traffic within a community and often between communities.

- **Collectors**: These two-lane facilities function as the main interior streets within neighborhoods and business areas. Collectors serve to connect these areas with higher classification roads (i.e., arterials and freeways).

- **Local Streets**: These facilities are two-lane streets that provide local access and service. They include residential, commercial, industrial, and rural roads.

Levels of Service

To evaluate a roadway's operational characteristics, a simple grading system is used that compares the traffic volume carried by a road with that road's design capacity. The ratio of the volume to the capacity (volume/capacity) is an indicator of traffic conditions, speeds, and driver maneuverability. Because the heaviest travel occurs during peak travel periods, when people are going to and from work, the volume/capacity ratio and correlated level of service (LOS) are reported for these periods. Levels of service typically are defined as follows:

- **LOS A**: Conditions of free flow; speed is controlled by the driver's desires, speed limits, or roadway conditions. Volume/capacity ratio = 0 to 0.34.

- **LOS B**: Conditions of stable flow; operating speeds beginning to be restricted; little or no restrictions on maneuverability from other vehicles. Volume/capacity ratio = 0.35 to 0.50.

- **LOS C**: Conditions of stable flow; speeds and maneuverability more closely restricted; occasional backups behind left-turning vehicles at intersections. Volume/capacity ratio = 0.51 to 0.74.
- **LOS D**: Conditions approach unstable flow; tolerable speeds can be maintained but temporary restrictions may cause extensive delays; little freedom to maneuver; comfort and convenience low; at intersection, some motorists, especially those making left turns, may wait through more than one or more signal changes. Volume/capacity ratio = 0.75 to 0.89.
- **LOS E**: Conditions approach capacity; unstable flow with stoppages of momentary duration; maneuverability severely limited. Volume/capacity ratio = 0.90 to 0.99.
- **LOS F**: Forced flow conditions; stoppages for long periods; low operating speeds. Volume/capacity ratio = 1.00 or greater.

San Joaquin County has a policy to maintain county roads at LOS C or better, and to encourage incorporated municipalities to maintain their roads at LOS C or better.

The San Joaquin County General Plan Public Facilities and Services Element, Transportation and Mobility (San Joaquin County 2016a: Part 3) assists in characterizing desired traffic network performance levels, as follows:

- Per the Congestion Management Program (CMP), all designated CMP roadways and intersections shall operate at an LOS D or better except for roadways with “grandfathered” LOS. LOS for state highways shall be maintained in cooperation with Caltrans. The County LOS standards for intersections is LOS D or better on minor arterials and roadways of higher classification and LOS C or better on all other roads.
- The County shall maintain the following:
    - on state highways, LOS D or the Caltrans standard, whichever is stricter;
    - within a city’s sphere of influence, LOS D or the city planned standards for that level of service; and
    - on Mountain House Gateways, as defined in the master plan, LOS D, and on all other roads, LOS C.

Freeways

Interstate 5

I-5 is the most prominent freeway in the vicinity of the Phase 3 Repair Project area. I-5 is the major north/south facility serving San Joaquin County. The Phase 3 Repair Project area for I-5 extends from the SR 120 split, north to the French Camp exit (see **Figure 2-9**). In this location, I-5 has three through-lanes in each direction, for a total of six lanes. In 2007, approximately 15–33 percent of the vehicles on this segment of I-5 were trucks (San Joaquin County 2016b:8-5). Based on a summary of state highway levels of service provided in the San Joaquin General Plan Update Background Report (San Joaquin County 2016b:8-17), 16 roadway segments on I-5 currently operate unacceptably at LOS E or F during at least one peak hour. Locations along I-5 (in the study area) below LOS D were as follows:

- **Junction I-205 to Junction SR-120:** LOS F north and southbound in the a.m. peak-hour and LOS F north and southbound in the p.m. peak-hour

- **Junction SR 120 to Lathrop Road:** LOS F northbound in the a.m. peak-hour and LOS F northbound in the p.m. peak-hour

- **Lathrop Road to French Camp overcrossing:** LOS E northbound in the a.m. peak-hour and LOS E northbound in the p.m. peak-hour

- **French Camp overcrossing to Mathews Road:** LOS F northbound in the a.m. peak-hour and LOS F northbound in the p.m. peak-hour

- **Mathews Road to French Camp interchange:** LOS F northbound in the a.m. peak-hour and LOS F northbound in the p.m. peak hour

Including the SR 120 eastbound split, six exits are located along I-5 in the Phase 3 Repair Project area. From south to north, they are SR 120, Louise Avenue, Lathrop Road, Roth Road, Mathews Road, and French Camp Road. Of these exits, only the Mathews Road exit operated below LOS D in the peak period. This exit operated at LOS F during the p.m. peak-hour (San Joaquin County 2016b:8-52).

State Route 120

In the Phase 3 Repair Project area, SR 120 is an east/west freeway that connects the City of Manteca with I-5 to the west and SR 99 to the east. Between I-5 and SR 99, SR 120 has two eastbound and two westbound through-lanes. Trucks accounted for about 6 to 18 percent of the total traffic, when evaluated in 2007 for the San Joaquin County General Plan Update Background Report (San Joaquin County 2016b:8-11). From the eastbound split from I-5 east to Airport Way, SR 120 operated at LOS D or better in the a.m. and p.m. peak-hour periods in both the westbound and eastbound directions (San Joaquin County 2016b:8-21).

Arterials, Collectors, and Local Roads by Jurisdiction

San Joaquin County

Seven haul routes have been specified in San Joaquin County's jurisdiction: South Airport Way, Yosemite Avenue, Frewert Road, Bowman Road, Mathews Road, French Camp Road, and Aplicella Court (**Figure 2-9**). Airport Way is a north/south arterial that connects Stockton to the north with Manteca, and with unincorporated areas of San Joaquin County in between. Airport Way is a two-lane arterial (one northbound and one southbound through-lane) that was reported to operate at LOS C and better in the 2007 study (San Joaquin County 2016b:8-34).

Yosemite Avenue is a northeast/southwest two-lane collector (one through-lane in each direction). This road extends northeast from SR 120 to the Manteca city limits. Yosemite Avenue reportedly operated at worse than LOS C in 2007 (San Joaquin County 2016b:8-41). Frewert Road, Bowman Road, Mathews Road, and French Camp Road are considered collectors because they provide east/west access either to South Manthey Road, an arterial street, or to an I-5 on- and off-ramp. Mathews Road did not exceed thresholds (San Joaquin County 2016b:8-39). French Camp Road did not exceed LOS thresholds either (San Joaquin County 2016b:8-37). Neither Frewert Road nor Bowman Road was included in the county's traffic study area for its General Plan update background report. Aplicella Court is a north-south local road that provides limited access to approximately 50 residences.

City of Lathrop

Nine roads in the jurisdiction of the City of Lathrop have been identified as haul routes. Recent traffic data are not available regarding volume/capacity ratios and resulting LOS grades, but Lathrop's sole policy regarding truck traffic is limited to roadway function classifications. As described above, to the extent practical, the City of Lathrop limits truck traffic on arterial streets. Therefore, the environmental setting discussion for the proposed haul routes within the Lathrop city limits focuses on their function classifications.

Of the nine roads identified as haul routes, two are arterial streets, one is a collector, and six are local roads. The arterial streets are River Islands Parkway and South Manthey Road (**Figure 2-9**). River Islands Parkway is an arterial street that provides an east/west connection between the Mossdale Landing development and Louise Avenue, which provides access to I-5. River Islands Parkway extends west from Golden Valley Parkway for a short distance before turning southwest and ending before it reaches the San Joaquin River. South Manthey Road is a two-lane roadway that parallels I-5 from Town Center Drive south across the San Joaquin River. It extends north to Stockton from Louise Avenue. The City of Lathrop is replacing South Manthey Road with Golden Valley Parkway between River Islands Parkway and Land Park Drive. This roadway is considered an arterial because it provides access to Franks Tract.

Dos Reis Road is an east/west collector that provides access to South Manthey Road, an arterial street.

The remaining facilities are classified as local roads. These facilities are Queirolo Road, Sadler Oaks Drive, Town Centre Drive, Golden Valley Parkway, McKee Boulevard, and Barbara Terry Boulevard.

City of Manteca

In this area, South Airport Way is a north/south arterial that extends from Lathrop Road to Woodward Avenue along the western border of Manteca near the Lathrop city limits (City of Manteca 2017:2-19, Figure 2.0-1). The daily volumes on Airport Way averaged around 17,000 vehicles per day in 2016, when the City of Manteca General Plan Update Existing Conditions Report was prepared. Airport Way is a two-lane roadway that operated at LOS C and LOS D in 2016 (City of Manteca 2017:2-16).

Woodward Avenue is an east/west two-lane local road (one eastbound and one westbound through lane). This road extends west from South Airport Way to Aplicella Court near the end of element VIIg. No segment operated worse than LOS D in 2008 (San Joaquin County 2016b:8-41).

3.8.3 Methodology and Thresholds of Significance

Methodology

This analysis considers the range and nature of foreseeable traffic conditions on roadways in the Phase 3 Repair Project area and identifies the primary ways that Phase 3 Repair Project construction could affect existing traffic conditions.

Available literature, including documents published by Federal, state, San Joaquin County, and city agencies that document traffic conditions relevant to the Phase 3 Repair Project, were reviewed for this analysis. The information obtained from these sources was reviewed and summarized to establish existing conditions and to identify potential environmental effects based on the significance criteria presented below.

LOS standards typically are used to evaluate long-term (operational) traffic effects resulting from residential, employment-generating, industrial, and institutional development projects. The Phase 3 Repair Project would not be a land use development project. Long-term operation of the Phase 3 Repair Project levee repairs would require a similar level of maintenance and monitoring as under existing conditions. Therefore, LOS standards were not used in this analysis because they typically are employed to evaluate long-term operational traffic congestion that would result from a project. Instead, this analysis focuses on construction-related traffic effects and effects of implementing the action alternatives on existing roadways.

Thresholds of Significance

The basis for determining the significance of effects for this analysis is based on professional standards and project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to transportation and circulation if they would do any of the following:

- conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities;
- substantially increase hazards as a result of a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); or
- result in inadequate emergency access.

In accordance with NEPA, the methods for determining the significance of an effect on transportation and circulation patterns are based on the intensity of the effect within the context of the existing transportation facility.

The following screening criterion is recommended by the Institute of Transportation Engineers (ITE) (1989) for assessing the effects of construction projects that may create temporary traffic increases. To account for the large percentage of heavy trucks associated with typical construction projects, ITE recommends a threshold level of 50 or more new peak-direction trips during the peak hour. Therefore, an alternative would cause an increase in traffic that would be substantial in relation to the existing traffic load and capacity of the street system, and would result in a significant adverse effect related to circulation patterns if it would result in 50 or more new truck trips during the a.m. peak-hour or the p.m. peak-hour.

3.8.4 Effects and Mitigation Measures

Effect 3.8-a: Potential Conflicts with an Applicable Plan, Ordinance, or Policy Establishing Measures of Effectiveness for the Performance of the Circulation System.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, traffic and circulation patterns would not be affected. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could result in temporary flooding and substantial long-term damage to the street infrastructure along a substantial number of collectors and local streets. Some freeway on-ramps and off-ramps likely would be closed, as would many segments of the freeways. Roads potentially could need repair in some places and replacement in others. Depending on the location and severity of the levee failure and duration of flooding, the location and extent of damage could be minor to extensive. However, repaired and replaced infrastructure likely would be designed in accordance with local design standards, as defined by each jurisdiction, consistent with the 2018 RTP/SCS (SJCOG 2018). For this reason, this effect would not result in a substantial adverse effect on the effectiveness and performance of local circulation systems. Therefore, the effect would be **less than significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Implementation of Alternative 1, Alternative 2, or the Requester's Preferred Alternative would conflict with the Transportation Element of the Comprehensive General Plan for the City of Lathrop, California (City of Lathrop 2004), but would not conflict with the SJCOG RTP/SCS (SJCOG 2018) or with the Transportation Element of either the San Joaquin County General Plan (San Joaquin County 2016a) or the City of Manteca General Plan 2023 Policy Document (City of Manteca 2003). The goals and objectives of the SJCOG RTP/SCS are to maintain and improve existing roadway infrastructure to keep pace with the mobility needs of regional growth. Like the RTP/SCS, the San Joaquin County and City of Manteca Transportation Elements call for adequate road facilities for the types and amounts of growth, identified in the Land Use Elements of the respective jurisdictions' general plans. Alternatives 1 and 2 temporarily would add truck traffic in the short term but would not result in the construction of new roadway facilities or traffic-generating land uses, such as homes and businesses. The Transportation Element of the Comprehensive General Plan for the City of Lathrop, on the other hand, has a specific policy limiting truck traffic to arterial streets, to avoid conflicts with residential land uses. It would not be feasible to limit truck trips to only arterial streets because collector and local streets would need to be used for haul trips under Alternative 1, Alternative 2, and the Requester's Preferred Alternative. Therefore, the following analysis assesses the potential for construction traffic generated by the Phase 3 Repair Project to have a substantial adverse effect on the effectiveness and performance of the circulation system. This is the type of performance degradation that the Transportation Element in the Lathrop General Plan and other transportation-related planning documents intend to minimize.

Traffic circulation and roadway capacities would be affected by use of haul routes for construction-related actions under Alternative 1, Alternative 2, and the Requester's Preferred Alternative, as shown in

Figure 2-9. Implementation of levee seepage remediation activities—construction of a setback levee, cutoff walls, and seepage berms at the various project elements—would require the importation of fill, drain rock, filter material, aggregate base, bentonite, and cement. Haul truck trips from the source of fill materials to the various project elements would be the primary cause of increased traffic on collector and local streets.

To determine the significance of the increased truck traffic, the number of peak-hour haul trips was estimated (volume of imported material divided by haul truck capacity, divided by number of construction days per construction season, divided by number of construction hours per day) for each action alternative. Then, this number was compared with the ITE significance threshold of 50 additional peak-hour truck trips.

Based on construction information and assumptions provided in Chapter 2, "Alternatives," approximately 27,798 haul trips would be necessary over the 123-day construction period, resulting in approximately 226 haul trips per day under Alternative 1. Assuming a 12-hour construction day, implementation of Alternative 1 would add 18 truck trips during the peak-hour periods. This number is well below the ITE quantitative significance threshold of 50 new truck trips during the peak-hour periods. In addition, haul trucks likely would be distributed over several haul routes within the Phase 3 Repair Project area because multiple element locations are expected to be under construction at the same time. The proposed simultaneous construction of levee repairs at different locations would reduce the likelihood that one collector or one local street would bear all 24 peak-hour truck trips.

Under Alternative 2, a total of 39,114 haul trips would be necessary over the 123-day construction period, adding approximately 318 haul trips per day, or 26 additional truck trips during the peak-hour periods. This number of new truck trips during the peak-hour periods is below the ITE quantitative significance threshold. As under Alternative 1, haul truck trips are expected to be distributed over several haul routes, reducing the number of potential peak-hour truck trips for any given collector or local street.

Based on construction information and assumptions provided in Chapter 2, "Alternatives," approximately 9,963 haul trips would be necessary over the 123-day construction period, resulting in approximately 81 haul trips per day under the Requester's Preferred Alternative. Assuming a 12-hour construction day, implementation of the Requester's Preferred Alternative would add approximately 7 truck trips during the peak-hour periods. This number is below the ITE quantitative significance threshold of 50 new truck trips during the peak-hour periods. As under Alternatives 1 and Alternative 2, haul truck trips under the Requester's Preferred Alternative are expected to be distributed over several haul routes, reducing the number of potential peak-hour truck trips for any given collector or local street.

Alternative 1, Alternative 2, and the Requester's Preferred Alternative would not exceed the ITE quantitative threshold of 50 new truck trips during the peak-hour periods. Truck trips are not expected to be concentrated on any one route but rather would be distributed over several collectors and local streets. Furthermore, the haul truck trips at any given access route would be temporary and short-term. Therefore, construction-related traffic effects from Alternative 1, Alternative 2, and the Requester's Preferred Alternative would not result in a substantial adverse effect on the effectiveness and performance of local circulation systems. Therefore, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Effect 3.8-b: Potential Conflict with an Applicable Congestion Management Program.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Therefore, traffic or circulation patterns would not change in such a way that congestion would increase in severity, intensity, or duration. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. Depending on the location and severity of the levee failure and duration of flooding, the location and extent of damage and effects on transportation and circulation patterns could be minor to extensive. A levee failure along the RD 17 levee system could result in temporary flooding and substantial long-term damage to the street infrastructure along a substantial number of collectors and local streets. Freeway on- and off-ramps also could be flooded, and freeway segments could be closed. Diversion of traffic from impassable roadways would cause congestion on alternate routes. Congestion would persist until repairs could be made or roads were replaced. Because this effect would have the potential to result in a substantial change in traffic or circulation patterns in such a way that congestion would increase in severity or duration, this effect could result in conflicts with applicable adopted CMPs. Therefore, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

The SJCOG Regional Congestion Management Program (2007) is the applicable CMP for Alternative 1, Alternative 2, and the Requester's Preferred Alternative. The alternatives would not conflict with the CMP, based on its goals and objectives. The CMP emphasizes travel demand measures to reduce the number of miles driven per capita; infrastructure improvements to reduce single-occupancy vehicle trips; land use regulations to encourage the use of alternative modes of transportation instead of cars; and monitoring and enforcement of travel demand measure implementation by development projects. As stated in the "Methodology" section in Section 3.8.3. implementation of the project alternatives would not include construction of homes, businesses, or other traffic-generating development. Alternative 1, Alternative 2, and the Requester's Preferred Alternative would result in temporary and short-term construction trips in the short term, associated with hauling of construction material to the Phase 3 Repair Project area. Because construction-related traffic is not targeted in the CMP to reduce congestion, no conflict with the CMP would occur with implementation of Alternative 1, Alternative 2, or the Requester's Preferred Alternative. **No effect** would occur.

Mitigation Measure: No mitigation is required.

Effect 3.8-c: Potential Change in Air Traffic Patterns, including Either an Increase in Traffic Levels or a Change in Location That Results in Substantial Safety Risks.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2, " Flood Problems and Needs") and no levee repairs would be constructed. Therefore, in the short term, air traffic patterns would not change and no new aviation risks would be introduced. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The location and extent of damage could be minor to extensive, depending on the location and severity of the levee failure and duration of flooding. Flood waters would have the potential to reach the Stockton Airport, and flooding at the airport could interfere with flights to and from the airport. Therefore, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Phase 3 Repair Project construction under Alternative 1, Alternative 2, and the Requester's Preferred Alternative would not increase air traffic levels or introduce new safety risks related to aviation. **No effect** would occur.

Mitigation Measure: No mitigation is required.

Effect 3.8-d: Potential Increase in Hazards Caused by a Design Feature.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Therefore, in the short term, no changes in road design would occur and land uses would remain the same. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could result in temporary flooding and substantial long-term damage to the street infrastructure along a substantial number of collectors and local streets. Roads could need repair in some places and replacement in others. Infrastructure is expected to be designed in accordance with San Joaquin County, City of Lathrop, and City of Manteca design standards, as defined by each jurisdiction. Because laws and regulations would be enforced by these jurisdictions, potential effects related to increased hazards caused by transportation infrastructure design features would be **less than significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Alternative 1, Alternative 2, and the Requester's Preferred Alternative would not involve modifications to existing transportation infrastructure nor result in local land use changes. Therefore, the alternatives would not result in a hazard related to design features or land use, and **No effect** would occur.

Mitigation Measure: No mitigation is required.

Effect 3.8-e: Potential Reduction in Adequate Emergency Access.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Therefore, in the near term, emergency service response times and access would not be affected. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The location and extent of damage could be minor to extensive, depending on the location and severity of the levee failure and duration of flooding. A substantial number of collectors and local streets would be flooded temporarily, freeway facilities could be closed, and substantial long-term damage to the transportation network could occur. On roads that would become impassable when flooded, emergency access would be reduced, and emergency response times would increase concurrent with increased demand for emergency services during a flood event. These conditions could persist until road repairs could be made or roads were replaced. Therefore, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Implementation of Alternative 1, Alternative 2, or the Requester's Preferred Alternative could delay emergency service response times because of the difficulty emergency vehicles could experience in passing through or near construction areas, and as a result of increased congestion.

Alternative 1, Alternative 2, and the Requester's Preferred Alternative would increase traffic on local roadways associated with construction trips. In addition, temporary lane closures associated with levee repairs and with construction staging and laydown could cause or contribute to temporary increases in traffic levels as traffic slowed down on some local, collector, and arterial streets. Increased traffic congestion on road segments and intersections could interfere with the use of main roadways for emergency evacuation routes. Because implementation of Alternative 1, Alternative 2, or the Requester's Preferred Alternative could result in delays in emergency service response times and could cause potential interference with evacuation routes, this effect would be **potentially significant**.

Mitigation Measure 3.8-e: Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Before the start of each construction season, RD 17 and its primary contractors for engineering and construction shall develop a coordinated construction traffic safety and control plan to minimize simultaneous use of roadways by different construction contractors for material hauling and equipment delivery to the extent feasible, and to avoid and minimize potential traffic hazards on local roadways during construction. The following items will be integrated as terms of construction contracts:

(a) The plan will outline phasing of activities and the use of multiple routes to and from off-site locations, to minimize the daily amount of traffic on individual roadways. RD 17 shall ensure that the construction contractors enforce the plans throughout the construction periods.

(b) The construction contractors will develop traffic safety and control plans for the local roadways that will be affected by construction traffic. Before initiation of construction-related activity involving high volumes of traffic, the plan will be submitted for review by the agency of local jurisdiction (i.e., San Joaquin County, City of Lathrop, City of Manteca, or Caltrans [if applicable]) that has responsibility for roadway safety at and between project sites. The plan will include the following elements:

- posting warnings about the potential presence of slow-moving vehicles;
- using traffic control personnel when appropriate; and
- placing and maintaining barriers and installing traffic control devices necessary for safety, as specified in Caltrans's Manual of Traffic Controls for Construction and Maintenance Work Zones and in accordance with City/County requirements.

The contractor will train construction workers in appropriate safety measures, as described in the plan, and will implement the plan. The plan will include the prescribed locations for staging equipment and parking trucks and vehicles. Provisions will be made for overnight parking of haul trucks, to avoid causing traffic or circulation congestion.

(c) All operations will limit the accumulation of project-generated mud or dirt from adjacent public streets, and will expeditiously remove the mud or dirt, as necessary, at least once every 24 hours, if substantial volumes of soil have been carried onto adjacent paved public roadways during project construction.

(d) If needed to comply with Caltrans requirements, a transportation management plan will be prepared and submitted to Caltrans to cover any points of access from the state highway system, for haul trucks and other construction equipment.

(e) Before the start of the first construction season, RD 17 shall enter into maintenance agreements with San Joaquin County, the City of Lathrop, and the City of Manteca, to address maintenance and repair of affected roadways resulting from increased truck traffic. The agreements will ensure that the affected roadways are repaired to a level that is equivalent to their preproject conditions, as determined by the affected jurisdiction.

(f) Before project construction begins, RD 17 shall provide notification of project construction to all appropriate emergency service providers in San Joaquin County, the City of Lathrop, and the City Manteca, and shall coordinate with providers throughout the construction period to ensure that emergency access throughout the Phase 3 Repair Project area is maintained.

Responsibility: RD 17 and its primary contractors.

Timing: Before and during construction.

Implementation of Mitigation Measure 3.8-e would reduce Effect 3.8-e to a **less-than-significant** level under Alternative 1, Alternative 2, and the Requester's Preferred Alternative because RD 17 would provide methods of access and routes around construction activities to ensure that emergency access is maintained and emergency personnel are notified throughout the term of each construction season.

3.8.5 Residual Significant Effects

No effects would remain significant following implementation of Mitigation Measure 3.8-e. Residual adverse effects related to reducing emergency access would be reduced to a less-than-significant level because the traffic control plan would ensure that emergency access is maintained throughout the duration of the Phase 3 Repair Project and that emergency service agencies are knowledgeable about the construction activities for their planning purposes. With implementation of Mitigation Measure 3.8-e, no residual significant adverse effects would occur.

3.9 Air Quality

This section discusses the existing air quality within the Phase 3 Repair Project area and surrounding areas, identifies applicable Federal and state laws and regulations, and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to air quality. Climate change and greenhouse gas emissions effects are presented in Section 3.10, "Climate Change." A discussion of cumulative effects related to air quality is provided in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements," of this FEIS.

3.9.1 Regulatory Setting

As required under NEPA, applicable Federal laws and regulations are identified in this section. State laws and regulations applicable to implementation of the Phase 3 Repair Project by RD 17 are described for informational purposes and to assist with NEPA review. Regional and local plans and ordinances have also been considered as a part of the environmental review process for this FEIS, where applicable to the Phase 3 Repair Project.

Federal

Clean Air Act of 1963, as Amended

The Federal government first adopted the Clean Air Act (CAA) (U.S. Code Section 7401) in 1963, to improve air quality and protect the citizens' health and welfare, which required implementation of national ambient air quality standards (NAAQS). The NAAQS are revised and changed when scientific evidence indicates a need. Current standards are set for sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone, fine particulate matter with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$), respirable particulate matter with an aerodynamic diameter of 10 micrometers or less (PM_{10}), and lead. These pollutants are collectively referred to as criteria pollutants. The CAA also requires each state to prepare an air quality control plan referred to as a State Implementation Plan (SIP). The Federal Clean Air Act Amendments of 1990 added requirements for states with nonattainment areas to revise their SIPs by incorporating additional control measures to reduce air pollution. The SIP is modified periodically to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies.

The U.S. Environmental Protection Agency (EPA) has been charged with implementing national air quality programs. EPA's air quality mandates are drawn primarily from the CAA, enacted in 1970. The most recent major amendments made by the U.S. Congress were in 1990. EPA reviews all SIPs to determine conformation to the mandates of the CAA and its amendments and to determine whether implementation of the SIPs will achieve air quality goals. If EPA determines that a SIP is inadequate, a Federal Implementation Plan that imposes additional control measures may be prepared for the nonattainment area. Failure to submit an approvable SIP or to implement the plan within the mandated time frame may result in application of sanctions to transportation funding and stationary air pollution sources in the air basin.

Pursuant to the CAA, state and local agencies are responsible for planning for attainment and maintenance of the NAAQS. EPA classifies air basins (i.e., distinct geographic regions) as either attainment or "nonattainment" for each criteria pollutant, based on whether or not the NAAQS have been achieved. Some air basins have not received sufficient analysis for certain criteria air pollutants and are designated as "unclassified" for those pollutants. The San Joaquin Valley Air Pollution Control District (SJVAPCD) and California Air Resources Board (CARB) are the responsible agencies for providing air quality attainment plans and for demonstrating attainment of these standards in the Phase 3 Repair Project area.

The Code of Federal Regulations (CFR) 40 Part 93 Subpart B, General Conformity, requires all federally funded projects, or projects requiring a Federal action or authorization, to demonstrate conformance with applicable air quality planning efforts as specified under the CAA. General conformity is determined by comparing project-level emissions to de minimis thresholds; projects that can demonstrate potential emissions below the de minimis thresholds are determined to confirm with air quality planning and policy goals established by the local air district. Projects that demonstrate potential emissions in excess of the de minimis thresholds are required to identify additional mitigation measures, designed to reduce and control criteria pollutant emissions to the extent feasible and practical, to lessen the potential air quality effects resulting from project implementation.

State

California Clean Air Act

CARB is the agency responsible for coordination and oversight of state and local air pollution control programs in California and for implementing the California Clean Air Act. This act, which was adopted in 1988, required CARB to establish California ambient air quality standards (CAAQS). The standards for criteria pollutants established by CARB are generally more restrictive than the NAAQS, as shown in **Table 3.9-1**. CARB also has established CAAQS for sulfates, hydrogen sulfide, vinyl chloride, visibility-reducing particulate matter, and the criteria air pollutants described in the "Criteria Air Pollutants" section in Section 3.9.2. Differences in the standards are generally explained by the health effects studies considered during the standard-setting process and the interpretation of the studies. In addition, the CAAQS incorporate a margin of safety to protect sensitive individuals.

The California Clean Air Act requires that all local air districts in the state endeavor to achieve and maintain the CAAQS by the earliest practical date. The act specifies that local air districts should focus particular attention on reducing the emissions from transportation and areawide emission sources and provides districts with the authority to regulate indirect sources (i.e., sources that are not stationary or regulated as a stationary source, such as construction sources).

Other CARB responsibilities include:

- overseeing local air district compliance with California and Federal laws;
- approving local air quality attainment plans (AQAPs);
- submitting SIPs to the EPA;
- monitoring air quality;
- determining and updating area designations and maps; and
- setting emissions standards for new mobile sources, consumer products, small utility engines, off-road vehicles, and fuels.

Table 3.9-1. National and California Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [a]		National Standards [b]		
		Concentration [c]	Method [d]	Primary [c,e]	Secondary [c,f]	Method
Ozone [g]	1 hour	0.09 ppm (180 μg/m³)	Ultraviolet Photometry	–	Same as primary standard	Ultraviolet Photometry
	8 hour	0.070 ppm (137 μg/m³)		0.070 ppm (137 μg/m³)		
Respirable particulate matter (PM_{10})	24 hour	50 μg/m³	Gravimetric or Beta Attenuation	150 μg/m³	Same as primary standard	Inertial Separation and Gravimetric Analysis
	Annual arithmetic mean	20 μg/m³		–		
Fine particulate matter ($PM_{2.5}$)	24 hour	–	–	35 μg/m³	Same as primary standard	Inertial Separation and Gravimetric Analysis
	Annual arithmetic mean	12 μg/m³	Gravimetric or Beta Attenuation	12 μg/m³	15 μg/m³	
Carbon monoxide	1 hour	20 ppm (23 mg/m³)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m³)	–	Non-Dispersive Infrared Photometry (NDIR)
	8 hour	9.0 ppm (10 mg/m³)		9 ppm (10 mg/m³)	–	
	8 hour (Lake Tahoe)	6 ppm (7 mg/m³)		–	–	
Nitrogen dioxide [h]	1 hour	0.18 ppm (339 μg/m³)	Gas Phase Chemiluminescence	100 ppb (188 μg/m³)	–	Gas Phase Chemiluminescence
	Annual arithmetic mean	0.030 ppm (57 μg/m³)		0.053 ppm (100 μg/m³)	Same as primary standard	
Sulfur dioxide [i]	1 hour	0.25 ppm (655 μg/m³)	Ultraviolet Fluorescence	75 ppb (196 μg/m³)	–	Spectrophotometry (Paraosaniline Method)
	3 hour	–		–	0.5 ppm (1,300 μg/m³)	
	24 hour	0.04 ppm (105 μg/m³)		0.14 ppm (for certain areas) [g]	–	
	Annual Arithmetic Mean	–		0.030 ppm (for certain areas) [g]	–	
Lead [j,k]	30-day average	1.5 μg/m³	Atomic Absorption	–	–	
	Calendar Quarter	–		1.5 μg/m³ (for certain areas) [i]	Same as primary standard	High Volume Sampler and Atomic Absorption
	Rolling 3-month average	–		0.15 μg/m³		
Visibility-reducing particles [l]	8 hour	See footnote j	Beta Attenuation and Transmittance through Filter Tape	No national standards		
Sulfates	24 hour	25 μg/m³	Ion Chromatography			

Table 3.9-1. National and California Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [a]		National Standards [b]		
		Concentration [c]	Method [d]	Primary [c,e]	Secondary [c,f]	Method
Hydrogen sulfide	1 hour	0.03 ppm (42 μg/m^3)	Ultraviolet Fluorescence			
Vinyl chloride [j]	24 hour	0.01 ppm (26 μg/m^3)	Gas Chromatography			

Notes: μg/m^3 = micrograms per cubic meter; mg/m^3 = milligrams per cubic meter; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ppb = parts per billion; ppm = parts per million.

[a] California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1- and 24-hour), nitrogen dioxide, and particulate matter (PM_{10}, $PM_{2.5}$, and visibility-reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

[b] National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μg/m^3 is equal to or less than 1. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standards. Contact the U.S. Environmental Protection Agency for further clarification and current national policies.

[c] Concentration expressed first in the units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25 degrees Celsius (°C) and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and reference pressure of 760 torr; parts per million (ppm) in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[d] Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

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

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

[g] On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm

[h] To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of ppm. To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

[i] On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until 1 year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.
Note that the 1-hour national standard is in units of ppb. California standards are in units of ppm. To directly compare the 1-hour national standard to the California standard, the units can be converted to ppm. In this case, the national standard of 75 ppb is identical of 0.075 ppm.

[j] The California Air Resources Board (CARB) has identified lead and vinyl chloride as toxic air contaminants with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

[k] The national standard for lead was revised on October 15, 2008, to a rolling 3-month average. The 1978 lead standard (1.5 μg/m^3 as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standards are approved.

[l] In 1989, CARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are “extinction of 0.23 per kilometer” and the “extinction of 0.07 per kilometer” for the statewide and Lake Tahoe Air Basin standards, respectively.

Source: CARB 2019a

3.9.2 Environmental Setting

The Phase 3 Repair Project area is located within the San Joaquin Valley Air Basin (SJVAB), which comprises eight counties in California’s Central Valley: San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and the SJVAB portion of Kern. Air quality within the Phase 3 Repair Project area is regulated by EPA, CARB, and the SJVAPCD. Each of these agencies develops rules, regulations, policies, and/or goals to comply with applicable legislation. Although EPA regulations may not be superseded, both state and local regulations may be more stringent than EPA regulations.

Criteria Air Pollutants

EPA has identified and established ground-level concentration criteria for seven common air pollutants known to have deleterious human health effects. These "criteria pollutants" include CO, ozone, nitrogen dioxide (NO_2), SO_2, PM_{10}, $PM_{2.5}$, and lead. EPA, under the CAA, is charged with establishing NAAQS for each criteria pollutant based on the concentration required to protect public health and welfare. In addition, the State of California has implemented more stringent air quality standards, known as the CAAQS, that aid in effectively reducing harmful emissions in areas with poor air quality or nonattainment designations. Criteria pollutants and their health effects are described next.

Carbon monoxide is a colorless, odorless gas formed through the process of incomplete combustion of fossil fuels. Exposure to harmful levels of CO reduces the blood's ability to transport oxygen through the body to vital organs and tissues and can have detrimental effects on the cardiovascular and central nervous systems.

Ozone is a highly reactive and unstable gas that is formed when reactive organic gases (ROG) and oxides of nitrogen (NO_X), both byproducts of internal combustion released in engine exhaust, undergo slow photochemical reactions in the presence of heat and sunlight. ROG and NO_X are referred to as ozone "precursors" because of their role in ozone formation. Exposure to unhealthy levels of ground-level ozone could result in coughing, throat irritation, chest pain, and congestion.

Nitrogen dioxide is highly reactive and is part of the larger NO_X group of gases. NO_2 is formed from engine or industrial process emissions during combustion of nitrogen-rich fossil fuels. Health effects from increased exposure include airway inflammation and increased respiratory ailments in asthmatics.

Sulfur dioxide is highly reactive and is part of a larger group of gases known as sulfur oxides. SO_2 is formed during engine operations or industrial processes where sulfur-containing fossil fuels are burned. Exposure to unhealthy levels of SO_2 can cause adverse respiratory effects including asthma and bronchoconstriction.

Respirable particulate matter includes both fine and coarse liquid and solid particles and is typically emitted through earthmoving activities, and from mobile sources and industrial processes. Exposure to unhealthy levels of PM_{10} could lead to effects on the respiratory and breathing systems and cause damage to lung tissue.

Fine particulate matter is a complex mixture of extremely small particles and liquid droplets, made up of a number of components, including acids such as nitrates and sulfates, organic chemicals, metals, and soil or dust particles. $PM_{2.5}$ is of particular concern because of its size and ability to cause respiratory ailments. Exposure to unhealthy levels could cause respiratory symptoms, including decreased lung function and aggravated asthma.

Lead is both a natural and human-made metal that poses a serious health threat through the introduction and use of leaded-fuels. Fuels no longer contain lead, which has significantly decreased lead emissions within the atmosphere. Common sources of lead today include lead smelters, waste incinerators, and battery manufacturing operations. Unhealthy levels of lead exposure can have adverse health effects affecting the nervous, immune, reproductive, developmental, and cardiovascular systems.

Ambient Air Quality Standards

EPA has established primary and secondary NAAQS for the following criteria air pollutants: ozone, PM_{10}, $PM_{2.5}$, CO, NO_2, SO_2, and lead. The primary standards protect the public health and the secondary standards protect public welfare. NAAQS applicable to the SJVAB are shown in **Table 3.9-1**. Regions throughout the nation are designated as in attainment or nonattainment of both the primary and secondary NAAQS based on ambient air monitoring data. Areas designated as in nonattainment for the ozone NAAQS are further designated as to their degree (or severity) of the nonattainment, which directly affects the control measures required in their AQAPs as well as the timeline for achieving attainment of the NAAQS.

Both CARB and EPA use monitoring data to designate areas according to attainment status for criteria air pollutants established by the agencies. The purpose of these designations is to identify those areas with air quality problems and thereby initiate planning efforts for improvement. The three basic designation categories are "nonattainment," "attainment," and "unclassified." The "unclassified" designation is used in an area that cannot be classified on the basis of available information as meeting or not meeting the standards. In addition, the California designations include a subcategory of the nonattainment designation, called "nonattainment-transitional." Attainment status designations for the SJVAB are shown in **Table 3.9-2**.

Of the several air pollutant monitoring stations located in the SJVAB, the Hazelton Street station in Stockton, California, is the closest monitoring station to the levee repair sites with data to meet EPA and CARB criteria for quality assurance for all criteria pollutants. **Table 3.9-2** summarizes the air quality data from this monitoring station for the latest 3 years for which data are available, 2016–2018 (2011-2012 for CO).

Toxic Air Contaminants

Toxic air contaminants (TACs) include air pollutants that cause or contribute to an increase in death or serious illness such as cancer, or those that pose a potential human health hazard. The California Air Toxics Program, developed by CARB, established the process for identification and control of toxic air contaminants and includes provisions to make the public aware of significant toxic exposures and for reducing risk. Reference exposure level (REL) thresholds have been established for TACs based on cancer or noncancer risk through TAC exposure.

Unlike carcinogens, for most noncarcinogens it is believed that a threshold level of exposure to the compound below exists at which it will not pose a health risk. The California Environmental Protection Agency and California Office of Environmental Health Hazard Assessment have developed RELs for noncarcinogenic TACs that are health-conservative estimates of the levels of exposure at or below which health effects are not expected. The noncancer health risk because of exposure to a TAC is assessed by comparing the estimated level of exposure to the REL. The comparison is expressed as the ratio of the estimated exposure level to the REL, called the hazard index (HI). An HI equal to or greater than 1.0 indicates an unsafe exposure that poses a significant health risk.

Diesel-fueled mobile sources including motor vehicles and off-road equipment emit compound emissions such as diesel particulate matter (DPM), which is a subset of PM_{10} exhaust emissions that is recognized as a TAC by CARB. Emissions of DPM have been related to long-term health effects, including noncancer chronic health hazards and increased cancer risk. Temporary construction activities would include operation of diesel-fueled nonroad equipment resulting in emissions of DPM. However, construction activities for the Phase 3 Repair Project would occur over a finite period of time, from July 1 to November 1 (approximately 123 days per year for 2 years); therefore, DPM emissions would result in short-term, temporary adverse effects, and would not result in a long-term cancer risk to residents and workers.

Table 3.9-2. Summary of Annual Ambient Air Quality Peak Concentrations (2016–2018) Hazelton Street Air Quality Monitoring Station, Stockton, CA

Attainment Designations[1] State	Attainment Designations[1] Federal	Pollutant and Averaging Time	2016	2017	2018
N (severe)	N (extreme)[2]	**Ozone**			
		Maximum concentration (1-hour/8-hour average, ppm)	0.102/0.079	0.085/0.080	0.088/0.078
		Number of days state standard exceeded (1-hour/8-hour)	2/2	0/2	0/2
		Number of days federal standard exceeded (8-hour)	2	2	1
N	N	**Fine Particulate Matter ($PM_{2.5}$)**			
		Maximum concentration (µg/m^3)[1]	43.7	53.7	188
		Number of days federal standard exceeded (measured/estimated)	4/4.0	16/16.9	25/25.0
N	A	**Coarse Particulate Matter (PM_{10})**			
		Maximum concentration (µg/m^3)[1] (state/federal)[3]	66.5/65.9	92.6/89.9	198.6/187.0
		Number of days state standard exceeded (measured/estimated)	5/30.6	7/42.9	5/31.7
		Number of days federal standard exceeded (measured/estimated)	0/0.0	0/0.0	2/13.1
A/U	A/U	**Carbon Monoxide**			
		Maximum concentration (8-hour average, ppm)	--	(2.13)[4]	(1.78)[4]

Notes: µg/m^3 = microgram per cubic meter; * no data available; EPA = U.S. Environmental Protection Agency; ppm = parts per million; SJVAB = San Joaquin Valley Air Basin.

1 Nonattainment (N): The designation for any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.
Attainment (A): The designation for any area that meets the national primary or secondary ambient air quality standard for the pollutant.
Unclassifiable (U): The designation for any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

2 Effective June 15, 2005, EPA revoked the Federal 1-hour ozone standard, including associated designations and classifications. EPA had previously classified the SJVAB as extreme nonattainment for this standard. EPA approved the 2004 Extreme Ozone Attainment Demonstration Plan on March 8, 2010 (effective April 7, 2010). Many applicable requirements for extreme 1-hour ozone nonattainment areas continue to apply to the SJVAB.

3 State and federal statistics may differ because: state data collected using California approved samplers may differ from data collected using federal reference or equivalent methods; state statistics are based on local meteorological conditions while federal statistics are based on standard conditions; state criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than federal criteria.

4 Most recent CO data available are from 2011 (2.13 ppm) and 2012 (1.78 ppm)

Source: CARB 2019b

Emission estimates for PM_{10} were used to evaluate effect significance from DPM emissions. Because this would be a linear project with an active construction site that would move at a rate of 7 to 100 feet per day, and because emissions of PM_{10} would be less than 10 tons per year (TPY) (see Section 3.9.4, “Effects and Mitigation Measures”) and would occur for a short-term duration, residents and workers would not be exposed to significant DPM emission levels. Therefore, a health risk assessment and prioritization screening were not conducted for this analysis.

3.9.3 Methodology and Thresholds of Significance

Methodology

The SJVAPCD provides guidance for evaluating air quality effects from proposed projects. USACE has considered SJVAPCD’s guidance in evaluating the Phase 3 Repair Project’s air quality effects in this FEIS. Emissions from the Phase 3 Repair Project are entirely related to construction activities. To evaluate the level of air quality analysis, preliminary emission estimates were used to determine if ROG and NO_X emissions may exceed the annual thresholds. Based on these preliminary emission estimates, it was determined that a full analysis level evaluation is appropriate for the Phase 3 Repair Project.

Construction emissions were estimated using emission factors taken from Sacramento Metropolitan Air Quality Management District's Roadway Construction Emissions Model (version 9.0.0, May 2019), which used emission factors from CARB's OFFROAD model (developed for off-road construction equipment emissions) and EMFAC 2017 model (developed for on-road vehicle emission) for the year 2020, when construction will commence. Off-road construction equipment factors were based on 2020 fleet mix averages and default horsepower values obtained from CalEEMod to calculate off-road equipment emissions. Additionally, fugitive PM emissions from construction activity, aggregate storage piles, and on-road truck trips along haul routes were determined using EPA AP-42 emission factors. Construction-related emissions were estimated based on number of equipment, duration of activity (in days) and 8 hours of operation per day; haul truck emissions were estimated based on total amount of material, haul capacity (in cubic yards) and trip length as provided in Chapter 2, "Alternatives." Detailed assumptions and model results are provided in **Appendix G**.

As stated above, increased pollutant emissions associated with the Phase 3 Repair Project would primarily be generated by construction-related activities; operational effects would be negligible, and therefore long-term regional (operational) emissions were not estimated. In addition, project implementation would not result in any major sources of odor, and the Phase 3 Repair Project would not involve operation of any of the common types of facilities that are known to produce odors (e.g., landfill, coffee roaster, wastewater treatment facility). Diesel exhaust, which is sometimes considered an objectionable odor source, would be associated with the use of on-site construction equipment, but it would be intermittent and temporary and would dissipate rapidly from the source with an increase in distance. Thus, project implementation would not expose sensitive receptors to odorous emissions, and this issue is not discussed further in this FEIS.

Thresholds of Significance

The basis for determining the significance of effects for this analysis is based on professional standards and project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to air quality if they would do any of the following:

- conflict with or obstruct implementation of the applicable air quality plan;
- expose sensitive receptors to substantial pollutant concentrations;
- result in other emissions such as those leading to odors adversely affecting a substantial number of people; or
- result in a cumulatively considerable net increase of any criteria pollutant for which the Phase 3 Repair Project region is designated nonattainment under the applicable Federal or state ambient air

quality standard (analysis presented in Chapter 4, “Cumulative and Growth-Inducing Effects and Other Statutory Requirements”).

SJVAPCD has developed quantitative thresholds that are used to evaluate project effects from construction and operation. Temporary and short-term construction-related emissions of criteria pollutants or precursors would violate an air quality standard, contribute substantially to an existing or projected air quality violation, or expose sensitive receptors to substantial pollutant concentration if any of the following thresholds were exceeded:

- PM_{10} — Emissions exceed the SJVAPCD-recommended threshold of 15 TPY;
- ROG — Emissions exceed SJVAPCD-recommended threshold of 10 TPY; or
- NO_X — Emissions exceed SJVAPCD-recommended threshold of 10 TPY.

SJVAPCD’s significance thresholds have been used in this FEIS to inform the analysis because SJVAPCD has developed quantitative thresholds that are more stringent than those of NEPA.

In addition to regional significance, General Conformity requirements under CFR 40 Part 93 require all federally funded projects, or projects requiring a Federal action or authorization, to demonstrate conformance with applicable air quality planning efforts as specified under the Clean Air Act. In addition, SJVAPCD has adopted the Federal General Conformity regulations, as Regulation IX, Rule 9110. The Phase 3 Repair Project may be assumed to conform to air quality plans if estimated project emissions are below the following de minimis nonattainment thresholds:

- 10 TPY of ROG,
- 10 TPY of NO_X,
- 100 TPY of PM_{10}, and
- 100 TPY of $PM_{2.5}$.

If project emissions are in excess of the de minimis thresholds, adverse project effects may be offset through a federally and state enforceable offset program that has gone through the SIP approval process. However, these off-site mitigation programs cannot be used to demonstrate that project emissions are below the applicable de minimis level. If project emissions are above the de minimis threshold, a General Conformity Determination must be completed.

3.9.4 Effects and Mitigation Measures

Effect 3.9-a: Temporary and Short-Term Emissions of ROG, NO_X, PM_{10} and $PM_{2.5}$ during Construction.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17’s current practice (see the “Management of Vegetation Encroachments” section in Section 1.6.2) and no levee repairs would be constructed. Because no construction activities would occur that would generate temporary and short-term emissions of ROG, NO_X, PM_{10}, and $PM_{2.5}$ in the near term, no temporary or short-term adverse effects related to air quality would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The magnitude of the effect of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. Cleanup actions in the event of a levee failure would likely require heavy use of construction equipment that would result in short-term, temporary emissions. Depending on the severity and extent of flood damage, emissions from cleanup activities could be minor or extensive. For this reason, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Concurrent construction of seepage berms, chimney and blanket drains, and cutoff walls under Alternative 1 would result in temporary and short-term generation of ROG, NO_X, PM_{10}, and $PM_{2.5}$ emissions from excavation, vegetation clearing, grading, motor vehicle exhaust associated with construction equipment, construction employee commute trips, material transport (especially on unpaved surfaces), material handling and other construction activities associated with construction of the Phase 3 Repair Project. Worst-case annual construction emissions were calculated based on the assumptions described in Chapter 2, "Alternatives," for completion of the 2020 through 2021 construction seasons. A summary of worst-case total and annual emissions is shown in **Table 3.9-3**.

Table 3.9-3. Summary of Annual Construction Emissions from the Minimum Footprint Alternative (Alternative 1) (2020–2021)

Total Project Emissions (tons)				
Element	**ROG**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
Ia	0.09	1.0	0.04	0.04
Ib	0.03	0.4	0.01	0.01
Ie	0.11	1.3	0.05	0.05
IIab	0.09	0.9	0.04	0.03
IIIa	0.10	1.1	0.04	0.04
IIIb	0.12	1.4	0.05	0.05
IVa	0.09	1.0	0.04	0.04
IVc	0.09	1.0	0.04	0.04
Va–VIa.1	0.29	3.0	0.12	0.11
VIa.4	0.02	0.3	0.01	0.01
VIb	0.05	0.5	0.02	0.02
VIcde	0.15	1.7	0.07	0.06
VIIb	0.07	0.8	0.03	0.03
VIIe	0.10	1.1	0.04	0.04
VIIg	0.12	1.4	0.05	0.05
Total Construction Activity Emissions (tons)	1.5	16.8	3.3	0.9
Total Haul Truck Emissions (tons)	0.15	2.3	0.29	0.07
Total Worker Commuter Trip Emissions (tons)	0.02	0.11	0.002	0.002
Total Project Emissions (tons)	**1.7**	**19.3**	**3.6**	**0.9**
Total 2020 Annual Emissions (tons/yr)	**0.85**	**9.6**	**1.8**	**0.47**
Total 2021 Annual Emissions (tons/yr)	**0.85**	**9.6**	**1.8**	**0.47**
Regional Threshold (tons/yr)	**10**	**10**	**15**	**-**
Exceed Regional Significance Threshold?	**No**	**No**	**No**	**-**

Table 3.9-3. Summary of Annual Construction Emissions from the Minimum Footprint Alternative (Alternative 1) (2020–2021)

Regional Threshold (tons/yr)	**10**	**10**	**15**	**-**
Exceed Regional Significance Threshold after Mitigation?	No	No	No	-

Notes: NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; ROG = reactive organic gases; SJVAPCD = San Joaquin Valley Air Pollution Control District; yr = year.

[1] Implementation of recommended mitigation measures listed under Mitigation Measures 3.9-a(1) and 3.9-a(2) would reduce mobile source emissions of NO_X and PM_{10}/$PM_{2.5}$ by approximately 20 percent and 45 percent, respectively (SJVAPCD Rule 9510, Section 6.0).

Refer to **Appendix G** for detailed assumptions and modeling output files.

Source: Data modeled by Ascent Environmental in 2019

As shown in **Table 3.9-3**, estimated worst-case annual emissions generated from implementation of Alternative 1 would not exceed the SJVAPCD regional thresholds for ROGs, NO_X, PM_{10}, or $PM_{2.5}$. Due to the PM_{10} serious maintenance status of the SJVAB, regional requirements pertaining to fugitive dust emissions have been adopted, including SJVAPCD Regulation VIII, “Fugitive Dust PM_{10} Prohibitions.” Regulation VIII requires implementation of applicable supplemental dust control measures to be adopted into a proposed project as control measures, mitigation measures, or design features to reduce dust emissions to the extent feasible. Without fugitive dust emission controls, construction-generated emissions could result in or substantially contribute to the violation of air quality standards if compliance with SJVAPCD Regulation VIII is not achieved. Therefore, this effect would be **significant**.

Alternative 2: Maximum Footprint Alternative

As with Alternative 1, annual construction emissions that would occur under Alternative 2 would result primarily from concentrated equipment operation associated with concurrent element activity including construction of seepage berms, chimney drains, cutoff walls, and setback levees. Emissions associated with this alternative were calculated based on element repair, duration, and differences in total fill material required relative to Alternative 1. **Table 3.9-4** shows total and annual emissions for Alternative 2.

As shown in **Table 3.9-4**, implementation of Alternative 2 would result in temporary and short-term construction-related emissions of ROG, PM_{10}, and $PM_{2.5}$ below the SJVAPCD regional thresholds. Due to the PM_{10} maintenance status of the SJVAB, regional requirements pertaining to fugitive dust emissions have been adopted, including SJVAPCD Regulation VIII, “Fugitive Dust PM_{10} Prohibitions.”

Table 3.9-4. Summary of Annual Emissions from the Maximum Footprint Alternative (Alternative 2) (2020–2021)

Total Project Emissions (tons)				
Element	**ROG**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
1a	0.09	1.0	0.04	0.04
1b	0.03	0.35	0.01	0.01
1e	0.11	1.3	0.05	0.05
IIab	0.10	1.3	0.05	0.05
IIIa	0.10	1.1	0.04	0.04
IIIb	0.12	1.4	0.1	0.05
IVa	0.09	1.0	0.04	0.04
IVc	0.04	0.49	0.02	0.02

Table 3.9-4. Summary of Annual Emissions from the Maximum Footprint Alternative (Alternative 2) (2020–2021)

Total Project Emissions (tons)				
Element	**ROG**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
Va–VIa.1	1.4	15.1	0.58	0.54
VIa.4	0.02	0.28	0.01	0.01
VIb	0.05	0.54	0.02	0.02
VIcde	0.05	0.65	0.02	0.02
VIIb	0.07	0.75	0.03	0.03
VIIe	0.10	1.1	0.04	0.04
VIIg	0.12	1.4	0.05	0.05
Total Construction Activity Emissions (tons)	2.5	27.8	3.9	1.3
Total Haul Truck Emissions (tons)	0.23	3.7	0.46	0.11
Total Worker Commuter Trip Emissions (tons)	0.024	0.11	0.002	0.002
Total Project Emissions (tons)	**2.7**	**31.6**	**4.4**	**1.4**
Total 2020 Emissions (tons/yr)	**1.4**	**15.8**	**2.2**	**0.69**
Total 2021 Emissions (tons/yr)	**1.4**	**15.8**	**2.2**	**0.69**
Regional Threshold (tons/yr)	**10**	**10**	**15**	**-**
Exceed Regional Significance Threshold?	**No**	**Yes**	**No**	**-**
Percent Reduction[1]	-	-	50%	50%
Total 2020 Emissions (tons/yr) with on-site emissions reductions	**1.4**	**15.8**	**1.5**	**0.62**
Total 2021 Emissions (tons/yr) with on-site emissions reductions	**1.4**	**15.8**	**1.5**	**0.62**
Regional Threshold	**10**	**10**	**15**	**-**
Exceed Regional Significance Threshold after Mitigation?	**No**	**Yes**	**No**	**-**

Notes: NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; ROG = reactive organic gases; SJVAPCD = San Joaquin Valley Air Pollution Control District; yr = year.

1 Implementation of recommended mitigation measures listed under Mitigation Measures 3.9-a(1) and 3.9-a(2) would reduce off-road exhaust emissions to the extent feasible and fugitive dust emissions by up to 50 percent.

Refer to **Appendix G** for detailed assumptions and modeling output files.

Source: Data modeled by Ascent Environmental in 2019

Regulation VIII requires implementation of applicable supplemental dust control measures to be adopted into a proposed project as control measures, mitigation measures, or design features reduce dust emissions to the extent feasible. Therefore, without fugitive dust emission controls, construction-generated emissions of PM10 and PM2.5 could result in or substantially contribute to the violation of air quality standards if compliance with SJVAPCD Regulation VIII is not achieved. In addition, annual unmitigated emissions of NOX would exceed the SJVAPCD regional 10 TPY threshold, and therefore could expose nearby existing sensitive receptors to substantial pollutant concentrations and/or substantially contribute to a violation of an air quality standard. Therefore, this effect would be **significant**.

Requester's Preferred Alternative

As with Alternative 1 and Alternative 2, annual construction emissions that would occur under the Requester's Preferred Alternative would result primarily from concentrated equipment operation associated with concurrent element activity including construction of seepage berms, chimney drains, cutoff walls, and the setback levee. **Table 3.9-5** shows total and annual emissions for the Requester's Preferred Alternative.

Table 3.9-5. Summary of Annual Emissions from the Requester's Preferred Alternative (2020–2021)

Total Project Emissions (tons)				
Element	**ROG**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
Ia	0.10	1.1	0.04	0.04
IIab	0.09	0.92	0.04	0.03
IIIa	0.07	0.88	0.03	0.03
IVc	0.29	3.0	0.12	0.11
Va–VIa.1	0.02	0.17	0.01	0.01
VIa.4	0.14	1.4	0.06	0.05
VIbc	0.07	0.84	0.03	0.03
VIIe	0.10	1.1	0.04	0.04
Total Construction Activity Emissions (tons)	**0.78**	**8.4**	**3.1**	**0.59**
Total Haul Truck Emissions (tons)	**0.14**	**2.3**	**0.28**	**0.07**
Total Worker Commuter Trip Emissions (tons)	**0.02**	**0.11**	**0.002**	**0.002**
Total Project Emissions (tons)	**0.95**	**10.8**	**3.4**	**0.66**
Total 2020 Emissions (tons/yr)	**0.47**	**5.4**	**1.7**	**0.33**
Total 2021 Emissions (tons/yr)	**0.47**	**5.4**	**1.7**	**0.33**
Regional Threshold (tons/yr)	**10**	**10**	**15**	**-**
Exceed Regional Significance Threshold?	**No**	**No**	**No**	**-**

Notes: NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; ROG = reactive organic gases; yr = year.

Refer to **Appendix G** for detailed assumptions and modeling output files.

Source: Data modeled by Ascent Environmental in 2019

Implementation of the Requester's Preferred Alternative would result in temporary and short-term construction-related emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$ that would be below the SJVAPCD regional thresholds. However, SJVAPCD has also defined significance for PM_{10} and PM2.5 emissions based not only on construction emissions estimates but also on the adoption of fugitive emissions control requirements. Due to the PM10 serious maintenance status of the SJVAB, regional requirements pertaining to fugitive dust emissions have been adopted, including SJVAPCD Regulation VIII, "Fugitive Dust PM10 Prohibitions." Regulation VIII requires implementation of applicable supplemental dust control measures to be adopted into a proposed project as control measures, mitigation measures, or design features to demonstrate effects proposed as less than significant. Without fugitive dust emission controls, construction-generated emissions could result in or substantially contribute to the violation of air quality standards if compliance with SJVAPCD Regulation VIII is not achieved. Annual unmitigated construction emissions associated with the Requester's Preferred Alternative would not exceed the

SJVAPCD regional thresholds for ROGs, NOX, PM10, or PM2.5 but could contribute substantially to an already adverse air quality condition with respect to PM emissions. Therefore, this effect would be significant.

Mitigation Measure 3.9-a(1): Prepare and Implement a Dust Control Plan in Accordance with SJVAPCD Regulation VIII to Control Fugitive Dust Emissions.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

In accordance with SJVAPCD Regulation VIII, Rule 8021, Construction, Demolition, Excavation, Extraction and Other Earthmoving Activities, RD 17 will prepare and implement a dust control plan that includes the following measures, as applicable:

- All disturbed areas, including storage piles, which are not being actively used for construction purposes, will be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, covered with a tarp or other suitable cover or vegetative ground cover.
- All on-site unpaved roads and off-site unpaved access roads will be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.
- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities will be effectively controlled of fugitive dust emissions using application of water or by presoaking. All vegetation cleared from the site will be chipped before removal from the site.
- When materials are transported off-site, all material will be covered, or effectively wetted to limit visible dust emissions, and at least 6 inches of freeboard space from the top of the container will be maintained.
- All operations will limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. (The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions.) (Use of blower devices is expressly forbidden.)
- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles will be effectively stabilized of fugitive dust emissions using sufficient water or chemical stabilizer/suppressant.
- Within urban areas, trackout will be immediately removed when it extends 50 or more feet from the site and at the end of each workday.
- Any site with 150 or more vehicle trips per day will prevent carryout and trackout.
- Limit traffic speeds on unpaved roads to 15 mph; and
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways from sites with a slope greater than 1 percent.

Responsibility: RD 17 and its primary construction contractors.

Timing: Development of a dust control plan to be completed prior to construction and implementation to occur throughout construction.

With implementation of Mitigation Measure 3.9-a(1), RD 17 would prepare and implement a dust control plan to control temporary and short-term construction-related emissions of PM_{10} and $PM_{2.5}$, under Alternative 1, Alternative 2, and the Requester's Preferred Alternative. Therefore, adverse effects of fugitive PM dust emissions would be reduced by up to 50 percent, and this impact would be reduced to **less than significant**.

Mitigation Measure 3.9-a(2): Implement Fleetwide Exhaust Emissions Reduction Measures

Alternative 2: Maximum Footprint Alternative

The SJVAPCD guidance provides mitigation measures for reducing temporary and short-term emissions of NO_X through implementation of general construction mitigation measures. The rule has a very prescriptive method for calculating NO_X emissions based on actual estimated equipment use. The following measures shall be implemented by the primary construction contractor to reduce exhaust emissions of NO_x and PM_{10}:

- Submit to the lead agency and SJVAPCD 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 model year, and projected hours of use for each piece of equipment. The project representative shall provide the anticipated construction timeline including start date, and name and phone number of the project manager and on-site foreman. Utilize off-road construction fleets that can achieve fleet average emissions equal to or cleaner than the Tier III emission standards, as set forth in §2423 of Title 13 of the California Code of Regulations, and Part 89 of Title 40 Code of Federal Regulations. This can be achieved through any combination of uncontrolled engines and engines complying with Tier III and above engine standards.

- Limit the hours of operation of heavy-duty equipment and/or the amount of equipment in use.

- Replace fossil-fueled equipment with electrically driven equivalents (provided they are not run via a portable generator set).

- Curtail construction during periods of high ambient pollutant concentrations. This may include ceasing construction activity during the peak hour of vehicular traffic on adjacent roadways.

- Implement activity management (e.g., rescheduling activities to reduce short-term impacts).

- To mitigate any additional emissions that cannot be offset through implementation of measures above, the following shall apply:

  Prior to the approval of improvement plans or the issuance of grading permits, the proponent will submit proof that the off-site air quality mitigation fee has been paid to SJVAPCD, consistent with the price per ton at the time of approval.

Responsibility: RD 17 and its primary construction contractors.

Timing: Submittal of contractor fleet inventories to SJVACPD for approval of project-wide fleet average NO_X and PM reductions to be completed before construction begins; the air quality effect assessment will be submitted to the SJVAPCD prior to construction commencement, in accordance with Rule 9510 requirements.

The use of EPA Tier 4 engines can reduce diesel exhaust (i.e., PM_{10}) and NO_X emissions by up to 90 percent over Tier 1 engines. However, construction fleets in California are composed of a combination of engines ranging from Tier 1 to Tier 4. As older equipment is rebuilt or replaced, the composition of higher-tiered engines will increase. Therefore, even though it is potentially possible to reduce emissions to below the thresholds, the total reduction cannot be quantified at this time because the ratio of Tier 4 or Tier 3 engines in the construction fleet at the time of construction is not yet determined. Nonetheless, if emissions do continue to exceed applicable thresholds after incorporation of all on-site measures, the off-site mitigation fee would mitigate emissions, on a ton-per-ton basis, to below thresholds. Therefore, Alternative 2 would not result in a direct temporary or short-term adverse effect on air quality with implementation of Mitigation Measure 3.9-a, and this impact would be reduced to **less than significant**.

Effect 3.9-b: Operational Emissions of ROG, NO_X, PM_{10}, and $PM_{2.5}$ Associated with Project Implementation.

No-Action Alternative

Under the No-Action Alternative, levee maintenance and vegetation would continue to be managed in accordance with RD 17’s existing practice (see the “Management of Vegetation Encroachments” section in Section 1.6.2); therefore, **no effects** related to operational emissions would occur.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, “Section Contents.”)

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester’s Preferred Alternative

Because the Phase 3 Repair Project is primarily a “construction-only” project, long-term project operation would not result in increased regional emissions of ROG, NO_X, PM_{10}, and $PM_{2.5}$ from mobile-, stationary-, or area-source emissions. Project implementation would require a negligible increase in operational maintenance activities and associated vehicle trips. In addition, the levee system would not require extensive landscape maintenance or other activities beyond those already being implemented by RD 17 that would result in a substantial net increase in emissions in comparison with the No-Action Alternative or existing conditions.

Furthermore, project implementation would not result in the operation of any new major stationary emission sources. Therefore, long-term operational emissions of criteria air pollutants or precursors would not result in or substantially contribute to a violation of the applicable air quality standards. Because project operation would not result in a direct, adverse effect on air quality, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Effect 3.9-c: General Conformity Applicability Analysis.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17’s current practice (see the “Management of Vegetation Encroachments” section in Section 1.6.2) and no levee repairs would be constructed. As a result, no emissions related to near-term construction activities or long-term operations would occur. Therefore, emissions would not immediately exceed the General Conformity de minimis threshold, and no conflict with the AQAPs would occur. However, however, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The magnitude of the effect of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. Cleanup actions in the event of a levee failure would likely require heavy use of construction equipment that would result in short-term, temporary emissions. Depending on the severity and extent of flood damage, emissions from cleanup activities could be minor or extensive. Therefore, effects related to general conformity with the AQAPs would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

EPA's General Conformity Rule, promulgated on November 30, 1993 to implement the conformity provision of Title I, section 176(c)(1) of the CAA, requires that the Federal government not engage, support, or provide financial assistance for licensing or permitting, or approve any activity not conforming to an approved CAA implementation plan. The General Conformity Rule applies to federally funded actions or actions requiring Federal permits or authorizations that would generate emissions of criteria air pollutant or precursor emissions in nonattainment or maintenance areas.

The Phase 3 Repair Project is located within the San Joaquin Valley, which is currently designated as extreme nonattainment with respect to the national 8-hour ozone standard (effective June 4, 2010). In addition, the San Joaquin Valley area is designated as serious maintenance for PM_{10} and moderate nonattainment for the national $PM_{2.5}$ standard. General conformity requirements would apply to actions where the total project-generated direct or indirect emissions would be equal to or in excess of the applicable emissions levels, known as the *de minimis* thresholds. If the *de minimis* thresholds were exceeded, a formal conformity determination would be required prior to project approval. The *de minimis* thresholds applicable within the Phase 3 Repair Project area are provided above in the "Thresholds of Significance" section in Section 3.9.3.

Table 3.9-6, which summarizes the projected annual emissions associated with construction of Alternative 1, shows that *de minimis* thresholds would not be exceeded under Alternative 1.

To demonstrate consistency with the 2016 Ozone AQAP, Alternative 1 was evaluated by comparing project emissions to the forecasted emissions budget (presented in the AQAP). As shown in **Table 3.9-6**, construction-related off-road emissions represent a negligible contribution (less than 0.5 percent) to the total daily off-road emissions budget for ROG and NO_X emissions, as forecasted in the 2016 Ozone AQAP. Therefore, Alternative 1 would conform to applicable SIPs regional attainment goals and would not conflict with implementation of the SIPs or attainment of regional air quality standards. However, since SIPs are based on land use and growth projections and do not account for construction-only projects, such as the Phase 3 Repair Project, the *de minimis* thresholds are still important in determining General Conformity compliance, and thus the significance of a project. When the total direct and indirect emissions attributable to a Federal action are found to be below the *de minimis emission* rates for a pollutant, that pollutant is excluded from General Conformity requirements, and no further analysis is required.

Table 3.9-6. Action Alternative 1: General Conformity Applicability Analysis

	ROG	NO_X	PM_{10}	$PM_{2.5}$
2020 Annual Emissions Summary (tons/year)	**0.85**	**9.6**	**1.80**	**0.47**
2021 Annual Emissions Summary (tons/year)	**0.85**	**9.6**	**1.80**	**0.47**
General Conformity de minimis Threshold (tons/year)	10	10	100	100
Could the Phase 3 Repair Project exceed the de minimis threshold during the 2020 or 2021 season?	No	No	No	No
Daily Emissions, Mitigated (tons/day)[1]	0.007	0.08	0.001	0.004
Ozone AQAP Off-Road Emissions Budget (tons/day)[2]	9.1	19.1	--	--
Project Contribution to Daily Off-Road Budget	<0.08%	<0.41%	--	--
Could the Phase 3 Repair Project exceed the AQAP off-road budget during the 2020 or 2021 season?	No	No	--	--

Notes: AQAP = air quality attainment plan; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; ROG = reactive organic gases; SJVAPCD = San Joaquin Valley Air Pollution Control District; yr = year.

1 Tons per day estimates are based on annual emissions (tons/year) divided by a 123-day construction season, as presented in Chapter 2, "Alternatives."

2 Off-road equipment emissions represent the 2021 forecast, which is the lower (more conservative) value to compare annual emissions for the 2 construction years associated with Alternative 1.

Refer to **Appendix G** for detailed assumptions and modeling output files.

Source: Data modeled by Ascent Environmental in 2019

As shown in **Table 3.9-6,** the estimated annual emissions associated with Alternative 1 are less than the General Conformity *de minimis* thresholds and represent less than 1 percent of the AQAP off-road emissions budget. Therefore, Alternative 1 would conform with the AQAP, as defined under the General Conformity regulations (40 CFR Section 93.160), and a formal conformity determination would not be required; this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Alternative 2: Maximum Footprint Alternative

Emissions from Alternative 2 would be greater than those resulting from Alternative 1 because of an increase in linear feet of construction (earth-moving activities), requiring a longer duration and an increase in total fill material required (i.e., increase in haul truck trips) for proposed activities. Because the unmitigated NO_X emissions exceed the *de minimis* threshold, the General Conformity Rule would apply to Alternative 2, and a General Conformity Applicability Analysis is required. **Table 3.9-7** summarizes the projected annual emissions associated with construction of Alternative 2.

To demonstrate consistency with the 2016 Ozone AQAP, Alternative 2 was evaluated by comparing project emissions to the forecasted 2021 emissions budget (presented in the AQAP). As shown in **Table 3.9-7**, construction-related off-road emissions represent a negligible contribution (less than 1 percent) to the total daily off-road emissions budget for ROG and NO_X emissions, conforming with the 2016 Ozone AQAP. Alternative 2 would thus conform to the applicable SIP regional attainment goals as defined under the general conformity regulations (40 CFR Section 93.160) and would not conflict with implementation of the SIP or attainment of regional air quality standards. However, since SIPs are based on land use and growth projections and do not account for construction-only projects, such as the Phase 3 Repair Project, the *de minimis* thresholds are still crucial in determining General Conformity compliance, and thus the significance of a project. When the total direct and indirect emissions attributable to a Federal action are found to be below the *de minimis* emission rates for a pollutant, that pollutant is excluded from General Conformity requirements, and no further analysis is required. Because unmitigated construction emissions of NOx associated with Alternative 2 would exceed the General Conformity de minimis threshold, this effect would be **significant**.

Table 3.9-7. Action Alternative 2: General Conformity Applicability Analysis

	ROG	NO_X	PM_{10}	$PM_{2.5}$
2020 Annual Emissions Summary (tons/year)	**1.4**	**15.8**	**2.2**	**0.69**
2021 Annual Emissions Summary (tons/year)	**1.4**	**15.8**	**2.2**	**0.69**
General Conformity de minimis Threshold (tons/year)	10	10	100	100
Could the Phase 3 Repair Project exceed the de minimis threshold during the 2020 or 2021 season?	No	Yes	No	No
Daily Emissions, Mitigated (tons/day)[1]	0.01	0.13	0.02	0.006
Ozone AQAP Off-road Emissions Budget (tons/day)[2]	9.1	19.1	--	--
Project Contribution to Daily Off-road Budget	<0.13%	<0.67%	--	--
Could the Phase 3 Repair Project exceed the AQAP off-road budget during the 2020 or 2021 season?	No	No	--	--

Notes: AQAP = air quality attainment plan; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; ROG = reactive organic gases; SJVAPCD = San Joaquin Valley Air Pollution Control District; yr = year.

Refer to **Appendix G** for detailed assumptions and modeling output files.

1 Tons per day estimates are based on annual emissions (tons/year) divided by a 123-day construction season, as presented in Chapter 2, “Alternatives.”

2 Off-road equipment emissions represent the 2021 forecast, which is the lower (more conservative) value to compare annual emissions for the 2 construction years associated with Alternative 2.

Source: Data modeled by Ascent Environmental in 2019

Mitigation Measure: Implement Mitigation Measure 3.9-a(2), “Implement Fleetwide Exhaust Emissions Reduction Measures.”

<u>**Alternative 2: Maximum Footprint Alternative**</u>

RD 17 shall implement Mitigation Measure 3.8-a(2), “Implement Fleetwide Exhaust Emissions Reduction Measures,” set forth in full under Effect 3.9-a: Temporary and Short-Term Emissions of ROG, NO_X, PM_{10} and $PM_{2.5}$ during Construction.

Responsibility: RD 17 and its primary construction contractors.

Timing: Submittal of contractor fleet inventories to the SJVACPD for approval of projectwide fleet average NO_X and PM reductions to be completed before construction begins; the air quality effect assessment will be submitted to the SJVAPCD prior to construction commencement, in accordance with Rule 9510 requirements.

The use of EPA Tier 4 engines can reduce NO_X emissions by up to 90 percent over Tier 1 engines. However, construction fleets in California are composed of a combination of engines ranging from Tier 1 to Tier 4. As older equipment is rebuilt or replaced, the composition of higher-tiered engines will increase. Therefore, even though it is potentially possible to reduce emissions to below the thresholds, the total reduction cannot be quantified at this time because the ratio of Tier 4 or Tier 3 engines in the construction fleet at the time of construction is not yet known. Nonetheless, if emissions do continue to exceed applicable thresholds after incorporation of all on-site measures, the off-site mitigation fee would mitigate emissions, on a ton-per-ton basis, to below thresholds. Therefore, Alternative 2 would conform to the approved CAA implementation plan with implementation of Mitigation Measure 3.9-a(2), and this impact would be reduced to **less than significant**.

Requester's Preferred Alternative

Annual construction emissions that would occur under the Requester's Preferred Alternative would result primarily from concentrated equipment operation associated with concurrent element activity including construction of seepage berms, chimney drains, cutoff walls, and the setback levee. **Table 3.9-8** summarizes the projected annual emissions associated with construction of the Requester's Preferred Alternative, showing that *de minimis* thresholds would not be exceeded under this alternative. The Requester's Preferred Alternative was also evaluated for consistency with the 2016 Ozone AQAP by comparing project emissions to the forecasted 2021 emissions budget (presented in the AQAP). As shown in **Table 3.9-8**, construction-related off-road emissions represent a negligible contribution (less than 1 percent) to the total daily off-road emissions budget for ROG and NO_X emissions, conforming with the 2016 Ozone AQAP. The Requester's Preferred Alternative would thus conform to the applicable SIP regional attainment goals as defined under the general conformity regulations (40 CFR Section 93.160) and would not conflict with implementation of the SIP or attainment of regional air quality standards. Because the Requester's Preferred Alternative would conform with the AQAP and the estimated annual emissions associated with the Requester's Preferred Alternative would be less than the General Conformity *de minimis* thresholds, a formal conformity determination would not be required, and this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Effect 3.9-d: Exposure of Sensitive Receptors to Substantial Pollutant or Toxic Concentrations.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2) and no levee repairs would be constructed. As a result, no near-term construction activities or long-term operational effects would occur. Therefore, sensitive receptors would not be exposed to substantial pollutant or toxic concentrations. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The magnitude of the effect of flooding resulting from levee failure would depend on the location of the levee breach, severity of the storm, and river flows at the time of flooding. Cleanup actions in the event of a levee failure would likely require heavy use of construction equipment that would emit recognized toxic air contaminants such as DPM. However, exposure to DPM would be temporary and short-term and would not result in long-term exposure related to cancer risk. For this reason, effects would be **less than significant**.

Table 3.9-8. Requester's Preferred Alternative: General Conformity Applicability Analysis

	ROG	NO_X	PM_{10}	$PM_{2.5}$
2020 Annual Emissions Summary (tons/year)	**0.47**	**5.4**	**1.7**	**0.33**
2021 Annual Emissions Summary (tons/year)	**0.47**	**5.4**	**1.7**	**0.33**
General Conformity de minimis Threshold (tons/year)	10	10	100	100
Could the Phase 3 Repair Project exceed the de minimis threshold during the 2020 or 2021 season?	No	No	No	No
Daily Emissions (tons/day)[1]	0.004	0.04	0.01	0.002

Table 3.9-8. Requester's Preferred Alternative: General Conformity Applicability Analysis

	ROG	NO_X	PM_{10}	$PM_{2.5}$
Ozone AQAP Off-road Emissions Budget (tons/day)[2]	9.1	19.1	--	--
Project Contribution to Daily Off-road Budget	<0.05%	<0.23%	--	--
Could the Phase 3 Repair Project exceed the AQAP off-road budget during the 2020 or 2021 season?	No	No	--	--

Notes: AQAP = air quality management plan; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; ROG = reactive organic gases; yr = year.

1 Tons per day estimates are based on annual emissions (tons/year) divided by a 123-day construction season, as presented in Chapter 2, "Alternatives."

2 Off-road equipment emissions represent the 2021 forecast, which is the lower (more conservative) value to compare annual emissions for the 2 construction years associated with the Requester's Preferred Alternative.

Refer to **Appendix G** for detailed assumptions and modeling output files.

Source: Data modeled by Ascent Environmental in 2019

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Project construction would result in the temporary and short-term generation of criteria pollutant concentrations, including diesel exhaust emissions, from the use of off-road diesel equipment required for site preparation, removal of landside structures, construction of levees, seepage berms and cutoff walls and other construction activities, in addition to diesel-fueled on-road haul and dump trucks used for hauling fill material. The dose to which the receptors are exposed (a function of concentration and duration of exposure) is the primary factor used to determine health risk (i.e., potential exposure to TAC emission levels that exceed applicable standards). According to the California Office of Environmental Health Hazard Assessment and California Air Pollution Control Officer's Association guidelines, health risk assessments that determine the exposure of sensitive receptors to TAC emissions should be based on a 70-year exposure period; however, such assessments should be limited to the period/duration of activities associated with the project (CAPCOA 2009).

The duration of mobilized equipment used near sensitive receptors located along the levee system would be finite (1–2 years). Each construction season would last approximately 6 months. In addition, as repairs are completed, mobile equipment would progress along the levees and would not operate near (within approximately 500 feet of) any one sensitive receptor for more than a maximum of a few weeks. The project would represent less than 0.1 percent of the 70-year exposure period for any nearby sensitive receptor in the area. Because the exposure period for receptors in the vicinity of the project alternatives would be minimal, and mitigated emissions are below the SJVAPCD-recommended significance thresholds, the effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

3.9.5 Residual Significant Effects

Implementation of Mitigation Measures 3.9-a(1), 3.9-a(2), and 3.9-a(3) would reduce potentially significant adverse effects under Alternatives 1 and 2 from construction-related emissions of NO_X, PM_{10}, and $PM_{2.5}$ to a less-than-significant level, and implementation of Mitigation Measure 3.9-a(1) would reduce potentially significant adverse effects under the Requester's Preferred Alternative from temporary and short-term construction-related emissions of PM_{10} and $PM_{2.5}$ to a less-than significant level. Therefore, no residual significant adverse effects would occur.

3.10 Climate Change

This section discusses the existing conditions within the Phase 3 Repair Project area and surrounding areas; identifies applicable Federal and state laws and regulations; and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to climate change. The regulatory setting, environmental setting, and effects related to air quality are presented in Section 3.9, “Air Quality.” A discussion of cumulative effects related to climate change is provided in Chapter 4, “Cumulative and Growth-Inducing Effects and Other Statutory Requirements,” of this FEIS.

3.10.1 Regulatory Setting

As required under NEPA, applicable Federal laws and regulations are identified in this section. State laws and regulations applicable to implementation of the Phase 3 Repair Project by RD 17, and additional advisory technical information are described for informational purposes and to assist with NEPA review. RD 17 also has considered regional and local plans and ordinances as a part of the environmental review process for this FEIS, where applicable to the Phase 3 Repair Project.

Federal

Supreme Court Ruling

In *Massachusetts et al. v. Environmental Protection Agency et al.*, 549 U.S. 497 (2007), the U.S. Supreme Court ruled that carbon dioxide (CO_2) is an air pollutant as defined under the Federal Clean Air Act and that the U.S. Environmental Protection Agency (EPA) has the authority to regulate greenhouse gas (GHG) emissions. The ruling in this case resulted in EPA taking steps to regulate GHG emissions and lent support for state and local agencies’ efforts to reduce GHG emissions.

Regulations for Greenhouse Gas Emissions from Passenger Cars and Trucks and Corporate Average Fuel Economy Standards

In October 2012, EPA and the National Highway Traffic Safety Administration (NHTSA), on behalf of the U.S. Department of Transportation, issued final rules to further reduce GHG emissions and improve corporate average fuel economy (CAFE) standards for light-duty vehicles for model years 2017 and beyond (77 *Federal Register* [FR] 62624). These rules would increase fuel economy to the equivalent of 54.5 miles per gallon, limiting vehicle emissions to 163 grams of CO_2 per mile for the fleet of cars and light-duty trucks by model year 2025 (77 FR 62630). NHTSA’s CAFE standards have been enacted under the Energy Policy and Conservation Act since 1978.

In January 2017, EPA signed a determination to maintain the current GHG emissions standards for model year 2022–2025 vehicles. However, on April 2, 2018, the EPA administrator announced a final determination that the current standards are not appropriate and should be revised. The Safer Affordable Fuel Efficient (SAFE) Vehicles Proposed Rule for Model Years 2021–2026 has been proposed and would freeze the CAFE standards from 2021 to 2026. It is not yet known if the SAFE Rule will be adopted or when it will be implemented (EPA 2018).

Clean Power Plan

In 2015, EPA unveiled the Clean Power Plan. The purpose of the plan was to reduce CO_2 emissions from electrical power generation by 32 percent relative to 2005 levels within 25 years. EPA is proposing to repeal the Clean Power Plan because of a change to the legal interpretation of Section 111(d) of the

Federal Clean Air Act, on which the Clean Power Plan was based. The comment period on the proposed repeal closed April 26, 2018.

State

Statewide GHG Emission Targets and the Climate Change Scoping Plan

Reducing GHG emissions in California has been the focus of the state for approximately two decades (State of California 2018). GHG emission targets established by the legislature include reducing statewide GHG emissions to 1990 levels by 2020 (Assembly Bill [AB] 32 of 2006) and reducing them to 40 percent below 1990 levels by 2030 (Senate Bill [SB] 32 of 2016). Executive Order (EO) S-3-05 calls for statewide GHG emissions to be reduced to 80 percent below 1990 levels by 2050. EO B-55-18 directs California to achieve carbon neutrality by 2045 and achieve and maintain net negative GHG emissions thereafter. These targets are in line with the scientifically established levels needed in the United States to limit the rise in global temperature to no more than 2 degrees Celsius, the warming threshold at which major climate disruptions, such as super droughts and rising sea levels, are projected. These targets also pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius (United Nations 2015:3).

California's 2017 Climate Change Scoping Plan (2017 Scoping Plan), prepared by the California Air Resources Board (CARB), outlines the main strategies California will implement to achieve the legislated GHG emission target for 2030 and "substantially advance toward our 2050 climate goals" (CARB 2017:1, 3, 5, 20, 25–26). It identifies the reductions needed by each GHG emission sector (e.g., transportation, industry, electricity generation, agriculture, commercial and residential, pollutants with high global warming potential [GWP], and recycling and waste). CARB and other state agencies also released the 2030 Draft Natural and Working Lands Climate Change Implementation Plan consistent with the carbon neutrality goal of EO B-55-18. The plan furthers the state's goals by improving the carbon sequestration potential of the state's natural and working lands through improved soil health and forest management strategies.

The state has also passed more detailed legislation addressing GHG emissions associated with industrial sources, transportation, electricity generation, energy consumption, and solid waste generation and diversion. A summary of relevant state laws and executive orders is presented in **Table 3.10-1**. Important regulatory measures presented in the table are further described in the text below.

Executive Order S-3-05

EO S-3-05 made California the first state to formally establish GHG emissions reduction goals. It includes the following GHG emissions reduction targets for California:

- by 2010, reduce GHG emissions to 2000 levels;
- by 2020, reduce GHG emissions to 1990 levels; and
- by 2050, reduce GHG emissions to 80 percent below 1990 levels.

The final emission target of 80 percent below 1990 levels would put the state's emissions in line with estimates of the required worldwide reductions needed to bring about long-term climate stabilization and avoidance of the most severe effects of climate change (IPCC 2007).

Table 3.10-1. Summary of State Laws and Executive Orders

Legislation Name	Signed into Law/Ordered	Description	Relevance
EO S-3-05, AB 32*	6/2005, 9/2006	Established statewide GHG reduction targets and biennial science assessment reporting on climate change effects and adaptation and progress toward meeting GHG reduction goals	Projects required to be consistent with statewide GHG reduction plan and reports to provide information for climate change adaptation analysis
SB 1368	9/2006	Established GHG emission performance standards for base load electrical power generation	Reduction of GHG emissions from purchased electrical power
EO S-1-07	1/2007	Established the Low Carbon Fuel Standard	Reduction of GHG emissions from transportation activities
SB 375	9/2008	Required metropolitan planning organizations to include sustainable communities' strategies in their regional transportation plans	Reduction of GHG emissions associated with housing and transportation
EO S-13-08*	11/2008	Directed the California Natural Resources Agency to work with the National Academy of Sciences to produce a California Sea Level Rise Assessment Report and directed the Climate Action Team** to develop a California Climate Adaptation Strategy	Reports to provide information for climate change adaptation analysis
EO S-14-08	11/2008	Established renewable energy goals as a percentage of total energy supplied in the state	Reduction of GHG emissions from purchased electrical power
EO B-30-15*	4/2015	Established a California GHG reduction target of 40 percent below 1990 levels by 2030	The next interim step in the state's efforts to pursue the long-term target to reach the goal of reducing emissions 80 percent below 1990 levels by 2050 under EO S-3-05
SB 32, AB 197*	8/2016	Extends California's GHG reduction programs beyond 2020; provides legislative oversight of CARB; requires annual emissions inventories of GHGs to be made public	SB 32 codifies the targets established by EO B-30-15 for 2030; AB 197 provides more legislative oversight of CARB and requires inventories of GHGs, criteria pollutants, and toxic air contaminants to be updated and made public at least once a year

Notes: AB = Assembly Bill; CARB = California Air Resources Board; EO = executive order; GHG = greenhouse gas; OPR = Office of Planning and Research; SB = Senate Bill.

* Most important laws and orders are discussed further below.

** The Climate Action team includes the Secretary of the Business, Transportation and Housing Agency; the Secretary of the Department of Food and Agriculture; the Secretary of the Resources Agency; the Chairperson of the California Air Resources Board; the Chairperson of the Energy Commission; and the President of the California Public Utilities Commission.

Source: Compiled by Ascent Environmental in 2019

EO S-3-05 was the subject of a California Appellate Court decision, *Cleveland National Forest Foundation v. San Diego Association of Governments* (SANDAG) (November 24, 2014), 231 Cal.App.4th 1056, which was reviewed by the California Supreme Court in January 2017. The case addressed the adequacy of the GHG analysis in the environmental impact report that SANDAG prepared for its 2011 Regional Transportation Plan. The Supreme Court decided a singular question in its decision, which was released on July 13, 2017. The California Supreme Court ruled that SANDAG did not abuse its discretion by declining "to adopt the 2050 goal as a measure of significance in light of the fact that the Executive Order does not specify any plan or implementation measures to achieve its goal."

Assembly Bill 32, the California Global Warming Solutions Act of 2006

In September 2006, the California Global Warming Solutions Act of 2006, AB 32, was signed into law. AB 32 establishes regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and a cap on statewide GHG emissions. It requires that statewide GHG emissions be reduced to 1990 levels by 2020. AB 32 also has the following requirements (California Health and Safety Code, Division 25.5, Part 3, Section 38551):

(a) The statewide greenhouse gas emissions limit shall remain in effect unless otherwise amended or repealed.

(b) It is the intent of the Legislature that the statewide greenhouse gas emissions limit continues in existence and be used to maintain and continue reductions in emissions of greenhouse gases beyond 2020.

(c) The state board [CARB] shall make recommendations to the Governor and the Legislature on how to continue reductions of greenhouse gas emissions beyond 2020.

Executive Order B-30-15

On April 20, 2015, EO B-30-15 was signed into law and established a California GHG reduction target of 40 percent below 1990 levels by 2030. The governor's EO aligns California's GHG reduction targets with those of leading international governments, such as the 28-nation European Union, which adopted the same target in October 2014. California is on track to meet or exceed the target of reducing GHG emissions to 1990 levels by 2020, as established in the California Global Warming Solutions Act of 2006 (AB 32, discussed above). California's new emission reduction target of 40 percent below 1990 levels by 2030 sets the next interim step in the state's continuing efforts to pursue the long-term target expressed under EO S-3-05 to reach the goal of reducing emissions 80 percent below 1990 levels by 2050. This is in line with the scientifically-established levels needed in the U.S. to limit global warming below 2 degrees Celsius, the warming threshold at which major climate disruptions are projected, such as super droughts and rising sea levels.

Senate Bill 32 and Assembly Bill 197 of 2016

In August 2016, SB 32 and AB 197 were signed into law and serve to extend California's GHG reduction programs beyond 2020. SB 32 amended the Health and Safety Code to include Section 38566, which contains language to authorize CARB to achieve a statewide GHG emission reduction of at least 40 percent below 1990 levels by no later than December 31, 2030. SB 32 codified the targets established by EO B-30-15 for 2030, which set the next interim step in the state's continued efforts to pursue the long-term target expressed in EOs S-3-05 and B-30-15 of 80 percent below 1990 emissions levels by 2050.

Climate Change Scoping Plan

In December 2008, CARB adopted its first version of its Climate Change Scoping Plan, which contained the main strategies that California will implement to achieve the mandate of AB 32 (2006) to reduce statewide GHG emissions to 1990 levels by 2020 (CARB 2008). In May 2014, CARB released and subsequently adopted the First Update to the Climate Change Scoping Plan to identify the next steps in reaching the goals of AB 32 (2006) and evaluate the progress made between 2000 and 2012 (CARB 2014). After releasing multiple versions of proposed updates in 2017, CARB adopted the final version titled California's 2017 Climate Change Scoping Plan (2017 Scoping Plan) in December of that year (CARB 2017). The 2017 Scoping Plan indicates that California is on track to achieve the 2020 statewide GHG target mandated by AB 32 of 2006 (CARB 2017:9). It also lays out the framework for achieving the mandate of SB 32 of 2016 to reduce statewide GHG emissions to at least 40 percent below 1990 levels by the end of 2030 (CARB 2017). The 2017 Scoping Plan identifies the GHG reductions needed by each emissions sector.

The 2017 Scoping Plan also identifies how GHGs associated with proposed projects could be evaluated (CARB 2017:101–102). Specifically, it states that achieving "no net increase" in GHG emissions is an appropriate overall objective of projects if conformity with an applicable local GHG reduction plan cannot be demonstrated. CARB recognizes that it may not be appropriate or feasible for every development project to mitigate its GHG emissions to zero and that an increase in GHG emissions due to a project may not necessarily imply a substantial contribution to the cumulatively significant environmental impact of climate change.

Executive Order S-13-08

EO S-13-08, issued November 14, 2008, directs the California Natural Resources Agency, the California Department of Water Resources, the Governor's Office Planning and Research, the California Energy Commission, the State Water Resources Control Board, the California Department of Parks and Recreation, and California's coastal management agencies to participate in a number of planning and research activities to advance California's ability to adapt to the effects of climate change. The order specifically directs agencies to work with the National Academy of Sciences to initiate the first California Sea Level Rise Assessment and to review and update the assessment every 2 years after completion; immediately assess the vulnerability of the California transportation system to sea level rise; and to develop a California Climate Change Adaptation Strategy.

In cooperation and partnership with multiple state agencies, the 2009 California Climate Adaptation Strategy summarizes the best-known science on climate change effects in seven specific sectors (i.e., public health, biodiversity and habitat, ocean and coastal resources, water management, agriculture; forestry, and transportation and energy infrastructure) and provides recommendations on how to manage against those threats.

Additional Technical Advisory Information

Council on Environmental Quality Guidance

On June 21, 2019, the Council on Environmental Quality issued a memorandum, Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (CEQ 2019). The draft guidance recognizes that many Federal actions would result in the emission of GHGs and that, when GHG emissions are substantial and quantification is practicable, the agency "should attempt to quantify a proposed action's projected direct and reasonably foreseeable indirect GHG emissions." When presenting quantifiable GHG data, the agency should discuss the relative magnitude of emissions estimates in a local, regional, or national context along with a "qualitative summary discussion of the effects of GHG emissions based on an appropriate literature review" in clear terms, thus allowing for a reasoned choice among the proposed project alternatives. However, if quantitative GHG data are not reasonably available or of high quality, or measurement is impracticable, a qualitative analysis may be performed based on sector-specific descriptions of the project's direct and indirect GHG emissions.

While NEPA does not require the adoption of mitigation measures, the short- and long-term effects and benefits of each alternative should be discussed.

California Air Pollution Control Officers Association Technical Advisory

In January 2008, the California Air Pollution Control Officers Association (CAPCOA) issued a “white paper” on evaluating and addressing GHGs under the California Environmental Quality Act (CEQA) (CAPCOA 2008). This resource guide was prepared to support local governments as they develop their climate change programs and policies. Though not a guidance document, the paper provides information about key elements of CEQA GHG analyses, including a survey of different approaches to setting quantitative significance thresholds. Some of the thresholds discussed include:

- zero (all emissions are significant);
- 900 metric tons of carbon dioxide equivalent per year ($MTCO_2e$ per year) (90 percent market capture for residential and nonresidential discretionary development);
- 10,000 $MTCO_2e$ per year (potential CARB mandatory reporting level for Cap and Trade program);
- 25,000 $MTCO_2e$ per year (the CARB mandatory reporting level for the statewide emissions inventory); and
- unit-based thresholds, based on identifying thresholds for each type of new development and quantifying significance by a 90-percent capture rate.

3.10.2 Environmental Setting

Global Climate Trends and Associated Effects

The rate of increase in global average surface temperature over the last 100 years has not been consistent; the last three decades have warmed at a much faster rate—on average 0.32 degree Fahrenheit (°F) per decade. Eleven of the 12 years from 1995 to 2006 rank among the 12 warmest years since 1850, based on global average surface temperature in the instrumental record (IPCC 2007).

During the same period over which this increased global warming has occurred, many other changes have occurred in other natural systems. Sea levels have risen on average 1.8 millimeters per year; precipitation patterns throughout the world have shifted, with some areas becoming wetter and other drier; tropical cyclone activity in the North Atlantic has increased; peak runoff timing of many glacial and snow fed rivers has shifted earlier; as well as numerous other observed conditions. Though it is difficult to prove a definitive cause and effect relationship between global warming and other observed changes to natural systems, high confidence exists in the scientific community that these changes are a direct result of increased global temperatures (IPCC 2007).

California Climate Trends and Associated Effects

Maximum (daytime) and minimum (nighttime) temperatures are increasing almost everywhere in California but at different rates. The annual minimum temperature averaged over all of California has increased 0.33°F per decade during the period 1920 to 2003, and the average annual maximum temperature has increased 0.1°F per decade (Moser et al. 2009).

With respect to California's water resources, the most significant effects of global warming have been changes to the water cycle and sea level rise. Over the past century, the precipitation mix between snow and rain has shifted in favor of more rainfall and less snow (Mote et al. 2005; Knowles et al. 2006) and snowpack in the Sierra Nevada is melting earlier in the spring (Kapnick and Hall 2009). The average early spring snowpack in the Sierra Nevada has decreased by about 10 percent during the last century, a loss of 1.5 million acre-feet of snowpack storage (DWR 2008). These changes have significant implications for water supply, flooding, aquatic ecosystems, energy generation, and recreation throughout the state. During the same period, sea levels along California's coast rose seven inches (DWR 2008). Sea level rise associated with global warming will continue to threaten coastal lands and infrastructure, increase flooding at the mouths of rivers, place additional stress on levees in the Delta, and will intensify the difficulty of managing the area as the heart of the state's water supply system.

Local Climate

The local climate in the San Joaquin Valley is characterized by hot, dry summers and cool, rainy winters with dense fog. The valley's rainy season is November through April. As measured by the Western Regional Climate Center at Western US COOP Station 045303 in the city of Manteca (the station closest to the project area), the average annual minimum and maximum temperatures between 1971 and 2000 were 47.5ºF and 74.2ºF, respectively. The average minimum and maximum temperatures for July were 55.9 and 88.6ºF, and the average minimum and maximum for December were 35.4ºF and 53.8ºF. Annual average total precipitation was 10.41 inches (WRCC 2010).

Greenhouse Gas Emissions

Certain gases in the earth's atmosphere, classified as GHGs, play a critical role in determining the earth's surface temperature. GHGs are defined as any gas that absorbs infrared radiation within the atmosphere. GHGs within the atmosphere lead to the trapping and buildup of heat near the earth's surface, commonly known as the "greenhouse effect." The earth's temperature is regulated by the accumulation of atmospheric GHGs. The following are GHGs that are widely accepted as the principal contributors to human-induced global climate change:

- **Carbon dioxide** (CO_2) is a colorless, odorless gas. Natural sources include: decomposition of dead organic matter; respiration by bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic degassing. Anthropogenic sources of carbon dioxide include burning fuels, such as coal, oil, natural gas and wood. Atmospheric concentrations are currently around 379 parts per million, which may rise to 1,130 CO_2e parts per million by 2100 as a direct result of anthropogenic sources (IPCC 2007).

- **Methane** is a gas; it is the main component of natural gas used in homes and forms naturally from decay of organic matter. Natural sources of methane include wetlands, permafrost, oceans and wildfires. Anthropogenic sources include fossil fuel production, rice cultivation, biomass burning, animal husbandry (fermentation during manure management), and landfills.

- **Nitrous oxide** (N_2O) is a colorless gas. Nitrous oxide is produced by microbial processes in soil and water, including those reactions that occur in nitrogen-rich fertilizers. In addition to agricultural sources, some industrial processes (i.e., nylon production, nitric acid production) also emit N_2O. N_2O is used in rocket engines, as an aerosol spray propellant, and in race cars. During combustion, NO_X emissions composed of NO_2 and nitrogen oxide are produced, which are not the same as N_2O.

Very small quantities of N_2O may be formed during fuel combustion by reaction of nitrogen and oxygen.

- **Hydrofluorocarbons** are synthetic chemicals that are used as a substitute for chlorofluorocarbons for automobile air conditioners and refrigerants.

- **Perfluorocarbons** are produced as a byproduct of various industrial processes associated with aluminum production and the manufacturing of semiconductors.

- **Sulfur hexafluoride** is an inorganic, colorless, odorless, nontoxic, nonflammable gas. It is used for insulation in electric power transmission and distribution equipment, in semiconductor manufacturing, in the magnesium industry, and as a tracer gas for leak detection.

All GHGs have a GWP, which is a value based on the heat-absorbing ability of each gas relative to the heat trapping potential of CO_2; the GWP value assigned to each gas allows for policy makers to develop policies and procedures aimed at reducing the effects of harmful GHG emissions. The reference gas for GWP is CO_2; therefore, CO_2 has a GWP of 1. The other main GHGs that have been attributed to human activity include methane, which has a GWP of 21, and N_2O, which has a GWP of 310 (UNFCC 2014). For example, 1 ton of methane has the same contribution to the greenhouse effect as approximately 21 tons of CO_2. GHGs with lower emissions rates than CO_2 still may contribute to climate change, because they are more effective at absorbing outgoing infrared radiation than CO_2 (i.e., high GWP).

Anthropogenic, or human-made, sources of GHGs such as electricity production and tailpipe emissions from operation of motor vehicles have elevated GHG concentrations within the atmosphere. Emissions of GHGs in excess of natural ambient concentrations are thought to be responsible for the enhancement of the greenhouse effect, and contribute to what is termed “global warming,” a trend of warming of the earth’s climate. Unlike criteria air pollutants and toxic air contaminants, which are pollutants of regional and local concern, GHGs are global pollutants and climate change is a global issue.

3.10.3 Methodology and Thresholds of Significance

Methodology

GHG emissions generated from construction equipment and on-road mobile sources, and carbon stock and carbon sequestration associated with vegetation affected by the Phase 3 Repair Project have been evaluated for their potential to contribute to climate change. The methods used to quantify GHG emissions during construction are described below. Because no change would occur in operation after construction is completed, the incremental increase in cumulative GHG emissions resulting from operations has not been quantified.

Evaluation of Mobile Sources

GHG emissions generated by the proposed alternatives would predominantly be in the form of CO_2 resulting from combustion sources (i.e., off-road equipment) during construction. The methodology used to analyze the Phase 3 Repair Project’s contribution to global climate change includes a calculation of GHG emissions using spreadsheets populated with emissions factors obtained from the Road Construction Emissions Model (RoadMod), Version 9.0.0, recommended by the San Joaquin Valley Air Pollution Control District (SJVAPCD). RoadMod was developed by the Sacramento Metropolitan Air Quality Management District and is recommended by various air districts, including SJVAPCD, for use in evaluating emissions associated with off-road diesel equipment. The employed methodology is based on *CEQA and Climate Change* (CAPCOA 2008) guidance for quantifying GHG emissions from "construction-only" projects, such as levee improvement projects, which includes the use of RoadMod for quantification of CO_2 emissions. For consistency with the CEQA document prepared for the Phase 3 Repair Project, USACE has considered CAPCOA's guidance in evaluating the Phase 3 Repair Project's GHG effects in this FEIS.

The SJVAPCD-recommended RoadMod includes emission factors for both on-road vehicles (i.e., light to heavy duty gasoline powered vehicles) and off-road construction equipment, derived from CARB's EMFAC 2017 and OFFROAD Emission Factor Models, respectively. The factors used to calculate emissions from on-road equipment, including employee trips and haul trucks. The on-road factors are in units of grams per mile and grams per trip. The haul truck trip distance was estimated based on the approximate distance travelled from the commercial source of materials (i.e., fill, drain rock, asphalt), which is assumed to be 8 miles round-trip. The factors used to calculate emissions from off-road equipment, including all on-site off-road construction equipment, are representative of the 2020 regional fleet mix[1] and are in units of pounds per day, which assumes an 8-hour workday. Detailed assumptions and model results are provided in **Appendix G**.

Evaluation of Carbon Stock and Sequestration

Implementation of the Phase 3 Repair Project would include the removal of landside woodlands and existing vegetation within the footprint of the existing levee system. Woodlands and vegetation actively store carbon through the process of photosynthesis where CO_2 is removed from the atmosphere and stored in the cellulose or other compounds of woodlands and vegetation. This is referred to as carbon sequestration. Quantifying the rate at which carbon sequestration occurs differs across ecosystems based on factors such as forest age, type, and land-use changes. The methodology employed in this analysis includes application of an EPA-developed carbon sequestration rate.

In addition to carbon sequestration, existing living biomass represents carbon stock that could be affected by the Phase 3 Repair Project. If carbon stock is removed because of the Phase 3 Repair Project, the carbon contained within that stock begins the process of being released back into the environment through decomposition or burning (combustion). The CO_2e was quantified for existing carbon stock and for the rate of carbon sequestration based on the proposed removal of woodlands and vegetation (in acres) to determine the effect (decrease or increase) in CO_2e emissions.

Thresholds of Significance

The basis for determining the significance of effects for this analysis is based on professional standards and project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to climate change if they would do any of the following:

1 Emission factors represent the regional vehicle fleet mix within the Sacramento Valley Air Basin; these emission factors are pre-populated in RoadMod and have been approved for use by SJVAPCD to evaluate emission impacts from linear projects located within the San Joaquin Valley Air Basin.

- generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment, or
- conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of GHGs.

The Final Staff Report: Addressing Greenhouse Gas Emissions Impacts under the California Environmental Quality Act (SJVAPCD 2009) presents an expansive view of GHG emissions, the science behind emissions quantifications, and the challenges facing the development of significance thresholds pursuant to CEQA. The report concludes that the SJVAPCD will use best performance standards (BPS) to determine the significance of project effects. The report also concludes that the effects of project specific GHG emissions are cumulative, and unless reduced or mitigated their incremental contribution to global climatic change could be considered cumulatively significant. However, the report does not detail the BPS for determining significance for construction activities, such as it does for stationary sources and development projects. The report does not detail BPS for construction activities in part because construction emissions are short-term and temporary in nature and could not be demonstrated as measurable reductions against the regional backdrop of meeting statewide emission reduction goals established in the AB 32 Scoping Plan.

Based on the size, scope, and purpose of this project, the significance of GHG emissions from this project would be based on exceedance of 25,000 $MTCO_2e$ per year, which is the limit for which GHG sources must comply with Cap-and-Trade emission reduction requirements. While the project itself would not result in new stationary sources, GHG emissions from all project elements can be combined and evaluated over the anticipated lifetime of the project for comparison to available emissions limits deemed by the state to be substantial. This value is the threshold established for GHG emitters for which emissions must be reduced under AB 32 and is used to provide further context regarding the magnitude of GHG emission estimates under the action alternatives. Thus, for purposes of determining significance for this project, if GHG emissions over the life of the project (i.e., 30 years) are small in comparison to the amount of GHG emissions for major facilities that are required to reduce such emissions (i.e., 25,000 $MTCO_2e$ per year), the impact would be less than significant.

3.10.4 Effects and Mitigation Measures

Effect 3.10-a: Generation of GHG Emissions, Either Directly or Indirectly, That May Have a Significant Effect on the Environment.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Therefore, in the near term, no direct or indirect GHG emissions would be generated. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. In the event of a flood, GHG emissions would be associated with the use of equipment during cleanup operations and vehicle miles traveled (VMT) from worker commute trips and haul trucks traveling to and from the site with remedial materials. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of effect is unknown. Because of this uncertainty, the effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Combustion Sources

Project construction would result in a net increase in GHG emissions over a finite period of 2 years (2020–2021), despite the implementation of mitigation measures. Because the Phase 3 Repair Project is a levee repair project, negligible operational effects were assumed in the analysis.

Table 3.10-2 shows the annual emissions of CO_2 from combustion sources for Alternative 1, Alternative 2, and the Requester's Preferred Alternative. Various agencies (including the Sacramento Metropolitan Air Quality Management District and the South Coast Air Quality Management District) have suggested amortizing construction emissions over the expected life of the project (e.g., 30 years) to evaluate project-level effects. Based on this analysis for Alternative 1, the estimated GHG emissions from combustion activities associated with construction equipment are 3,012 $MTCO_2$ for the entire construction period, which equates to a 30-year annualized value of approximately 100 $MTCO_2e$ per year. The estimated GHG emissions from combustion activities for Alternative 2 are 4,371 $MTCO_2$ for the entire construction period, which equates to a 30-year annualized value of approximately 146 $MTCO_2e$ per year. The estimated GHG emissions from combustion activities for the Requester's Preferred Alternative are 2,012 $MTCO_2$ for the entire construction period, which equates to a 30-year annualized value of approximately 67 $MTCO_2e$ per year.

Table 3.10-2. Construction-Related CO_2 Emissions

	Alternative 1– Minimum Footprint Alternative[1]	Alternative 2– Maximum Footprint Alternative[1]	Requester's Preferred Alternative
Total Project CO_2 Emissions During Construction (MT)	3,012	4,371	2,012
Amortized Construction Emissions (30 years)	100	146	67.1

Notes: CO_2 = carbon dioxide; MT = metric tons.
Emissions are expected to occur over 2 years (2020 and 2021 construction season). To annualize greenhouse gas emissions from construction activities, some agencies have suggested amortizing the total project emissions over the expected life of the project (e.g., 30 years). Refer to **Appendix G** for detailed assumptions and modeling output files.
Source: Data modeled by Ascent Environmental in 2019

Carbon Stock

Construction of the Phase 3 Repair Project would involve removal of landside woodlands vegetation from the footprint of the proposed levee repairs. Tree brush removal, as well as mulching associated with disposal of this material, would cause some of the accumulated carbon in the woodland biomass ("carbon stock") to be released into the atmosphere. An estimate of the total biomass accumulation in trees and other vegetation within the Phase 3 Repair Project area has been performed to evaluate how much sequestered CO_2e would be released if the landside woodlands and other vegetation were removed.

Based on the evaluation of effects provided in Section 3.6, "Biological Resources," existing woodlands within the project footprint include riparian woodlands, primarily consisting of Great Valley cottonwood and oak trees, and other riparian vegetation. The estimated quantity of carbon contained in a given acre of forested area similar to the Phase 3 Repair Project area, within the California Central Valley, is shown in **Table 3.10-3**.

Table 3.10-3. Estimated Carbon Stocks

Alternative 1: Minimum Footprint Alternative			
Tree	Acres[1]	Carbon Stock (ton C/acre)	Metric Tons of Carbon (MT)[2]
Oak	2.17	97.0[3]	190.9[4]
Cottonwood	2.88	73.2[3]	191.2[4]
Total Estimated Carbon Stock within Affected Area (MT)			**382.1**
Alternative 2–Maximum Footprint Alternative			
Oak	2.20	97.0[3]	193.6[4]
Cottonwood	3.58	73.2[3]	237.7[4]
Total Estimated Carbon Stock within Affected Area (MT)			**431.3**
Requester's Preferred Alternative			
Oak	0.18	97.0[3]	15.8[4]
Cottonwood	3.14	73.2[3]	208.5[4]
Total Estimated Carbon Stock within Affected Area (MT)			**224.3**

Notes: C = carbon; MT = metric tons.

1 Acreages obtained from Section 3.6, "Biological Resources," **Table 3.6-5**.

2 Metric tons of carbon calculated using the following equation: Acres x Carbon Stock (ton C/acre) x 0.907 (metric tons/ton).

3 Source: USFS 2005

4 Source: EPA 2010

Alternatives 1 and 2 would remove approximately 5.1 and 5.8 acres, respectively, of riparian woodlands. The Requester's Preferred Alternative would remove approximately 3.3 acres of riparian woodland. Based on the affected area of Alternatives 1 and 2 and the Requester's Preferred Alternative, the total potential carbon stock that could be released if the live trees, standing dead trees or downed-woody debris are removed and disposed (through mulching or other project-approved process) is 382.1 MT, 431.3 MT, and 224.3 MT, respectively, as shown in **Table 3.10-3.** This is a one-time loss of carbon stock (not an annual loss). The estimated one-time loss of 382.1 MT of carbon associated with Alternative 1 equates to an estimated 1,402 $MTCO_2e$.[2] Alternative 2 would result in an estimated one-time loss of carbon stock estimated to be 431.3 MT of carbon, which equates to an estimated 1,583 $MTCO_2e$. Similarly, the Requester's Preferred Alternative would result in an estimated one-time loss of carbon stock estimated to be 224.3 MT of carbon, which equates to an estimated 823.2 $MTCO_2e$. Because this would be a one-time loss related to construction activities, emissions also would be amortized over 30 years. This would result in an estimate of 46.7 $MTCO_2e$, 52.8 $MTCO_2e$, and 27.4 $MTCO_2e$ per year for Alternative 1, Alternative 2, and the Requester's Preferred Alternative, respectively.

As presented in Section 3.6, "Biological Resources," for each acre of converted nonwetland (i.e., Oak Woodlands), 3 acres of preserve would be acquired, enhanced and managed in perpetuity through the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP). Preserve enhancements include planting additional trees and shrubs; specific enhancements (e.g., the species and number of plantings) are determined based on conditions at each preserve site. Additional replanting efforts to replace removed carbon stock are expected to be achieved through implementation of the

2 Conversion factor of 3.67 was used to convert tons of carbon to tons of CO_2.

SJMSCP. Because the SJMSCP does not link preserve enhancements to any specific projects, the total amount of replanting that would occur as a result of the Phase 3 Repair Project cannot be determined. However, much of the carbon stock lost as a result of the Phase 3 Repair Project may be recovered over time with successful efforts to enhance the riparian preserve.

Carbon Sequestration

Carbon sequestration is the process by which atmospheric carbon dioxide is absorbed by trees [plants] through photosynthesis and stored as carbon in biomass and soils. An estimate of the potential change in carbon sequestration has been performed to evaluate the project effects on live native trees (including roots). The baseline or existing rate of carbon sequestration would decrease, and in some cases be eliminated because of the removal of trees and other vegetation as a result of Alternative 1, Alternative 2, or the Requester's Preferred Alternative.

The total acres for Alternative 1, Alternative 2, and the Requester's Preferred Alternative are based on information presented in Section 3.6, "Biological Resources." Sequestration rates for the Phase 3 Repair Project area under Alternatives 1 and 2 and the Requester's Preferred Alternative (riparian Great Valley cottonwood and oak trees) were drawn from EPA's guidance on Best Practices for Including Carbon Sinks in GHG Inventories (Ravin and Raine 2007). **Table 3.10-4** lists the sequestration rate assumptions and total annual sequestration calculations for Alternatives 1 and 2 and the Requester's Preferred Alternative.

Table 3.10-4. Total Effect on Carbon Stock and Sequestration within the Phase 3 Repair Project Area

Carbon Stock and Sequestration	Affected Area (acres)	Estimated Carbon Stock (MT carbon/year)[1]	Sequestration Rate (MT CO_2/acre/year)[2]	Total Annual Sequestration (MT CO_2/year)[3]
Alternative 1	5.1	382.1	0.8	4.1
Alternative 2	5.8	431.3	0.8	4.6
Requester's Preferred Alternative	3.3	224.3	0.8	2.6

Notes: MT = metric tons; MTCO_2/yr = metric tons of carbon dioxide per year.

1 Carbon stock estimated by total study area (acres) x estimated carbon stock within project region.

2 Sequestration rate based on general forest management practices, obtained from Best Practices for Including Carbon Sinks in Greenhouse Gas Inventories (cited below).

3 Annual sequestration calculated based on sequestration rate (0.8 MTCO_2/acre/year) x total affected acres.

Source: Ravin and Raine 2007

Annual carbon sequestration potentially affected by Alternative 1, Alternative 2, and the Requester's Preferred Alternative was evaluated based on the sequestration rates shown in **Table 3.10-4.** The net change in annual carbon sequestration for the Phase 3 Repair Project area under Alternative 1, Alternative 2, and the Requester's Preferred Alternative is an estimated net decrease of 4.1, 4.6, and 2.6 MT of CO_2 per year, respectively.

Total Construction-Related Greenhouse Gas Emissions

Project construction would result in GHG emissions associated with construction equipment, loss of carbon stock, and changes in carbon sequestration. **Table 3.10-5** summarizes the estimated annual GHG emissions for Alternative 1, Alternative 2, and the Requester's Preferred Alternative.

Table 3.10-5. Total Annual Emissions

	Alternative 1–Minimum Footprint Alternative[1] (MT/year)	Alternative 2–Maximum Footprint Alternative[1] (MT/year)	Requester's Preferred Alternative (MT/year)
Amortized Construction Emissions (30 years)	100	146	67.1
Amortized Carbon Stock Loss (30 years)	46.7	52.8	27.4
Carbon Sequestration	4.1	4.6	2.6
Total CO_2e Emissions	**150.8**	**203.4**	**97.1**
Total Project CO_2e Emissions[1]	**4,422**	**5,963**	**2,840**

Notes: CO_2e = carbon dioxide equivalents; MT = metric tons.
1 Total Project CO_2e Emissions are equal to nonamortized construction emissions and carbon stock loss plus the MT/year loss of carbon sequestration over 2 years.
Emissions are expected to occur over 2 years (2020 and 2021 construction season). To annualize greenhouse gas emissions from construction activities, some agencies have suggested amortizing the total project emissions over the expected life of the project (e.g., 30 years). Refer to **Appendix G** for detailed assumptions and modeling output files.
Source: Data modeled by Ascent Environmental in 2019

Based on this analysis for Alternative 1, the annual GHG emissions would be 151 $MTCO_2$e per year. Based on this analysis for Alternative 2, the estimated GHG emissions would be approximately 203 $MTCO_2$e per year. Based on this analysis for the Requester's Preferred Alternative, the estimated GHG emissions would be approximately 97 $MTCO_2$e per year. Even considering the total amount of GHG emissions for Alternative 1, Alternative 2, and the Requester's Preferred Alternative over 2 years—4,422 $MTCO_2$e, 1, 5,963 $MTCO_2$e, and 2,840 $MTCO_2$e, respectively—these levels are still far below the 25,000 $MTCO_2$e threshold. The amortized construction-related GHG emissions for the Requester's Preferred Alternative would be less than any of the proposed or adopted thresholds discussed above. Compliance with CARB's In-Use Diesel Idling requirements, which limits off-road vehicle idling to 5-minutes, would be consistent with SJVAPCD measures recommended to reduce GHG emissions. Considering the total and amortized annual construction emissions for Alternative 1, Alternative 2, and the Requester's Preferred Alternative, the level of GHG emissions associated with the project would not exceed 25,000 $MTCO_2$e per year and would not be substantial. For these reasons, project-related GHG emissions would not make a cumulatively considerable contribution to climate change. Therefore, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Effect 3.10-b: Conflict with an Applicable Plan, Policy or Regulation Adopted for the Purpose of Reducing GHG Emissions.

Demonstrating consistency with adopted applicable plans, polices, and/or regulations related to GHG emissions and climate change requires an evaluation of the project outcomes against the six key elements of the Scoping Plan as presented in AB 32; the "Statewide GHG Emission Targets and the Climate Change Scoping Plan" (as described in Section 3.10.1, "Regulatory Setting," herein); CARB's recommended actions in the Scoping Plan; and other applicable local or regional plans.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" discussion in Section

1.6.2, “Flood Problems and Needs”) and no levee repairs would be constructed. Therefore, in the near term, no GHG emissions or climate change effects would occur. In addition, no current plans or policies are aimed at reducing climate change effects that apply to the project. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. In the event of a flood, GHG emissions would be associated with the use of equipment during cleanup operations and VMT from worker commute trips and haul trucks traveling to and from the site with remedial materials. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of effect is unknown. Because of this uncertainty, the effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, “Section Contents.”)

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester’s Preferred Alternative

The SJVAPCD’s Climate Change Action Plan Addressing Greenhouse Gas Emissions under CEQA guidance recommends demonstration of less than significance be achieved through adoption and implementation of BPS. Applicable BPS include limiting unnecessary vehicle idling; pursuant to the CARB’s In-Use Off-Road Idling Rule, a 5-minute idling limit, will be in place during construction reducing diesel particulate emissions, as well as CO_2 emissions. No additional BMPs are proposed and no additional mitigation would be required. As described above under Effect 3.10-a, Alternative 1, Alternative 2, and the Requester’s Preferred Alternative would be below the recommended thresholds, and therefore, would not pose any conflict with the goals of AB 32, the Scoping Plan key elements, and GHG reduction measures or any other plans for reduction or mitigation of GHGs. Therefore, the project would not result in a cumulatively considerable adverse effect, and the effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Effect 3.10-c: Contribution to a Lower Carbon Future and Energy Efficiency.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17’s current practice (see the “Management of Vegetation Encroachments” discussion in Section 1.6.2, “Flood Problems and Needs”) and no levee repairs would be constructed. Therefore, no conflict with or contribution to a lower carbon future or improved energy efficiency would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. In the event of a flood, GHG emissions would be associated with the use of equipment during cleanup operations and VMT from worker commute trips and haul trucks traveling to and from the site with remedial materials. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of effect is unknown. Because of this uncertainty, the effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, Section Contents.”)

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

The project is needed to reduce potential levee breaches and flooding events, to provide enhanced flood protection and to meet USACE design standards. The result of enhanced flood protection indirectly reduces the potential future electrical demand (of pumps and associated levee system hydro-equipment) and helps to improve energy efficiency of the levee. In addition, the project is primarily a construction project resulting in temporary and short-term GHG emissions from combustion associated with operation of off-road construction equipment. GHG emissions from operation would be negligible and are assumed not to have a significant adverse effect on the regional or statewide GHG inventories. In addition, as described under Effect 3.10-a, carbon sequestration potential temporarily affected during construction would be replaced through acquisition of woodlands at a ratio of 1:3 acres. Applicable BPS/BMPs, including implementation of idling limits, would reduce temporary, short-term construction-related GHG emissions, and therefore would contribute to a lower carbon future. The project directly would contribute to a lower carbon future and indirectly would contribute to improved energy efficiency. Therefore, this effect would not result in a cumulatively considerable adverse effect and would be **less than significant**.

Mitigation Measure: No mitigation is required.

3.10.5 Residual Significant Effects

No long-term residual significant GHG emissions or climate change effects would occur under the No-Action scenario because no near-term construction or operational GHG emissions would be associated with the No-Action scenario. As described in Section 2.4.1, "No-Action Alternative," it can be assumed that RD 17, USACE, and/or the State of California would repair remaining portions of the RD 17 levee system at some time in the future to meet the Federal and state seepage criteria. It is reasonable to assume that RD 17, USACE, and/or the state would implement some combination of the alternative methods for improving the levee as identified for each element described under the Requester's Preferred Alternative and the additional two action alternatives (Alternative 1 and Alternative 2); therefore, the effects would be the same, or very similar to, the action alternatives, as described below.

In the period before implementing measures to reduce flood damage for the RD 17 levee system, however, the current level or risk would remain for a major levee failure and flooding of areas within the RD 17 service areas. In order to achieve the full benefits of flood damage reduction in the RD 17 levee system, all phases of the project must be implemented. Cleanup actions in the event of simultaneous levee failures in more than one location would likely require heavy use of construction equipment that would result in temporary and short-term GHG emissions and would not result in residual significant adverse effects. For this reason, residual effects would be the same, or very similar to, the action alternatives as described below.

In addition, mitigation measures cannot be required for the No-Action Alternative; therefore, adverse effects that result from the No-Action scenario would not be mitigated.

No significant adverse effects were identified related to GHG emissions and climate change under Alternative 1, Alternative 2, and the Requester's Preferred Alternative; therefore, no residual significant adverse effects associated with the Phase 3 Repair Project would occur.

3.11 Noise

This section discusses existing noise conditions and noise-sensitive receptors within the Phase 3 Repair Project area and surrounding areas; identifies applicable Federal and state laws, guidelines, and regulations; and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to noise. A discussion of cumulative effects related to noise is provided in Chapter 4, “Cumulative and Growth-Inducing Effects and Other Statutory Requirements,” of this FEIS.

3.11.1 Regulatory Setting

As required under NEPA, applicable Federal laws and regulations are identified in this section. State laws and regulations applicable to implementation of the Phase 3 Repair Project by RD 17 are described for informational purposes and to assist with NEPA review. RD 17 also has considered regional and local plans and ordinances as a part of the environmental review process for this FEIS, where applicable to the Phase 3 Repair Project.

Federal

U.S. Environmental Protection Agency Office of Noise Abatement and Control

The U.S. Environmental Protection Agency (EPA) Office of Noise Abatement and Control was originally established to coordinate Federal noise control activities. In 1981, EPA administrators determined that subjective issues such as noise would be better addressed at more local levels of government. Consequently, in 1982 responsibilities for regulating noise control policies were transferred to state and local governments. However, documents and research completed by the EPA Office of Noise Abatement and Control continue to provide value in the analysis of noise effects.

Federal Transit Administration

To address the human response to ground vibration, the Federal Transit Administration (FTA) has set forth guidelines for maximum-acceptable vibration criteria for different types of land uses. These guidelines are presented in Table 3.11-1.

Table 3.11-1. Ground-Borne Vibration Impact Criteria for General Assessment

	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/second)		
Land Use Category	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations.	65 [4]	65 [4]	65 [4]
Category 2: Residences and buildings where people normally sleep.	72	75	80
Category 3: Institutional land uses with primarily daytime uses.	75	78	83

Notes: VdB re 1 micro-inch/second = vibration decibels referenced to 1 μ inch/second and based on the root mean square (RMS) velocity amplitude.
[1] Frequent Events” is defined as more than 70 vibration events of the same source per day.
[2] Occasional Events” is defined as between 30 and 70 vibration events of the same source per day.
[3] Infrequent Events” is defined as fewer than 30 vibration events of the same source per day.
[4] This criterion is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research would require detailed evaluation to define acceptable vibration levels.
Source: FTA 2018

State

State of California General Plan Guidelines

The State of California General Plan Guidelines 2017, published by the California Governor's Office of Planning and Research (OPR) (2017), provides guidance for the compatibility of projects within areas of specific noise exposure. Acceptable and unacceptable community noise exposure limits for various land use categories have been determined to help guide new land use decisions in California communities. In many local jurisdictions, these guidelines are used to derive local noise standards and guidance. Citing EPA materials and the State Sound Transmissions Control Standards, the state's general plan guidelines recommend interior and exterior CNEL of 45 and 60 decibels (dB) for residential units, respectively (OPR 2017:378). The Office of Planning and Research guidelines also provide adjustment factors for determining noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

California Code of Regulations, Title 24

Title 24 of the California Code of Regulations establishes standards governing interior noise levels that apply to all new multifamily residential units in California. These standards require that acoustical studies be performed before construction begins at locations where the existing L_{dn} exceeds 60 A-weighted dB (dBA). Such acoustical studies are required to establish mitigation measures that limit maximum L_{dn} levels to 45 dBA in any habitable room. Although no interior noise standards are pertinent to all uses, many communities in California have adopted an L_{dn} of 45 dBA as an upper limit on interior noise in all residential units.

3.11.2 Environmental Setting

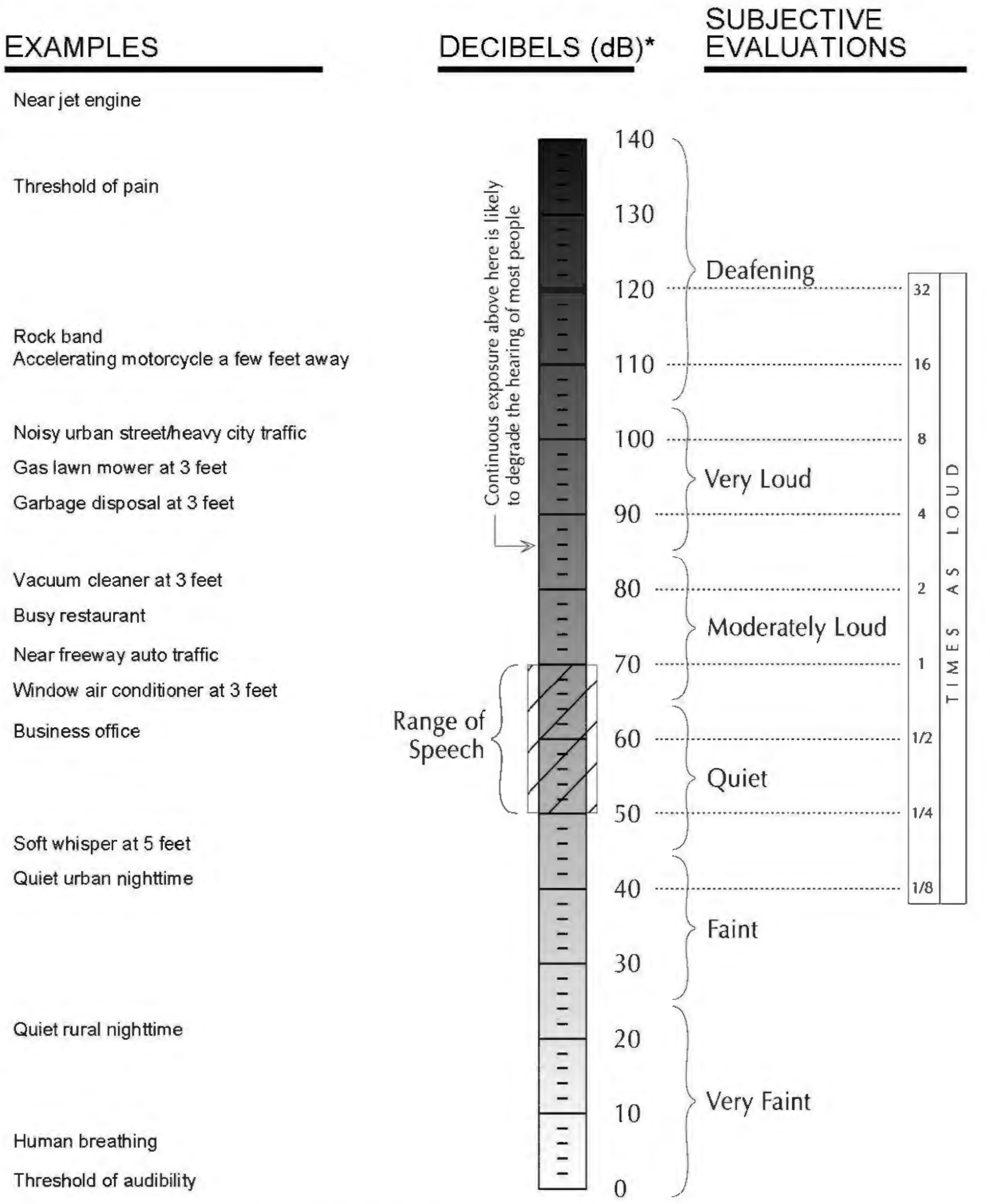
Sound and the Human Ear

Noise generally is defined as sound that is loud, disagreeable, or unexpected. Sound, as described in more detail below, is mechanical energy transmitted in the form of a wave caused by a disturbance or vibration. Because of the ability of the human ear to detect a wide range of sound pressure fluctuations, sound pressure levels are expressed in logarithmic units called decibels. The sound pressure level in decibels is calculated by taking the log of the ratio between the actual sound pressure and the reference sound pressure squared. The reference sound pressure is considered the absolute hearing threshold (Caltrans 2009:2-7 through 2-8).

Because the human ear is not equally sensitive to all sound frequencies, a specific frequency-dependent rating scale was devised to relate noise to human sensitivity. A dBA scale performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. The basis for compensation is the faintest sound audible to the average ear at the frequency of maximum sensitivity. This dBA scale has been adopted by most authorities for the purpose of regulating environmental noise. A decibel scale for typical indoor and outdoor noise sources is shown in **Figure 3.11-1**.

Because the decibel scale is logarithmic, sound levels measured in decibels are not additive. For example, a 65-dBA source of sound, such as a truck, when joined by another 65-dBA source results in sound amplitude of 68 dBA, not 130 dBA (i.e., doubling the source strength increases the sound pressure by 3 dBA). Amplitude is interpreted by the ear as corresponding to different degrees of

Figure 3.11-1 Typical Noise Levels



* dB are "average" values as measured on the A-scale of a sound-level meter.
From Concepts in Architectural Acoustics: M. David Egan, McGraw Hill, 1972 and U.S. Department of Housing and Urban Development, Office of Community Planning and Development "The Noise Guidebook."

Source: Egan 1988:13

loudness. Laboratory measurements correlate a 10-dBA increase in amplitude with a perceived doubling of loudness and establish a 3-dBA change in amplitude as the minimum difference perceptible to the average person (Caltrans 2009:2-47 through 2-50).

Sound Propagation

As sound (or noise) propagates from the source to the receptor, the attenuation, or manner of noise reduction in relation to distance, depends on surface characteristics, atmospheric conditions, and the presence of physical barriers. The inverse square law describes the attenuation caused by the pattern of sound traveling from the source to the receptor. Sound travels uniformly outward from a point source in a spherical pattern with an attenuation rate of 6 dBA per doubling of distance. However, from a line source (e.g., a road), sound travels uniformly outward in a cylindrical pattern, with an attenuation rate of 3 dBA per doubling of distance. The surface characteristics between the source and the receptor may result in additional sound absorption and/or reflection. Atmospheric conditions such as wind speed, temperature, and humidity may affect noise levels. Furthermore, the presence of a barrier between the source and the receptor also may attenuate noise levels. The actual amount of attenuation depends on the barrier size and frequency of the noise. A noise barrier may be any natural or human-made feature, such as a hill, tree, building, wall, or berm (Caltrans 2009:2-39 through 2-40).

Noise Descriptors

The selection of a proper noise descriptor for a specific source depends on the spatial and temporal distribution, duration, and fluctuation of the noise. The noise descriptors most often encountered when dealing with traffic, community, and environmental noise are defined as follows (Caltrans 2009:2-52):

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

- **L_{min} (Minimum Noise Level):** The minimum instantaneous noise level during a specific period of time.

- **L_X (Statistical Descriptor):** The noise level exceeded X percent of a specific period of time. The L_{50} is the noise level exceeded 50 percent of the time, for example.

- **L_{eq} (Equivalent Noise Level):** The energy mean (average) noise level. 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}.

- **L_{dn} (Day-Night Noise Level):** The 24-hour L_{eq} with a 10-dBA "penalty" for the noise-sensitive hours between 10 p.m. and 7 a.m. In calculating the L_{dn}, 10 dBA is added to each noise event occurring in the nighttime hours, resulting in a higher reported sound level than would occur without the penalty. The L_{dn} is intended to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal human sleeping hours.

- **CNEL (Community Noise Equivalent Level):** CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m. and a 5-dB penalty applied to the sound levels occurring during evening hours between 7 p.m. and 10 p.m. (Caltrans 2013:2-48). . If the same 24-hour noise data are used, the CNEL is typically approximately 0.5 dBA higher than the L_{dn}. Many agencies and local jurisdictions in California often have established noise standards using the

CNEL metric. The CNEL metric is not used by Federal agencies and not commonly used in standards established by local communities outside of California

Existing Noise Conditions and Noise-Sensitive Land Uses near the Phase 3 Repair Project Area

Noise-sensitive land uses in the vicinity of the Phase 3 Repair Project area consist of urban residential uses (elements IVa, IVc, VIa.1, and VIa.4), rural residential uses (elements IIab, VIIb, VIIe, and VIIg), agricultural uses (elements Ia, Ib, Ie, IIIa, IIIb, Va, and VIb), and schools (i.e., Lathrop High School, located within 0.25 mile of element IIIa, and Mossdale Elementary located within 0.25 mile of element VIa.1). Some residences are located almost immediately adjacent to Phase 3 Repair Project construction areas (e.g., element VIIe), and some rural residences are located within 300 feet of construction areas (e.g., waterside residences [Haven Acres mobile home park] are located adjacent to the south end of elements IIab). Furthermore, a residential subdivision is located within 200 feet of two construction areas (i.e., elements IVa, VIa.1, and VIa.4). See **Figures 2-9a** through **2-9c** in Chapter 2, “Alternatives,” for a visual reference between the Phase 3 Repair Project area and surrounding land uses.

The primary noise sources in the area include vehicle traffic, agricultural activities, miscellaneous sources within residential communities, and boating operations on the San Joaquin River. The major highways and roadways in the area include Interstate 5, Interstate 205, State Route 120), Stewart Road, Howard Road, Dos Reis Road, Bowman Road, and Cohen Road. The most substantial roadway traffic noise in the area is generated by vehicle traffic along the highways. Arterial roadways and stationary sources have a localized influence on the noise environment.

Sensitive receptors would be exposed to construction noise for several weeks to as long as several months, depending on the extent to which schedules for the various construction activities listed above are staggered over the construction season.

3.11.3 Methodology and Thresholds of Significance

Methodology

Construction-related and stationary-source noise effects were calculated using the Federal Transit Noise and Vibration Impact Assessment methodology (FTA 2018). Reference emission noise levels and usage factors were based on the Federal Highway Administration (FHWA) Roadway Construction Noise Model. The FHWA Roadway Noise Prediction Model (FHWA-RD-77-108) was used to calculate traffic noise levels along haul routes using estimates (FHWA 1978), described in Chapter 2, “Alternatives.”

Construction noise attributable to the Phase 3 Repair Project was estimated using the FTA noise methodology for the prediction of combined heavy equipment noise sources, or the cumulative noise level generated by the three loudest pieces of equipment operating simultaneously (FTA 2018:176, Table 7-1).

Thresholds of Significance

The basis for determining the significance of effects for this analysis is based on professional standards and on project-specific criteria developed by the lead agency to address potential effects unique to the project’s location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to noise if they would do any of the following:

- generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- generate excessive groundborne vibration or groundborne noise levels; or
- for a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels.

The following considerations apply to the first and second significance criteria:

- **Temporary and short-term construction noise effects:** Temporary and short-term construction noise effects are considered significant if construction-generated noise levels exceed the applicable standards of San Joaquin County: 50 dBA L_{eq} during daytime—7 a.m. to 10 p.m., and 45 dBA L_{eq} during nighttime—10 p.m. to 7 a.m. for outdoor activity areas; the City of Lathrop: 50 dBA between 7:00 a.m. and 10:00 p.m., and 40 dBA between 10 p.m. and 7 a.m. for exterior spaces; and the City of Manteca: 50 dBA L_{eq} between 7 a.m. and 10 p.m., and 45 dBA L_{eq} between 10 p.m. and 7 a.m. for exterior spaces, at nearby noise-sensitive land uses.
- **Generation of excessive groundborne vibration or noise levels:** Temporary and short- and long-term vibration effects would be significant if project construction or operation would expose sensitive receptors to, or would generate, vibration levels that exceed the California Department of Transportation's (Caltrans's) recommended standard of 0.2 inch per second (in/sec) peak particle velocity (PPV) with respect to the prevention of structural damage for normal buildings (Caltrans 2004:24), or the FTA's maximum acceptable vibration standard of 80 vibration decibels (VdB) with respect to human response for residential uses (i.e., annoyance) (FTA 2018:117-120) at any nearby existing sensitive land uses.

For the purposes of this analysis, the local noise level standards presented above were applied and considered in this FEIS to evaluate the effects of noise and vibration generated by construction equipment (i.e., truck-mounted augers, excavators, backhoes, bulldozers, scrapers, rollers, graders, loaders, compactors, and various trucks) relative to each jurisdiction, including traffic generated by construction activities. Temporary, short-term construction noise level standards for San Joaquin County (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime) and the City of Lathrop (50 dBA during daytime and 40 dBA during nighttime) were applied to evaluate the effects of noise generated by construction-related truck trips.

The Phase 3 Repair Project area is not located within an Airport Land Use Compatibility Plan (ALUCP) area. The nearest airport to the Phase 3 Repair Project area is the Stockton Metropolitan Airport, located approximately 3 miles east of the Phase 3 Repair Project area. The Phase 3 Repair Project would not result in locating new noise-sensitive receptors or workers in the ALUCP area of the Stockton Metropolitan Airport. Therefore, effects associated with the Phase 3 Repair Project being located within an ALUCP, within 2 miles of a public airport, or in the vicinity of a private airstrip are not discussed further in this FEIS.

3.11.4 Effects and Mitigation Measures

Effect 3.11-a: Generation of Temporary and Short-Term Construction Noise.

Analysis of temporary and short-term construction noise is divided into discussions for on- and off-site activities. On-site activities are considered those that would occur at the levee elements. Off-site activities are considered those associated with hauling material needed for levee repairs to the levee elements.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. In the event of a levee breach, repair-related construction activities would occur. The location and extent of repair-related activities could be minor to extensive, depending on the location and severity of the levee failure and duration of flooding. Repair-related construction activities would be likely to include repairing damaged homes, utility infrastructure, roads, and highways. Noise-sensitive land uses (i.e., residential uses) are scattered throughout the area in which repair-related construction could be needed. Levee failure would be likely to result in evacuation of people (i.e., sensitive receptors) from damaged levee locations until levee repairs were completed. Without these sensitive receptors present, potential effects related to temporary and short-term construction noise associated with levee repair would not occur. Because the No-Action Alternative would include the potential for further flood system repairs that, as described under the action alternatives evaluated below, would result in significant adverse effects related to the generation of temporary and short-term construction noise, this adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

On-Site Activities

Construction of levee repairs under Alternative 1, as described under "Alternative 1: Minimum Footprint Alternative" in Section 2.4.2, "Action Alternatives," would generate temporary, short-term, and intermittent noise at or near individual noise-sensitive locations in the Phase 3 Repair Project area.

Overview of Construction Activities and Equipment

Construction of slurry cutoff walls along the RD 17 levees generally would proceed in a linear manner, with the highest noise levels affecting individual residences for 2 to 3 weeks in most locations. Construction of cutoff walls would take place in elements IIab, IVc, Va–VIa.1, and VIIe of the Phase 3 Repair Project footprint. Construction activities associated with other seepage remediation measures (e.g., seepage berms, chimney drains) would not proceed in a linear fashion; rather, construction of these facilities would involve recurring construction activities along the entire length of the construction site until construction is completed. In elements Ia, Ib, Ie, IIIb, IVa, VIa.4, VIIb, and VIIg of the Phase 3 Repair Project area, seepage berms would be constructed. Chimney drains (to collect water seeping through aboveground portions of the levee) also would be installed with the seepage berms in elements Ib, Ie, IIIb, IVa, and VIa.4, and a blanket drain would be combined with the seepage berm in element VIIb. In elements IIIa and VIb, a chimney drain and a blanket drain, respectively, would be installed in existing seepage berms. Furthermore, construction activities occurring in elements VIcde would include placing fill in an existing parking lot.

Noise levels near noise-sensitive land uses (i.e., residences) would fluctuate, depending on the physical location of construction activities and on the particular type, number, and duration of use of various pieces of construction equipment. On-site equipment required for construction activities would include excavators, backhoes, bulldozers, scrapers, rollers, graders, loaders, compactors, and various trucks. Maximum noise levels produced by individual equipment during these operations could range from 79 to 90 dBA without the implementation of feasible noise control and at a distance of 50 feet from the nearest noise source, as shown in **Table 3.11-2**.

Table 3.11-2. Construction Equipment Noise Emission Levels[1]

Equipment Type	Typical Noise Level (dB) at 50 feet	Equipment Type	Typical Noise Level (dB) at 50 feet
Air compressor	78	Generator	81
Asphalt paver	77	Grader	85
Backhoe	78	Hoe ram extension	90
Compactor	83	Jack hammer	89
Concrete breaker	82	Pneumatic tools	85
Concrete pump	81	Rock drill	81
Concrete saw	90	Scraper	84
Crane, mobile	81	Trucks	74–81
Dozer	82	Water pump	81
Front-end loader	79	Impact/Vibratory Pile Driver	95

Notes: dB = A-weighted decibels

[1] All equipment fitted with properly maintained and operational noise control device, per manufacturer specifications. Noise levels listed are the actual measured noise levels for each piece of heavy construction equipment.

Sources: BBN 1981:8-5; FTA 2018:176, Table 7-1; Caltrans 2009:8-38

Predicted Noise Levels from Construction Activity

Table 3.11-3 shows the results of construction noise modeling for the various stages of construction activities associated with the proposed levee repairs (for Alternative 1, Alternative 2, and the Requester's Preferred Alternative) based on the equipment requirements for construction discussed in Chapter 2, "Alternatives," and the distances to the 50-dBA, 45-dBA, and 40-dBA noise contours assuming no intervening barriers. **Appendix H** provides a complete listing of inputs and the methodology for predicting noise levels from construction.

As shown in **Table 3.11-3**, the predicted highest noise level associated with non-pile driving construction activities would be 77.9 dBA L_{eq} at 100 feet, generated by heavy equipment associated with the levee repairs. In some locations, construction noise would be temporary and short-term, and effects generally would not result in annoyance. In other instances, the levee itself may serve as a sound barrier that provides some protection to sensitive land uses on the opposite side of the levee. For example, rural residences on the west side of the San Joaquin River would be shielded from the highest noise levels that would occur with construction activity at the landside toe of the east levee. This noise shielding would not include construction activities associated with slurry cutoff walls, which would occur at the top of the levee.

Table 3.11-3. Predicted Noise Levels Attributable to Major Construction Activities Included in Alternative 1, Alternative 2, and the Requester's Preferred Alternative

Action	Resulting Noise Level in dBA L_{eq} at 100 feet	Distance to Noise Contour (feet)		
		40 dBA[1]	45 dBA[1]	50 dBA[1]
Clearing and grubbing/stripping	76.3	2,948	1,860	1,174
Removal of landside structures and other facilities	76.7	3,060	1,931	1,218
Cutoff wall construction	77.9	3,393	2,141	1,351
Seepage berm construction	77.9	3,393	2,141	1,351
Sheet pile installation[2]	81.0	3,600	2,325	1,500
Setback levee construction (part of Alternative 2)	77.9	3,393	2,141	1,351
Site restoration, demobilization	74.3	2,441	1,540	972

Notes: dBA = A-weighted decibel; L_{eq} = energy-equivalent noise level
1 Distances to noise contours do not take into account intervening topography or existing structure.
2 The Requester's Preferred Alternative would not include any sheet pile installation.
Source: FTA 2018:176, Table 7-1; data modeled by Ascent Environmental in 2019

Because of their proximity to residences, construction activities associated with the proposed levee repairs along all elements excluding element VIIb could result in temporary and short-term noise levels (**Table 3.11-3**) that would exceed the applicable daytime or nighttime standards of San Joaquin County (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime for outdoor activity areas), the City of Lathrop (50 dBA during daytime and 40 dBA during nighttime for exterior spaces), and the City of Manteca (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime for exterior spaces). This effect would not apply to element VIIb because sensitive receptors would be sufficiently distant so that noise standards at the nearest receptor would not be exceeded.

As described in Section 3.11.1, "Regulatory Setting," both San Joaquin County and the City of Lathrop provide exceptions for construction noise if construction occurs during specifically defined daytime hours. Using these exceptions, the loudness or intensity of construction noise would not be a consideration in assessing compliance, only the times that construction would take place. In addition, the City of Lathrop Noise Ordinance would allow operation of construction equipment to continue outside exempt hours if a permit is obtained from the City of Lathrop before the work begins (as required under Section 8.20.110, Construction of Buildings and Projects, City of Lathrop Municipal Code). It is already known that slurry cutoff wall construction would take place on a 24-hour, 7-day a week (24/7) basis and would not be able to comply with the standard construction timing guidelines provided by San Joaquin County and the City of Lathrop. Because of the size and intensity of other seepage remediation measures in some project elements and the fact that agency guidelines would limit some planned construction activities to periods when no risk of a high water event would exist, all Phase 3 Repair Project elements may not be able to be constructed entirely within the daytime construction hours identified by San Joaquin County and the City of Lathrop. The City of Lathrop may or may not provide a permit for construction activities outside the standard daytime construction hours. Because compliance with local noise regulations specific to construction noise may not be possible, the exceptions for construction noise provided in the regulations are not considered in the effects analysis and the assessment of effects is based on the levels of noise generation relative to acceptable noise levels identified by local jurisdictions.

Non-Pile Driving Construction 24 Hours per Day, 7 Days per Week

Noise generated by construction equipment could result in exterior noise levels that would exceed the noise standards of San Joaquin County (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime for outdoor activity areas), the City of Lathrop (50 dBA during daytime and 40 dBA during nighttime for exterior spaces), or the City of Manteca (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime for exterior spaces) during all construction activities. Although construction activity is expected to take place during daytime hours (between 7 a.m. and 10 p.m.), because of the need to complete levee repairs outside the flood season, and because of other environmental and engineering constraints on project schedule, as described in Chapter 2, "Alternatives," it is possible that construction of cutoff walls would need to be conducted 24/7. For example, installation of cutoff walls along the elements IIab, IVc, Va, and VIIe would be conducted 24/7 during the relatively short levee construction window. Therefore, noise may be generated by construction equipment that is operating near homes during the more noise-sensitive early morning and nighttime hours (i.e., during hours that are not exempted by the applicable local ordinances of the City of Lathrop and San Joaquin County) and could result in sleep disturbance at nearby residences. The City of Manteca does not exempt noise created by construction activities.

The standard for an acceptable exterior nighttime noise level established by San Joaquin County and the City of Manteca is 45 dBA L_{eq}, and by the City of Lathrop is 40 dBA L_{eq}. Construction noise modeling results indicate that noise levels from cutoff wall construction equipment (deep-soil mixing [DSM] equipment) would be above 45 dBA L_{eq} at a distance of 2,140 feet and above 40 dBA L_{eq} at a distance of 3,400 feet from the construction equipment. (See **Appendix H** for noise modeling assumptions and results.) Based on these distances from construction equipment, residents located within 2,140 feet of all elements proposed for cutoff wall construction could be affected by 24/7 construction while the cutoff wall is being installed along the levee during the relatively short levee construction window. Also, the 2,140- and 3,400-foot-long distances were modeled based on the assumption that sensitive receptors would be located in the line-of-sight from the noise source and did not take into account intervening topography or structures.

Because of their proximity to residences, construction activities associated with the proposed levee repairs along all elements, excluding VIIb, could result in temporary and short-term noise levels (**Table 3.11-3**) that would exceed the applicable daytime or nighttime standards of San Joaquin County (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime for outdoor activity areas), the City of Lathrop (50 dBA during daytime and 40 dBA during nighttime for exterior spaces), and the City of Manteca (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime for exterior spaces). These temporary, short-term noise levels could result in increased annoyance and/or disrupted sleep for occupants of residential dwellings and other sensitive receptors. Therefore, adverse noise effects associated with levee construction would be **significant**.

Pile Driving Activities

The installation of sheet piles instead of slurry cutoff walls has been proposed as a possible alternative construction method for element VIIe due to the lack of alternatives to the DSM method. A berm would not be feasible at this location due to the adjacent trailer park. The design cutoff wall depth would exceed the traditional open-cut method's capability, and the narrow crown width would render any levee degrade impractical. Noise generated by impact pile driving would be higher than for traditional construction methods. As shown in **Table 3.11-3**, if pile driving is used for installation of sheet piles in element VIIe, noise levels would reach approximately 81 dBA L_{eq} during pile driving activities. Element VIIe is located in San Joaquin County. Therefore, the following County standards (including a -5-

decibel adjustment for impact pile driving noise) would be applicable to pile driving activities: 45 dBA L_{eq} daytime, 40 dBA L_{eq} nighttime, 65 dBA L_{max} daytime, and 60 dBA L_{max} nighttime. Pile driving activities would exceed 45 dBA L_{eq} daytime at 2,325 feet, 40 dBA L_{eq} nighttime at 3,600 feet, 65 dBA L_{max} daytime at 1,450 feet, and 60 dBA L_{max} nighttime at 2,550 feet. Multiple residential neighborhoods are located within the distances outlined above, especially the Oakwood Lake neighborhood that is located directly adjacent to element VIIe.

Pile driving activities are expected to take place during daytime hours (between 7 a.m. and 10 p.m.). Because of the need to complete levee repairs outside the flood season, and because of other environmental and engineering constraints on project schedule (see also Chapter 2, “Alternatives”), pile driving activities at element VIIe possibly may need to be conducted 24/7. Therefore, noise may be generated by pile driving activities near homes during the more noise-sensitive early morning and nighttime hours (i.e., during hours that are not exempted by the applicable local ordinances in San Joaquin County) and could result in sleep disturbance at nearby residences.

Because of proximity to residences, pile driving activities associated with the proposed levee repairs along element VIIe could result in temporary and short-term noise levels (**Table 3.11-3**). These levels would exceed the applicable hourly and maximum daytime or nighttime standards of San Joaquin County (50 dBA L_{eq}/65 dBA L_{max} during daytime, and 45 dBA L_{eq}/60 dBA L_{max} during nighttime for outdoor activity areas). These temporary, short-term noise levels could result in increased annoyance and/or disrupted sleep for occupants of residential dwellings and other sensitive receptors. Therefore, adverse noise effects associated with sheet pile driving would be **significant**.

Off-Site Activities

Construction of Alternative 1 during all Phase 3 Repair Project construction years would generate substantial truck haul trips on area roads during transport of materials from commercial quarries to the Phase 3 Repair Project levee repair sites, as shown in **Figure 2-10** and described in Section 3.8, “Transportation and Circulation.” Noise level estimates are based on the amount of material to be hauled, number of days of construction, and the hours per day in which hauling would occur. Trucks hauling material to individual elements of the Phase 3 Repair Project would use the same roadways and highways until approaching the general Phase 3 Repair Project area. In proximity to the Phase 3 Repair Project area, haul routes would differ, depending on the element destination of individual haul trucks. Roadways used by haul trucks to access specific elements are shown in **Figure 2-10**.

Up to approximately 205 daily trips are expected during the maximum construction activity periods under Alternative 1. Construction-related traffic would be distributed over the roadway network, as shown in **Figure 2-10** and discussed in Section 3.8, “Transportation and Circulation.” Based on the number of trips, noise levels attributable to anticipated haul truck traffic from implementation of the Phase 3 Repair Project would be approximately 66 dBA L_{eq} at a distance of 50 feet from the roadway centerline for material hauled to the Phase 3 Repair Project elements.

Most of the Phase 3 Repair Project area roadways serve a limited volume of traffic; therefore, the modeled noise levels are assumed to represent substantial increases compared to existing traffic noise levels. Not only would Alternative 1 result in substantially more vehicle trips along the off-road haul route located at the toe of elements Ie, IIab, IIIa, IIIb, IVa, IVc, and Va–VIa.1 near residences and along public roadways with residences (haul routes for elements IVa, IVc, Va–VIa.1, VIa.4, VIb, VIIe, and VIIg), but the vehicles would be predominantly haul trucks, which generate considerably more noise than passenger vehicles. However, haul truck trips would vary, depending on specific elements and construction activity occurring. For example, the number of haul trips for construction of cutoff walls would be substantially less than the number for construction of setback levees.

Predicted traffic noise levels along haul routes associated with the Phase 3 Repair Project would exceed local exterior noise standards of San Joaquin County (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime), the City of Lathrop (50 dBA during daytime and 40 dBA during nighttime), and the City of Manteca (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime) at residential land uses located along designated haul routes (**Figure 2-10**). Specifically, residences located within approximately 60 feet of the roadway centerline along Manila Road, Dos Reis Road, River Islands Parkway, Golden Valley Parkway, and Woodward Avenue would experience an increase in traffic noise levels from Phase 3 Repair Project-related hauling activities.

Assuming a standard exterior-to-interior attenuation rate of 25 dBA for residential buildings with windows and doors closed, noise generated by haul trucks supplying material for the Phase 3 Repair Project repairs could result in maximum interior noise levels of 40 dBA L_{eq}. Based on these results, noise levels from haul trucks would not result in an exceedance of the interior noise standard of San Joaquin County (45 dBA L_{eq} during nighttime), the City of Lathrop (40 dBA L_{eq} during nighttime), or the City of Manteca (45 dBA L_{eq} during nighttime) for residential land uses. Because of the need to complete levee repairs outside the flood season and because of other environmental constraints on project schedule (e.g., 24/7 construction of cutoff walls), it may be necessary to conduct some hauling activity during some noise-sensitive early morning and nighttime hours, by which noise levels from haul trips would exceed exterior standards in San Joaquin County, the city of Lathrop, and the city of Manteca, potentially disturbing the sleep of occupants at nearby residences. Adverse noise effects associated with hauling activities would be **significant**.

Alternative 2: Maximum Footprint Alternative

On-Site Activities

Noise generation under Alternative 2 would be similar to Alternative 1. However, only one cutoff wall, in element VIIe, would be constructed. In elements IIab and VIcde, setback levees would be constructed rather than either a cutoff wall or fill. At element IVc, either a seepage berm and chimney drain or a setback levee would be constructed rather than a cutoff wall, and at elements Va–VIa.1 a seepage berm with toe drain would be constructed rather than a cutoff wall. As discussed previously for Alternative 1, construction of cutoff walls would require construction work to continue 24/7. Therefore, construction of seepage berms or setback levees would eliminate the need to conduct construction work on a 24/7 basis at elements IIab, IVc, Va–VIa.1, and VIcde, and thereby would reduce noise created compared to Alternative 1. Specifically, noise-sensitive receptors are located within 200 feet of the levee at element IVc and within 300 feet at elements IIab. Therefore, residences near elements IVc and IIab would not be exposed to noise from construction activities occurring 24/7 for placement of cutoff walls but would be exposed to higher levels of construction noise associated with setback levees because setback levees would be constructed behind existing levees. This would locate the sources of noise from construction activities closer to sensitive receptors. Residents would be subject to noise from excavators and dozers used to construct the setback levees.

Although these construction activities would be more likely to be restricted to less sensitive daytime time periods when construction activities are exempt from noise standards in the city of Lathrop and San Joaquin County, as discussed above for Alternative 1, some construction outside of these exemption periods may be required.

Overall, Alternative 2 would be likely to cause less noise disturbance to residents located near construction areas along elements IIab, IVc, Va–VIa.1, and VIcde than under Alternative 1. However, construction activities would continue to occur close to noise-sensitive receptors, and short-term, temporary noise levels could exceed the applicable daytime or nighttime standards of San Joaquin County (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime for outdoor activity areas), the City of Lathrop (50 dBA during daytime and 40 dBA during nighttime for exterior spaces), or the City of Manteca (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime for exterior spaces) These temporary, short-term noise levels could result in increased annoyance and/or disrupted sleep for occupants of residential dwellings and other sensitive receptors. Therefore, adverse noise effects associated with levee construction would be **significant**.

<u>Pile Driving Activities</u>

Sheet pile driving in element VIIe under Alternative 2 would be the same as that described above under Alternative 1. Therefore, as under Alternative 1, temporary, short-term noise levels from sheet pile driving could result in increased annoyance and/or disrupted sleep for occupants of residential dwellings and other sensitive receptors. Therefore, adverse noise effects associated with sheet pile driving would be **significant**.

<u>Off-Site Activities</u>

Construction of Alternative 2 during all Phase 3 Repair Project construction years would generate more truck haul trips on area roads during transport of materials from commercial quarries to the Phase 3 Repair Project levee repair sites than construction of Alternative 1. Up to approximately 315 daily trips are expected during the maximum construction activity periods under Alternative 2. Based on the number of trips, noise levels attributable to anticipated haul truck traffic from implementation of the Phase 3 Repair Project would be approximately 68dBA L_{eq} at a distance of 50 feet from the roadway centerline for material hauled to the Phase 3 Repair Project elements.

Most of the Phase 3 Repair Project area roadways serve a limited volume of traffic; therefore, the modeled noise levels are assumed to represent substantial increases compared to existing traffic noise levels. Not only would Alternative 2 result in substantially more vehicle trips than Alternative 1 along the off-road haul route located at the toe of elements Ie, IIab, IIIa, IIIb, IVa, IVc, and Va–VIa.1 near residences and along public roadways with residences (haul routes for elements IVa, IVc, Va–VIa.1, VIa.4, VIb, VIIe, and VIIg), but the vehicles would be predominantly haul trucks, which generate considerably more noise than passenger vehicles. However, the number of haul truck trips would vary, depending on specific elements and construction activity occurring. For example, haul trips for construction of cutoff walls would be substantially less than those for construction of setback levees.

Predicted traffic noise levels along haul routes associated with the Phase 3 Repair Project would exceed local exterior noise standards of San Joaquin County (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime), the City of Lathrop (50 dBA during daytime and 40 dBA during nighttime), and the City of Manteca (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime) at residential land uses located along designated haul routes (**Figure 2-10**). Specifically, residences located within approximately 60 feet of the roadway centerline along Manila Road, Dos Reis Road, River Islands Parkway, Golden Valley Parkway, and Woodward Avenue would experience an increase in traffic noise levels from hauling activities.

Assuming a standard exterior-to-interior attenuation rate of 25 dBA for residential buildings with windows and doors closed, noise generated by haul trucks supplying material for the Phase 3 Repair Project repairs could result in maximum interior noise levels of 41 dBA L_{eq}. Based on these results, noise levels from haul trucks would not result in an exceedance of the interior noise standard of San Joaquin County (45 dBA L_{eq} during nighttime), the City of Lathrop (50 dBA L_{eq} during daytime), or the City of Manteca (45 dBA L_{eq} during nighttime) for residential land uses. However, noise levels from haul trucks would result in an exceedance of the interior noise standard for residential land uses in the city of Lathrop during nighttime hours (40 dBA L_{eq}).

Because of the need to complete levee repairs outside the flood season, and because of other environmental constraints on project schedule (e.g., 24/7 construction of cutoff walls), it may be necessary to do hauling during some noise-sensitive early morning and nighttime hours, when noise levels from these haul trips would exceed exterior standards in San Joaquin County, the city of Lathrop, and the city of Manteca, potentially disturbing occupant's sleep at nearby residences. Adverse effects associated with hauling activities would be **significant**.

Requester's Preferred Alternative

On-Site Activities

The Requester's Preferred Alternative would include 10 elements. Noise generation from two of these elements (i.e., VIc and VIIe) would be similar to that discussed above under Alternatives 1 and 2. Of the remaining eight elements, noise generation from four elements (IIab and Va–VIa.1) would be similar to that discussed above under Alternative 1. Noise generation from the remaining four elements (Ia, IVc, VIa.4, and VIb, would be slightly different from that considered in Alternatives 1 and 2. Of the five different elements in the Requester's Preferred Alternative, one element (Ia) would include installing a chimney drain in a proposed seepage berm; one element (IVc) would include installing a cutoff wall with a seepage berm and setback levee; and the remaining three elements (VIa.4, VIb, and VId) would include installing a cutoff wall (not proposed in Alternatives 1 and 2).

As shown in **Table 3.11-3**, the predicted highest noise level associated with construction activities would be 77.9 dBA L_{eq} at 100 feet from use of heavy equipment associated with the levee repairs. Because of their proximity to residences, construction activities associated with the proposed levee repairs along all elements excluding VIIb under the Requester's Preferred Alternative could result in temporary and short-term noise levels (**Table 3.11-3**) that would exceed the applicable daytime or nighttime standards of San Joaquin County (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime for outdoor activity areas) and the City of Lathrop (50 dBA during daytime and 40 dBA during nighttime for exterior spaces). Although these construction activities would be likely to be restricted to less sensitive daytime periods when construction activities are exempt from noise standards in the city of Lathrop and San Joaquin County, as discussed previously for Alternatives 1 and 2, some construction outside these exemption periods may be required.

Construction of cutoff walls would require construction work to continue 24/7. Therefore, residences near elements IVc, Va-VIa.1, VIa.4, VIb, and VIcde, would be exposed to noise from construction activities occurring 24/7 for placement of cutoff walls. Overall, construction activities under the Requester's Preferred Alternative would continue to occur close to noise-sensitive receptors, and temporary, short-term, noise levels could exceed the applicable daytime or nighttime standards of San Joaquin County (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime for outdoor activity areas) or the City of Lathrop (50 dBA during daytime and 40 dBA during nighttime for exterior spaces). These temporary, short-term noise levels could result in increased annoyance and/or disrupted sleep for occupants of residential dwellings and other sensitive receptors. Therefore, adverse noise effects associated with levee construction would be **significant**.

Pile Driving Activities

No sheet pile driving in element VIIe would occur under the Requester's Preferred Alternative. Therefore, **no effect** would occur.

Off-Site Activities

Construction of the Requester's Preferred Alternative during all Phase 3 Repair Project construction years would generate less truck haul trips than Alternative 1 and Alternative 2 on area roads during transport of materials from commercial quarries to the Phase 3 Repair Project area. Up to approximately 192 daily trips are expected during the maximum construction activity periods under the Requester's Preferred Alternative. Based on the number of trips, noise levels attributable to anticipated haul truck traffic would be approximately 66 dBA L_{eq} at a distance of 50 feet from the roadway centerline for material hauled to the Phase 3 Repair Project elements.

Most of the Phase 3 Repair Project area roadways serve a limited volume of traffic; therefore, the modeled noise levels represent substantial increases compared to existing traffic noise levels. Not only would the Requester's Preferred Alternative result in substantially more vehicle trips along the off-road haul route located at the toe of element IVc near residences and along public roadways near residences (haul route for element IVc), but the vehicles would be predominantly haul trucks, which would generate considerably more noise than passenger vehicles.

Traffic noise levels along haul routes associated with the Phase 3 Repair Project are predicted to exceed local exterior noise standards of San Joaquin County (50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime) and the City of Lathrop (50 dBA during daytime and 40 dBA during nighttime) at residential land uses located along designated haul routes (**Figure 2-10**). Specifically, residences located within approximately 60 feet of the roadway centerline along Manila Road, Dos Reis Road, River Islands Parkway, and Golden Valley Parkway would experience an increase in traffic noise levels from hauling activities under the Requester's Preferred Alternative.

Assuming a standard exterior-to-interior attenuation rate of 25 dBA for residential buildings with windows and doors closed, noise generated by haul trucks supplying material for the Phase 3 Repair Project repairs could result in a maximum interior noise level of 40 dBA L_{eq}. At that level, noise from the haul trucks would not result in an exceedance of the interior noise standard of San Joaquin County (45 dBA L_{eq} during nighttime) or the City of Lathrop (50 dBA L_{eq} during daytime) for residential land uses. Also, noise levels from the haul trucks would not result in an exceedance of the interior noise standard for residential land uses in the city of Lathrop during nighttime hours (40 dBA L_{eq}).

Because of the need to complete levee repairs outside the flood season, and because of other environmental constraints on project schedule (e.g., 24/7 construction of cutoff walls), hauling during some noise-sensitive early morning and nighttime hours may be necessary, when noise levels from haul trips would exceed exterior standards in San Joaquin County and the city of Lathrop, potentially disturbing occupants' sleep at nearby residences. Adverse effects associated with hauling activities under the Requester's Preferred Alternative would be **significant**.

Mitigation Measure 3.11-a: Implement Noise-Reducing Measures Near Sensitive Receptors during Project Construction.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

RD 17 will implement the measures below to avoid and minimize adverse temporary and short-term construction noise effects on sensitive receptors. These measures will be implemented during construction, when construction occurs during the daytime (7 a.m. to 10 p.m.) and is within 1,400 feet of a sensitive receptor, or when construction occurs during the nighttime (10 p.m. to 7 a.m.) and is within 2,200 feet of a sensitive receptor in San Joaquin County or the city of Manteca, or is within 3,400 feet of a sensitive receptor in the city of Lathrop.

- All construction equipment will be equipped with noise-reduction devices, such as mufflers, to minimize construction noise, and all internal combustion engines will be equipped with exhaust and intake silencers, in accordance with manufacturers' specifications.

- Equipment that is quieter than standard equipment will be used, including electrically powered equipment instead of internal combustion equipment, where use of such equipment is a readily available substitute that accomplishes project tasks in the same manner as internal combustion equipment.

- The use of bells, whistles, alarms, and horns will be restricted to safety warning purposes only.

- Noise-reducing enclosures will be used around stationary noise-generating equipment (e.g., compressors and generators at slurry pond locations).

- Mobile and fixed construction equipment (e.g., compressors and generators), construction staging and stockpiling areas, and construction vehicle routes will be located at the most distant point feasible from noise-sensitive receptors.

- When noise-sensitive uses are located within 450 feet of and subject to prolonged construction noise, noise-attenuating buffers, such as structures, truck trailers, or soil piles, will be located between noise generation sources and sensitive receptors.

- Before construction activity begins within 450 feet of one or more residences or businesses, RD 17 will provide written notification to the potentially affected residents or business owners, identifying the type, duration, and frequency of planned construction activities. A noise disturbance coordinator will be designated, and contact information will be provided in the notices and posted near the Phase 3 Repair Project area in a conspicuous location that is clearly visible to the nearby receptors who are most likely to be disturbed. This coordinator will manage complaints and concerns resulting from noise-generating activities. The severity of any noise concerns will be assessed by the coordinator, and if necessary, will be evaluated by a qualified noise control engineer.

- RD 17 will properly maintain all heavy trucks and will equip them with noise-control devices (e.g., mufflers), in accordance manufacturers' specifications, at each work site during project construction to minimize construction traffic noise effects on sensitive receptors.

- Before haul truck trips are initiated during a construction season on roads within 1,500 feet (under Alternative 1) or 2,000 feet (under Alternative 2) of residences located along haul routes for elements IVa, IVc, Va–VIa.1, VIa.4, VIb, VIIe, and VIIg, or within 1,650 feet (under the

Requester’s Preferred Alternative) of residences located along haul routes for elements IVc, Va–VIa.1, VIa.4, VIb, and VIIe, written notification will be provided to the potentially affected residents identifying the hours and frequency of haul truck trips. Notification materials will include contact information for the designated noise disturbance coordinator and also will identify a mechanism for residents to register complaints with the appropriate jurisdiction if haul truck noise levels are overly intrusive or occur outside the exempt daytime hours for the applicable jurisdiction.

- No impact or vibratory pile driving will be performed, whenever feasible. To help reduce noise from pile driving involving impact or vibratory driving or drilling pilot holes, measures will be taken such as placing noise absorbing caps between piles and hammers.

- Noise-reducing enclosures will be used to surround the area where pile driving is to occur, when feasible.

- When 24/7 impact pile driving activities occur, RD 17 will honor requests from affected residents (when no other recourse is effective), to provide reasonable reimbursement for local hotel or short-term rental stays (i.e., within city of residence or nearest city of county residence) when impact pile driving activities take place within 3,600 feet of any residents, or when reduced impact pile driving techniques are used within 450 feet of any residents requesting reimbursement. Reimbursements will pay only lodging costs.

When construction other than pile driving activities takes place during nighttime hours (between 10 p.m. and 7 a.m.), some nearby residents possibly will not be able to sleep adequately, even if the noise limiting measures listed above are implemented. Under these circumstances, if no other recourse proves effective, RD 17 will honor requests from affected residents to provide reasonable reimbursement of local hotel or short-term rental stays (i.e., within city of residence or nearest city of county resident) for the period of time that cutoff wall construction takes place within 450 feet of the residents requesting reimbursement. Reimbursement will be only for lodging costs.

Responsibility: RD 17 and its primary construction contractors.

Timing: Before and during construction near affected sensitive receptor(s).

Implementing this mitigation measure would reduce the adverse effects of construction noise generated from construction equipment, pile driving, and hauling as well as from bells, whistles, alarms, and horns, but may not reduce noise levels at all times to a less-than-significant level because of the close proximity of noise-sensitive receptors to construction activities along all elements of the project, excluding element VIIb, because predicted noise levels may not meet the applicable standards for local exterior noise for residential land uses (San Joaquin County established 50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime, the City of Lathrop established 50 dBA during daytime and 40 dBA during nighttime, and the City of Manteca established 50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime), and the limited feasibility of mitigating construction noise to acceptable levels. There are no additional feasible mitigation measures available to reduce this adverse effect. Therefore, the temporary and short-term adverse noise effects would remain **significant** and **unavoidable** for Alternative 1, Alternative 2, and the Requester’s Preferred Alternative.

Effect 3.11-b: Temporary and Short-Term Exposure of Sensitive Receptors to, or Temporary and Short-Term Generation of, Excessive Groundborne Vibration.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. In the event of a levee breach, repair-related construction activities would occur. The location and extent of repair-related activities could be minor to extensive, depending on the location and severity of the levee failure and duration of flooding. Repair-related construction activities would be likely to include repairing damaged homes, utility infrastructure, roads, and highways. Noise-sensitive land uses (i.e., residential uses) are scattered throughout the area in which repair-related construction could be needed. Levee failure would be likely to result in evacuation of people (i.e., sensitive receptors) from damaged levee locations until levee repairs were completed. Without these sensitive receptors present, potential effects related to temporary and short-term construction noise associated with levee repair would not occur. Because the No-Action Alternative would include the potential for further flood system repairs that, as described under the three action alternatives evaluated below, would result in significant adverse effects related to the generation of excessive groundborne vibration, this adverse effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Construction activities for Alternative 1, Alternative 2, and the Requester's Preferred Alternative would have the potential to result in varying degrees of temporary ground vibration, depending on the specific construction equipment used and operations involved. Vibration generated by construction equipment would spread through the ground and would diminish in magnitude with increases in distance. **Table 3.11-4** shows vibration levels for typical construction equipment.

Table 3.11-4. Vibration Levels of Typical Construction Equipment

Equipment	PPV at 25 feet (in/sec)	Approximate Lv at 25 feet[1]
Large bulldozer	0.089	87
Trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58
Impact Pile Driving	1.518	112

Notes: in/sec = inches per second; PPV = peak particle velocity
1 Where Lv is the velocity level in decibels and based on the root mean square velocity amplitude.
Source: FTA 2018:184

Typical project construction equipment would include truck-mounted augers, excavators, backhoes, bulldozers, scrapers, rollers, graders, loaders, compactors, and various trucks. The most intense generation of ground vibration would be associated with large bulldozers that could generate levels of 0.089 in/sec PPV and 87 VdB at a distance of 25 feet. These levels would attenuate to 0.037 in/sec PPV or 79 VdB at a distance of 45 feet. Vibration sensitive receptors generally are located beyond the maximum construction limit areas throughout the Phase 3 Repair Project area. However, residences along element VIIe are located within 45 feet of the maximum construction limit areas, and vibration generated by construction equipment could exceed the recommended FTA (80 VdB) standard for the potential of human annoyance at these receptors. Furthermore, the sleep of these sensitive receptors could be disturbed because nighttime construction activities would take place in element VIIe. Ground vibration also would be generated by haul trucks operating on area haul routes. As shown in **Table 3.11-4**, vibration levels generated by trucks could reach as high as 0.076 in/sec PPV or 86 VdB at a distance of 25 feet. At a distance of 50 feet, haul truck levels would attenuate to 0.027 in/sec PPV and 77 VdB. Residential buildings would be located within 50 feet of Phase 3 Repair Project haul routes for elements IVa, IVc, Va–VIa.1, VIa.4, VIb, VIIe, and VIIg, shown in **Figure 2-10**. Because the VdB levels of project construction equipment could exceed Caltrans and FTA's recommended standards for off-road construction equipment, these temporary and short-term adverse effects related to vibration from other construction equipment would be **significant**.

Pile Driving Activities

Under Alternatives 1 and 2, installation of sheet piles instead of slurry cutoff walls would be a possible alternative construction method for element VIIe. Vibration generated by impact pile driving would be higher than for traditional construction methods. As shown in **Table 3.11-4**, if impact pile driving were to be used for installation of sheet piles in element VIIe, vibration levels could reach as high as 1.518 in/sec PPV or 112 VdB at a distance of 25 feet. Vibration levels would exceed recommended thresholds (0.2 in/sec PPV and 80 VdB) within 100 feet and 300 feet, respectively, of pile driving activities.

Because of proximity to residences and possible 24/7 operations, pile driving activities associated with the Phase 3 Repair Project under Alternatives 1 and 2 along element VIIe could result in temporary and short-term vibration levels (**Table 3.11-3**) that would exceed applicable standards. These temporary, short-term vibration levels could result in increased annoyance and/or disrupted sleep for occupants of residential dwellings and other sensitive receptors. Therefore, adverse vibration effects associated with sheet pile driving would be **significant**.

Mitigation Measure 3.11-b: Implement Vibration-Reducing Measures Near Sensitive Receptors during Project Construction.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

RD 17 will implement the following measures at work sites along elements IVa, IVc, Va–VIa.1, VIa.4, VIb, VIIe, and VIIg during project construction to avoid and minimize the adverse effects of temporary and short-term construction-related groundborne vibration, including pile driving, on sensitive receptors:

- Equipment will be operated as far away as practical from vibration-sensitive receptors.
- A noise disturbance coordinator will be designated, and contact information will be posted near the Phase 3 Repair Project area in a conspicuous location that is clearly visible to the nearby receptors who are most likely to be disturbed. This coordinator will manage complaints and concerns resulting from vibration-inducing activities. The severity of any vibration concerns will be assessed by the coordinator, and if necessary, will be evaluated by a qualified vibration control engineer.
- When construction-generated vibration is determined to exceed the threshold of human annoyance at a sensitive receptor and no other recourse has proven effective in alleviating the annoyance, RD 17 will honor requests from affected residents to provide reasonable reimbursement for local hotel or short-term rental stays (i.e., within city of residence or nearest city of county resident) when

construction takes place within 45 feet of any residents requesting reimbursement. Reimbursement will be only for lodging costs.

The primary contractor will prepare and implement a detailed vibration control plan, based on the proposed construction methods. This plan will identify specific measures to provide compliance with the vibration control measures specified above. The vibration control plan will be submitted to and approved by RD 17 before any construction activity that may generate vibration would begin.

Responsibility: RD 17 and its primary construction contractors.

Timing: Before and during construction.

Implementing this mitigation measure at work sites along elements IVa, IVc, Va–VIa.1, VIa.4, VIb, VIIe, and VIIg would reduce the temporary and short-term adverse effect, but may not reduce vibration levels at all times to a less-than-significant level because of the close proximity of vibration-sensitive receptors to construction activities, including haul trucks, and the limited feasibility of mitigating construction-induced vibration to acceptable levels, especially during nighttime hours. No additional feasible mitigation measures are available to reduce this adverse effect. Therefore, these temporary and short-term adverse effects would remain **significant** and **unavoidable** for Alternative 1, Alternative 2, and the Requester's Preferred Alternative.

Effect 3.11-c: Long-Term Increases in Project-Generated Noise.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. The level of effort and period of time required to reconstruct failed levees and damaged structures and facilities would depend on the extent and location of damage. However, after completion of repairs and reconstruction, noise generation would not be substantially greater than under a No-Action, no-flood scenario. Therefore, this effect would be **less than significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Alternative 1, Alternative 2, and the Requester's Preferred Alternative would not include any components involving the long-term operation of noise-generating, stationary equipment. Long-term operation of Phase 3 Repair Project repairs (i.e., cutoff walls, seepage berms, setback levees, and drains) would not incorporate any new activities that would generate long-term operational noise. Existing maintenance and patrolling activities of the levee would continue, and temporary, short-term noise levels would not change with project implementation. **No effect** would occur.

Mitigation Measure: No mitigation is required.

3.11.5 Residual Significant Effects

No residual significant noise impacts would occur under the No-Action Alternative because construction associated with the Phase 3 Repair Project would not occur, and impacts associated with construction after a potential levee failure would be likely to result in evacuation of any sensitive receptors under the No-Action Alternative.

Under Alternative 1, Alternative 2, and the Requester's Preferred Alternative, the adverse effects of both temporary and short-term exposure on sensitive receptors to construction noise and vibration and exposure of residents to increased traffic noise levels from hauling activity would be significant. Implementing Mitigation Measures 3.11-a and 3.11-b would reduce these effects, but not to a less-than-significant level, because the mitigation would not fully reduce exterior noise and vibration levels below established standards for residential land uses (San Joaquin County established 50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime, the City of Lathrop established 50 dBA during daytime and 40 dBA during nighttime, and the City of Manteca established 50 dBA L_{eq} during daytime and 45 dBA L_{eq} during nighttime). Therefore, Alternative 1, Alternative 2, and the Requester's Preferred Alternative would result in temporary and short-term significant and unavoidable adverse effects on noise-sensitive receptors (e.g., nearby residents).

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3.12 Recreation

This section discusses existing recreational facilities in the Phase 3 Repair Project area and vicinity and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to recreation. Additional related information is contained in Section 3.14, “Utilities and Public Services,” and Section 3.13, “Visual Resources.” A discussion of cumulative effects related to recreation is provided in Chapter 4, “Cumulative and Growth-Inducing Effects and Other Statutory Requirements,” of this FEIS.

3.12.1 Regulatory Setting

No Federal or state laws or regulations related to recreation apply to the Phase 3 Repair Project.

3.12.2 Environmental Setting

Regional Parks

Several parks are in the Phase 3 Repair Project vicinity. **Table 3.12-1** identifies those parks located within 0.5 mile and east of one or more Phase 3 Repair Project elements.

Table 3.12-1. Parks within 0.5 Mile of the Phase 3 Repair Project

Park Name	Address	Nearest Element(s)
The Green at Mossdale Landing	16700 English Country Trail, Lathrop, CA 95330	VIa.1
The Commons at Mossdale Landing	740 Green Plaza, Lathrop, CA 95330	VIa.1
Crescent Park	15980 Crescent Park Circle, Lathrop, CA 95330	IVc
Mossdale Crossing Regional Park	19091 South Manthey Road, Lathrop, CA 958330	VIcde
Mossdale Landing Community Park	700 Towne Centre, Lathrop, CA 95330	VIa.1
Park West	16130 Sheltered Cove Circle, Lathrop, CA 95330	IVc
River Park North	16001 South Lathrop Road, Lathrop, CA 95330	IVa
River Park South	17801 Inland Passage Way, Lathrop, CA 95330	VIa.1

In addition to the more formal recreational facilities in the area, the tops of local levees are occasionally used for walking and jogging. However, the areas of RD 17 associated with the Phase 3 Repair Project are not intended to act as recreational facilities. Frequently locked gates prevent vehicle access and severely limit bicycle use. Although fishing opportunities exist along the San Joaquin River at access points available to the public, nearly all areas of the Phase 3 Repair Project area and vicinity are not intended to be public access points. The San Joaquin River provides a variety of recreational opportunities, including water-related and land-based recreational activities. One marina is in the Phase 3 Repair Project area, just south of elements IIab. Adjacent to the Phase 3 Repair Project area, recreational boating is one of the primary uses of the San Joaquin River. Boat ramps are located in the following San Joaquin County parks:

- Morelli Park in Stockton on the Deep Water Ship Channel,
- Buckley Cove Park in Stockton on the Deep Water Ship Channel,
- Dos Reis Park in the Lathrop area on the San Joaquin River,
- Louis Park in Stockton on the Smith Canal, and
- Mossdale Crossing Regional Park in Lathrop on the San Joaquin River.

Mossdale Crossing Regional Park, which is located within elements VIcde along the San Joaquin River, includes a two-lane boat ramp with a floating dock, picnic tables, and a playground.

Elements IIIa and IIIb are designated as open space in the City of Lathrop's general plan. The open space classifications in the general plan that provide recreation opportunities are detailed below:

- **Preservation of Natural and Human Resources** consist of unique geological, landscape, and historical features and fish and wildlife habitat. Nature-oriented passive recreation includes visits to arboretums and zoological gardens, hiking, and nature study. This designation is used for naturally landscaped corridors that would serve as a major component of the recreation and open space system. This type of open space area should provide for a system of pedestrian, bicycle, and equestrian trails, where such uses are compatible with riparian habitats. This designation should ensure public access to the San Joaquin River as required by state policy and law and as permitted by RD 17.

- **Health, Welfare, and Well-Being** open space is used, for example, to protect water quality, dispose of solid and liquid wastes, improve air quality, and protect developed lands from flooding.

- **Shaping Urban Growth** land is used to preserve community identity and provide form and dimension to urban environments.

- **Outdoor Recreation** includes neighborhood and community recreation parks, school site recreation areas, regional and state parks, recreation corridors and trails, unspoiled natural areas, and scenic and recreation travel corridors.

3.12.3 Methodology and Thresholds of Significance

Methodology

Recreational opportunities within the Phase 3 Repair Project area are limited to Mossdale Crossing Regional Park, open space in elements IIIa and IIIb, and the San Joaquin River (e.g., for boaters). Effects on recreation are evaluated based on temporary and permanent changes to those resources that would occur with implementation of the Phase 3 Repair Project.

Thresholds of Significance

The basis for determining the significance of effects for this analysis is based on professional standards and on project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to recreation if they would do any of the following:

- 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,
- substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity, or
- implement operational or construction-related activities related to the placement of project facilities that would cause a substantial long-term disruption of any institutionally recognized recreational activities.

Implementing the Phase 3 Repair Project would not increase the population in the project footprint and thus would not increase the use of existing recreational facilities such that substantial physical deterioration would occur. Additionally, the Phase 3 Repair Project does not include the construction or expansion of recreational facilities. Therefore, these issues are not discussed further in this FEIS.

3.12.4 Effects and Mitigation Measures

Effect 3.12-a: Temporary Disruption of Recreational Activities and Facilities.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Therefore, in the near term, no disturbance of existing recreational opportunities would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could result in temporary or permanent destruction to and limited access to recreational facilities (e.g., Mossdale Crossing Regional Park, San Joaquin River) depending on the location of the levee breach. In the event of simultaneous levee failures in more than one location in the levee system, adverse effects would be more widespread. Loss of recreational facilities within the RD 17 service district could force recreationalists to use other facilities. Increased use at nearby facilities could result in physical deterioration at these alternative locations or require the construction or expansion of new or existing recreational facilities, which could have an adverse physical effect on the environment.

For these reasons, the effect related to disruption of recreational activities and facilities land would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Implementation of Alternative 1 or Alternative 2 would disrupt recreational activities in the open space in elements IIIa and IIIb. Implementation of Alterative 1, Alternative 2, or the Requester's Preferred Alternative would disrupt recreational activities at Mossdale Crossing Regional Park and on the San Joaquin River. Construction activities, such as grading, removing vegetation, trenching and constructing cutoff walls, and placing seepage berms, would affect the scenery and thus passive recreational activities (e.g., walking, photography, bird watching). However, effects would be temporary because construction-related equipment that would be visible from recreational facilities (i.e., open space, Mossdale Crossing Regional Park, San Joaquin River) would be removed after completion of construction activities.

Under all three alternatives, the parking lot associated with Mossdale Crossing Regional Park (elements VIcde) would be temporarily disrupted, potentially affecting use of the boat ramp and passive recreational opportunities for approximately 60–90 days. Temporary alternative parking would be provided for recreationalists during construction at this site. After completing construction at this site, the boat ramp and parking facilities would be reopened.

Under Alternative 1, construction activities would include installation of new utility infrastructure, placement of fill, and repaving of the facility. Although implementation of Alternative 2 or the Requester's Preferred Alternative would not require fill of Mossdale Crossing Regional Park, the parking area could be used for staging of materials and equipment. Under the Requester's Preferred Alternative, a cutoff wall would be installed within the levee at this location, and the Mossdale Crossing Regional Park parking area would be used for staging of materials and equipment during construction. Several public boat launch facilities are located within San Joaquin County that may be used while the Mossdale Crossing Regional Park boat launch facility is closed (i.e., Morelli Park in Stockton on the Deep Water Ship Channel, Buckley Cove Park in Stockton on the Deep Water Ship Channel, Dos Reis Park in the Lathrop area on the San Joaquin River, and Louis Park in Stockton on the Smith Canal). In addition, RD 17 would coordinate construction phasing, temporary parking requirements, and access to Mossdale Crossing Regional Park with San Joaquin County Parks and Recreation. Thus, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

3.12.5 Residual Significant Effects

Because mitigation would not be required for the No-Action Alternative, adverse effects associated with temporary disruption of recreational activities and facilities would remain significant and unavoidable.

Recreation-related effects associated with implementing Alternative 1, Alternative 2, or the Requester's Preferred Alternative would be less than significant, and mitigation is not required.

3.13 Visual Resources

This section discusses existing visual resources within the Phase 3 Repair Project area and surrounding areas, identifies applicable Federal and state laws and regulations, and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to visual resources. A discussion of cumulative effects related to visual resources is provided in Chapter 4, “Cumulative and Growth-Inducing Effects and Other Statutory Requirements,” of this FEIS.

3.13.1 Regulatory Setting

No Federal or state laws or regulations related to visual resources apply to the Phase 3 Repair Project.

3.13.2 Environmental Setting

Visual Assessment and Visual Quality Criteria

The aesthetic quality of an area is determined by the variety and contrasts of the area’s visual features, the character of those features, and the scope and scale of the scene. The aesthetic quality of an area depends on the relationships between its features and their importance in the overall view. Evaluating scenic resources requires a method that characterizes visual features, assesses their quality in relation to the visual character of the surrounding area, and identifies their importance to the individuals viewing them. This process is derived from established procedures for visual assessment developed by Federal agencies and commonly is used for a variety of project types.

Both natural and created features in a landscape contribute to its visual quality. Landscape characteristics influencing visual quality include geologic, hydrologic, botanical, wildlife, recreation, and urban features. Several sets of criteria have been developed for defining and evaluating visual quality. The criteria developed by the Federal Highway Administration (FHWA) in 1981, which are used in this analysis, include the concepts of vividness, intactness, and unity. According to FHWA, none of these visual criteria by themselves can define the visual quality of a view. Visual quality is determined by considering all three criteria together; all three must be considered high to indicate high quality (FHWA 1981:47–48). The concepts are defined as follows:

- “Vividness” is the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns.
- “Intactness” is the visual integrity of the natural and human-built landscape and its freedom from encroaching elements.
- “Unity” is the visual coherence and compositional harmony of the landscape considered as a whole.

The analysis of visual resources for the Phase 3 Repair Project uses a qualitative approach for characterizing and evaluating the visual resources of the areas that could be affected by the project. The quality of views of areas that could be affected by the project is evaluated based on the relative degree of vividness, intactness, and unity apparent in views.

Viewer sensitivity, considered in relation to these criteria, also plays a role in this analysis. Viewer sensitivity reflects several factors, as follows:

- visibility of the landscape,
- proximity of viewers to the visual resources,
- frequency and duration of views,
- number of viewers,
- types of individuals and groups of viewers, and
- viewers' expectations as influenced by their activity.

The viewer's distance from landscape elements plays an important role in determining an area's visual quality. Landscape elements are considered higher or lower in visual importance based on their proximity to the viewer. Generally, the closer a resource is to the viewer, the more dominant, and therefore visually important, it is to the viewer. The U.S. Forest Service (USFS) separates landscapes into foreground, middle ground, and background views. Although the separation of the landscape should be considered on a case-by-case basis, in general, the foreground is characterized by clear details (within 0.25 or 0.5 mile from the viewer); the middle ground is characterized by loss of clear texture within a landscape, creating a uniform appearance (foreground to 3–5 miles in the distance); and the background extends from the middle ground to the limit of human sight (USFS 1974). The USFS foreground, middle ground, and background view approach is used in this analysis.

Visual Quality of the Phase 3 Repair Project Area

The Phase 3 Repair Project area consists of 23 levee elements along the east side of the San Joaquin River, starting near the southern boundary of the city of Stockton, through the city of Lathrop, and into the unincorporated portion of San Joaquin County between Lathrop and the city of Manteca. A small portion of the Phase 3 Repair Project area is located within the city of Manteca's sphere of influence, in an area proposed for annexation. Land uses within the Phase 3 Repair Project area generally consist of agricultural land, open space, recreational facilities, and urban development.

The Phase 3 Repair Project area is located in the approximate center of the Central Valley. The Central Valley is a nearly flat alluvial plain that extends approximately 400 miles north from Redding to Bakersfield in the south. It generally is bordered by the Sierra Nevada foothills and mountains to the east, the Coast Ranges to the west, the Klamath Mountains to the north, and the San Gabriel Mountains to the south.

The foreground views within the Phase 3 Repair Project area are characterized by the San Joaquin River and its adjoining waterways. The San Joaquin River varies between 150 and 400 feet in width along the RD 17 western boundary. The right bank of the river is bounded by an earthen levee, approximately 100 feet wide and 15 feet high, which has been extensively modified through its 85-year history. A single-lane dirt road is located atop the levee crown.

Middle ground views of the Phase 3 Repair Project area consist of land covered in ruderal vegetation and scattered with a variety of features, including agricultural land, rural residences, and numerous water features (see Section 3.6, "Biological Resources," for more information). Trees in varying densities are located along the waterside of the RD 17 levee system (the San Joaquin River east levee and north bank of Walthall Slough) and small groves of trees are scattered along the landside. Middle ground views generally are limited to scattered trees, housing developments, roadways, agricultural land, and infrastructure related to agricultural land (e.g., ponds, rural housing, and farming equipment).

Because the Phase 3 Repair Project area is located at the approximate center of the Central Valley, the surrounding areas are flat and do not provide background views. **Table 3.3-1** provides detailed information related to the land uses existing within each element of the Phase 3 Repair Project area.

Sensitive viewers located within the Phase 3 Repair Project area include people recreating at parks and open spaces along the levee system, people at nearby residences, farmers, and motorists travelling along adjacent and perpendicular roadways. In addition, a nearby marina just south of elements IIab (see Section 3.12, “Recreation”) provides access to waterside views of the San Joaquin River. Although the Phase 3 Repair Project area is not particularly unique and is typical of views found within the Delta, the aesthetic resources in this area are important generally to residents and recreationalists; thus, sensitive viewers have views of the Phase 3 Repair Project area.

3.13.3 Methodology and Thresholds of Significance

Methodology

This visual analysis is based on field observations and a review of maps and aerial photographs. Analysis of the Phase 3 Repair Project’s effects was based on evaluation of the changes to the existing visual resources that would result from implementation of the Phase 3 Repair Project. In making a determination of the extent and implications of the visual changes, consideration was given to the following:

- specific changes in the visual composition, character, and valued qualities of the affected environment;
- the visual context of the affected environment;
- the extent to which the affected environment contained places or features that have been designated in adopted plans and policies for protection or special consideration; and
- the numbers of viewers, their activities, and the extent to which these activities are related to the aesthetic qualities affected by the project-related changes.

An assessment of visual quality is a subjective matter, and reasonable people can disagree as to whether alteration in the visual character of the Phase 3 Repair Project area would be adverse or beneficial.

Thresholds of Significance

The basis for determining the significance of effects for this analysis is based on professional standards and project-specific criteria developed by the lead agency to address potential effects unique to the project’s location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to visual resources if they would do any of the following:

- 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;
- in nonurbanized area, substantially degrade the existing visual character or quality of public views of the site and its surroundings (public views are those that are experienced from publicly accessible vantage points);
- in an urbanized area, conflict with applicable zoning and other regulations governing scenic quality; or
- create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

A scenic vista generally is considered a view of an area that has remarkable scenery or of a resource that is endemic to the area. The Phase 3 Repair Project area's scenery consists of urban development, agricultural/rural housing, open space, and recreational uses. Because of these land uses and the existing flood maintenance structures, the Phase 3 Repair Project area is considered to be substantially disturbed and no longer resembles the natural landscape. Therefore, the project area is not considered to contain remarkable scenery or to be a resource that is endemic to the area, and no adverse effect would occur related to substantial degradation of the existing visual character or quality of the area. Thus, this issue is not discussed further in this FEIS.

No State Scenic Highway contain views of the Phase 3 Repair Project area. Thus, no adverse effect would occur associated with substantial damage to scenic resources within a State Scenic Highway. Therefore, this issue is not discussed further in this FEIS.

No new light fixtures would be installed as part of the Phase 3 Repair Project. Cutoff wall construction in Elements Va and VIa.1 is anticipated to occur 24 hours a day, 7 days a week, with occasional shutdowns for equipment maintenance, when necessary. Lights and possibly power generators would be used during nighttime construction hours. Disturbances to nearby residences are expected to be minor because of the limited number of residences near these cutoff wall installation areas. However, where lights would exceed allowable nighttime standards for the applicable local jurisdiction, work hours would be restricted to daytime work hours. Therefore, no adverse effects would occur related to creation of new sources of substantial light or glare that would adversely affect day or nighttime views in the area. Thus, this issue is not discussed further in this FEIS.

3.13.4 Effects and Mitigation Measures

Effect 3.13-a: Substantial Degradation of the Existing Visual Character or Quality of the Phase 3 Repair Project Area and Its Surroundings.

<u>No-Action Alternative</u>

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, no potential would exist to degrade the existing visual character or quality of the area and its surroundings. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. Damage to visual resources would depend on the extent and duration of a flood event and subsequent repair. Flooding resulting either from a localized levee failure or simultaneous levee failures in more than one location in the levee system could cause damage to structures, vegetation, and woodlands. Sensitive viewers, such as residents and recreational users, could lose aspects of visual coherence, vividness, and unity. For this reason, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative

Under Alternative 1, project implementation generally would include construction of seepage berms and installation of chimney drains in scattered locations along the landside of the RD 17 levee system. Construction would require the removal and/or relocation of several features within the Phase 3 Repair Project footprint, including power poles, vegetation, and a variety of agricultural-related items (e.g., irrigation infrastructure, fences) (see **Table 2-3**). The proposed seepage berm would remain below the top elevation of the adjacent levee. The seepage berm would be planted with a seed mix to control erosion and would appear as annual grassland habitat. Thus, the berm would be visually integrated with the current agricultural and open space uses east of the levee. In Phase 3 Repair Project elements where cutoff walls would be installed (i.e., elements IIab, IVc, Va–VIa.1, VIIe), the existing physical character would not change.

Although implementation of Alternative 1 would change some existing features, the visual quality of the Phase 3 Repair Project area would not be altered substantially. The Phase 3 Repair Project area would continue to contain flood reduction structures and generally would be covered in ruderal vegetation and scattered with a variety of features, including agricultural land, rural residences, and some water features. Therefore, postproject foreground views would be consistent with preproject foreground views. In addition, middle-ground views would not be disturbed or otherwise interrupted as a result of project implementation under Alternative 1. Furthermore, residences and recreationalists (i.e., sensitive viewers) would continue to have views similar to existing conditions. Therefore, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Alternative 2: Maximum Footprint Alternative

Effects associated with Alternative 2 would be similar to those discussed above, under Alternative 1. However, the project footprint under Alternative 2 would be larger than its footprint under Alternative 1. The proposed setback levees in elements IIb, IVc, and VIcde would result in nearly four times as much land disturbance as Alternative 1 (see Section 3.6, "Biological Resources," for acreages). In addition, more encroachments along the landside of the levee may require removing, for example, irrigation infrastructure or fences to prepare for construction (see **Table 2-7**). Regardless of this increase in disturbed acreage, implementation of Alternative 2 would not result in a substantial change to the existing visual quality of the Phase 3 Repair Project area. Sensitive viewers (i.e., recreationalists and residents) would have similar views toward the levee system from both the landside and waterside, and the overall quality and visual character would remain the same as under existing conditions. In addition, in elements IIab, VIcde, and possibly IVc, a setback levee would be installed and the existing levee would be removed. Although this could improve the aesthetic value of the levee bank to recreationalists on the river and other viewers, it could change the foreground views of sensitive viewers from the landside of the levee. However, from either side of the levee, the visual quality and character would not be altered substantially. Thus, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Requester's Preferred Alternative

The size of the overall project footprint of the Requester's Preferred Alternative, including temporary impact areas (59.58 acres), would be less than the overall footprint size of Alternative 1 and Alternative 2 (see Section 3.6, "Biological Resources," for acreages), and the potential effects under the Requester's Preferred Alternative would be similar to those discussed above under Alternatives 1 and 2. Unique to the Requester's Preferred Alternative would be a small breach of the existing levee at element IVc, to allow water into the setback area during high flows. The breach area on the existing levee would be buttressed by riprap, and riparian habitat would be planted within the setback area. The changes that are unique to the Requester's Preferred Alternative would be minor because the breach area and rock riprapped area would be small. Implementation of the Requester's Preferred Alternative would not result in a substantial change to the existing visual quality of the Phase 3 Repair Project area because sensitive viewers (i.e., recreationalists and residents) would have similar views toward the levee system from the landside and waterside, and the overall quality and visual character would remain the same as under existing conditions. Therefore, this effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

Effect 3.13-b: Temporary, Short-Term Degradation of Visual Character during Construction.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's existing practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Under these conditions, no potential would exist to degrade the existing visual character or quality of the area and its surroundings. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. Flooding resulting either from a localized levee failure or simultaneous levee failures in more than one location in the levee system could cause damage to structures, vegetation, and woodlands. Construction would be required to repair damage caused by the flood, resulting in the presence and movement of heavy construction equipment for varying periods of time in various locations that would result in temporary, short-term loss of aspects of visual coherence, vividness, and unity for sensitive viewers, such as residents and recreational users. For this reason, this effect would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

The presence and movement of heavy construction equipment and staging areas could temporarily degrade the existing visual character of the Phase 3 Repair Project area. Construction activities would require the use of various types of equipment, such as scrapers, graders, dozers, and cranes. Project construction would involve staging areas for construction equipment and materials. Although these staging areas would be located in disturbed areas, construction equipment and materials would be visible to residents, recreationalists, and travelers (i.e., sensitive viewers). Thus, construction activities temporarily would degrade the existing visual character of the Phase 3 Repair Project area. This temporary and short-term adverse effect would be **significant** under Alternatives 1 and 2 and the Requester’s Preferred Alternative.

Mitigation Measure: No feasible mitigation is available.

No feasible mitigation is available to reduce the adverse effect of temporary, short-term degradation of visual character during construction to a less-than-significant level. Thus, this adverse effect would remain **significant and unavoidable** under Alternative 1, Alternative 2, and the Requester’s Preferred Alternative.

3.13.5 Residual Significant Effects

Adverse effects associated with degradation of visual resources as a result of the No-Action Alternative are uncertain. Because of this uncertainty, these potential effects are considered too speculative for meaningful consideration. In addition, mitigation of effects from the No-Action Alternative would not be the responsibility of RD 17, and therefore would not be required; thus, adverse effects that result from the No-Action Alternative would not be mitigated.

Effect 3.13-a, “Substantial Degradation of the Existing Visual Character or Quality of the Phase 3 Repair Project area and Its Surroundings,” would be less than significant under Alternative 1, Alternative 2, and the Requester’s Preferred Alternative. However, Effect 3.13-b would remain significant and unavoidable under Alternative 1, Alternative 2, and the Requester’s Preferred Alternative because no feasible mitigation is available to reduce the adverse effect of temporary, short-term degradation of visual character during construction to a less-than-significant level.

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3.14 Utilities and Public Services

This section discusses existing utilities and public services—water and wastewater, solid waste, electrical and natural gas, telephone and cable, and fire protection and law enforcement services—within the Phase 3 Repair Project area and surrounding areas; identifies applicable Federal and state laws and regulations; and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to utilities and public services. Drainage systems are described in Section 3.5, "Hydrology and Water Quality." A discussion of parks is included in Section 3.12, "Recreation." A discussion of cumulative impacts related to utilities and public services is provided in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements," of this FEIS. See Section 3.15, "Hazards and Hazardous Materials," for a discussion of effects related to schools in the action area.

3.14.1 Regulatory Setting

No Federal or state laws or regulations related to utilities and public services apply to the Phase 3 Repair Project.

3.14.2 Environmental Setting

Water Supply

The South County Surface Water Supply Project, which delivers water to the Phase 3 Repair Project area and surrounding area, consists of water supplies from South San Joaquin Irrigation District and the Cities of Manteca, Lathrop, Tracy, and Escalon. Water is delivered to each participating city from the Woodward Reservoir as a means to supplement groundwater sources in the Phase 3 Repair Project area (City of Manteca 2008). Agricultural water use includes riparian rights users, agricultural users with private wells, water conservation districts, and irrigation districts (San Joaquin County 2016a).

Stormwater Drainage

Stormwater drainage in the city of Lathrop is managed by the City of Lathrop Public Works Department. Stormwater is collected in detention basins and ultimately is discharged into the San Joaquin River. In compliance with the National Pollutant Discharge Elimination System (NPDES), the City of Lathrop published the NPDES Phase II Storm Water Management Plan, which includes six elements intended to reduce pollutants discharged into receiving water bodies to the maximum extent feasible (LAFCo 2016).

Wastewater

Wastewater treatment and disposal in rural areas of San Joaquin County generally are provided through private septic systems (San Joaquin County 2016a). Wastewater from the city of Lathrop is treated in the city at the Lathrop Consolidated Treatment Facility (LCTF), which became operational August 25, 2015, and at the Manteca-Lathrop Wastewater Quality Control Facility. The City uses recycled water from the LCTF for irrigation of agricultural crops and plans to apply the treated water on planned landscape areas within the Mossdale and River Island developments (LAFCo 2016).

Solid Waste

The nearest landfill in the project region that could be used for waste disposal during project construction is Forward Landfill, located at 9999 South Austin Road, Manteca. As of September 15, 2019, 11,008,942 cubic yards of the 51,040,000 cubic yards total capacity were remaining. Forward Landfill accepts agricultural waste, asbestos, ash, construction/demolition, contaminated soil, green materials, industrial waste, mixed municipal waste, sludge (biosolids), tires, and shreds as waste (CalRecycle 2019).

Electrical and Natural Gas Service

As of 2007, Pacific Gas and Electric Company was providing electricity to approximately 291,525 customers and natural gas to approximately 273,305 customers in San Joaquin County (San Joaquin County 2016b:9-62 and 9-64). The Phase 3 Repair Project area contains subterranean natural gas transmissions lines and overhead electrical transmission lines.

Fire Protection

The northern portion of the Phase 3 Repair Project area (i.e., elements Ia, Ib, and Ie) is served by the French Camp McKinley Fire District, which has a fire station at 310 East French Camp Road in the town of French Camp, approximately 3.5 miles east of the nearest portion of element Ib. The remainder of the Phase 3 Repair Project area is served by the Lathrop-Manteca Fire Protection District, which has five fire stations situated throughout an approximately 100-square-mile area. The Lathrop-Manteca Fire Protection District serves the city of Lathrop and rural areas of Manteca, and consists of Fire Station 31, at 800 East J Street in Lathrop, approximately 2 miles east of element IVc; Fire Station 32, at 22701 South Union Road in Manteca, approximately 5.5 miles southeast of element VIIg; Fire Station 33, at 9121 East Lathrop Road in Manteca, approximately 7 miles west of element IIIa; and Fire Station 34, at 460 River Islands Parkway, approximately 0.5 miles east of element VIa.1 (LMFD 2019). The Lathrop-Manteca Fire District has a standard response time (including dispatch to travel time) of 6–7 minutes for emergency calls emergency (Code 3: lights and sirens activated) (LAFCo 2016).

Law Enforcement Services

San Joaquin County Sheriff's Department provides law enforcement services for the unincorporated areas of the County. It has 138 deputies who rotate shifts to provide law enforcement services 24 hours a day, 7 days per week (San Joaquin County Sheriff's Office 2019). The City of Lathrop Police Department has 26 officers, 20 deputy sheriffs, and three civilian staff members. The City of Lathrop contracts with the San Joaquin County Sheriff's Department for law enforcement services, and Lathrop police officers are San Joaquin County deputy sheriffs, assigned to the City of Lathrop. San Joaquin County and the City of Lathrop have a flexible police staff agreement that accommodates modifications to service levels. The current citywide priority 1 average response time is 4 minutes (LAFCo 2016).

School Facilities

Manteca Unified School District provides educational services to the Phase 3 Repair Project area. **Table 3.14-1** shows the schools in the Manteca Unified School District.

3.14.3 Methodology and Thresholds of Significance

Methodology

Effects on utilities and public services that would result from implementation of the Phase 3 Repair Project were identified by comparing the existing service capacity and facilities with anticipated service capacity and facilities. Evaluation of potential utilities and public services effects were based on a review of documents pertaining to the Phase 3 Repair Project area and vicinity.

Table 3.14-1. Manteca Unified School District Schools

High Schools	
Calla High School	130 South Austin Road, Manteca
East Union High School	1700 North Union Road, Manteca
Lathrop High School	647 West Lathrop Road, Lathrop
Lindbergh Adult School	311 East North Street, Manteca
Manteca Day School	680 Mikesell Street, Manteca
Manteca High School	450 East Yosemite Avenue, Manteca
New Vision Education Center	4726 McCuen Avenue, Stockton
Sierra High School	1700 Thomas Street, Manteca
Weston Ranch High School	4606 McCuen Avenue, Stockton
Elementary Schools	
August Knodt	3939 EWS Wood Boulevard, Stockton
Brock Elliott	1110 Stonum Lame, Manteca
French Camp	241 East 4th Street, French Camp
George Komure	2121 Henry Long Boulevard, Stockton
George McParland	1601 Northgate Drive, Manteca
Golden West	1031 North Main Street, Manteca
Great Valley	4223 McDougald, Stockton
Joseph Widmer, Jr.	751 Stonebridge Lane, Lathrop
Joshua Cowell	740 Pestana Avenue, Manteca
Lathrop	15851 South 5th Street, Lathrop
Lincoln	750 East Yosemite Avenue, Manteca
Mossdale	455 Brookhurst Boulevard, Lathrop
Neil Hafley	849 Northgate Drive, Manteca
New Haven	14600 South Austin Road, Manteca
Nile Garden	5700 East Nile Avenue, Manteca
Sequoia	710 Martha Street, Manteca
Shasta	751 East Edison Avenue, Manteca
Stella Brockman	763 Silverado Drive, Manteca
Veritas	1600 Pagola Avenue, Manteca
Walter Woodward	575 Tannehill Drive, Manteca
Manteca Day School	680 Mikesell Street, Manteca

Source: Manteca Unified School District 2010; compiled by AECOM in 2010

Thresholds of Significance

The basis for determining the significance of effects for this analysis is based on professional standards and project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements. The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to utilities and public services if they would do any of the following:

- exceed wastewater treatment requirements of the applicable regional water quality control board;
- require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- exceed water supplies available to service the project from existing entitlements and resources, such that new or expanded entitlements would be needed;
- result in a determination by the wastewater treatment provider that serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments;
- generate waste materials that would exceed the permitted capacity of local landfills or fail to comply with Federal, state, and local statutes and regulations related to solid waste; or
- result in substantial adverse physical effects associated with the provision of new or altered governmental facilities in order to maintain acceptable service ratios, response times, or other performance objectives for public services such as fire protection, police protection, schools, or parks.

The Phase 3 Repair Project would not include any changes in land use that would increase short- or long-term demand for public services (i.e., fire and police protection, schools, parks, and other public facilities), and thus necessitating construction of new or altered government service facilities. Similarly, the Phase 3 Repair Project would not result in demand for increased natural gas facilities, electrical transmission lines, communication systems, water infrastructure, sewer lines, or solid waste facilities beyond the existing capacity. Therefore, these issues do not apply to this analysis and are not addressed further in this FEIS.

3.14.4 Effects and Mitigation Measures

Effect 3.14-a: Potential Temporary Disruption of Irrigation Water Supply.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Therefore, no potential would exist for the project to cause temporary and short-term construction-related disruption to irrigation water supply. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could cause flooding that would damage canals, potentially disrupting irrigation of cropland. Disruptions typically would be limited to localized areas within the general vicinity of a levee breach. However, in the event of simultaneous levee failures in more than one location in the levee system, adverse effects on irrigation water supply would be more widespread. For these reasons, the adverse effect related to the disruption of irrigation water supply would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See the discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Buried irrigation lines may exist that would need to be removed or reconnected as a result of project implementation. Substantial temporary interruptions of irrigation supply could occur if irrigation infrastructure is damaged or otherwise rendered inoperable at a time when it is needed (e.g., if reconnections to water supply sources are not completed by the time crop irrigation must begin). Because of the anticipated extent and intensity of project construction activities, it is possible that these activities could impede the repair of damaged infrastructure or delay the provision of irrigation supply. This temporary, short-term adverse effect would be **potentially significant**.

Mitigation Measure 3.14-a: Coordinate with Irrigation Water Supply Users before and during All Irrigation Infrastructure Modifications and Minimize Interruptions of Supply.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

RD 17 and its primary contractors for engineering design and construction shall implement the following measures, to minimize the potential for interruptions in irrigation water supply before and during Phase 3 Repair Project construction activities:

1. Coordinate the timing of all modifications to irrigation supply infrastructure with the affected infrastructure owners and water supply users;

2. Include detailed scheduling of the phases for modifications/replacement of existing irrigation infrastructure components in Phase 3 Repair Project design as well as in construction plans and specifications;

3. Plan and complete modifications of irrigation infrastructure during the nonirrigation season to the extent feasible;

4. Provide for alternative water supply, if necessary, when modification/replacement of irrigation infrastructure is to be conducted during a period when it otherwise is to be in normal use by an irrigator; and

5. Ensure that (1) users of irrigation water supply do not, as a result of physical interference associated with the Phase 3 Repair Project, experience a substantial interruption in irrigation supply when such supply is needed for normal, planned farming operations (i.e., a decrease in level of service in comparison with the existing level of service), or (2) users of irrigation water supply that experience a substantial decrease in an existing level of service that meets the

established standards for the Phase 3 Repair Project area are compensated in kind for losses associated with the reduction in level of service.

Responsibility: RD 17 and its primary contractors.

Timing: Measures 1 and 2 above will occur before and during project construction activities. Measure 3 will occur during the nonirrigation season. Measures 4 and 5 will occur during project construction activities that interrupt water supply during the irrigation season.

Implementing this mitigation measure would reduce the potential temporary, short-term adverse effect of disruptions to irrigation supply to a **less-than-significant** level because RD 17 would coordinate with water supply providers and water supply users to minimize interruptions, would conduct work during the nonirrigation season whenever feasible, and would ensure that essential water supply necessary during the irrigation season is provided by an alternative supply if an interruption is unavoidable.

Effect 3.14-b: Potential Disruption of Utility Service.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Therefore, no potential would exist for the project to cause temporary and short-term construction-related disruption to utility service. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could cause minor to substantial flooding that could substantially interrupt utilities and public services. Disruptions could be limited to localized areas within the general vicinity of a levee breach, or in the event of simultaneous levee failures in more than one location in the levee system, disruptions to utilities and public services would be more widespread. For these reasons, the adverse effect related to the disruption of utility services would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Project implementation would encroach on multiple types of utility equipment and facilities, including storm drains, irrigation lines, electric power lines, and gas pipelines. Project construction activities, including grading and excavation, could damage identified and unidentified utility equipment and facilities. In addition, required relocation of existing electrical lines and gas pipelines could interrupt service.

Design of the Phase 3 Repair Project would include consultation with all known service providers to identify infrastructure locations and appropriate protection measures, and consultation would continue during construction so that facilities are avoided and protected to minimize service disruptions as construction proceeds. The extent and intensity of project construction activities, however, may affect service providers' abilities to quickly repair damage and/or restore interrupted service. This temporary, short-term adverse effect would be **potentially significant**.

Mitigation Measure 3.14-b: Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training with Respect to Accidental Utility Damage.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Before construction begins, RD 17 and its primary contractors will coordinate with USACE, the Central Valley Flood Protection Board, and applicable utility providers to implement orderly relocation of utilities that need to be removed or relocated. RD 17 and its primary contractors will provide the following:

- Notification of any potential interruptions in service will be provided to the appropriate agencies and affected landowners.
- Before beginning construction, utility locations will be verified through field surveys and the use of Underground Service Alert services. Any buried utility lines will be clearly marked, showing where construction activities will take place on the construction specifications before any earthmoving activities begin.
- Before beginning construction, a response plan will be prepared to address potential accidental damage to a utility line. The plan will identify chain of command rules for notification of authorities and appropriate actions and responsibilities to protect the safety of the public and workers. Worker education training in response to such accidental situations will be conducted by the contractor. RD 17 and its contractors will implement the response plan during construction activities.
- Utility relocations will be staged to minimize interruptions in service.

Responsibility: RD 17 and its primary contractors.

Timing: Before any potential interruptions in service and before construction begins.

Implementing this mitigation measure would reduce the temporary and short-term adverse effect caused by disruption of utility services to a **less-than-significant** level because RD 17 and its primary contractors would coordinate with utility service providers and utility supply consumers to minimize interruptions, to the maximum extent feasible, and a response plan to address service interruptions would be prepared and implemented.

3.14.5 Residual Significant Effects

Adverse effects associated with disruption to irrigation supply and utility services as a result of the No-Action Alternative are uncertain. Because of this uncertainty, these potential effects are considered too speculative for meaningful consideration. In addition, mitigation of effects from the No-Action Alternative is not the responsibility of RD 17, and thus is not required; therefore, adverse effects that result from the No-Action Alternative would not be mitigated.

Implementation of the mitigation measures described in this section for Alternative 1, Alternative 2, and the Requester's Preferred Alternative would reduce the adverse effects of a potential temporary, short-term disruption of the irrigation supply and the potential disruption of other utility services to less-than-significant levels; therefore, no residual significant effects would occur.

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3.15 Hazards and Hazardous Materials

This section discusses potential hazards and hazardous materials that may occur in the Phase 3 Repair Project area and surrounding areas, identifies applicable Federal and state laws and regulations, and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to hazards and hazardous materials. A discussion of cumulative effects related to hazards and hazardous materials is provided in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements," of this FEIS.

3.15.1 Regulatory Setting

As required under NEPA, applicable Federal laws and regulations are identified in this section. State laws and regulations applicable to implementation of the Phase 3 Repair Project by RD 17 are described for informational purposes and to assist with NEPA review. RD 17 also has considered regional and local plans and ordinances as a part of the environmental review process for this FEIS, where applicable to the Phase 3 Repair Project.

Federal

Resource Conservation and Recovery Act

The U.S. Environmental Protection Agency (EPA) is the primary Federal agency regulating the generation, transport, and disposal of hazardous substances, under the authority of the Resource Conservation and Recovery Act (RCRA). RCRA established an all-encompassing Federal regulatory program for hazardous waste that is administered in California by the California Department of Toxic Substances Control. Under RCRA, this department regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA was amended in 1984 by the Hazardous and Solid Waste Amendments of 1984, which specifically prohibits the use of certain techniques for the disposal of various hazardous wastes. The Federal Emergency Planning and Community Right-to-Know Act of 1986 contains planning requirements to help protect local communities in the event of accidental release of an extremely hazardous substance.

Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) created the Superfund hazardous substance cleanup program (Public Law [PL] 96-510, enacted December 11, 1980). A trust fund was created to provide broad Federal authority for releases or threatened release of hazardous substance that could endanger public health or the environment. It was enlarged and reauthorized by the Superfund Amendments and Reauthorization Act of 1986 (PL 99-499). EPA compiles a list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories, known as the National Priorities List. These locations are commonly referred to as "Superfund sites."

State

Hazardous Waste Control Act

The Hazardous Waste Control Act created the state's hazardous waste management program, similar to but more stringent than the Federal program under RCRA. The Hazardous Waste Control Act is implemented by regulations contained in Title 26 of the California Code of Regulations (CCR), which describes the key aspects of hazardous waste management, including identification and classification;

sources; transport; design and permitting of recycling, treatment, storage, and disposal facilities; treatment standards; operation of facilities, including staff training; closure of facilities; and liability issues.

Regulations in Title 26 list more than 800 materials that may be hazardous and establish criteria for their identification, packaging, and disposal. Under the Hazardous Waste Control Act and Title 26, hazardous waste generators must complete a manifest that accompanies the waste from the generator to the transporter to the ultimate disposal location. Copies of the manifest must be filed with the California Department of Toxic Substances Control (DTSC).

Hazardous Materials Handling

The California Hazardous Materials Release Response Plans and Inventory Law of 1985 requires preparation of hazardous materials business plans and disclosure of inventories of hazardous materials. A business plan includes an inventory of hazardous materials handled, facility floor plans showing where hazardous materials are stored, an emergency response plan, and provisions for employee training in safety and emergency response procedures (California Health and Safety Code, Division 20, Chapter 6.95, Article 1). Statewide, DTSC has primary regulatory responsibility for management of hazardous materials, with delegation of authority to local jurisdictions that enter into agreements with the state. Local agencies, including the San Joaquin County Environmental Health Department, administer this law and regulations.

Worker Safety Requirements

The California Occupational Health and Safety Administration (Cal/OSHA) assumes primary responsibility for developing and enforcing workplace safety regulations in California. Cal/OSHA regulations pertaining to the use of hazardous materials in the workplace (Title 8 of the CCR) include requirements for safety training, availability of safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and preparation of emergency action and fire prevention plans. Cal/OSHA enforces regulations for hazard communication programs that contain training and information requirements, including procedures for identifying and labeling hazardous substances, communicating hazard information related to hazardous substances and their handling, and preparation of health and safety plans to protect workers and employees at hazardous waste sites. The hazard communication program requires that employers make Material Safety Data Sheets available to employees and document employee information and training programs. Construction activities near high-priority installations that are located underground, such as the natural gas pipelines that penetrate the levee, are regulated by Title 8 of the CCR, Section 1541 (8 CCR 1541).

Emergency Response to Hazardous Materials Incidents

California has developed an emergency response plan to coordinate emergency services provided by Federal, state, and local governments and private agencies. Response to hazardous material incidents is one part of this plan. The plan is managed by the Governor’s Office of Emergency Services, which coordinates the responses of other agencies, including the California Environmental Protection Agency (CalEPA), California Highway Patrol, California Department of Fish and Wildlife, Central Valley Regional Water Quality Control Board (RWQCB), and San Joaquin County Department of Public Works.

Hazardous Materials Transport

The U.S. Department of Transportation regulates transportation of hazardous materials between states. State agencies with primary responsibility for enforcing Federal and state regulations and responding to hazardous materials transportation emergencies are the California Highway Patrol and the California Department of Transportation. Together, these agencies determine container types to be used and license hazardous waste haulers for transportation of hazardous waste on public roads.

The U.S. Department of Transportation's Federal Railroad Administration enforces the Hazardous Materials Regulations (49 Code of Federal Regulations [CFR], Parts 100–185), which are promulgated by the Pipeline and Hazardous Materials Safety Administration for rail transportation. These regulations apply to railroads, shippers, and other transporters of hazardous materials. Such transporters are required to adhere to security plans and to train employees involved in offering, accepting, or transporting hazardous materials, on both safety and security matters.

California Government Code Section 65962.5 (Cortese List)

Section 65962.5 of the California Government Code requires CalEPA to develop, at least annually, an updated list of known hazardous waste and substance spill and leak locations (known as the Cortese List). DTSC, the State Water Resources Control Board (SWRCB), the California Integrated Waste Management Board, and other state and local government agencies are required to provide additional material release information for the Cortese List.

Many changes have occurred related to web-based information access since 1992, when Section 65962.5 was last amended, and this information now generally is available at the websites of the responsible organizations. CalEPA now refers interested parties directly to the appropriate information resources contained at the websites of the boards or departments that are referenced in the statute.

A database search was completed at the time of release of the Notice of Intent/Notice of Preparation for the September 2011 DEIS/DEIR. No sites on the Cortese List were identified within the Phase 3 Repair Project area.

3.15.2 Environmental Setting

In this section, the term "hazardous materials" refers to both hazardous substances and hazardous wastes. A "hazardous material" is defined as "a substance or material that…is capable of posing an unreasonable risk to health, safety, and property when transported in commerce" (49 CFR 171.8). Section 25501 of the California Health and Safety Code defines a hazardous material as follows:

> "Hazardous material" means any material that, because of its quantity, concentration, or physical, or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. "Hazardous materials" include, but are not limited to, hazardous substances, hazardous waste, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.

“Hazardous wastes” are defined in Section 25141(b) of the California Health and Safety Code as wastes that:

> because of their quantity, concentration, or physical, chemical, or infectious characteristics, [may either] cause, or significantly contribute to an increase in mortality or an increase in serious illness[, or] pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Phase I Environmental Site Assessments

Phase I environmental site assessments (ESAs) were completed for elements Ia, Ib, Ic, IVc, Va, VIa, VIb, VIc, VIe, VIIb, VIIe, and VIIg by ENGEO in June 2019. For all 11 elements, the ESAs concluded that there were no Recognized Environmental Conditions (RECs) for the subject properties (ENGEO 2019a, 2019b, 2019c, 2019d, 2019e, 2019f, 2019g, 2019h, 2019i, 2019j, 2019k). Elements Ie, IVc, Va, VIa, VIb, VIc, VIIe, and VIIg were historically used for agriculture, and according to the ESAs, these areas could potentially contain elevated levels of pesticides and metals. Based on the proposed use of the sites, this is not an environmental concern. However, if soil from these agricultural areas is to be exported, the soil should be tested for organochlorine pesticides, lead, and arsenic.

Reported Hazardous Waste Sites

A search of the DTSC’s EnviroStor database and SWRCB’s GeoTracker database revealed no reported hazardous waste sites within the Phase 3 Repair Project area (GeoTracker 2010, 2016; EnviroStor 2010, 2016).

Hazards Associated with Agricultural Land

Agricultural land use often involves the application of pesticides, the residues of which may remain in soils for years. In addition, agricultural land uses often require wells, underground piping that can contain asbestos, and other subsurface infrastructure that can become a hazard if encountered during construction activities. The Phase 3 Repair Project area historically has and currently is used mainly for agricultural purposes.

Schools within 0.25 Mile of the Phase 3 Repair Project Area

The school sites closest to the Phase 3 Repair Project footprint are:

- Lathrop High School, located approximately 0.25 mile from element IIIa, and
- Mossdale Elementary, located approximately 0.28 mile from element VIa.1.

Phase 3 Repair Project Evacuation Routes

The San Joaquin County Office of Emergency Services has prepared emergency evacuation routes in case of flooding. Maps that contain these routes also provide rally points, estimates of flood depths in the event of a sudden levee breach, emergency broadcasting information, and other general safety considerations. The Phase 3 Repair Project area is located within the Lathrop Zone and Manteca Zone.

Airports and Airstrips

The airstrip located in the northeastern corner of the City of Lathrop is associated with the Sharpe Defense Distribution Center. According to the center's personnel, the airstrip has been inactive since the early 1990s (Umstead, pers. comm., 2010). No other airports, public-use airports, or airstrips are within 2 miles of the Phase 3 Repair Project area. The Stockton Metropolitan Airport is the nearest airport, located approximately 4.75 miles northeast of element Ia.

Wildland Fire Risk

Sections 4201–4204 of the California Public Resources Code and Sections 51175–51189 of the California Government Code require identification of fire hazard severity zones within the state. Fire hazard severity zones are measured qualitatively, based on vegetation, topography, weather, potential for crown fire (i.e., a fire's tendency to burn upward into trees and tall brush), and ember production and movement within a specific area. Fire prevention areas considered to be under state jurisdiction are referred to as "state responsibility areas," and areas considered to be under local jurisdiction (e.g., county) are called "local responsibility areas." Both state responsibility areas and local responsibility areas are zoned as having one of three fire hazard levels: moderate, high, and very high. The Phase 3 Repair Project area contains a small area near the intersection of Interstate 5 and State Route 120 that is zoned as a moderate local responsibility area. No state or local responsibility areas are rated as high or very high fire hazard severity in the Phase 3 Repair Project area (CAL FIRE 2007).

3.15.3 Methodology and Thresholds of Significance

Methodology

This analysis included a search of the DTSC EnviroStor database and SWRCB's GeoTracker database, and a review of aerial photographs. Potential sources of wildfire hazards and risks associated with implementation of the Phase 3 Repair Project also were evaluated by reviewing the historic local weather conditions, historic sources of fires, topography, vegetation, and fire history. In addition, fire hazard severity zones, which are established by CAL FIRE, were identified and compared to the Phase 3 Repair Project area.

Thresholds of Significance

The basis for determining the significance of effects for this analysis is based on professional standards and project-specific criteria developed by the lead agency to address potential effects unique to the project's location and elements The significance thresholds that follow were developed in the joint DEIS/DEIR based on NEPA and CEQA requirements and have been retained to the extent that they are consistent with the requirements for determining significance under 40 CFR 1508.27. These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The Phase 3 Repair Project alternatives under consideration would have a significant adverse effect related to hazards and hazardous materials if they would do any of the following:

- create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;

- emit hazardous emissions or involve the handling of hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;
- be located on a site that is included on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment;
- impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan;
- result in a safety hazard for people residing or working in a project area that is located within 2 miles of a public airport or public-use airport; or
- result in a significant effect related to wildfire hazards if they would expose people or structures to a significant risk of loss, injury, or death from wildland fires.

The closest airport to the Phase 3 Repair Project area is the Stockton Metropolitan Airport, which is located approximately 3 miles east of the Phase 3 Repair Project area. Because no active airports are located within 2 miles of the Phase 3 Repair Project area, issues related to safety hazards for people residing or working in a project area that is located within 2 miles of a public airport, public-use airport, or airstrip are not discussed further in this FEIS.

No local or state responsibility areas with high or very high fire hazard severity are in the Phase 3 Repair Project area; thus, people or structures would not be exposed substantially to a risk of loss, injury, or death involving wildland fires. This issue is not discussed further in this FEIS.

3.15.4 Effects and Mitigation Measures

Effect 3.15-a: Accidental Spills of Hazardous Materials in the Phase 3 Repair Project Area.

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur in the short term; therefore, no accidental spills of hazardous materials related to the Phase 3 Repair Project would occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could result in flooding that could upset stored hazardous materials and spread agricultural pesticides, oil, gasoline, and other hazardous materials in flood waters, creating somewhat localized or widespread hazardous conditions for the public and the environment. For these reasons, the adverse effect related to accidental spills of hazardous materials would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, “Section Contents.”)

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester’s Preferred Alternative

Phase 3 Repair Project-related construction and maintenance activities would include the use of potentially hazardous materials, such as fuels (e.g., gasoline and diesel), oils and lubricants, and cleaners (e.g., solvents, corrosives, soaps, detergents), which are used commonly in construction projects. Bentonite (a nonhazardous material) and/or cement would be used where cutoff walls are being constructed to remediate levee seepage conditions. Construction contractors would be required to use, store, and transport hazardous materials in compliance with Federal, state, and local regulations during project construction and operation. Risks to water quality associated with incidental releases of these materials are addressed in Section 3.5, "Hydrology and Water Quality."

Compliance with the applicable regulations would reduce the potential for accidental release of hazardous materials during their transport and during project construction activities. Although the risk of substantial hazards associated with the transport, use, and disposal of these materials is low, accidental spills of construction-related substances (such as oils and fuels) still could occur. Therefore, this temporary, short-term adverse effect would be **potentially significant**.

Mitigation Measure 3.15-a: Implement Mitigation Measure 3.4-a, "Implement Best Management Practices, Prepare and Implement a Storm Water Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions."

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

RD 17 will implement Mitigation Measure 3.4-a, "Implement Standard Best Management Practices, Prepare and Implement a Storm Water Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions," as described in Section 3.4, "Geology, Soils, Minerals, and Paleontological Resources." The final design and construction specifications will include pollution prevention measures to control hazardous spills. In summary, this mitigation measure will require filing a Notice of Intent with the Central Valley RWQCB; preparing and implementing a storm water pollution prevention plan (SWPPP) that will include appropriate hazardous materials handling, storage, and spill response practices; and complying with the conditions of the National Pollutant Discharge Elimination System general stormwater permit for construction activity.

Responsibility: RD 17 and its primary contractors.

Timing: Prepare a Notice of Intent and a SWPPP before the start of project construction; implement SWPPP and BMPs during construction; and monitor effectiveness of the mitigation during and at completion of construction.

Implementation of Mitigation Measure 3.15-a would reduce the adverse effects related to accidental spill and release of hazardous materials into the environment to a **less-than-significant** level under Alternative 1, Alternative 2, and the Requester's Preferred Alternative because a SWPPP and BMPs, that include appropriate hazardous materials handling, storage, and spill response practices, would be implemented.

Effect 3.15-b: Potential Exposure of Construction Workers and the General Public to Unknown Hazardous Materials Encountered in the Phase 3 Repair Project Area.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Phase 3 Repair Project. Agricultural land uses exist in the Phase 3 Repair Project area, which often involve the application of pesticides, the residues of which may remain in soils for years. Without project implementation, humans would not be exposed to these potentially hazardous materials through direct contact with soil, groundwater leaching, or exposure to airborne dust created by typical agricultural crop management practices, such as disking. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could result in flooding of known sites with hazardous materials, potentially exposing the public and the environment to unknown hazardous conditions in areas that have not been evaluated under a Phase I and/or II ESA. Under seepage and boils resulting from high river stages may force groundwater to the surface within or adjacent to areas containing pesticide residues or contaminated soils, which could transport sediments containing hazardous materials from agricultural fields into waterways. For these reasons, the adverse effect related potential exposure to hazardous materials would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Former land uses in the Phase 3 Repair Project area, particularly agricultural use, may have resulted in a release of hazardous materials into the soil, groundwater, or air; however, the presence or likely presence of such materials is unknown for some elements because a Phase I and/or II ESA has not been conducted for all elements of the Phase 3 Repair Project area. Phase I ESAs were completed for 11 of the 19 elements, as discussed in Section 3.15.2. For all 11 elements evaluated, no RECs were observed, but it was acknowledged that areas historically used for agriculture could contain elevated levels of pesticides and that any soils to be exported from the agricultural areas should be tested for organochlorine pesticides, lead, and arsenic (ENGEO 2019a, 2019b, 2019c, 2019d, 2019e, 2019f, 2019g, 2019h, 2019i, 2019j, 2019k). Other hazardous materials generally associated with past agricultural use include asbestos in underground pipelines. If hazardous materials exist, construction activities could cause construction workers and the general public to be exposed to harmful substances.

In addition, electrical power infrastructure may need to be relocated as part of Phase 3 Repair Project implementation. Some pole-mounted transformers contain polychlorinated biphenyls (PCBs), which are known to be hazardous to human health and the environment. However, without further investigation, the content of the transformers is unknown.

Because the presence of hazardous materials within some portions of the Phase 3 Repair Project area is unknown, this adverse effect would be **potentially significant**.

Mitigation Measure 3.15-b: Conduct Phase I and II Environmental Site Assessments and Implement Required Measures.

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Before ground-disturbing activities begin for the Phase 3 Repair Project, RD 17 shall retain a registered environmental assessor to conduct Phase I ESAs, and, if necessary, Phase II ESAs and/or other appropriate testing for the Phase 3 Repair Project area and shall have performed, as necessary, an analysis of soil and/or groundwater samples for potential contamination sites. Recommendations in the Phase I and II ESAs addressing any contamination that is found will be implemented in those locations before beginning ground-disturbing activities.

To reduce health hazards associated with potential exposure to hazardous substances, RD 17 shall implement the following measures before beginning ground-disturbing activities:

- Prepare a plan that identifies any necessary remediation activities, including excavation and removal of on-site contaminated soils and redistribution of clean fill material within the Phase 3 Repair Project area, if necessary. The plan will include measures for the safe transport, use, and disposal of contaminated soil and building debris that is removed. In the event that contaminated groundwater is encountered during excavation activities, the contractor will report the contamination to the appropriate regulatory agencies, dewater the excavated location, and treat the contaminated groundwater to remove contaminants before discharge into the sanitary sewer system. RD 17 and its contractors shall be required to comply with the plan and applicable Federal, state, and local laws. The plan will outline measures for specific handling and reporting procedures for hazardous materials and disposal of hazardous materials removed from the Phase 3 Repair Project area to an appropriate off-site disposal facility.

- Notify the appropriate Federal, state, and local agencies if evidence of previously undiscovered soil or groundwater contamination (e.g., stained soil, odorous groundwater) is encountered during construction activities. Any contaminated locations will be remediated in accordance with recommendations made by the San Joaquin County Environmental Health Department, the Central Valley RWQCB, DTSC, and/or other appropriate Federal, state, or local regulatory agencies.

- Obtain an assessment conducted by the Pacific Gas and Electric Company pertaining to the contents of any existing pole-mounted transformers that would be relocated or removed as part of Phase 3 Repair Project implementation. The assessment will determine whether existing on-site electrical transformers contain PCBs and if any records exist of spills from such equipment. If equipment containing PCBs is identified, the maintenance and/or disposal of the transformer will be subject to the regulations of the Toxic Substances Control Act, under the authority of the San Joaquin County Environmental Health Department.

Responsibility: RD 17 and its primary contractors.

Timing: Before beginning construction activities.

Implementation of Mitigation Measure 3.15-b would reduce the potentially significant adverse effect from possible human exposure to unknown hazardous materials in the Phase 3 Repair Project area to a **less-than-significant** level under Alternative 1, Alternative 2, and the Requester’s Preferred Alternative because potentially hazardous materials would be identified; a site management plan that specifies remediation activities and procedures to appropriately identify, stockpile, handle, reuse, and/or remove and dispose of hazardous materials would be prepared and implemented; monitoring activities would be implemented so that construction workers and the general public are not exposed to unsafe levels of hazardous materials; and hazardous materials that are encountered would be removed and properly disposed or otherwise remediated by licensed contractors, in accordance with Federal, state, and local laws and regulations. As discussed in Section 3.15.2, Phase I ESAs have been completed for 11 of the 19 elements, and no RECs were observed (ENGEO 2019a, 2019b, 2019c, 2019d, 2019e, 2019f, 2019g, 2019h, 2019i, 2019j, 2019k). For the 11 elements evaluated, Mitigation Measure 3.15-b has been satisfied. Should work be required in any of the elements not already evaluated in the ESAs, Mitigation Measure 3.15-b would still apply, and Phase I ESAs would be required.

Effect 3.15-c: Hazardous Emissions or Handling of Hazardous or Acutely Hazardous Materials, Substances, or Waste within One-Quarter Mile of an Existing or Proposed School.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" discussion in Section 1.6.2, "Flood Problems and Needs") and no levee repairs would be constructed. Therefore, no emission or handling of hazardous or acutely hazardous materials, substances, or waste would occur within 0.25 mile of an existing or proposed school. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. A levee failure along the RD 17 levee system could result in flooding that could upset stored hazardous materials and spread agricultural pesticides, oil, gasoline, and other hazardous materials in flood waters, creating hazardous conditions for the public and the environment, including within 0.25 mile of a school. For these reasons, the adverse effect related to emission or handling of hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school would be **potentially significant**.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Two schools are located approximately 0.25 mile from the Phase 3 Repair Project area (see the "Schools within 0.25 Mile of the Phase 3 Repair Project Area" section in Section 3.15.2, "Environmental Setting"). Construction and maintenance activities would include the use of potentially hazardous materials that commonly are used in construction projects, such as fuels (e.g., gasoline and diesel), oils and lubricants, and cleaner (which could include solvents and corrosives in addition to soaps and detergents). In addition, undocumented contaminated soil or water may be found during construction.

Compliance with the applicable regulations would reduce the potential for accidental release of hazardous materials during their transport and during project construction activities. In addition, any discovered contaminated soil or water would be remediated in accordance with applicable regulations. As a result, the risk of emission or handling of hazardous or acutely hazardous materials within 0.25 mile of a school would be low. Therefore, this temporary, short-term adverse effect would be **less than significant**.

Mitigation Measure: No mitigation is required.

3.15.5 Residual Significant Effects

Residual significant effects associated with spills of hazardous materials, exposure to hazardous materials, interference with emergency evacuation, increased hazards near the airport, or increased wildfire hazards caused by the No-Action Alternative are uncertain. Because of this uncertainty, these potential adverse effects are considered too speculative for meaningful consideration. In addition, mitigation of effects from the No-Action Alternative would not be the responsibility of RD 17, and therefore are not required. Thus, residual significant effects that would result from the No-Action Alternative would not be mitigated.

Implementation of Mitigation Measures 3.15-a and 3.15-b would reduce potential adverse effects associated with accidental spills and releases of contaminants and possible human exposure to unknown hazardous materials to a less-than-significant level under Alternative 1, Alternative 2, and the Requester's Preferred Alternative of the Phase 3 Repair Project.

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3.16 Environmental Justice

Environmental justice is defined by the U.S. Environmental Protection Agency (EPA) Office of Environmental Justice as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies” (EPA 2010). Fair treatment means that “no group of people, including racial, ethnic, or socioeconomic group, shall bear a disproportionate share of negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and policies” (EPA 2010). Analysis of a project’s effects on environmental justice is required by NEPA. Accordingly, this section discusses the existing setting (the demographic and income profile) within the Phase 3 Repair Project area and surrounding areas; identifies applicable Federal and state laws and regulations; and includes an analysis of the potential short- and long-term effects of the Phase 3 Repair Project related to environmental justice, specifically its potential to result in a disproportionate effect on minority or low-income populations. A discussion of cumulative effects related to environmental justice is provided in Chapter 4, “Cumulative and Growth-Inducing Effects and Other Statutory Requirements,” of this FEIS.

3.16.1 Regulatory Setting

As required under NEPA, applicable Federal laws and regulations are identified in this section. State laws and regulations applicable to implementation of the Phase 3 Repair Project by RD 17 are described for informational purposes and to assist with NEPA review. USACE also has considered regional and local plans and ordinances as a part of the environmental review process for this FEIS, where applicable to the Phase 3 Repair Project.

Federal

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order (EO) 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” (59 Federal Register 7629 [1994]) requires Federal agencies to identify and address disproportionately high and adverse health or environmental effects on minority populations, low-income populations, and Native Americans that may result from any proposed action. The Council on Environmental Quality (CEQ) has oversight of the Federal government’s compliance with EO 12898. To facilitate compliance, the Council prepared and issued, in association with EPA, Environmental Justice Guidance under the National Environmental Policy Act (CEQ 1997). The guidance provides six principles by which environmental justice issues should be identified and addressed (CEQ 1997:9):

1. Consider the composition of the affected area to determine whether minority populations, low-income populations, or Indian tribes are present in the area affected by the proposed action, and if so, determine whether human health or environmental effects would be disproportionately high on those populations.

2. Consider relevant public health data and industry data concerning the potential for multiple or cumulative exposure to human health or environmental hazards including historical patterns of exposure to hazards.

3. Recognize the interrelated cultural, social, occupational, historical, or economic factors that may amplify the natural and physical environmental effects of the action.

4. Develop effective public participation strategies.

5. Ensure meaningful community representation in the process.

6. Seek tribal representation in the process.

To facilitate compliance with this Federal law, CEQ prepared and issued, in association with EPA, Environmental Justice Guidance under NEPA (CEQ 1997). One of the principles by which environmental justice issues should be identified and addressed as provided in the Environmental Justice Guidance is to seek tribal representation in the process (CEQ 1997:9). Because no distinct Native American tribe currently resides in the Phase 3 Repair Project vicinity, Phase 3 Repair Project potential effects on this community are not addressed further in this section. Native American tribes are known to have lived in the Phase 3 Repair Project area; evidence exists of their occupation of this area. Native American sites, which are considered culturally significant, are discussed in Section 3.7, "Cultural Resources."

State

Most state governments have plans and policies intended to protect and expand the local and regional economies affecting the communities and residents within their jurisdictions. State plans and policies also frequently address other social and economic effect topics, including fiscal conditions and related public services that affect local residents' quality of life.

Senate Bill 115 (Environmental Justice Program Coordination)

Within California, Senate Bill (SB) 115 (Chapter 690) was signed into law in 1999. The legislation established the Governor's Office of Planning and Research (OPR) as the coordinating agency for state environmental justice programs (California Government Code, Section 65040.12[a]) and defined environmental justice in statute as "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies" (California Government Code Section 65040.12[e]). SB 115 further required the California Environmental Protection Agency (CalEPA) to develop a model environmental justice mission statement for boards, departments, and offices within the agency by January 1, 2001 (California Public Resources Code [PRC] Sections 72000–72001).

Senate Bill 89 and Senate Bill 828 (CalEPA Intra-Agency Environmental Justice Strategy)

SB 89 (Chapter 728) was signed into law in 2000. This law complemented SB 115 by requiring the creation of an environmental justice working group and an advisory group to assist CalEPA in developing an intra-agency environmental justice strategy (PRC Sections 72002–72003). SB 828 (Chapter 765, Statutes of 2001) added and modified due dates for the development of CalEPA's intra-agency environmental justice strategy and required each board, department, and office within CalEPA to identify and address, no later than January 1, 2004, any gaps in its existing programs, policies, and activities that could impede environmental justice (PRC Sections 71114–71115).

CalEPA adopted its environmental justice policy in 2004 (PRC Sections 71110–71113). This policy (or strategy) provides guidance to its resource boards, departments, and offices. It is intended to help achieve the state's goal of "achieving fair treatment of people of all races, cultures and incomes with respect to the development, adoption, implementation and enforcement of environmental laws and policies" (PRC Section 65040.12).

Assembly Bill 1553 (General Plan Consideration of Environmental Justice)

Assembly Bill (AB) 1553 (Health and Safety Code Sections 44548 and 44559.13) required OPR to incorporate environmental justice considerations in the General Plan Guidelines. AB 1553 specified that the guidelines should propose methods for local governments to address the following:

- planning for the equitable distribution of new public facilities and services that increase and enhance community quality of life,
- providing for the location of industrial facilities and uses that pose a significant hazard to human health and safety in a manner that seeks to avoid over-concentrating these uses in proximity to schools or residential dwellings,
- providing for the location of new schools and residential dwellings in a manner that avoids proximity to industrial facilities and uses that pose a significant hazard to human health and safety, and
- promoting more livable communities by expanding opportunities for transit-oriented development.

Although environmental justice is not a mandatory topic in a general plan, OPR is required to provide guidance to cities and counties for integrating environmental justice into their general plans. The 2003 edition of the General Plan Guidelines included the contents required by AB 1553 (see pages 8, 12, 20–27, 40, 114, 142, 144, and 260 of the revised General Plan Guidelines).

3.16.2 Environmental Setting

The environmental setting for environmental justice consists of the minority and low-income profiles for the affected geographic regions. Two different data sets were compiled for the Phase 3 Repair Project, the demographic and income profile for San Joaquin County, and the demographic and income profile for the immediate vicinity of the Phase 3 Repair Project. Profiles of the minority and low-income populations of San Joaquin County are shown in **Tables 3.16-1** and **3.16-2**.

The U.S. Census Bureau tabulates race and place-of-origin data within the United States. Available data sets (U.S. Census Bureau 2010a, 2010b) indicate that slightly over half (58.1percent) of the population is white, while the remainder (41.9 percent) of the population consists of minorities. San Joaquin County also has a Hispanic/Latino population of 30.5 percent (the U.S. Census Bureau counts Hispanic/Latino as a geographic place of origin).

The income and demographic profile for San Joaquin County indicates that approximately 17.7 percent of the population earns income below the poverty level, while 82.7 percent of the population earns an income at or above the U.S. poverty threshold.

Demographic data also were tabulated for the census block groups in which the Phase 3 Repair Project area is located (**Tables 3.16-3** and **3.16-4**). The white population constitutes 73.5 percent of the total

(26.5 percent minority). The Hispanic/Latino population (a category that cuts across race and is counted as geographic place of origin) constitutes 25 percent of the population.

Table 3.16-1. Race and Hispanic/Latino Population Data for San Joaquin County, California[1]

Race and Hispanic/Latino Population	Number	Percent[2]
White	327,607	58.1
Black or African American	37,689	6.9
American Indian and Alaska Native	6,377	1.1
Asian	64,283	11.4
Native Hawaiian and Other Pacific Islander	1,955	0.3
Some other race	91,613	16.3
Two or more races	34,074	6.0
Total	***563,598***	***100***
Hispanic or Latino	**172,073**	**30.5**

Notes:
1 The U.S. Census Bureau counts the Hispanic/Latino category as a geographic place of origin rather than a race; thus the percentage of the total population that is Hispanic/Latino is provided separately from categories that are counted as race.
2 Numbers are approximate because of rounding.
Sources: U.S. Census Bureau 2010a, 2010b

Table 3.16-2. Poverty Status for San Joaquin County, California

Poverty Status	Number	Percent
Income in 1999 below poverty level	97,105	17.7
Income in 1999 at or above poverty level	450,193	82.3
Total	**547,298**	**100**

Source: U.S. Census Bureau 2010c

Table 3.16-3. Race and Hispanic/Latino Population Data for the Phase 3 Repair Project Area[1]

Race and Hispanic Population	Block Group 4, Census Tract 38.03	Block Group 1, Census Tract 51.06	Block Group 1, Census Tract 51.19	Block Group 1, Census Tract 51.22	Total	Percent[2]
White	231	1,188	413	2,133	3,965	73.5
Black or African American	12	16	19	77	124	2.3
American Indian and Alaska Native	2	18	3	59	82	1.5
Asian	50	12	85	159	306	5.7
Native Hawaiian and Other Pacific Islander	1	6	0	7	14	0.3
Some other race	110	150	119	261	640	11.9
Two or more races	36	47	56	126	265	4.9
Total	***442***	***1,437***	***695***	***2,822***	***5,396***	***100***

Table 3.16-3. Race and Hispanic/Latino Population Data for the Phase 3 Repair Project Area[1]

Race and Hispanic Population	Block Group 4, Census Tract 38.03	Block Group 1, Census Tract 51.06	Block Group 1, Census Tract 51.19	Block Group 1, Census Tract 51.22	Total	Percent[2]
Hispanic or Latino	**190**	**275**	**189**	**697**	**1,351**	**25.0**

Notes:
[1] The U.S. Census Bureau counts the Hispanic/Latino category as a geographic place of origin rather than a race; thus, the percentage of the total population that is Hispanic/Latino is provided separately from categories that are counted as race.
[2] Numbers are approximate because of rounding.
Sources: U.S. Census Bureau 2010d, 2010e

Table 3.16-4. Poverty Status for the Phase 3 Repair Project Area

Poverty Status	Block Group 4, Census Tract 38.03	Block Group 1, Census Tract 51.06	Block Group 1, Census Tract 51.19	Block Group 1, Census Tract 51.22	Total	Percent
Income in 1999 below poverty level	145	157	91	258	651	12.2
Income in 1999 at or above poverty level	324	1,317	501	2,554	4,696	87.8
Total	**469**	**1,474**	**592**	**2,812**	**5,347**	**100**

Source: U.S. Census Bureau 2010f

The vast majority of the population within the Phase 3 Repair Project area earns income at or above the poverty level (87.8 percent). The remaining 12.2 percent of the population earns an income below the poverty line.

3.16.3 Methodology and Thresholds of Significance

Methodology

The following analysis is based on Environmental Justice: Guidance under the National Environmental Policy Act, prepared by the CEQ and the Executive Office of the President (CEQ 1997). Although none of the published guidelines define the term “disproportionately high and adverse,” the CEQ includes a non-quantitative definition stating that an effect is disproportionate if it appreciably exceeds the risk or benefit rate to the general population.

Under the CEQ guidelines, the first step in conducting an environmental justice analysis is to determine the presence of minority and low-income populations and whether they are present in sufficient numbers to constitute environmental justice populations. (CEQ 1997:25). Minority populations exist if: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997:25). A minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds (CEQ 1997:25). Low-income populations in an affected area are identified with the annual statistical poverty thresholds from the Bureau of the Census’ Current Population Reports, Series P-60 on Income and Poverty (CEQ 1997:25).

The second step in conducting an environmental justice analysis requires that the Federal agency determine whether the Federal action would result in disproportionately high or adverse health or environmental effects for the environmental justice populations (CEQ 1997:26). The CEQ guidance indicates that when determining whether the effects are high and adverse, agencies are to consider whether the risks or rates of effect "are significant [as employed by NEPA] or above generally accepted norms" (CEQ 1997:26). The CEQ offers a non-quantitative definition, stating that an effect is disproportionate if it appreciably exceeds the risk or rate to the general population (CEQ 1997:26). This environmental justice analysis is based on a review of relevant demographic data to define the relative proportion of minority and low-income populations in the vicinity of the Phase 3 Repair Project area, to determine whether the Phase 3 Repair Project would result in environmental justice effects on the relevant populations.

Thresholds of Significance

The thresholds of significance encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and intensity of its effects. To prove a violation of Federal environmental justice principles, low-income populations, individuals belonging to minority populations, and/or the minority populations themselves (i.e., Native American or Alaska Native, Asian or Pacific Islander, black, or Hispanic) must be affected by the project or alternatives under consideration. According to the CEQ, two types of environmental justice effects may exist: disproportionately high and adverse human health effects and disproportionately high and adverse environmental effects. For a project to result in disproportionately high and adverse human health effects, the project or alternatives under consideration must result in one or more of the following conditions:

- The anticipated health effects, which may be measured in risks and rates, would be significant (as employed by NEPA), or above the generally accepted norm. Adverse health effects may include bodily impairment, infirmity, illness, or death.

- The risk or rate of hazard exposure by a minority population, low-income population, or Native American tribe to an environmental hazard would be significant (as employed by NEPA) and would appreciably exceed the risk or rate to the general population or other appropriate comparison group.

- The health effects would occur in a minority population, low-income population, or Native American tribe affected by cumulative or multiple adverse exposures from environmental hazards.

For the project or alternatives under consideration to result in disproportionately high and adverse environmental effects, one or more of the following conditions must exist:

- An effect would occur on the natural or physical environment that would significantly (as employed by NEPA) and adversely affect a minority population, low-income population, or Native American tribe. Such effects may include ecological, cultural, human health, economic, or social effects on minority communities, low-income communities, or Native American tribes when those adverse effects are interrelated to effects on the natural or physical environment.

- The environmental effects would be significant (as employed by NEPA) and may have an adverse effect on minority populations, low-income populations, or Native American tribes that would appreciably exceed or would be likely to appreciably exceed those on the general population or other appropriate comparison group.

- The environmental effects would occur in a minority population, low-income population, or Native American tribe affected by cumulative or multiple adverse exposures from environmental hazards.

3.16.4 Effects and Mitigation Measures

Effect 3.16-a: Potential to Result in a Disproportionately High and Adverse Environmental Effect on Minority or Low-Income Populations.

No-Action Alternative

Under the No-Action Alternative, levee vegetation would continue to be managed in accordance with RD 17's current practice (see the "Management of Vegetation Encroachments" section in Section 1.6.2) and no levee repairs would be constructed. Therefore, in the near term, a disproportionately high or adverse environmental effect on minority and low-income populations would not occur. However, the current level of risk would remain for a major levee failure and flooding of areas within the RD 17 service area. Although significant minority and low-income populations occur in the immediate Phase 3 Repair Project vicinity, the population and effects are equally distributed; therefore, **no disproportionately high and adverse effects** on minority or low-income populations would occur under the No-Action Alternative.

Mitigation Measure: No mitigation is provided for the No-Action Alternative. (See discussion of environmental effects and mitigation measures in Section 3.1.1, "Section Contents.")

Alternative 1: Minimum Footprint Alternative, Alternative 2: Maximum Footprint Alternative, and the Requester's Preferred Alternative

Low-income and minority populations Although this EIS/EIR identifies impacts that may remain significant after mitigation, the absence of substantial minority and low-income populations near the Phase 3 Project Area and in San Joaquin County indicates that these impacts would not result in a disproportionate burden on minority and low-income groups in general. Furthermore, the flood protection benefits of the project would accrue to all segments of the population within the RD 17 boundary. The Phase 3 Repair Project would reduce the risk of flooding to existing residential, commercial, and industrial land uses within the RD 17 service area, including the immediate Phase 3 Repair Project vicinity. Low-income and minority populations are present within the RD 17 service area, but these groups do not constitute a significant portion of the total population (i.e., 50% or greater) in this area (*see* **Tables 3.16-3** and **3.16-4**). Therefore, while this FEIS identifies adverse construction-related effects that may remain significant after implementation of mitigation, these effects would not affect low-income or minority populations disproportionately, and the flood protection benefits of the Phase 3 Repair Project would benefit all segments of the population, including low-income and minority populations, within the RD 17 service area. Therefore, **no disproportionately high and adverse effects** on minority or low-income populations would occur under Alternative 1, Alternative 2, or the Requester's Preferred Alternative.

3.16.5 Residual Significant Effects

No residual significant effects would occur under any of the alternatives because no disproportionately high and adverse effects on minority or low-income populations would occur under the No-Action Alternative, Alternative 1, Alternative 2, or the Requester's Preferred Alternative. Therefore, no mitigation is required.

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Chapter 4. Cumulative and Growth-Inducing Effects and Other Statutory Requirements

4.1 Cumulative Effects

Phase 1 of the RD 17 Levee Seepage Repair Project (LSRP) was addressed with a California Environmental Quality Act (CEQA) Categorical Exemption, and construction has been completed. The environmental effects of the Phase 2 Repair Project, which also has been constructed, were analyzed in a CEQA initial study/mitigated negative declaration. The following analysis includes a summary of the overall cumulative effects of the RD 17 LSRP, including effects associated with the Phase 1 and 2 Projects, and an analysis of the Phase 3 Repair Project's cumulative effects taken together with other past, present, and reasonably foreseeable future projects producing related effects in space and time, as required by NEPA implementing regulations (40 Code of Federal Regulations [CFR] Section 1508.7). The goal of the analysis is twofold: to determine whether the effects of all such projects would be cumulatively significant and to determine whether Phase 3 of the RD 17 LSRP would cause a "cumulatively considerable" (and thus significant) incremental contribution to any such cumulatively significant adverse effects.

The Council on Environmental Quality regulations to implement the provisions of NEPA define a cumulative effect as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR Section 1508.7). Cumulative effects can result from individually minor but collectively significant actions over time, and they differ from indirect effects (40 CFR Section 1508.8). Cumulative effects are caused by the incremental increase in total environmental effects, and thus they can arise from causes that are totally unrelated to the project being evaluated.

4.1.1 Geographic Scope and Time Frame

The geographic area that could be affected by implementing the RD 17 LSRP, including the Phase 3 Repair Project, varies depending on the type of environmental issue being considered. When the Phase 3 Repair Project's effects are considered in combination with those other past, present, and reasonably foreseeable future projects to identify cumulative effects, the other projects considered also may vary, depending on the type of environmental effects being assessed. The general geographic area associated with the different environmental effects of the RD 17 LSRP, including the Phase 3 Repair Project, defines the boundaries of the area used for compiling the list of projects considered in the cumulative effects analysis. **Table 4-1** shows the general geographic areas associated with the different resource topics addressed in this FEIS.

Table 4-1. Geographic Areas That Would Be Affected by the RD 17 LSRP, Including the Phase 3 Repair Project

Resource Area	Geographic Area
Agricultural resources	Agricultural areas located within RD 17 service area as well as the remainder of San Joaquin County for regional context.
Air quality	Regional (San Joaquin Valley Air Pollution Control District); global for greenhouse gas emissions.
Biological resources:	
Woodland habitat and wildlife corridors, sensitive aquatic habitat, and special-status plant and wildlife species	RD 17 LSRP project area, with regional implications.
Fish and aquatic habitats	San Joaquin River system near the RD 17 service area with regional implications for special-status species.
Cultural resources	Individual ground disturbance sites, with regional implications.
Environmental justice	San Joaquin County and affected tribes; however, environmental justice is not addressed further in this cumulative effects analysis. See Section 3.16, “Environmental Justice,” for the Phase 3 Repair Project effects analysis.
Geology, soils, and mineral resources	Individual construction sites, soil erosion repair sites, and other ground disturbance sites within the RD 17 service area.
Groundwater	Groundwater basins with connectivity to the San Joaquin River in the vicinity of the Phase 3 Repair Project area.
Hazards and hazardous materials	Individual construction and ground-disturbance sites.
Hydraulics	San Joaquin River system near the RD 17 service area.
Hydrology	The San Joaquin River system near the RD 17 service area and the drainage system on the east side of the San Joaquin River and southwest of the city of Manteca.
Land use, socioeconomics, and population and housing	The only potential effects on land use from the RD 17 LSRP relate to possible inconsistency with adopted land use plans and policies; inconsistency with policies is not a cumulative effect; therefore, land use is not addressed further in this cumulative effects analysis. See Section 3.3, “Land Use, Socioeconomics, and Population and Housing,” for the Phase 3 Repair Project effects analysis.
Noise	Immediate vicinity of the individual sites of construction activities.
Paleontological resources	Individual ground disturbance sites within the RD 17 service area.
Recreation	Local (facilities near construction sites).
Transportation and circulation	Roadway network within the RD 17 service area, including the cities of Stockton, Manteca, and Lathrop and the western portion of San Joaquin County, with regional implications.
Utilities and public services	Local service areas.
Visual resources	Individual levee repair sites and landscape level.
Water quality	Ditches and canals in the RD 17 service area, with implications for the San Joaquin River system near the RD 17 service area.

Notes: RD 17 = Reclamation District 17; LSRP = Levee Seepage Repair Project.
Source: Data compiled by AECOM in 2014

The time frame for consideration of cumulative effects is approximately 25 years into the future, generally consistent with the time frame for buildout of approved general plans, specific plans, and proposed and approved development projects within the RD 17 service area (encompassing portions of the cities of Stockton, Lathrop, and Manteca, and some unincorporated areas of San Joaquin County).

4.1.2 Approach to the Phase 3 Repair Project Cumulative Effects Analysis

Relevant material from a previous document has been incorporated by reference. Incorporation by reference is encouraged by NEPA (40 CFR Sections 1500.4, 1502.21). NEPA requires the referenced material to be cited and briefly summarized. Information about the public availability of the incorporated material must also be provided. The following document has been incorporated by reference: Initial Study/Proposed Mitigated Negative Declaration, Phase 2–RD 17 100-Year Levee Seepage Project (RD 17 2009). Printed copies of this document are available to the public at the offices of Nomellini, Grilli & McDaniel, 235 East Weber Avenue in Stockton, California.

4.1.3 Related Actions in RD 17/San Joaquin County

Past, present, and reasonably foreseeable future actions are those projects that have already been constructed, are currently under construction, or are in various stages of planning but have yet to start construction. Some projects producing related effects are planned to be under construction during the period in which the Phase 3 Repair Project would be under construction (anticipated in 2020–2021), while others are expected to be developed after 2021. These projects are organized into the following categories:

- RD 17 LSRP,
- other flood damage reduction system repair or improvement projects, and
- development projects.

Details about these projects are discussed next.

RD 17 Levee Seepage Repair Project

The RD 17 LSRP consists of three phases of levee repairs to remedy levee seepage within the RD 17 levee system.

Phase 1 Repair Project

The Phase 1 Repair Project affected levee elements IIIa and VIb and consisted of reconstruction and extension of landside levee toe berms with earth and gravel fill, both landward and along the levee toe, to reduce seepage exit gradients to less than 0.5. NEPA compliance was not necessary for the Phase 1 Repair Project because no Federal permits or approvals were required to implement this phase. The levee elements selected for the Phase 1 Project were chosen because these elements lacked any sensitive environmental resources that potentially could be affected by construction activities. The Phase 1 Repair Project was completed in 2008.

Phase 2 Repair Project

The Phase 2 Repair Project consisted of the repairs shown in **Table 4-2**. Under CEQA, environmental impacts associated with the Phase 2 Repair Project were addressed in the Initial Study/Proposed

Mitigated Negative Declaration, Phase 2–RD 17 100-Year Levee Seepage Project (RD 17 2009). NEPA compliance was not necessary for the Phase 2 Repair Project work because no Federal permits or approvals were required to implement this phase. **Table 4-3** summarizes the effects of the Phase 2 Repair Project, as described in the initial study/proposed mitigated negative declaration. Construction of the Phase 2 Repair Project was completed in summer 2010.

Table 4-2. Phase 2 of the Reclamation District 17 Levee Seepage Repair Project Summary of Activities and Characteristics of Each Project Element

Element	Element Length	Proposed Repair Activity	Disturbance Surface Area	Existing Use
Ic	Approximately 1,070 feet	Construction of a 65-foot seepage berm and placement of approximately 14,000 cu. yd. of fill material	Approximately 1.6 acres	Agriculture—row crops and alfalfa
Id	Approximately 1,140 feet	Construction of a 65- to 75-foot seepage berm and placement of approximately 16,000 cu. yd. of fill material	Approximately 1.8 acres	Partially an existing seepage berm Partially agriculture—row crops and alfalfa
IVb	Approximately 1,260 feet	Construction of a 65-foot seepage berm with toe drain* and placement of approximately 15,000 cu. yd. of fill material	Approximately 1.9 acres	Lathrop city park, corridor park
VIa.2	Approximately 2,500	Construction of an 80-foot seepage berm with toe drain and placement of approximately 30,000 cu. yd. of fill material	Approximately 4.6 acres	Lathrop city park, corridor park
VIa.3	Approximately 1,890 feet	Construction of a 65-foot seepage berm with toe drain and placement of approximately 23,000 cu. yd. of fill material	Approximately 2.8 acres	Vacant strip between levee toe and adjacent residential; ruderal vegetation Planned as a city corridor park
VIa.4	Approximately 10 feet	Construction of a 65-foot seepage berm with toe drain and placement of approximately 120 cu. yd. of fill material	Approximately 0.015 acre	Vacant strip between levee toe and adjacent residential development; ruderal vegetation
VIIc	Approximately 2,140 feet	Construction of a 65-foot seepage berm and placement of approximately 26,000 cu. yd. of fill material	Approximately 3.2 acres	Agriculture—row crops and alfalfa
VIId	Approximately 570 feet	Easement acquisition and levee maintenance with placement of no fill	Less than 1 acre	Vacant; annual grassland and ruderal vegetation
VIIf	Approximately 2,500 feet	Construction of an 80-foot seepage berm with toe drain and placement of approximately 30,000 cu. yd. of fill material	Approximately 4.6 acres	Undeveloped residential lots; graded, utility “stub-outs” present; no structures or foundations

Notes: cu. yd. = cubic yards.
* Space for the toe drain is included in the seepage berm widths shown for each project element.
Source: Data compiled by AECOM in 2014

Table 4-3. Summary of the Environmental Effects of the Phase 2 Repair Project

Resource Topic	Summary of Environmental Effect
Aesthetics	The Phase 2 Repair Project had no effects on aesthetic resources. No effect occurred on scenic resources, on scenic vistas, or was related to creation of light or glare. Effects on the existing visual setting were less than significant because proposed repairs generally were consistent with existing land uses and the visual character of the Phase 2 Repair Project area.
Agricultural Resources	The Phase 2 Repair Project did not conflict with existing zoning for agricultural land uses or Williamson Act contracts. The Phase 2 Repair Project had a less-than-significant effect from conversion of farmland because the land covered by seepage berms could be used for agricultural uses consistent with the flood control function of the facilities after project construction.
Air Quality	The Phase 2 Repair Project resulted in less-than-significant effects associated with short-term construction-related emissions of criteria pollutants after implementation of mitigation. The Phase 2 Repair Project resulted in no effect associated with long-term operational emissions. Because the Phase 2 Repair Project's greenhouse gas emissions were finite and below the reporting standard for Assembly Bill 32, emissions of greenhouse gas were less than significant. Short-term exposure of sensitive receptors to pollutants was less than significant because the dispersal of pollutants occurred quickly. In addition, operation of the project has not resulted in new permanent odor sources or the placement of sensitive receptors near odor sources.
Biological Resources	With incorporation of appropriate mitigation (preconstruction training for construction workers, exclusion zones around habitat and special-status plants, and appropriate timing of construction), the Phase 2 Repair Project had less-than-significant effects on special-status species. The Phase 2 Repair Project had no effect on riparian habitat or waters of the United States. The project did not interfere with wildlife corridors. Furthermore, the Phase 2 Repair Project did not conflict with any tree preservation policies.
Cultural Resources	With the incorporation of mitigation, the Phase 2 Repair Project had less-than-significant effects on historical resources (including historic-era and prehistoric cultural resources, and previously unidentified human remains). The Phase 2 Repair Project had no effect on paleontological resources.
Geology and Soils	The Phase 2 Repair Project did not expose people to substantial risk from exposure to faults, seismic events, liquefaction or landslides; and the potential risks were less than significant. With incorporation of mitigation, erosion was less than significant. In addition, the project was not located on unstable or expansive soils; therefore, the effects were less than significant. No septic systems or wastewater disposal systems were constructed as part of the Phase 2 Repair Project. Therefore, no effect occurred related to soils incapable of supporting septic tanks.
Hazards and Hazardous Materials	With the incorporation of mitigation, the Phase 2 Repair Project resulted in less-than-significant effects associated with the handling and potential environmental release of hazardous materials. Mitigation consisted of handling and spill management protocols as well as implementation of BMPs for erosion and runoff. Effects associated with hazardous material releases were less than significant because the project incorporated appropriate mitigation measures. The Phase 2 Repair Project did not result in exposure of persons to hazardous materials because the project did not occur on identified hazardous materials deposits. The Phase 2 Repair Project did not result in any effects related to airport safety. The project had no effect related to emergency response plans and had less-than-significant effects related to wildfire hazards.
Hydrology and Water Quality	With the incorporation of mitigation, the Phase 2 Repair Project resulted in no significant effects on water quality. Because the Phase 2 Repair Project did not substantially alter groundwater recharge or groundwater levels, the project had less-than-significant effects on groundwater levels. Although the seepage berms constructed as part of the Phase 2 Repair Project altered drainage patterns slightly, this effect was less than significant. The installation of seepage berms did not result in a substantial increase in runoff, and thus did not result in effects on stormwater capacity. The Phase 2 Repair Project did not result in risks associated with placement of housing or structures in 100-year floodplains, nor did it result in risks associated with levee or dam failure or seiches, tsunamis, or mudflows.
Land Use Planning	The Phase 2 Repair Project did not result in effects associated with land use planning because it did not physically divide an established community or conflict with any applicable land use laws. In addition, the Phase 2 Repair Project did not conflict with any applicable habitat conservation plans.
Mineral Resources	The construction of seepage berms as part of the Phase 2 Repair Project did not result in significant effects on the availability of sands and aggregates in and near the Phase 2 Repair Project area. The Phase 2 Repair Project did not result in the loss of locally important aggregate deposits.
Noise	The Phase 2 Repair Project resulted in some short-term noise increases related to construction. With the incorporation of mitigation to time construction according to local noise ordinances, this effect was less than

Table 4-3. Summary of the Environmental Effects of the Phase 2 Repair Project

Resource Topic	Summary of Environmental Effect
	significant. No effects occurred from long-term operational noise increases because the project did not result in such noise. Short-term vibration related to construction was less than significant. With the incorporation of mitigation, the project did not result in a substantial increase in ambient noise levels. The project was not close enough to local airports to result in effects associated with human exposure to airport noise.
Population and Housing	The Phase 2 Repair Project did not result in any effects associated with population and housing because it did not induce growth or displace persons or residences requiring new construction with associated environmental effects.
Public Services	The Phase 2 Repair Project resulted in no effects associated with demand or access to fire protection, police protection, schools and other public facilities. Implementation of the project required temporary closure of River Park North, River Park South, and the dog park at River Park South during construction of the proposed seepage berm. Because the loss of these parks was short-term and temporary, the effects were less than significant.
Recreation	The Phase 2 Repair Project required temporary closure and later reconstruction of North River Park and South River Park. Because effects were temporary and any deterioration of other regional parks from increased use was not substantially accelerated, this effect was less than significant. The Phase 2 Repair Project did not include recreational facilities or require construction or expansion of recreational facilities.
Transportation/ Traffic	The Phase 2 Repair Project increased truck trips along local roadways because construction required hauling of fill for seepage berms; however, the increase in traffic was not substantial in relation to existing conditions and congestion. Therefore, the project did not exceed the designated level of service for these roadways. The Phase 2 Repair Project had no effect on air traffic patterns. Because the Phase 2 Repair Project did not alter local roadways, implementation of the project did not increase roadway hazards. The project did not result in effects on emergency access, and it did not result in inadequate parking or conflict with alternative transportation.
Utilities and Service Systems	The Phase 2 Repair Project did not result in any effects associated with the need for additional wastewater treatment capacity, construction of new treatment facilities, exceedance of treatment standards, and compliance with solid waste disposal laws. Because construction demand for water was small in relation to available supplies, effects on water supply were less than significant. Although construction temporarily generated some waste, this waste stream was not substantial in relation to available disposal capacity.

Note: BMP = best management practice.
Source: Data compiled by AECOM in 2014

Phase 3 Repair Project

As discussed in Chapter 1, "Introduction and Project Purpose, Need, and Objectives," the Phase 3 Repair Project is the last of the currently planned LSRP phases and 11 of 19 of its elements are the subject of this FEIS; eight elements of the Phase 3 Project were completed prior to preparation of this FEIS.

2017 Emergency Flood Response Construction Project

In 2017, the RD 17 Board of Trustees issued a Declaration of Emergency in response to a severe flood threat related to a historical snowpack, encroached upstream reservoirs, king tides, and ongoing forecasts of atmospheric river–fed storm systems. The 2017 Emergency Flood Response Construction Project involved the construction of seepage berms and raised landside grades using predeployed materials at 11 Phase 3 Repair Project elements: Ia, Ib, Ie, IIIb, IVa, Va, VIa.1, VIc, VId, VIe, and VIIb. Construction began in February 2014, carried through the summer alongside the extended high water levels of the San Joaquin River, and was concluded in October 2017.

Table 4-4 summarizes the effects of the 2017 Emergency Flood Response Construction Project.

Table 4-4. Summary of the Environmental Effects of the 2017 Emergency Flood Response Construction Project

Resource Topic	Summary of Environmental Effect
Aesthetics	The Emergency Flood Response Construction Project had no effects on aesthetic resources. No effect occurred on scenic resources, on scenic vistas, or was related to creation of light or glare. Effects on the existing visual setting were less than significant because proposed repairs generally were consistent with existing land uses and the visual character of the Emergency Flood Response Construction Project area.
Agricultural Resources	The Emergency Flood Response Construction Project did not conflict with existing zoning for agricultural land uses or Williamson Act contracts. The Emergency Flood Response Construction Project had a less-than-significant effect from conversion of farmland because the land covered by seepage berms could be used for agricultural uses consistent with the flood control function of the facilities after project construction.
Air Quality	The Emergency Flood Response Construction Project resulted in less-than-significant effects associated with short-term construction-related emissions of criteria pollutants after implementation of mitigation. The Emergency Flood Response Construction Project resulted in no effect associated with long-term operational emissions. Because the Emergency Flood Response Construction Project's greenhouse gas emissions were finite and below the reporting standard for Assembly Bill 32, emissions of greenhouse gas were less than significant. Short-term exposure of sensitive receptors to pollutants was less than significant because the dispersal of pollutants occurred quickly. In addition, operation of the project has not resulted in new permanent odor sources or the placement of sensitive receptors near odor sources.
Biological Resources	With incorporation of appropriate mitigation (preconstruction training for construction workers, exclusion zones around habitat and special-status plants, and appropriate timing of construction), the Emergency Flood Response Construction Project had less-than-significant effects on special-status species. The Emergency Flood Response Construction Project had no effect on riparian habitat or waters of the United States. The project did not interfere with wildlife corridors. Furthermore, the Emergency Flood Response Construction Project did not conflict with any tree preservation policies.
Cultural Resources	With the incorporation of mitigation, the Emergency Flood Response Construction Project had less-than-significant effects on historical resources (including historic-era and prehistoric cultural resources, and previously unidentified human remains). The Emergency Flood Response Construction Project had no effect on paleontological resources.
Geology and Soils	The Emergency Flood Response Construction Project did not expose people to substantial risk from exposure to faults, seismic events, liquefaction or landslides; and the potential risks were less than significant. With incorporation of mitigation, erosion was less than significant. In addition, the project was not located on unstable or expansive soils; therefore, the effects were less than significant. No septic systems or wastewater disposal systems were constructed as part of the Emergency Flood Response Construction Project. Therefore, no effect occurred related to soils incapable of supporting septic tanks.
Hazards and Hazardous Materials	With the incorporation of mitigation, the Emergency Flood Response Construction Project resulted in less-than-significant effects associated with the handling and potential environmental release of hazardous materials. Mitigation consisted of handling and spill management protocols as well as implementation of BMPs for erosion and runoff. Effects associated with hazardous material releases were less than significant because the project incorporated appropriate mitigation measures. The Emergency Flood Response Construction Project did not result in exposure of persons to hazardous materials because the project did not occur on identified hazardous materials deposits. The Emergency Flood Response Construction Project did not result in any effects related to airport safety. The project had no effect related to emergency response plans and had less-than-significant effects related to wildfire hazards.
Hydrology and Water Quality	With the incorporation of mitigation, the Emergency Flood Response Construction Project resulted in no significant effects on water quality. Because the Emergency Flood Response Construction Project did not substantially alter groundwater recharge or groundwater levels, the project had less-than-significant effects on groundwater levels. Although the seepage berms constructed as part of the Emergency Flood Response Construction Project altered drainage patterns slightly, this effect was less than significant. The installation of seepage berms did not result in a substantial increase in runoff, and thus did not result in effects on stormwater capacity. The Emergency Flood Response Construction Project did not result in risks associated with placement of housing or structures in 100-year floodplains, nor did it result in risks associated with levee or dam failure or seiches, tsunamis, or mudflows.

Table 4-4. Summary of the Environmental Effects of the 2017 Emergency Flood Response Construction Project

Resource Topic	Summary of Environmental Effect
Land Use Planning	The Emergency Flood Response Construction Project did not result in effects associated with land use planning because it did not physically divide an established community or conflict with any applicable land use laws. In addition, The Emergency Flood Response Construction Project did not conflict with any applicable habitat conservation plans.
Mineral Resources	The construction of seepage berms as part of the Emergency Flood Response Construction Project did not result in significant effects on the availability of sands and aggregates in and near the Emergency Flood Response Construction Project area. The Emergency Flood Response Construction Project did not result in the loss of locally important aggregate deposits.
Noise	The Emergency Flood Response Construction Project resulted in some short-term noise increases related to construction. With the incorporation of mitigation to time construction according to local noise ordinances, this effect was less than significant. No effects occurred from long-term operational noise increases because the project did not result in such noise. Short-term vibration related to construction was less than significant. With the incorporation of mitigation, the project did not result in a substantial increase in ambient noise levels. The project was not close enough to local airports to result in effects associated with human exposure to airport noise.
Population and Housing	The Emergency Flood Response Construction Project did not result in any effects associated with population and housing because it did not induce growth or displace persons or residences requiring new construction with associated environmental effects.
Public Services	The Emergency Flood Response Construction Project resulted in no effects associated with demand or access to fire protection, police protection, schools and other public facilities. Implementation of the project required temporary closure of Mossdale Crossing Regional Park during construction. Because the loss of these parks was short-term and temporary, the effects were less than significant.
Recreation	The Emergency Flood Response Construction Project required temporary closure and later reconstruction of Mossdale Crossing Regional Park. Because effects were temporary and any deterioration of other regional parks from increased use was not substantially accelerated, this effect was less than significant. The Emergency Flood Response Construction Project did not include recreational facilities or require construction or expansion of recreational facilities.
Transportation/ Traffic	The Emergency Flood Response Construction Project increased truck trips along local roadways because construction required hauling of fill for seepage berms; however, the increase in traffic was not substantial in relation to existing conditions and congestion. Therefore, the project did not exceed the designated level of service for these roadways. The Emergency Flood Response Construction Project had no effect on air traffic patterns. Because the Emergency Flood Response Construction Project did not alter local roadways, implementation of the project did not increase roadway hazards. The project did not result in effects on emergency access, and it did not result in inadequate parking or conflict with alternative transportation.
Utilities and Service Systems	The Emergency Flood Response Construction Project did not result in any effects associated with the need for additional wastewater treatment capacity, construction of new treatment facilities, exceedance of treatment standards, and compliance with solid waste disposal laws. Because construction demand for water was small in relation to available supplies, effects on water supply were less than significant. Although construction temporarily generated some waste, this waste stream was not substantial in relation to available disposal capacity.

Note: BMP = best management practice.
Source: Data compiled by AECOM in 2014

2019 Categorical Permissions Construction Project

As discussed in Chapter 1, USACE established a categorical permission (CP) for federally authorized civil works projects (Federal projects) in early January 2019 to expedite and streamline the review and decisions of Section 408 requests that are similar in nature and have similar effects. In September 2019, USACE approved use of a CP and Section 408 permission was granted for construction of repairs at eight Phase 3 Repair Project elements (Ie, IIIa, IIIb, IVa, VIb, VIcde, VIIb, and VIIg) under CVFPB

Permit No. 18980-1. Construction of these features was initiated in October 2019, and completed in December 2019.

The CP Construction Project involved the construction of several chimney drains in existing seepage berms at elements Ie, IIa, IIIb, IVa, VIde, and VIIb, and construction of seepage berms with chimney drains at elements VIb, VIc, and VIIg.

Table 4-5 summarizes the effects of the 2019 CP Construction Project.

Table 4-5. Summary of the Environmental Effects of the 2019 Categorical Permissions Construction Project

Resource Topic	Summary of Environmental Effect
Aesthetics	The CP Construction Project had no effects on aesthetic resources. No effect occurred on scenic resources, on scenic vistas, or was related to creation of light or glare. Effects on the existing visual setting were less than significant because proposed repairs generally were consistent with existing land uses and the visual character of the CP Construction Project area.
Agricultural Resources	The CP Construction Project did not conflict with existing zoning for agricultural land uses or Williamson Act contracts. The CP Construction Project had a less-than-significant effect from conversion of farmland because the land covered by seepage berms could be used for agricultural uses consistent with the flood control function of the facilities after project construction.
Air Quality	The CP Construction Project resulted in less-than-significant effects associated with short-term construction-related emissions of criteria pollutants after implementation of mitigation. The CP Construction Project resulted in no effect associated with long-term operational emissions. Because the CP Construction Project's greenhouse gas emissions were finite and below the reporting standard for Assembly Bill 32, emissions of greenhouse gas were less than significant. Short-term exposure of sensitive receptors to pollutants was less than significant because the dispersal of pollutants occurred quickly. In addition, operation of the project has not resulted in new permanent odor sources or the placement of sensitive receptors near odor sources.
Biological Resources	With incorporation of appropriate mitigation (preconstruction training for construction workers, exclusion zones around habitat and special-status plants, and appropriate timing of construction), the CP Construction Project had less-than-significant effects on special-status species. The CP Construction Project had no effect on riparian habitat or waters of the United States. The project did not interfere with wildlife corridors. Furthermore, the CP Construction Project did not conflict with any tree preservation policies.
Cultural Resources	With the incorporation of mitigation, the CP Construction Project had less-than-significant effects on historical resources (including historic-era and prehistoric cultural resources, and previously unidentified human remains). The CP Construction Project had no effect on paleontological resources.
Geology and Soils	The CP Construction Project did not expose people to substantial risk from exposure to faults, seismic events, liquefaction or landslides; and the potential risks were less than significant. With incorporation of mitigation, erosion was less than significant. In addition, the project was not located on unstable or expansive soils; therefore, the effects were less than significant. No septic systems or wastewater disposal systems were constructed as part of the CP Construction Project. Therefore, no effect occurred related to soils incapable of supporting septic tanks.
Hazards and Hazardous Materials	With the incorporation of mitigation, the CP Construction Project resulted in less-than-significant effects associated with the handling and potential environmental release of hazardous materials. Mitigation consisted of handling and spill management protocols as well as implementation of BMPs for erosion and runoff. Effects associated with hazardous material releases were less than significant because the project incorporated appropriate mitigation measures. The CP Construction Project did not result in exposure of persons to hazardous materials because the project did not occur on identified hazardous materials deposits. The CP Construction Project did not result in any effects related to airport safety. The project had no effect related to emergency response plans and had less-than-significant effects related to wildfire hazards.
Hydrology and Water Quality	With the incorporation of mitigation, the CP Construction Project resulted in no significant effects on water quality. Because the CP Construction Project did not substantially alter groundwater recharge or groundwater levels, the project had less-than-significant effects on groundwater levels. Although the seepage berms and chimney drains constructed as part of the CP Construction Project altered drainage patterns slightly, this effect was less than significant. The installation of seepage berms and chimney drains

Table 4-5. Summary of the Environmental Effects of the 2019 Categorical Permissions Construction Project

Resource Topic	Summary of Environmental Effect
	did not result in a substantial increase in runoff, and thus did not result in effects on stormwater capacity. The CP Construction Project did not result in risks associated with placement of housing or structures in 100-year floodplains, nor did it result in risks associated with levee or dam failure or seiches, tsunamis, or mudflows.
Land Use Planning	The CP Construction Project did not result in effects associated with land use planning because it did not physically divide an established community or conflict with any applicable land use laws. In addition, The CP Construction Project did not conflict with any applicable habitat conservation plans.
Mineral Resources	The construction of seepage berms and chimney drains as part of the CP Construction Project did not result in significant effects on the availability of sands and aggregates in and near the CP Construction Project area. The CP Construction Project did not result in the loss of locally important aggregate deposits.
Noise	The CP Construction Project resulted in some short-term noise increases related to construction. With the incorporation of mitigation to time construction according to local noise ordinances, this effect was less than significant. No effects occurred from long-term operational noise increases because the project did not result in such noise. Short-term vibration related to construction was less than significant. With the incorporation of mitigation, the project did not result in a substantial increase in ambient noise levels. The project was not close enough to local airports to result in effects associated with human exposure to airport noise.
Population and Housing	The CP Construction Project did not result in any effects associated with population and housing because it did not induce growth or displace persons or residences requiring new construction with associated environmental effects.
Public Services	The CP Construction Project resulted in no effects associated with demand or access to fire protection, police protection, schools and other public facilities. Implementation of the project required temporary closure of Mossdale Crossing Regional Park during construction. Because the loss of these parks was short-term and temporary, the effects were less than significant.
Recreation	The CP Construction Project required temporary closure and later reconstruction of Mossdale Crossing Regional Park. Because effects were temporary and any deterioration of other regional parks from increased use was not substantially accelerated, this effect was less than significant. The CP Construction Project did not include recreational facilities or require construction or expansion of recreational facilities.
Transportation/ Traffic	The CP Construction Project increased truck trips along local roadways because construction required hauling of fill for seepage berms and materials for chimney drains; however, the increase in traffic was not substantial in relation to existing conditions and congestion. Therefore, the project did not exceed the designated level of service for these roadways. The CP Construction Project had no effect on air traffic patterns. Because the CP Construction Project did not alter local roadways, implementation of the project did not increase roadway hazards. The project did not result in effects on emergency access, and it did not result in inadequate parking or conflict with alternative transportation.
Utilities and Service Systems	The CP Construction Project did not result in any effects associated with the need for additional wastewater treatment capacity, construction of new treatment facilities, exceedance of treatment standards, and compliance with solid waste disposal laws. Because construction demand for water was small in relation to available supplies, effects on water supply were less than significant. Although construction temporarily generated some waste, this waste stream was not substantial in relation to available disposal capacity.

Notes: BMP = best management practice; CP = categorical permission.
Source: Data compiled by Ascent Environmental in 2019

Other Flood Damage Reduction System Repair or Improvement Projects

Other proposed projects related to repairs or improvements to flood damage reduction systems and located near RD 17 are described in **Table 4-6**.

Table 4-6. Related Flood Damage Reduction System Programs, and Other Delta Projects

Project Name/ Agency	Description
Delta Aqueduct Protection Levee Projects, CVFPB/DWR/EBMUD	The 2010–2013 Delta Aqueduct Protection Levee Projects were intended to reinforce sections of levees in the Sacramento-San Joaquin Delta (Delta) that protect the Mokelumne Aqueduct, which crosses the Delta and is vulnerable to flood damage. The affected levees included those that had the highest potential to suffer breaches or failure and cause harm to the water supply aqueduct. The projects, totaling approximately $41 million, involved levee crown, slope, and habitat/setback improvements at Lower Roberts Island, Lower Jones Tract, Upper Jones Tract, Woodward Island, and Orwood and Palm Tracts.
Central Valley Flood Protection Plan, CVFPB/USACE/FEMA/ U.S. Bureau of Reclamation/ local flood management agencies	The Central Valley Flood Protection Plan (CVFPP) is a long-term planning document to address flood management challenges in areas currently protected by facilities of the State Plan of Flood Control (SPFC) as part of a systemwide investment approach for sustainable, integrated flood management. The CVFPP also considers operation and management of facilities in tributary watersheds that influence SPFC-protected areas. The CVFPP is intended to provide a foundation for prioritizing Central Valley flood risk reduction and ecosystem restoration investments, including feasibility studies on the appropriate scales—from valley-wide to project-specific. The CVFPP is to be updated every 5 years, with each update providing support for subsequent policy, program, and project implementation. Following adoption of the CVFPP in 2012, regional and state-level financing documents are to guide investments in the range of $13 billion to $16 billion during the next 20–25 years. The 2017 Central Valley Flood Protection Plan Update Draft Supplemental Program EIR was released for public review in 2017.
Lower San Joaquin River Feasibility Study, USACE/CVFPB/ DWR/SJAFCA	The Lower San Joaquin River Feasibility Study is a multi-year, $10 million study, extending to the southern part of San Joaquin County along the San Joaquin River up to and through Stockton, including the Lodi wastewater treatment plant. The study includes the watersheds east of Stockton, and covers nearly 140 miles of levees. The results of this study include the needed improvements for future flood protection systems in an effort to reach or exceed the future 200-year level of flood protection. The report was authorized on July 31, 2018.
Lower San Joaquin River Urban Protection Project, SJAFCA	Projects like the Lower San Joaquin River Urban Flood Protection Project are being considered as part of the Lower San Joaquin River Feasibility Study. The Flood Protection Technical Advisory Committee has identified a possible San Joaquin County Urban Flood Protection Project, consisting of improvements to existing project and non-project levees from Lathrop to White Slough, including levees along creek channels entering from the east, plus possible modifications to New Hogan Reservoir. The Lower San Joaquin River Urban Flood Protection Project is intended to create improved urban protection between the primary and secondary zones of the Delta, to help attain state-mandated levels of flood protection for Lathrop, Manteca, and Stockton, and urbanized unincorporated areas of San Joaquin County.
San Joaquin River Restoration Program, U.S. Bureau of Reclamation/USFWS/NMFS/ DWR/CDFW/CalEPA	The goal of the program is to restore and maintain fish populations in the mainstem of the San Joaquin River below Friant Dam to the confluence of the Merced River, and to reduce or avoid adverse water supply effects on all of the Friant Division long-term contractors. The San Joaquin River Restoration Program involves reoperation of Friant Dam and downstream flow-control structures to release flows to the San Joaquin River, and diversion of surplus water during wet hydrologic conditions to the Friant-Kern and Madera canals.
Bay Delta Conservation Plan, DWR/U.S. Bureau of Reclamation	The Bay Delta Conservation Plan (BDCP) was prepared through a collaboration of state, Federal, and local water agencies, state and Federal fish agencies, environmental organizations, and other interested parties, with the goal of identifying water flow and habitat restoration actions to recover endangered and sensitive species and their habitats in California's Sacramento-San Joaquin River Delta. A range of alternatives for providing species/habitat protection and improving water supply reliability is being evaluated through the development of an Environmental Impact Statement/Environmental Impact Report. In April 2015, state and Federal agencies announced a new sub-alternative—Alternative 4A (California WaterFix) —which replaced Alternative 4 (the proposed BDCP) as the state's proposed project. Alternative 4A reflects the state's proposal to separate the conveyance facility and habitat restoration measures into two separate efforts: California WaterFix and California EcoRestore. In July 2015, DWR and the U.S. Bureau of Reclamation, the state

Table 4-6. Related Flood Damage Reduction System Programs, and Other Delta Projects

Project Name/ Agency	Description
	and Federal lead agencies for compliance with CEQA and NEPA, prepared and issued a partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement for public review and comment.
California WaterFix DWR/Conveyance Project Coordination Agency	DWR and a Joint Powers Authority made up of public water agencies are collaborating in the design and construction of California WaterFix. The objective of California WaterFix is to modernize the 50-year-old State Water Project delivery system in the Sacramento-San Joaquin Delta to improve ecological conditions in the Delta and stabilize water supplies for much of the state. The project would include construction of three new intakes on the east bank of the Sacramento River south of Hood, with two 30-mile-long, large-diameter tunnels to carry water to the existing State Water Project pumping plant in the South Delta. Mitigation for California WaterFix construction and operation is expected to include about 2,300 acres of habitat restoration and up to 13,300 acres of habitat protection (e.g. conservation easements). This additional acreage is expected to focus primarily on preserving habitat and working landscape values in the Delta.
California EcoRestore State and Federal public water agencies currently required to mitigate the ecological impacts of the State Water Project and the Central Valley Project in the Delta / Local and Federal partners	California EcoRestore is a state-led initiative to help coordinate and advance at least 30,000 acres of critical habitat restoration in the Delta over the next 4 years. California EcoRestore includes a broad range of habitat restoration projects, including projects to address aquatic, sub-tidal, tidal, riparian, floodplain, and upland ecosystem needs. Goals of the program include advancing (i.e. completing or breaking ground on) 25,000 acres associated with existing mandates for habitat restoration, pursuant to Federal biological opinions. These projects would be funded exclusively by the state and Federal water contractors that benefit from the State Water Project and the Central Valley Project systems. The program goals also include supporting at least 5,000 acres of habitat enhancements throughout the Delta through Proposition 1 grants to local governments, non-profit organizations, and other entities. Additional priority restoration projects also are expected to be identified through regional and locally-led planning processes facilitated by the Delta Conservancy. Plans for the Cache Slough, West Delta, Cosumnes, and South Delta are to be completed. Planning for the Suisun Marsh region already has been completed and a process for integrated planning in the Yolo Bypass is underway. The Delta Conservancy is leading implementation of identified restoration projects, in collaboration with local governments and with a priority on using public lands in the Delta. California EcoRestore is unassociated with any habitat restoration that may be required as part of construction and operation of new Delta water conveyance (i.e., California WaterFix).
Smith Canal Closure Structure, SJAFCA	A flood control gate would be installed in the Sacramento–San Joaquin Delta in the city of Stockton north of the Deep Water Channel to prevent flood flows from entering Smith Canal in the event of imminent or existing levee breach and during 100-year flood events (1 percent chance of occurring in any given year, or 0.01 AEP). The Final EIR for the Smith Canal Gate Project was certified in January 2015. Construction contractor bids are currently being awarded.
Paradise Cut, Califia, LLC/Cambay Group	Improvements to Paradise Cut associated with the River Islands at Lathrop Project would increase floodwater conveyance capacity of Paradise Cut. These actions would be consistent with the South Delta Flood Conveyance Plan. (See River Islands in Table 4-8.)
CALFED Levee Stability Program, Reclamation District 404	Levee improvements are being considered for a project site located on the right bank of the San Joaquin River and French Camp Slough within the "legal" Delta boundary to address under seepage and through seepage, as well as waterside erosion to reduce the flood risk to 2,000 acres of residential and industrial land. Improvements under consideration include construction of a seepage berm and installation of a slurry cutoff wall.
CALFED Levee Stability Program, Reclamation District 2064	The River Junction levee has severely eroded to almost a vertical waterside slope. Increased risk of levee failure from overtopping and erosion along the San Joaquin River could result in flood effects on people, a public school, infrastructure and a major transportation route (State Route 120). Alternatives under consideration include (1) continued maintenance coupled with stockpiled riprap for emergency response; (2) repair scoured riverbank through installation of waterside riprap below the mean summer water surface, and cover riprap

Table 4-6. Related Flood Damage Reduction System Programs, and Other Delta Projects

Project Name/ Agency	Description
	above the water surface with soil to create a 10-foot wide riparian bench; and (3) same as previous alternative with addition of fill on the landside slope to conform with the PL 84-99 Delta specific standard (Stations TBD) template, construction of a toe ditch, and relocation of the adjacent county road
Oxbow Preserve, Center for Natural Lands Management	The Oxbow Preserve, located between elements VIa.2 and VIa.4, was created in 2004 by Union Pacific Homes as mitigation for a development in the city of Lathrop. This 30-acre preserve was established to protect the federally endangered riparian brush rabbit (Sylvilagus bachmani riparius). The Center for Natural Lands Management took ownership of the Oxbow Preserve in 2004.

Notes: AEP = annual exceedance probability; CalEPA = California Environmental Protection Agency; CDFW = California Department of Fish and Wildlife; CVFPB = State Central Valley Flood Protection Board; CVFPP = Central Valley Flood Protection Plan; DWR = California Department of Water Resources; EBMUD = East Bay Municipal Utility District; FEMA = Federal Emergency Management Agency; NMFS = National Marine Fisheries Service; SJAFCA = San Joaquin Area Flood Control Agency; USACE = U.S. Army Corps of Engineers.
Sources: SJAFCA 2009a, 2009b, 2009c; Neudeck 2014; SJAFCA 2019

Development Projects

The development projects listed in **Table 4-7** are within the RD 17 service area in the cities of Manteca, Stockton, Lathrop, and unincorporated areas of San Joaquin County.

4.1.4 Cumulative Effects Analysis

Agricultural Resources

The California Department of Conservation, Division of Land Resource Conservation (DOC), tracks conversion of Important Farmlands to nonagricultural uses for the state in the biennial California Farmland Conversion Report. The acreage of Important Farmland committed to nonagricultural use in the San Joaquin Valley region and in San Joaquin County between 2014 and 2016 (the most recent data available, published in 2016) is shown in **Table 4-8**.

Urbanization, consisting of residential, commercial, and industrial land uses and supporting infrastructure (i.e., roadways, water treatment facilities, utilities, flood protection improvements), has steadily reduced the acreage of Important Farmland in the San Joaquin Valley. The 2010–2012 biennial report noted a net loss in irrigated farmland between 2010 and 2012 (DOC 2015:1). For the years between 2000 and 2012, the conversion of Important Farmland (including the Grazing category) to urban and built-up land exceeded 7,000 acres per year in the San Joaquin Valley (DOC 2002, 2004, 2006, 2008, 2011, 2014, 2015). These data show that ongoing land conversion to nonagricultural uses in the San Joaquin County has resulted in a significant cumulative effect on Important Farmland.

Table 4-7. Major Development Projects in or near RD 17

Jurisdiction	Date Approved/Anticipated	Location	Size	Significant Environmental Impacts
City of Lathrop				
Mossdale Village	Under development.	West of I-5, adjacent to San Joaquin River in RD 17.	1,161-acre residential development with an associated village center, service commercial, and highway commercial uses.	*West Lathrop Specific Plan Draft Environmental Impact Report (City of Lathrop 1995:I-4)* **Significant Unavoidable Impact** ▪ Loss of Prime Farmland ▪ Increase in regional criteria air pollutant emissions ▪ Increase in light and glare ▪ Increase in traffic congestion ▪ Increased potential for flood damage
Central Lathrop Specific Plan[1]	Entitlements approved in 2004, annexed in 2005. The major infrastructure has been constructed, but the area is largely undeveloped.	West of I-5, adjacent to San Joaquin River in RD 17 (north of Mossdale Landing).	6,800 units + 5 million sq. ft. office and commercial	*Central Lathrop Specific Plan Draft Environmental Impact Report* (City of Lathrop 2004:7-1, 7-5) **Significant Unavoidable Impact** ▪ Deficient level of service at intersections and highway segments ▪ Increase in regional criteria air pollutants during construction period ▪ Increase in long-term regional emissions ▪ Increase in traffic noise levels by 3 dBA or more ▪ Noise levels would exceed City's "normally acceptable" land use compatibility standards ▪ Loss of Important Farmland in categories of Prime, Statewide, and Local Importance ▪ Cancellation of Williamson Act contracts ▪ Direct impacts on riparian brush rabbit and loss of habitat ▪ Degradation of visual character
River Islands[1]	Approximately 430 building permits issued as of March 2016. Project is currently under construction.	Stewart Tract (bounded by Paradise Cut, San Joaquin River, and Old River; north of I-205 and west of the San Joaquin River.	Up to 11,000 units + 2 golf courses, 45-acre town center, boat docks, 260 acres of parks, 600 acres of lakes and water ways, 600 acres of open space. (City of Lathrop 2002:2-9 through 2-77). Includes improvements to Paradise Cut (a flood control bypass), consistent with the South Delta	*Draft Environmental Impact Report for the River Islands at Lathrop Project* (City of Lathrop 2002: 2-9 to 2-77). **Significant Unavoidable Impacts** ▪ Degradation of freeway and ramp operations on I-205 ▪ Degradation of freeway and ramp operations on I-5 ▪ Increases in long-term regional emissions ▪ Odors associated with water reclamation plants ▪ Conversion of 3,620 acres of Important Farmland in the Prime and Statewide Importance categories

Table 4-7. Major Development Projects in or near RD 17

Jurisdiction	Date Approved/Anticipated	Location	Size	Significant Environmental Impacts
			Flood Conveyance Plan (see Paradise Cut in **Table 4-4**).	▪ Cancellation of up to 1,770 acres of Williamson Act contracts
South Lathrop Specific Plan[4]	Approved in July 2015. Project is currently under construction.	South of SR 120 at I-5/ SR 120 split.	689 acres GPA, prezone, annexation and SP. Land uses consist of: 222 acres of limited industrial, 10 acres of commercial office, 31.5 acres of open space, and 36 acres of related public facilities.	*Draft Environmental Impact Report for the South Lathrop Specific Plan* (City of Lathrop 2013: ES-6 to ES-40). **Significant Unavoidable Impacts** ▪ Conversion of 3,620 acres of Important Farmland in the Prime, Statewide, and Unique Importance categories ▪ Potential to violate an air quality standard or contribute to an existing air quality violation ▪ Loss of known mineral resources ▪ Degradation operations at the I-120/Yosemite Avenue unsignalized intersection ▪ Decreased level of service at the Yosemite Avenue/Airport Way and Louise Avenue/McKinley Avenue intersection ▪ Degradation of existing visual character and introduction of substantial light and glare
Lathrop Gateway Business Park Specific Plan[1]	Approved May 2011. Approximately 213 acres were annexed into the city limits in 2012; awaiting annexation of the remainder of the specific plan area. Large-lot subdivision map approved in February 2015 for six developable lots for the portion within the city limits. Project is currently under construction.	South of Vierra Road and Yosemite Avenue, north of the Union Pacific Railroad tracks, east of the I-5 freeway, and north of SR 120.	Annexation of the 384 acres; approximately 57 acres of commercial office uses, 168 acres of limited industrial uses, 83 acres of service commercial uses and the remaining 77 acres in roads and public facility sites	*Draft Environmental Impact Report for the Lathrop Gateway Business Park Specific Plan* (City of Lathrop 2010). **Significant Unavoidable Effects** ▪ Conversion of agricultural land ▪ Exceedance of air quality criteria pollutant emissions standards ▪ Generation of greenhouse gas emissions ▪ Exposure of noise-sensitive land uses to traffic-related noise ▪ Degradation of existing levels of service at roadway segments
City of Manteca				
Trails of Manteca Project[2]	Approved tentative map, pending final map for 1,055 lots in 2015; no construction has occurred.	Southwestern portion of Manteca, southwest of the intersection of West Woodward Avenue and McKinley Avenue adjacent to the	477 acres, 1,651-unit residential development	*Trails of Manteca Project Draft Environmental Impact Report* (City of Manteca 2010a) **Significant Unavoidable Effects** ▪ Conversion of Important Farmland ▪ Violation of an air quality standard or substantial contribution to an existing or projected air quality violation

Table 4-7. Major Development Projects in or near RD 17

Jurisdiction	Date Approved/Anticipated	Location	Size	Significant Environmental Impacts
		dryland levee and near Oakwood Shores.		▪ Conflict with or ▪ Obstruction of the applicable air quality attainment plan ▪ Permanent increase in ambient noise levels from vehicle trips ▪ Degradation of existing levels of service on local roadway intersections
Terra Ranch[2]	Tentative map approved June 2011; final map approval for some areas of the subdivision. Areas of the subdivision are under development.	South side of West Woodward Avenue, one-half mile west of Airport Way; southern boundary is adjacent to the dryland levee.	Approximately 66 acres, 409 unit residential development	*Terra Ranch Subdivision Draft Environmental Impact Report* (City of Manteca 2010b) **Significant Unavoidable Impacts** ▪ Degradation of existing levels of service at freeway segments and SR 120/Airport Way interchange
City of Stockton				
Weston Ranch Towne Center Project[3]	City council approved December 2, 2008. Under development.	West side of I-5, north side of French Camp Road.	500,000 sq. ft. large-scale retail, 210,000 sq. ft. retail: shops, restaurants, commercial	*Weston Ranch Towne Center Mitigation Monitoring and Reporting Program* (City of Stockton 2008) **Significant and Unavoidable Impacts** ▪ Conversion of Prime Farmland (42.24 acres) ▪ Deficient level of service at Mathews Road/I-5 ramp ▪ Traffic impacts at French Camp Road/I-5 Interchange ▪ Increase in emissions of criteria air pollutants
San Joaquin County				
Oakwood Shores[4] (Oakwood Lake)	Approved and partially constructed.	South of SR 120/580 between the cities of Lathrop and Manteca.	436 lots	Not Applicable: Former sand and gravel extraction site and former site of Manteca Waterslides; was converted to lake and resort community; went into foreclosure in 2008

Notes: dBA = A-weighted decibels; GPA = general plan amendment; I-5 = Interstate 5; LAFCo = local agency formation commission; NOA = Notice of Availability; RD 17 = Reclamation District 17; sq. ft. = square feet; SP = specific plan; SR 120 = State Route 120.

1 Caguiat, pers. comm., 2016
2 Kang, pers. comm., 2016
3 Liaw, pers. comm., 2016
4 Hates, pers. comm., 2016

Source: Data compiled by AECOM in 2016 and Ascent Environmental in 2019

Table 4-8. Important Farmland Converted to Urban and Built-up Land in the San Joaquin Valley and in San Joaquin County 2014–2016

County or Region	Important Farmland Existing in 2016 (acres)	Important Farmland Converted to Urban and Built-up Land (2014–2016) (acres)
San Joaquin Valley[1]	5,591,159	14,364
San Joaquin County	615,075	1,371

Note:
1 The region consists of Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare Counties.
Source: DOC 2016:Tables A-7, A-10, A-11, A-14, A-18, A-30, A-41, A-44

Development projects (i.e., residential, commercial, industrial), infrastructure projects, and flood facilities repair and improvement projects (including the Phase 1 Repair Project, the Phase 2 Repair Project, the 2017 Emergency Flood Response Construction Project, and the 2019 Categorical Permissions Construction Project) include or would include grading and other earthmoving activities that could result in temporary disturbance to or permanent loss of agricultural resources. The Phase 1 Repair Project, Phase 2 Repair Project, 2017 Emergency Flood Response Construction Project, and the 2019 CP Construction Project made no contributions to the cumulative loss of Important Farmland because farmland was not permanently converted to nonagricultural uses for the reconstruction or construction of seepage berms. Land covered by seepage berms could be used for agricultural uses consistent with the flood control function of the facilities after project construction. Also, as noted in Table 4-4 and 4-5, neither the 2017 Emergency Flood Response Construction Project, nor the 2019 CP Construction Project, resulted in conflicts with existing zoning for agricultural land uses or Williamson Act contracts.

As described in Section 3.2, "Agricultural Resources," the estimated maximum total of Important Farmland that is expected to be permanently converted by the Phase 3 Repair Project would be approximately 14.4 acres for the Requester's Preferred Alternative. Although the acreage of land converted to nonagricultural uses is relatively small when compared with the county and region as a whole, a loss of Important Farmland would occur. Therefore, the Phase 3 Repair Project **would contribute considerably to a cumulatively significant adverse effect** related to agricultural resources.

Geology, Soils, and Mineral Resources

Development projects (i.e., residential, commercial, industrial), infrastructure projects, and flood facilities repair and improvement projects (including the Phase 1 Repair Project, the Phase 2 Repair Project, the 2017 Emergency Flood Response Construction Project, and the 2019 Categorical Permissions Construction Project) include or would include grading and other earthmoving activities that could result in temporary and short-term localized soil erosion and topsoil loss. However, these site-specific effects are not expected to combine with the effects of other activities because compliance with the National Pollutant Discharge Elimination System (NPDES) regulations, including construction site best management practices (BMPs), would help control erosion and topsoil loss at each construction site. Because effects from development projects, infrastructure projects, and flood facilities repair and improvement projects would be temporary and short-term, and soil erosion and loss of topsoil would be localized, the cumulative effect on geology and soils would be minor.

Grading and other earthmoving activities associated with the Phase 3 Repair Project under the Requester's Preferred Alternative could result in temporary and short-term localized soil erosion and topsoil loss. However, with proposed mitigation, the Phase 3 Repair Project would comply with the

NPDES regulations, including construction site BMPs, which would help control erosion and topsoil loss in the Phase 3 Repair Project area. Because the effect would be temporary and short-term, and soil erosion and loss of topsoil would be localized, implementation of the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** related to geology and soils.

Paleontological Resources

Phase 3 Repair Project elements are immediately adjacent to the San Joaquin River and are underlain by Holocene-age (less than 11,700 years old) Dos Palos Formation. By definition, to be considered a fossil, an object must be more than 11,700 years old. Therefore, construction activities that occur in the Holocene alluvium would have no effect on paleontological resources. However, the Phase 3 Repair Project also would include construction of slurry cutoff walls within the existing levees. Although Holocene-age sediments are present at the surface, excavation activities for slurry cutoff wall installation are expected to extend from 60 to 120 feet below the ground surface, and therefore, may encounter sediments of the Modesto Formation.

The Modesto Formations are considered a paleontological sensitive rock unit under Society of Vertebrate Paleontology guidelines (SVP 1995). As discussed in detail in Section 3.4, "Geology, Soils, Minerals, and Paleontological Resources," in the subsection titled "Paleontological Resource Inventory and Assessment by Rock Unit," numerous vertebrate fossil specimens have been recorded from the Modesto Formation in the cities of Stockton, Lathrop, Manteca, Modesto, and Tracy. However, discovery of paleontological resources does not necessarily constitute damage to these resources because discovery, proper investigation, and recordation of finds benefits the accumulated body of scientific knowledge. Therefore, these recorded specimens cannot be considered evidence of significant cumulative damage to paleontological resources. Incidents where paleontological resources are substantially damaged and/or not properly investigated typically are not recorded because the finds are not reported. Therefore, whether a significant adverse cumulative effect has occurred in the project region related to paleontological resources cannot be determined.

Vertebrate fossils have been recovered near the Phase 3 Repair Project area, and other vertebrate fossil locales have been recorded throughout the Sacramento area and San Joaquin Valley, all in sediments referable to the Modesto Formation, which suggests that the potential exists for uncovering additional similar fossil remains during construction-related earthmoving activities in the Phase 3 Repair Project area. Therefore, the effect of damage related to unique paleontological resources during earthmoving activities in the Phase 3 Repair Project area would be potentially significant. Possible damage to paleontological resources would be reduced to a less-than-significant level through implementation of Mitigation Measure 3.4-d, "Conduct Construction Personnel Education, Stop Work if Paleontological Resources Are Discovered, Assess the Significance of the Find, and Prepare and Implement a Recovery Plan as Required." Therefore, implementation of the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** related to paleontological resources.

Hydrology

Development projects (i.e., residential, commercial, industrial), infrastructure projects, and flood facilities repair and improvement projects (including the Phase 1 Repair Project, the Phase 2 Repair Project, the 2017 Emergency Flood Response Construction Project, and the 2019 Categorical Permissions Construction Project) include or would include grading and other earthmoving activities that could result in temporary and short-term localized soil erosion that could affect hydrology. However, these site-specific effects are not expected to combine with the effects of other activities, because compliance with the NPDES regulations, including construction site BMPs, would help control erosion at each construction site (Mitigation Measure 3.5-a1). Because effects from development projects, infrastructure projects, and flood facilities repair and improvement projects would be temporary and short-term, and soil erosion would be localized, implementation of the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** related to hydrology.

The Phase 3 Repair Project would not substantially alter groundwater recharge or groundwater levels. In addition, it would be unlikely that related and foreseeable projects would have a substantial, adverse effect on groundwater recharge, although as lands are converted from agricultural use to developed uses, some reduction in groundwater recharge from deep percolation of irrigation water could be expected. Because the Phase 3 Repair Project would not directly change land use to the extent that the rate of groundwater recharge would decrease, implementation of the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** on groundwater recharge.

Under the Requester's Preferred Alternative, the setback levee at element IVc would have much less effect on the hydraulics of the San Joaquin River compared to the setback levee proposed under Alternative 2 because much of the remnant levee under the Requester's Preferred Alternative would be maintained in place by RD 17. Thus, changes in water surface elevations and maximum flows would be very minor. Because all other construction and reconstruction activities would take place on the landside of the levee and would not alter water surface elevations in the Phase 3 Repair Project area or contribute to any such alteration, implementation of the Requester's Preferred Alternative **would *not* contribute considerably to a cumulatively significant adverse effect** on water surface elevations.

As discussed in Section 3.5, "Hydrology and Water Quality," the Phase 3 Repair Project would not result in risks associated with placement of housing or structures in 100-year floodplains, nor would it result in risks associated with levee or dam failure or seiches, tsunamis, or mudflows. Similarly, the scale of waterside vegetation plantings that may be necessary to mitigate for vegetation removal (4–6 acres) would likely be spread over a long linear area to provide shaded riverine aquatic habitat, and therefore would have only limited potential for localized effects on flood flows during high-water events. Therefore, implementation of the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** related to any of these risks.

Water Quality

Construction activities potentially could temporarily degrade water quality through the direct release of soil and construction materials into water bodies or the indirect release of contaminants into water bodies through runoff. Related projects, including development projects anticipated in the RD 17 boundaries, would have a similar potential to release materials into watercourses, thereby potentially affecting water quality of the San Joaquin River, Walthall Slough, and local water bodies, each of which support fish and other aquatic resources. Potential sedimentation, increased turbidity, or the release of and exposure to contaminants could adversely affect water quality. However, as described above, related development projects, infrastructure projects, and flood facilities repair and improvement projects would be required to comply with the NPDES regulations, including implementation of construction site BMPs, which are expected to control erosion and runoff at each construction site. Because effects from these construction activities would be temporary and short-term, and soil erosion and runoff would be localized, the cumulative effect on water quality would be minor.

For any of the alternatives under the Phase 3 Repair Project, implementation of BMPs and adherence to the conditions of a storm water pollution prevention plan would meet the requirements of the Clean Water Act (CWA) and Porter-Cologne Water Quality Control Act, as required by Mitigation Measure 3.4-a. Because of the temporary nature of any effects and the protections afforded by regulatory programs under the CWA and Porter-Cologne Water Quality Control Act, any degradation of surface waters by construction activities of the Phase 3 Repair Project and related projects would be minimized. Therefore, implementation of the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** related to water quality.

Biological Resources

Large areas of native riparian and wetland vegetation in the Phase 3 Repair Project area and Central Valley region have been lost or degraded in the past 150 years. The U.S. Fish and Wildlife Service (USFWS) estimates that over 90 percent of wetland and riparian habitat has been lost in the Central Valley compared to historic levels, and that most losses have occurred as a result of modification of flow patterns below dams, particularly channelization, and then clearing or filling behind levees for the conversion to agriculture and urban land uses. Channelization of the San Joaquin River channel over time has resulted in limited shaded riverine aquatic habitat functions, limited recruitment of large woody debris, and limited habitat conditions for native fish species and other aquatic organisms. This habitat conversion has affected many plant and wildlife species substantially, and when combined with many other modifications and alterations to habitats and the introduction of nonnative species, has resulted in various species declining and being listed as threatened or endangered under the Federal Endangered Species Act (ESA) and California Endangered Species Act (CESA).

Present and future conversions of open space lands in San Joaquin County and the region include converting agricultural lands to residential and urban development, and a number of recent flood control projects are being implemented across the Central Valley to improve the integrity of levees. Some of these flood control projects, however, would implement compensatory mitigation in the form of habitat creation and preserves designed to actually increase these habitats and their values related to ecosystem functions and special-status species. Upstream from the Phase 3 Repair Project area, the San Joaquin River Restoration Program would result in future structural and channel improvements, and instream flows to benefit special-status fish and wildlife species, including the potential reintroduction of spring-run Chinook salmon.

However, even with these benefits, the overall losses of sensitive habitats in the RD 17 area, numerous threatened and endangered species that are present, ongoing declines of other species, and continuing conversions of habitats and open space lands to various development are evidence that past, present, and reasonably foreseeable future projects combine to result in cumulatively significant effects on biological resources.

When combined with past, present, and reasonably foreseeable future projects, implementation of the Phase 3 Repair Project has the potential to contribute to the loss or degradation of sensitive riparian and wetland habitat and adversely affect special-status species. Several special-status fish occur or have the potential to occur in the San Joaquin River, and special-status wildlife, including valley elderberry longhorn beetle, Swainson's hawk, and riparian brush rabbit, are either known or have the potential to occur in the Phase 3 Repair Project area.

The Requester's Preferred Alternative potentially could temporarily degrade fish habitat and populations through the direct release of soil and construction materials into the San Joaquin River or the indirect release of contaminants into water bodies through runoff. The extensive array of development projects anticipated in the region and other flood control projects would have a similar potential to release materials into the San Joaquin River. Potential increases in sedimentation, turbidity, and contaminants could expose and adversely affect fish and aquatic habitats. However, as described above under "Water Quality," related development projects, infrastructure projects, and flood facilities repair and improvement projects would be required to comply with the NPDES regulations, including implementation of construction site BMPs, which are expected to control erosion and runoff at each construction site. Because effects from these construction activities would be temporary and short-term, and soil erosion and runoff would be localized, the cumulative effect on water quality as well as fish habitat and populations would be minor. For any of the alternatives under the Phase 3 Repair Project, implementation of BMPs and adherence to the conditions of a storm water pollution prevention plan would meet the requirements of the CWA and Porter-Cologne Water Quality Control Act, as required by Mitigation Measure 3.4-a. Because of the temporary nature of any effects and the protections afforded by regulatory programs under the CWA and Porter-Cologne Water Quality Control Act, any degradation of surface waters by construction activities of the Phase 3 Repair Project and related projects would be minimized. Therefore, implementation of the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** related to water quality for fish habitat and populations.

Potential effects on terrestrial wildlife would be associated with vegetation removal needed to clear ground for the Phase 3 Repair Project, construction disturbances to wildlife and their habitats, and permanent and temporary losses of foraging and breeding habitat for affected species. Although the majority of habitat in the area is considered low quality, even small losses could contribute to species declines, leading to the need to protect the affected species under the ESA and CESA. The primary mitigation mechanism to address these effects in the region is participation in the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP). The SJMSCP, by design, addresses cumulative effects on biological resources in San Joaquin County through the collection of impact fees from individual projects, use of these fees to purchase conservations easements and lands in fee title to preserve habitat areas and agricultural lands (which benefit many species addressed in the SJMSCP), and implementation of project-by-project effect avoidance and minimization measures. On a countywide basis, the SJMSCP is intended to achieve a no net loss of biological resources values of species and habitats addressed in the SJMSCP. The primary mitigation mechanism for the Phase 3 Repair Project to address these effects is through the creation of riparian habitat in the setback levee area, which would increase the amount of available habitat for the riparian brush rabbit, valley elderberry longhorn beetle, and many species of birds. By creating this habitat for the long-term benefit of numerous species in the project area and through the implementation of effect avoidance and minimization measures, as well as implementation of other mitigation measures included in this FEIS, the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** on biological resources.

Cultural Resources

A historical trend exists towards losses of archaeological resources as artifacts of cultural significance and as objects of research importance as a cumulative result of land disturbance from agricultural and urban development and infrastructure projects such as highways, pipelines, and flood control improvements. Past, present, and reasonably foreseeable projects, including similar flood control projects and commercial and residential development, contribute to effects on cultural resources. Because of the multiple known incidents of damage to cultural resources sites and associated losses of both cultural and scientific values, a significant adverse cumulative effect exists on cultural resources. Even in instances where historic and archeological resources are removed concurrent with scientific study, data collection, and recordation, often cultural values, which can be fully maintained only when resources are retained in their original location (e.g., Native American occupation sites), are lost or degraded.

The Phase 1 and Phase 2 Repair Projects, the 2017 Emergency Flood Response Construction Project, and the 2019 Categorical Permissions Construction Project, did not result in disturbance of archaeological resources and therefore did not contribute to cumulatively significant effects on archaeological resources. No known cultural resources sites would be affected by the Phase 3 Repair Project, although it is possible that currently unknown archaeological resources could be disturbed and cultural resources potentially could be damaged or destroyed during construction activities. Significant and unavoidable losses of a unique archaeological resource, historical resources, or historic properties within the meaning of Section 106 of the National Historic Preservation Act, could occur if excavations encounter archaeological deposits that cannot be removed or recovered (e.g., under the footprint of proposed improvements). Although mitigation would be implemented to reduce effects on potentially significant cultural resources (refer to Section 3.7, "Cultural Resources"), significant effects, particularly on archaeological resources, may still occur. Therefore, implementation of the Phase 3 Repair Project **potentially could contribute considerably to a cumulatively significant adverse effect** on cultural resources. If a significant cultural resource is encountered during project construction and it cannot be avoided, no feasible mitigation other than data collection and recordation exists to reduce the project's contribution to a cumulatively significant adverse effect.

Transportation and Circulation

In the Phase 3 Repair Project area, northbound Interstate 5 (I-5), Mathews Road on- and off-ramps, and Yosemite Avenue currently are operating below the minimum standards for operation because of traffic volumes exceeding the facilities' design capacity. The transportation system has not been able to keep pace with ongoing use. These existing adverse traffic conditions are substantial. Implementation of the Requester's Preferred Alternative would add haul-truck traffic to the circulation system. These road sections and interchanges are shown as haul routes in **Figure 2-9** and are discussed in Section 3.8, "Transportation and Circulation," in Section 3.8.2, "Environmental Setting." Implementation of either of the action alternatives was determined to be less than significant. Nevertheless, the number, location, and type of trucks potentially could contribute to cumulative traffic effects at these locations that currently are not operating at acceptable levels of service during peak-hour periods. RD 17 and its primary contractors would determine the a.m. and p.m. peak-hour periods for northbound I-5, the Mathews Road on- and off- ramps, and Yosemite Avenue. RD 17 would state on bid advertisements and all plans and specifications that no haul truck trips are to be permitted on northbound I-5, the Mathews Road on- and off-ramps, and Yosemite Avenue during the peak-hour periods. Therefore, implementation of the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** related to transportation and circulation.

Air Quality

San Joaquin County and the San Joaquin Valley Air Basin (SJVAB) are in state and Federal nonattainment for ozone and particulate matter (PM) air quality standards. Construction activities in the region, though temporary and short-term, would add additional ozone and PM emissions into the SJVAB that may conflict with attainment efforts.

To evaluate the Phase 3 Repair Project's adverse effects regionally on a cumulative basis, baseline conditions must account for the effects of past, present, and reasonably foreseeable future projects. To determine this, projects listed in **Tables 4-2**, **4-3, 4-5, 4-6,** and **4-7** were evaluated for potential adjustments to the baseline conditions for the Phase 3 Repair Project. Because emissions from the Phase 3 Repair Project would be entirely caused by temporary, short-term construction activities, determining whether emissions would be concurrent with other projects was a primary factor for consideration. Because of the extreme nonattainment status for the 8-hour ozone national ambient air quality standard (NAAQS) in the San Joaquin Valley, a cumulatively significant effect was also considered to be foreseeable.

1. Under the Requester's Preferred Alternative, construction-related Phase 3 Repair Project emissions of oxides of nitrogen (NO_X) and other criteria pollutants would not exceed the applicable annual mass emissions thresholds for the region established by San Joaquin Valley Air Pollution Control District (SJVAPCD) (see Section 3.9, "Air Quality," "Effect 3.9-a: Temporary and Short-Term Emissions of ROG, NO_X, PM_{10} and $PM_{2.5}$ during Construction" in Section 3.9.4). Because implementing the Requester's Preferred Alternative would not exceed the applicable mass emissions thresholds, , Phase 3 Repair Project construction would not result in a considerable contribution to the regional cumulative air quality condition and would not interfere with attainment of any NAAQS.

Regarding particulate matter with an aerodynamic resistance diameter of 10 micrometers or less (PM_{10}) and particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less ($PM_{2.5}$), Phase 3 Repair Project construction would not exceed SJVAPCD thresholds under any of the alternatives (see Section 3.9, "Air Quality," Section 3.9.3.2). Nonetheless, Mitigation Measure 3.9-a(1) would reduce construction-related exhaust and fugitive dust emissions by requiring dust suppression and limiting equipment idle time. Thus, considering that worst-case scenario construction-related activities would not exceed SJVAPCD-adopted thresholds for PM, and mitigation is in place to further reduce these emissions, construction-related PM emissions would not result in substantial concentrations at nearby receptors. Given that construction-related emissions would be mitigated to the extent feasible, construction-related emissions would not exceed SJVAPCD's cumulative thresholds for criteria air pollutants and ozone precursors. Therefore, the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effec**t on air quality.

Climate Change

Greenhouse gas (GHG) emissions generated by the Phase 3 Repair Project would predominantly be in the form of carbon dioxide (CO_2). CO_2 emissions would be generated from combustion sources, including operation of construction vehicles, mobile vehicles, and haul trucks. CO_2 emissions also would be generated through land use changes because of removal of existing woodlands. Construction emissions of CO_2 would be temporary and short-term and would have a less-than-significant effect for the Phase 3 Repair Project. CO_2 emissions generated through the removal of existing woodlands would result in a loss of carbon stock and a change in the existing rate of carbon sequestration. As presented in Section 3.10, "Climate Change," carbon stock estimates are based on forest types for similar project areas, based on a forest age of up to 100 years.

Carbon stock removed and changes in the sequestration potential of woodland areas would result in temporary effects compared to existing conditions. However, the temporary effects would not result in emissions in excess of the California Air Resources Board interim threshold for GHG emissions and would not result in a cumulatively significant effect. In addition, effects from GHG emissions are not localized in nature, and therefore replanting efforts planned within the project vicinity as part of the SJMSCP would provide sequestration potential similar to that of affected areas.

Annualized CO_2 emissions are small relative to any available numeric threshold and also can be considered less than cumulatively considerable. Therefore, the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** on climate change.

Noise

Ambient noise levels in the Phase 3 Repair Project area are generated by sources that include vehicle traffic on area roadways, boat activity on the San Joaquin River, and agricultural activity. The Phase 3 Repair Project implementation would result in a temporary significant effect on noise levels experienced by noise-sensitive receptors at residences that are near sites of construction activity and/or along haul routes for construction traffic. In some locations along the San Joaquin River levee, Phase 3 Repair Project construction work could take place simultaneously with the continued buildout of the Central Lathrop Specific Plan area. If construction associated with the two projects would take place at locations near one another during the same time periods, these projects would have the potential to cumulatively affect noise levels as perceived at nearby residences. Residents in these locations could be exposed simultaneously to increased noise levels from levee improvements and urban development activities, particularly during noise-sensitive hours. No feasible mitigation measures are available to reduce project-specific temporary and short-term effects associated with construction noise and truck haul traffic to less-than-significant levels. Therefore, the Phase 3 Repair Project **potentially could contribute considerably to a cumulatively significant adverse effect** related to noise.

Recreation

The Phase 1 Repair Project did not affect any recreational facilities. Construction activities for the Phase 2 Repair Project affected River Park North in element IVb and River Park South in element VIa.2. These effects were temporary and did not contribute to any cumulatively significant effects related to recreation near these projects.

Construction activities associated with the 2017 Emergency Flood Response Construction Project and the 2019 CP Construction Project disrupted recreational activities at the open space in elements IIIa and IIIb, at Mossdale Crossing Regional Park. However, these effects were temporary

Construction activities associated with the Requester's Preferred Alternative would disrupt recreational activities at Mossdale Crossing Regional Park. However, these effects would be temporary because construction-related equipment that would be visible from recreational facilities (i.e., open space, Mossdale Crossing Regional Park, San Joaquin River) would be removed after completion of construction activities. The parking lot associated with Mossdale Crossing Regional Park (elements VIcde), would be closed, preventing use of the boat ramp and passive recreational opportunities for approximately 60–90 days. However, because this closure would be temporary, implementation of the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** related to recreation.

Visual Resources

Alterations to visual resources within the RD 17 service area from past, present, and reasonably foreseeable projects have been considerable. Conversion of agricultural land for construction of urban land uses within the cities of Lathrop, Stockton, and Manteca has altered the visual character of the area by eliminating visual open space, introducing structures and paved surfaces that have degraded visual quality and introduced light and glare. Therefore, a cumulatively significant effect on visual resources already exists within the Phase 3 Repair Project area.

Construction of the Phase 3 Repair Project would require the removal and/or relocation of several features within the Phase 3 Repair Project footprint, including power poles, vegetation, and a variety of agricultural-related items (e.g., irrigation infrastructure, fences). The proposed seepage berms would remain below the top elevation of the adjacent levees, would be planted with a seed mix to control erosion, and would appear as annual grassland habitat. Thus, the berm would be visually integrated with the current agricultural uses east of the levee. Upon completion, cutoff walls would not result in any noticeable change in the visual character because they would be installed within existing levee features. Setback levees would result in altered views, but these features would appear similar to and be consistent with existing levee features in the immediate vicinity. Because effects associated with all the action alternatives would be similar regardless of differences in disturbed acreage (see Section 3.6, “Biological Resources,” for acreages), implementation of any of the proposed action alternatives would not result in a substantial change to the existing visual quality of the Phase 3 Repair Project area. Project-specific effects associated with all three action alternatives would be minor. Therefore, the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** related to visual resources**.**

Utilities and Public Services

Construction activities have the potential to cause damage to irrigation systems and public utility infrastructure, resulting in temporary disruptions to service. These effects on utilities and public services occur on a project-specific basis rather than a cumulative basis and are mitigated on a project-by-project basis through coordination with irrigation system users and service providers. Therefore, the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** related to utilities and public services.

Hazards and Hazardous Materials

Hazards and hazardous materials effects associated with construction activities occur on a project-specific basis rather than a cumulative basis. Existing Federal, state, and local regulations regarding the storage and handling of hazardous materials and wastes, the use and removal of leaking underground storage tanks, and the cleanup and remediation of leaking contaminants, hazardous wastes, and hazardous substances limit the public health and safety effects from the accidental release of and exposure to hazardous substances. Therefore, the Phase 3 Repair Project **would *not* contribute considerably to a cumulatively significant adverse effect** related to hazards and hazardous materials.

4.2 Growth Inducement

Executive Order (EO) 11988 requires Federal Agencies to “provide leadership and take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and reserve the natural and beneficial values served by floodplains in carrying out its responsibilities….” USACE’s Engineer Regulation (ER) 1165-2-26, Implementation of Executive Order 11988 on Flood Plain Management, states that USACE should, to the extent possible, avoid or minimize adverse impacts associated with use of the base flood plain.

Under NEPA (40 CFR Section 1508.8[b]), indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. NEPA (40 CFR Sections 1508[a] and [b]) requires an examination of the direct and indirect effects of the proposed project, including the potential of the project to induce growth leading to changes in land use patterns and population densities and related effects on environmental resources.

Direct growth inducement would result if a project involved construction of new housing. Indirect growth inducement would result, for instance, if implementing a project resulted in any of the following:

- substantial new permanent employment opportunities (e.g., commercial, industrial, or governmental enterprises);
- substantial short-term employment opportunities (e.g., construction employment) that indirectly stimulates the need for additional housing and services to support the new temporary employment demand; or
- removal of an obstacle to additional growth and development, such as removing a constraint on a required public utility or service (e.g., construction of a major sewer line with excess capacity through an undeveloped area).

While the RD 17 Phase 3 Project would not have a direct effect on growth inducement in the Cities of Lathrop, Manteca, and Stockton, it would reduce flood risk in the area and, thereby, indirectly support development.

4.2.1 Executive Order 11988

Engineer Regulation (ER) 1165-2-26 provides the general guidance and policy for USACE’s implementation of Executive Order (EO) 11988. EO 11988 has as an objective for avoidance, to the extent possible, of long-and short-term adverse impacts associated with the occupancy and modification of the base floodplain and the avoidance of direct and indirect support of development in the base floodplain wherever a practicable alternative exists. ER 1165-2-26 defines direct support of flood plain development as an action in the flood plain that encourages, allows, serves or otherwise facilitates additional flood plain development. Achieving flood and coastal storm risk management objectives generally cannot avoid locating actions in riverine or coastal floodplains. The Water Resources Council Floodplain Management Guidelines for implementation of EO 11988, as referenced in USACE’s ER 1165-2-26, require an eight-step process that agencies are to carry out as part of their decision-making on projects that have potential impacts to or within the floodplain. The eight steps reflect the decision-making process required in Section 2(a) of the EO. See Section 4.2.3.3, “EO 11988 Analysis,” for a summary of the eight steps and responses to them.

4.2.2 Environmental Setting

Local land use decisions are within the jurisdiction of the cities and counties within the Phase 3 Repair Project area: the Cities of Stockton, Lathrop, and Manteca and San Joaquin County. Each of these agencies has adopted a general plan consistent with state law. These general plans provide an overall framework for growth and development within the jurisdiction of each agency, including the Phase 3 Repair Project area. Within the RD 17 service area, as elsewhere, population growth and urban development are also influenced by national, regional, and local economic conditions.

Development within the RD 17 service area is directed by the Central Lathrop Specific Plan and the West Lathrop Specific Plan for the City of Lathrop, the City of Stockton General Plan, the City of Manteca General Plan, and the San Joaquin County General Plan. Development projects, planned and approved or proposed, are listed in **Table 4-8**, along with a summary of the significant unavoidable effects that were identified in the environmental impact report for each project. The majority of planned or proposed development projects would be located in Lathrop and Manteca.

4.2.3 Growth-Inducing Effects

Flood Risk Reduction Facility Repair Effects

The Phase 3 Repair Project would indirectly support growth currently approved or planned for undeveloped lands within the boundaries of RD 17. These lands have been identified as the area most suitable for urban growth in the general plans and additional planning policy documents of the Cities of Lathrop, Manteca, and Stockton and San Joaquin County. Much of the land considered for future urban growth currently is in agricultural production. USACE and RD 17 do not influence local land use decisions, and RD 17 contributes to purchases of agricultural easements through participation in the SJMSCP. Many of the projects listed in **Table 4-8** currently may be stalled by economic conditions.

The Central Lathrop Specific Plan in the city of Lathrop and the buildout of the general plan in the southwestern portion of the city of Manteca represent major growth areas within the RD 17 service area and the potential for growth-inducing effects to result from the implementation of specific plans. General plans in these areas were addressed by the environmental documents prepared for these projects. The types of environmental effects typically associated with such urban development include conversion of agricultural lands, loss of habitat, air emissions, and traffic congestion.

The City of Manteca General Plan's Draft Environmental Impact Report (DEIR) (City of Manteca 2003a) addressed growth-inducing effects that would result from adoption and implementation of the general plan. The general plan is designed to promote job creation in the service, light industrial, finance, and insurance and real estate sectors in major planned employment centers. The DEIR addressed the extent to which regulatory changes and/or infrastructure capacity provided to support the implementation of the general plan allow additional, unforeseen development in the surrounding areas. The extension of public service infrastructure (e.g., roadways, water, and sewer lines) into areas that are not currently provided with these services would be expected to support new development. The adoption of the 2023 general plan was a precursor to the update of the public facilities implementation plan, a recreation master plan, and other City of Manteca improvement plans that enable development to occur (City of Manteca 2003a:17-2).

The City of Manteca General Plan contains Land Use Policy 11, which requires the City of Manteca to manage the rate and type of growth in Manteca according to a growth management program that provides for an annual allocation of residential, commercial, and industrial development. The growth management programs consider the capacities of city facilities and services and the ability of the community to assimilate new development and consider the fluctuations in the balance of market demand for new housing and new job development (City of Manteca 2003b:2-15). City Council Resolution No. R2004-22 established a program called a "Phase 3 Point Rating System" pursuant the

City of Manteca's Revised Growth Management Program (Growth Program) (Article 18 of the Manteca Municipal Code). The Phase 3 Point Rating System is for development projects seeking project allocations involving Phase 3 sewer capacity. The system contains criteria and point ratings intended to promote the goals and policies of the general plan and Growth Program by, among other things, encouraging and promoting an orderly pattern of growth, efficient use and expansion of public services and facilities, conservation of agricultural land and natural resources, optimum public safety, improved housing opportunities, contribution to basic infrastructure, and improved public amenities.

The DEIR for the Central Lathrop Specific Plan concluded that the Central Lathrop Specific Plan would be growth inducing because it would provide additional wastewater treatment capacity beyond that needed to serve development under the Specific Plan and because the increased population associated with this development would increase demand for goods and services, thereby fostering population and economic growth in the city of Lathrop and nearby communities (City of Lathrop 2004:6-5).

The DEIR for the City of Stockton General Plan concluded that implementation of the general plan would directly induce population, employment, and economic growth by allowing development and associated infrastructure in areas that are currently undeveloped (City of Stockton 2018: 6-1). While the City of Stockton General Plan does allow growth, it also includes the Open Space and Agriculture designation in the proposed land use map and policies and actions that would control the geographical extent of growth and encourage sustainable patterns of urban land uses. Thus, because the City of Stockton General Plan commits to only allow development where infrastructure is in place or is planned, there would be less-than-significant indirect growth-inducing effects (City of Stockton 2018:6-2 and 6-3).

In addition to the general plans and specific plans described above, which have undergone the process of CEQA review, San Joaquin Council of Governments (SJCOG) has adopted the San Joaquin County Regional Blueprint (Blueprint). The Blueprint is a regional vision addressing transportation, land use, and the environment. As a vision, the Blueprint recognizes that economic, environmental, and social issues are interdependent and integrated approaches necessary in order to effect needed changes. The Blueprint provides a long-term planning framework that shows how the region collectively could respond to growth and infrastructure challenges in a comprehensive manner. Among the Blueprint's Performance Measures and Indicators is the guiding principle of Sustainable Planning and Growth with goal of s*upporting innovative strategies that target growth in existing urban areas, with an emphasis on efficient design, land conservation, infill, and redevelopment.* Although the Blueprint was adopted by SJCOG in March 2010, it is not a land use plan as such, and was not subject to CEQA review. The Blueprint supports the principles found in partner agency general plans; however, the cities and San Joaquin County retain the land use planning responsibilities within their own jurisdictions (SJCOG 2010).

The above-described general plan and specific plan documents evaluated expected growth that could occur with the implementation of the respective specific plans and general plans. This information indicates that based on substantial evidence, the Phase 3 Repair Project would indirectly support planned growth in the area in a manner consistent with adopted local growth management plans and the state's emerging State Plan of Flood Control.

4.3 Executive Order 11988 Analysis

The following sections discuss the analysis undertaken by USACE to comply with EO 11988.

1. Determine if the proposed action is in the base floodplain.

The overall purpose of the Phase 3 Repair Project is to implement landside levee repairs along portions of the approximately 19-mile RD 17 levee system to assure the performance of the existing levees (based on the USACE's new levee seepage criteria) so that they continue to reduce the risk of flooding in the RD 17 service area during a 1/100 annual exceedance probability (AEP) flood event. The Phase 3 Repair Project would involve repairing existing levees or constructing new levees in the base floodplain. The base floodplain is delineated as all areas that are at risk of being flooded by the 1/100 AEP flow. In other words, the base floodplain has been delineated by assuming that existing levees do not provide protection from the 1/100 AEP event. This is because this definition of the base floodplain addresses the USACE requirement in ER 1105-2-101 to describe a project's performance using risk and uncertainty methods, and ER 1105-2-101 does not require USACE to give deference to the current accreditation for RD 17's levee system, provided by the Federal Emergency Management Agency (FEMA) in 2011. For this reason, the entire area was evaluated for EO 11988 compliance.

2. If the action is in the base floodplain, identify and evaluate practicable alternatives to the action or to location of the action in the base floodplain.

The Water Resources Council Floodplain Management Guidelines and ER 1165-2-26 define "practicable" as "capable of being done within existing constraints. The test of what is practicable depends upon the situation and includes consideration of the pertinent factors, such as environment, cost or technology." The alternatives considered in this FEIR are discussed in detail in Section 2.2, but only the practicable alternatives that were considered are discussed below:

- **No Action:** This alternative would involve no Federal action within the base floodplain. No additional reductions in flood risk to the area would be realized.

- **Minimum Footprint Alternative:** This alternative would encompass the proposed method(s) for reducing flood risk at each levee element that would result in the least disturbance relative to other options under consideration for the same element. This action alternative would include right-of-way acquisition, removal of all landside vegetation within 15 feet of the landside toe of the levee, and the trimming of the upper one-third of the waterside levee slope for all Phase 3 Repair Project levee elements.

- **Maximum Footprint Alternative:** This alternative would encompass the proposed method(s) for reducing flood risk for each levee element that would result in the greatest disturbance relative to other options under consideration for the same element. As with the previous action alternative, this action alternative would include right-of-way acquisition, removal of all landside vegetation within 15 feet of the landside toe of the levee, and the trimming of the upper one-third of the waterside levee slope for all Phase 3 Repair Project levee elements.

- **Requester's Preferred Alternative:** This alternative would include improvements to 11 elements in the minimum footprint and maximum footprint alternatives. Alternatives 1 and 2 contain 19 elements, but 8 of these elements have been completed. Therefore, the Requester's Preferred Alternative only consists of the 11 remaining Phase 3 Repair Project elements (see Table 2-12). Of the 11 elements comprising the Requester's Preferred Alternative, the proposed flood risk reduction methods would include the same method as under both Alternatives 1 and 2 at two elements, the same method as under Alternative 1 at four elements, the same method as under Alternative 2 at one element, and a different method than used in either Alternative 1 or 2 at the remaining three elements. As with the previous action alternatives, the Requester's Preferred Alternative would include right-of-way acquisition, removal of all landside vegetation within 15 feet of the landside toe of the levee, and the trimming of the upper one-third of the waterside levee slope for all Phase 3 Repair Project levee elements.

- **Continuous Setback Levee:** RD 17 also considered constructing new setback levees because they not only could provide flood protection infrastructure, but also could reduce water surface elevations through the expansion of the floodway and would provide habitat restoration/enhancement opportunities. However, a continuous levee setback approach was not practicable for the RD 17 levee system because substantial cost implications and land acquisition difficulties make the approach infeasible. See Section 2.3.2 for a more detailed discussion on the reasons this alternative was determined to be infeasible.

3. If the action must be in the floodplain, advise the general public in the affected area and obtain their views and comments.

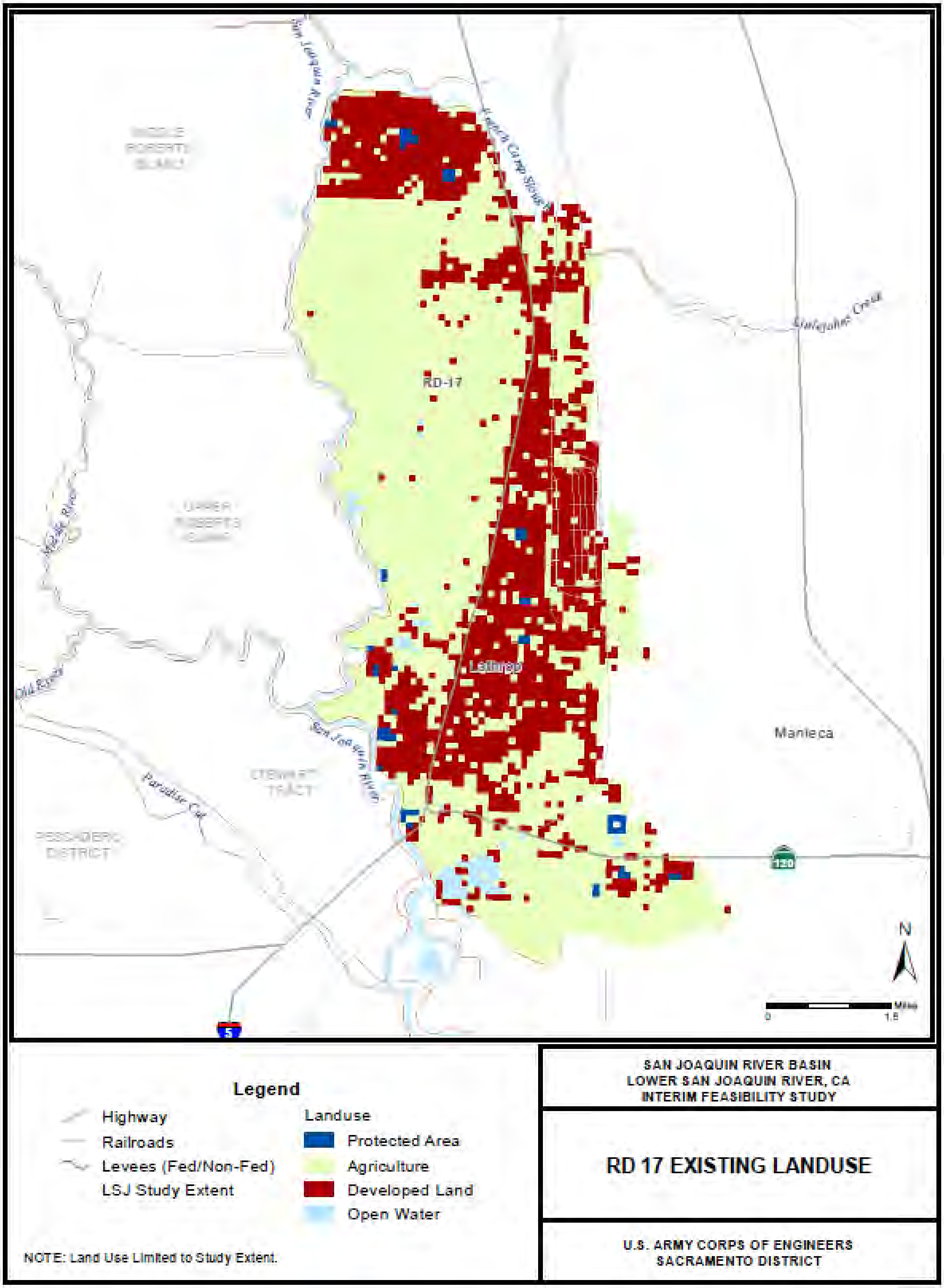
Early public review has been conducted through public scoping via a published CEQA Notice of Preparation of an EIR and a NEPA Notice of Intent to Prepare an Environmental Impact Statement, and a request for comments. A public scoping meeting was held and public comments received on the proposed Phase 3 Repair Project. Interested parties and resource agencies have been coordinated with during the course of the review. The DEIS/DEIR was released in 2011 and open for public comments as well. Additional opportunities for public input and comment are provided during the review period for this FEIS.

4. Identify beneficial and adverse impacts due to the action and any expected losses of natural and beneficial floodplain values. Where actions proposed to be located outside the base floodplain will affect the base floodplain, impacts resulting from these actions should also be identified.

a) Beneficial impacts because of the action

By improving flood risk management for the RD 17 project levees, the risk would be reduced to approximately 19,600 acres of mixed-use lands with a current population estimated at 43,000 people and an estimated $5 billion in damageable property. **Figure 4-1** shows the breakdown of land usage within the RD 17 area; currently 13,000 acres are used for agricultural purposes. The LSRP levees also provide flood risk management for critical infrastructure, including 18 schools, 33 long-term care facilities, a minimum security facility, a juvenile detention facility, a children's shelter, fire and police stations, the county jail, Sharpe Army Depot, and a hospital, along with major transportation routes including I-5 and State Route 120, and two Union Pacific Railroad lines.

Figure 4-1. Existing Land Use in Study Area



Source: Data compiled by USACE in 2016

b) Adverse impacts because of the action

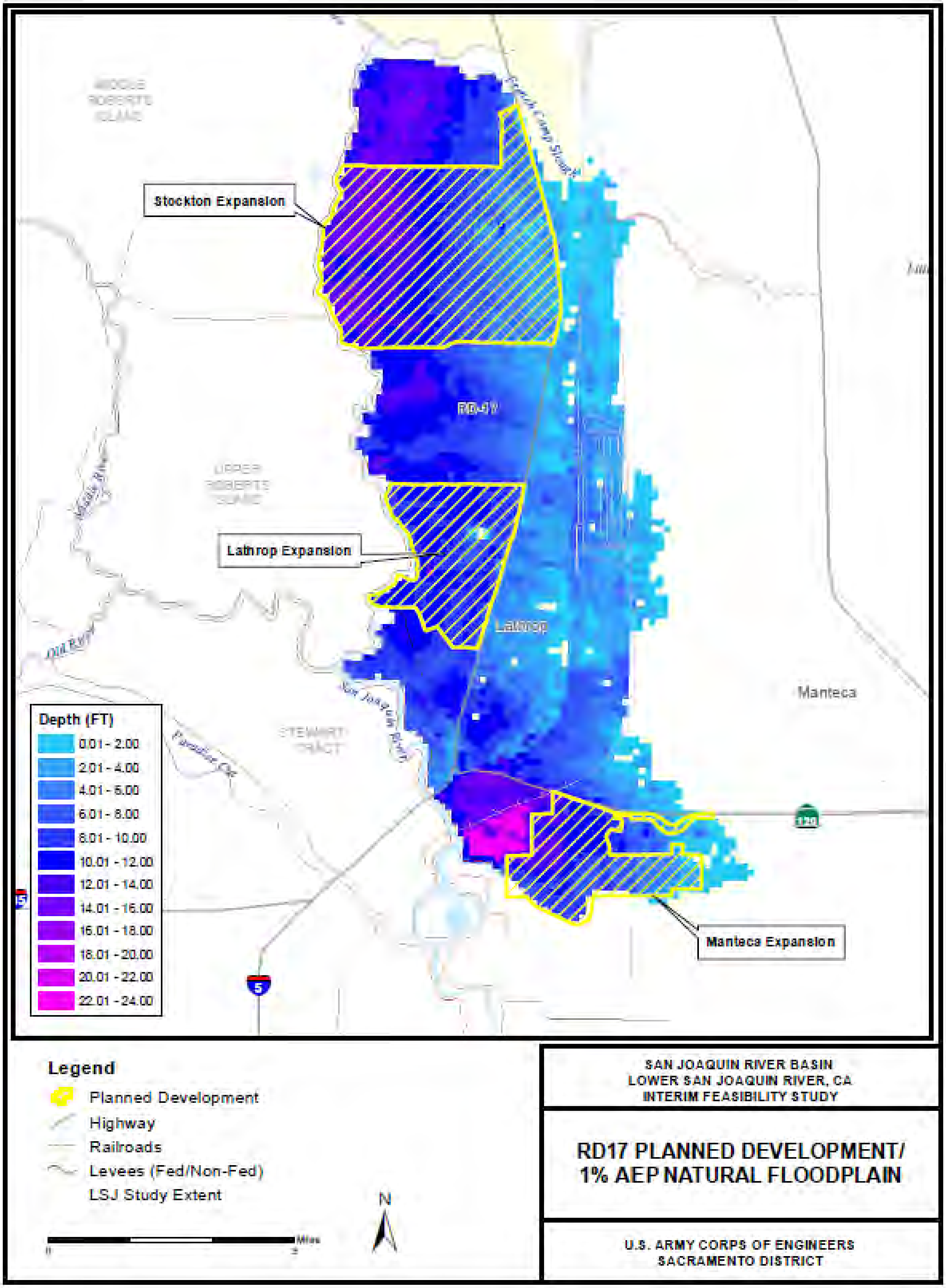
The proposed Phase 3 Repair Project would likely induce growth by providing a higher degree of flood risk management [reduced flood risk] which would indirectly support development of disturbed but not yet urbanized areas of Stockton, Lathrop, Manteca and unincorporated San Joaquin County. The Stockton, Manteca and Lathrop General Plans have designated approximately 5,300 acres for urbanization within the RD 17 area. A majority of the 5,300 acres would be new urbanization versus infill. In addition, approximately 7,200 acres of disturbed but not yet urbanized land would be available for future development if the local communities update their General Plans. The RD 17 levee system currently is accredited by FEMA; therefore, the area currently has no Federal restriction associated with development, and proposed development could go forward, subject to compliance with various state zoning laws, such as California Senate Bill (SB) 5. **Figure 4-2** shows the planned development areas in the RD 17 area and inundation depths for the base flood (1/100 AEP event).

While the proposed Phase 3 Repair Project would indirectly support development in the RD 17 area, some measures would temper the development. In addition to the General Plans and local building and zoning ordinances, the state enacted Senate Bill (SB) 5 in October 2007, which compels communities in the Central Valley to provide a plan for achieving 1/200 AEP flood risk management (200-year) for urban and urbanizing areas (a population greater than 10,000) by 2016, and to have substantially accomplished or implemented those plans by 2025. The requirements extend beyond levee structural requirements and include other measures, such as easements, to allow future improvements and flood emergency measures. Implementation of proposed structural improvements would meet certain compliance requirements for SB 5. SB 5 required the state to establish a Central Valley Flood Protection Plan by July 2012. Additional improvements likely will be necessary by non-Federal agencies to fully comply with SB 5. The penalty for non-compliance is a moratorium on future development until the appropriate level of flood risk management is attained.

c) Expected losses of natural and beneficial floodplain values

The natural floodplain would not be reduced in the study area by the proposed action. The natural floodplain has been greatly reduced in the study area by the manner in which the existing levee system was constructed in the early twentieth century. The system was constructed with the levees in close proximity to the active river channel, to maximize development of arable land for agriculture, followed by urban growth of the Stockton, Lathrop and Manteca communities into unincorporated areas of San Joaquin County. The Flood Control Act of 1944 provided USACE with authorization to further improve the levee system. The Standard Operation and Maintenance Manual for the Lower San Joaquin River Levees, Lower San Joaquin River and Tributaries Project, California (USACE 1959) describes the protection provided by the LSRP levees: “The Lower San Joaquin and Tributaries Project will provide protection from all floods of record to about 120,000 acres of fertile agricultural lands; to a suburban area south of the city of Stockton and about four small communities; to other areas developed for residential and industrial purposes; to two transcontinental highways and other state and County highways from all floods of record. The project made possible the reclamation of areas that can be developed to a higher degree when protection against flood hazard is assured.” The natural floodplain has been separated from the river channels by the levee system so that the functionality and natural values are severely constrained. Because of the

Figure 4-2. Planned Development in RD 17 and the 100-year Inundation Area



Source: Data compiled by USACE in 2016

urbanization, few opportunities exist for restoration of the natural floodplain in the study area. As described in step 5 below, approximately 3,250 acres of planned development with infrastructure improvements are in place in the Lathrop portion of the RD 17 area.

Current placement of the levees and activities related to the improvements to those levees would reduce the beneficial values of water resources (i.e., natural moderation of floods, water quality maintenance, and ground water recharge); living resource values (i.e., fish, wildlife, and plant resources) and cultural resource values (i.e., open space, natural beauty, scientific study, outdoor education, and recreation). Continuing urban development of the floodplain would have additional adverse effects on these values. Some benefits would occur to cultivated resource values (i.e., agriculture, aquaculture, and forestry) resulting from implementation of proposed improvements.

USACE permission for local improvement of the levee is not prohibited by EO 11988; however, any future recommendations regarding investment in levee improvements through the USACE civil works program would also require the consideration of residual risks, including potential increased economic losses and loss of life due to induced floodplain development.

5. If the action is likely to induce development in the base floodplain, determine if a practicable non-floodplain alternative for the development exists.

In RD 17, agriculture was followed by the urban growth of the Stockton, Lathrop, and Manteca communities into unincorporated areas of San Joaquin County. Because of the urbanization, large populations already are in the RD 17 basin. Although the city limits of Stockton and Manteca have areas not yet urbanized that are outside the floodplain, the city of Lathrop is entirely within the floodplain. As noted in Section 4.b above, USACE approval of the proposed levee Phase 3 Repair Project would indirectly support development in the floodplain by providing a higher degree of flood risk management. The City of Lathrop has no practicable alternatives to development within the floodplain because of its location. Within the city of Lathrop, approximately 3,200 acres of infrastructure (e.g., utilities, roads) have been placed in anticipation of additional development. The following discussion describes some of the major investments that already have occurred in Lathrop that would make it difficult to relocate some of the planned development:

West Lathrop Specific Plan Area: This location includes vacant areas in the Mossdale Village portion of the West Lathrop Specific Plan Area and includes 230 acres of undeveloped land owned by Silviera plus 131 acres under various ownerships. Full infrastructure has been constructed to bring the transportation network and utilities (i.e., water, sewer, storm drainage, and flood control) to these properties, and most properties are paying special property tax assessments for these improvements. The over-sizing of these improvements anticipates, and requires, that the remaining area within Mossdale be developed to pay back these costs. Tens of millions of dollars have been spent on this infrastructure.

Central Lathrop Specific Plan Area: This includes 1,520 acres that have been master-planned and annexed into Lathrop. Improvements include sewer and storm drain collection systems to serve the overall plan area. Approximately $200 million in assessments have been approved, and $50 million already have been sold, plus another $50 million in developer equity to construct infrastructure.

Gateway Specific Plan Area: This includes 384 acres of industrial and commercially zoned property in an approved Specific Plan and EIR. Much of the land already has been annexed and is under active development planning. Millions of dollars have been spent on this entitlement planning, and tens of millions are about to be spent on infrastructure.

East (historic) Lathrop: This includes two underdeveloped areas, including 168 acres on McKinley near Shideler Parkway, and 253 acres in the Louise/Park Avenue area. This was a portion of the original city of Lathrop boundaries, has full utilities and adjacent arterial roadways, and is under active development planning. Tens of millions of dollars have been spent on infrastructure.

Roth Road Area: This area of 250 acres is adjacent to the northern border of Lathrop, and so fronts a major arterial with existing water mains for build-out, paid for by assessments on the undeveloped parcels. All utilities in this area have been masterplanned, and detailed plans for storm drainage and sewer service currently are under review, to allow for build-out of this area. Millions of dollars have been spent on infrastructure, and tens of millions are about to be spent to allow development in this area.

South Lathrop Specific Plan Area: This area is within the original 1989 General Plan boundaries of Lathrop. This 315-acre industrial and commercial area has a completed Specific Plan, Development Agreement, and EIR that will come to City Council for approval in the near future. Millions of dollars have been spent on these entitlements.

Another example is located within the deepest area of flooding in Manteca. The Oakwood Shores development is fully developed, with roads and utilities, and many of the lots already contain housing. As **Figure 4-2** shows, the proposed urbanization in the RD 17 area occurs in the deepest areas of inundation. Although some of the planned development could be relocated from the deepest areas of inundation, it may not be practicable to fully relocate all future development outside the floodplain.

6. Determine viable methods to minimize any adverse impact of the action including any likely induced development for which there is no practicable alternative and methods to restore and preserve the natural and beneficial floodplain values. This should include reevaluation of the "no action" alternative.

The No Action alternative would leave approximately 43,000 current residents, 10,698 residential units, 182 nonresidential (commercial/industrial) properties, and critical infrastructure behind existing levees that have through and under seepage gradients not meeting current engineering standards. Viable methods to minimize adverse impacts and methods to restore and preserve natural and beneficial floodplain values were considered and incorporated when practicable. As discussed, the historic placement of levees in the RD 17 area precludes opportunities for large-scale restoration or enhancement of natural floodplain values. Under the No Action alternative, a potential still exists for development in RD 17 and the existing 43,000 residents, 10,698 residential units, 182 nonresidential (commercial/industrial) properties and critical infrastructure to continue to be exposed to flood risk. A number of laws and policies already are in place to minimize risk for any induced development, and ongoing flood risk reduction actions already are being implemented in the RD 17 area. These include the following:

Land Use Regulation and Development Restrictions: State law requires that every city adopt a "General Plan" that incorporates a long-term framework for the physical development of the city itself and any outlying land that is necessarily related to the city's land use planning (California Government Code Section 65300). Although a city may add optional elements, each General Plan must include seven mandatory elements—land use, circulation, housing, conservation, open space, noise, and safety (California Government Code Section 65302). The San Joaquin County 2035 General Plan was adopted in December 2016. The City of Lathrop amended its General Plan in July 2015, to incorporate the requirements of SB 5.

The General Plan is considered the "constitution for all future development." Furthermore, zoning ordinances are used to establish land uses that are included in a General Plan. Therefore, no development may occur within a given California city unless such development is consistent with the zoning and land use elements that are codified in a valid General Plan. In the case where approving a land use decision would require amending the general plan, the City must follow a complicated procedure involving comment by numerous agencies and public hearings before the Planning Commission and City Council. (California Government Code Section 65350 et seq.)

California's State Zoning Law gives all cities and counties the authority to divide land within a given entity's jurisdiction into use districts (California Government Code Section 65800 et seq.). In addition, zoning laws allow a City or County to regulate the size and shape of physical structures. Zoning ordinances typically classify use districts into four different types: residential; commercial; industrial; and agricultural. Within each use category, the City may impose a different set of restrictions to regulate both the use to which a landowner may dedicate property and the size and placement of physical structures on the property. City and County zoning ordinances receive an extreme degree of deference from the courts, because they need only be "reasonably related" to the promotion of the public welfare.

Land use in areas at risk from flooding is highly regulated in California. SB 5 required the state to establish a Central Valley Flood Protection Plan by July 2012. The Central Valley Flood Protection Board (CVFPB) adopted the plan on June 29, 2012. Within 2 years of the adoption (by July 2014), communities in the Central Valley had to amend their General Plans to include the data and analysis contained in the plan, identify goals and policies for the protection of lives and property from flooding, and include related feasible implementation measures.

Development in a flood hazard zone is allowed only if the City or County can find, based on substantial evidence in the record, that urban or urbanizing areas will be protected to higher levels of flood protections (a 200-year-flood protection level.) Therefore, as of mid-2016, cities and counties in the RD 17 area are prevented from entering into development agreements, approving discretionary permits, approving a ministerial permit that would result in construction of a new residence, and approving subdivision or parcel maps in urban or urbanizing areas without a finding of 200-year-flood level protection.

In addition, the cities and county in the RD 17 area participate in the National Flood Insurance Program (NFIP) and must conform to FEMA regulations regarding approval of development and/or the type of development that may occur. These regulations have severe growth-limiting measures for areas that are mapped in the 100-year floodplain. FEMA also incentivizes cities and counties (through reduced NFIP insurance rates) to limit or regulate development in the floodplain.

Enlarged Right-of-Way: When urban development occurs in the RD 17 area, RD 17 would require a minimum of a 50-foot land-side right-of-way at the landside levee toe, to accommodate possible future Phase 3 Repair Projects to the levee system and eliminate the potential for levee encroachments. The enlarged landside right-of-way is used for open space and recreation.

San Joaquin County Multi-Species Habitat and Conservation and Open Space Plan: The agencies that govern land use in the RD 17 area (i.e., San Joaquin County and the cities of Lathrop, Manteca, and Stockton) have adopted the SJMSCP. The SJMSCP has been approved by USFWS as a certified Habitat Conservation Plan (HCP). HCPs provide a pathway forward to balance wildlife conservation with development. The primary objective of the HCP program is to conserve species and the ecosystems they depend on while streamlining permitting for economic development. Provided by the ESA, "regional" HCPs (such as the SJMSCP) are a successful conservation tool because they can anticipate, prevent, and resolve controversies and conflict associated with project-by-project permitting. They do this by addressing these issues on a large regional scale, collaboratively and over the long term.

The SJMSCP Planned Land Use Map also identifies the boundaries for expected urban development and anticipated annexation areas, and provides conservation strategies to offset the impacts of development. At the state and Federal levels, the SJMSCP provides adequate compensation and measures for avoiding impacts on plants, fish, and wildlife for the SJMSCP, pursuant to CESA, the California Native Plant Protection Act, the ESA, Section 404 of the CWA, Section 10 of the Rivers and Harbors Act of 1899, and the Migratory Bird Treaty Act (MBTA) for listed SJMSCP Covered Bird Species also protected under the MBTA, as these laws relate to California Department of Fish and Wildlife (CDFW), USFWS, and USACE responsibilities for Covered Species with respect to SJMSCP Permitted Activities located within the boundaries of San Joaquin County. Adoption and implementation of the SJMSCP by local planning jurisdictions provides adequate compensation for and minimization of impacts on plants, fish, and wildlife for SJMSCP permitted activities as necessary to implement conservation and open space policies of local General Plans, for wildlife, and as necessary to fulfill the obligations of local jurisdictions with respect to the analysis, minimization, and mitigation of impacts on plants, fish, and wildlife, pursuant to the state and Federal laws described above as well as to CEQA and NEPA.

The SJMSCP is designed to provide 100,841 acres of preserves, based on an estimated conversion acreage of 109,302 acres. The SJMSCP anticipates acquiring land primarily through conservation easements and fee title at a ratio of approximately 90 percent easements to 10 percent fee title acquisition. Establishment and/or use of mitigation banks and in-lieu land dedications also plays a role in preserving habitats under the SJMSCP. The SJMSCP has over 30 preserves, totaling 11,883 acres of land in San Joaquin County that has been permanently protected for habitat pursuant to its program.

Emergency Response Plan: RD 17, in coordination with the San Joaquin County Office of Emergency Services, has developed a robust program of flood emergency preparedness and response for the RD 17 area. A key component of this program is the RD 17 Flood Safety Plan (FSP), which was developed by RD 17 to ensure effective collaboration with other jurisdictions performing emergency functions in the RD 17 area. The FSP is used in conjunction with the emergency operations plans of the state and the San Joaquin Operational Area to facilitate multi-jurisdictional coordination in the RD 17 area during a flood emergency. The FSP is structured as a traditional functional emergency operations plan, in accordance with Comprehensive Preparedness Guide 101 issued by FEMA (FEMA 2010), and meets the requirements of Section 9650 of the California Water Code. The FSP requires RD 17 to comply with the provisions of the National Incident Management System Training Program and also with California Standardized Emergency Management System training requirements.

Annual Flood Risk Notifications: Annual flood risk notifications are mailed to all property owners in the RD 17 area. The risk notification informs property owners that levees reduce but do not eliminate the risk of flooding for properties and structures protected by levees. The risk notification encourages property owners to purchase flood insurance and provides access to information on how property owners can reduce their flood risk.

7. If the final determination is made that no practicable alternative exists to locating the action in the floodplain, advise the general public in the affected area of the findings.

The public has been notified through the release of the FEIS.

8. Issue findings

Existing federally authorized levees historically were placed in close proximity to the river channels, reducing the extent of the natural floodplain in the area. Existing infrastructure (such as transportation routes, housing, agricultural improvements, levees, and drains) limits the potential for restoration of the San Joaquin River's natural hydrology and ecosystem functions. The proposed placement of development within the RD 17 basin is in the deepest part of the floodplain (with the highest life-safety consequence). Local communities have developed emergency response plans, distributed information concerning flood risk by mailing fliers, and adhered to land use regulation and development restrictions in an attempt to minimize any adverse impacts of the proposed Phase 3 Repair Project. As noted in Section 4.b above, USACE approval of the proposed Phase 3 Repair Project would facilitate development by reducing flood risk which would likely induce development. Although further development will likely occur within the base floodplain, no practicable alternative exists to provide flood risk reduction for the current population and infrastructure. Based on the above evaluation, the proposed Phase 3 Repair Project is compliant with EO 11988.

Critical Actions

Repeat steps 1 through 8 above for critical actions in the critical action floodplain for the full range of potential residual flood risks. The critical action floodplain is defined as the 500-year floodplain (0.2 percent chance floodplain).

1. Determine whether the proposed action is in the critical action floodplain.

   The entire area delineated in **Figure 4-2** is included in the critical action floodplain (500-year floodplain). The proposed Phase 3 Repair Project being analyzed is within the critical action floodplain.

2. If the action is in the critical action floodplain, identify and evaluate practicable alternatives to the action or location of the action in the base floodplain.

No practicable alternatives exist to the proposed Phase 3 Repair Project being situated within the critical action floodplain. See Base Flood Plain Step 2.

3. If the action must occur in the critical action floodplain, advise the general public in the affected area and obtain their views and comments.

   See Base Flood Plain Step 3.

4. Identify potential beneficial and adverse impacts resulting from the action and any expected losses of natural and beneficial floodplain values. When actions proposed to be located outside the 0.2 percent floodplain will affect the 0.2 percent floodplain, impacts resulting from these actions also should be identified.

   Beneficial impacts resulting from the action would include improved flood risk reduction to the current critical infrastructure in the RD 17 area. The critical infrastructure currently located in the critical action floodplain includes two major inter-state and international highways (I-5, State Route 99), four hospitals, nine fire stations, eight police stations, three railroads, a wastewater treatment plant, Sharpe Army Depot, and an airport, and currently consists of the developed portions of the cities of Stockton, Lathrop and Manteca. No liquefied natural gas terminals and facilities are producing and storing highly volatile, toxic or water-reactive materials. The current population at risk is approximately 235,047 people within the 0.2 percent AEP (500-year) natural floodplain, and economic damages as defined by damageable property would amount to $21 billion. If flooded, an added dimension to the disaster would be a possible wastewater treatment plant containment failure, which would affect water quality in the Delta and could interrupt water deliveries to communities in the southern valley and southern California.

   The most likely mode of failure for the RD 17 basin is under or through seepage of the existing levee. Flooding from a geotechnical-type levee breach would be expected to occur with little to no advance warning (less than 1 hour), and the flood wave rapidly would inundate the immediately adjacent areas. The flood warning time would likely be greater for an overtopping-related breach (24 to 48 hours). Effective evacuation would be highly unlikely to occur if an unforeseen levee breach happens along the San Joaquin River. This would be likely to lead to loss of life and injury. The proposed Phase 3 Repair Project would improve the current through and underseepage, reducing the likelihood of a geotechnical-type levee breach. This would provide increased flood risk reduction to the residences, commercial/industrial properties, and critical infrastructure already in place.

   Adverse impacts because of the proposed action include the likely possibility for additional critical infrastructure being located within the RD 17 basin, potentially in the deepest areas of flooding, thereby increasing the critical infrastructure already in place. The RD 17 levee system currently is accredited by FEMA; therefore, the area currently has no Federal restriction against further critical infrastructure development.

   See Base Flood Plain Step 4 above for a description of the expected losses of natural and beneficial floodplain values.

5. If the proposed action would be likely to induce development in the critical action floodplain, determine whether a practicable non-floodplain alternative exists for the development.

   USACE approval of the proposed levee Phase 3 Repair Project would result in reduced flood risk within RD 17, which would likely induce growth by indirectly supporting development. Opportunities may exist to locate some future critical facilities outside the critical action floodplain. However, facilities such as schools and fire stations have to be placed within close proximity to any future development. Therefore, if development occurs as shown in **Figure 4-2**, no practicable non-critical action floodplain alternative would exist for these critical facilities.

6. Determine viable methods to minimize any adverse impact of the proposed action, including any likely induced development for which no practicable alternative and methods to restore and preserve the natural and beneficial floodplain values exist. This should include reevaluation of the No-Project Alternative.

   See Base Flood Plain Step 6.

7. If a final determination is made that no practicable alternative exists to locating the proposed action in the floodplain, advise the general public about the affected area.

   See Base Flood Plain Step 7.

8. Issue Findings.

   Existing, federally authorized levees historically were placed in close proximity to river channels, reducing the extent of the natural floodplain in the area. Existing critical infrastructure is located within the critical action floodplain. Although further critical facility development would likely occur within the critical action floodplain, no practicable alternative exists to provide flood risk reduction to existing critical infrastructure. Based on the above evaluation, the Phase 3 Repair Project would be compliant with EO 11988.

Results of EO 11988 Analysis

Based on the analysis required for compliance with EO 11988 as discussed above, the Phase 3 Repair Project would reduce flood risk which would likely induce growth in the floodplain by indirectly supporting development. General Plans in the local communities have been updated to comply with the Central Valley Flood Protection Plan. In addition, SB 5 would require communities in the Central Valley to provide a plan for achieving a 1/200 AEP level of protection for urban and urbanizing areas by 2016. The Phase 3 Repair Project would not be likely to meet this objective. Because 43,000 local inhabitants, 10,698 residential units, 182 nonresidential (commercial/industrial) properties, and critical infrastructure currently are at risk of flooding from a levee breach from seepage and under seepage, no other practicable alternatives exist to the Phase 3 Repair Project.

4.4 Relationship Between Short-Term Uses of the Environment and Long-Term Productivity

NEPA requires that an EIS include a discussion of the relationship between short-term uses of the environment and long-term productivity. Within the context of this FEIS, "short term" refers to the construction period, while "long term" refers to the operational life of the project and beyond.

Project construction would result in short-term construction-related effects, such as interference with local traffic and circulation, and increased air emissions, ambient noise levels, dust generation, and disturbance of wildlife. These effects would be temporary, occurring only during construction, and are not expected to alter the long-term productivity of the natural environment. Project implementation also would result in long-term effects, including permanent loss of farmland, changes in visual resources, and limited adverse effects on existing wetlands and woodland habitat.

Project implementation also would assist in the long-term productivity of the environment by improving the levee system that protects the RD 17 service area, by reducing the overall flood risk. This benefit would contribute to the long-term productivity of farmlands within the boundaries of RD 17; protect terrestrial species of plants and animals from flood impacts; protect the health and safety of thousands of residents, visitors, and highway travelers; and protect billions of dollars of public and private investment, including critical facilities; and this would outweigh the long-term effect of conversion of a limited amount of farmland located in the project footprint. The potential long-term adverse effect of permanent loss of habitat from the landside of levees would be mitigated to a less-than-significant level. Therefore, the long-term beneficial effect of the Phase 3 Repair Project would outweigh its potentially significant, short-term effects on the environment.

4.5 Irreversible and Irretrievable Commitment of Resources

NEPA requires that an EIS include a discussion of the irreversible and irretrievable commitments of resources that may be involved if the project is implemented. The irreversible and irretrievable commitment of resources is the permanent loss of resources for future or alternative purposes. Irreversible and irretrievable resources are those that cannot be recovered or recycled, or those that are consumed or reduced to unrecoverable forms. Project implementation would result in the irreversible and irretrievable commitment of energy and material resources during project construction and maintenance, including the following:

- construction materials, including such resources as soil and rocks;
- land and water area committed to new/expanded project facilities; and
- energy expended in the form of electricity, gasoline, diesel fuel, and oil for equipment and transportation vehicles that would be needed for project construction, operation, and maintenance.

The use of these nonrenewable resources is expected to account for only a small portion of the region's resources and would not affect the availability of these resources for other needs within the region. Construction activities would not result in inefficient use of energy or natural resources.

Energy used during project construction and operation would be expended in the form of electricity, gasoline, and diesel fuel, which would be used primarily by construction equipment and haul trucks during project construction and operation and maintenance activities (e.g., levee patrolling and flood fighting). Therefore, reactive organic gases (ROG), NO_X, and PM_{10} emissions associated with the use of fuels would be directly related to energy consumption. Although no significance thresholds are available for analysis of energy consumption, as shown in Effect 3.9-a, "Temporary and Short-Term Emissions of ROG, NO_X, PM_{10}, and $PM_{2.5}$ during Construction," and Effect 3.9-b, "Operational Emissions of ROG, NO_X, PM_{10}, and $PM_{2.5}$ Associated with Project Implementation," it is reasonable to conclude that energy use during construction would be considerable.

Energy use for operations and maintenance activities would be similar to existing conditions. Mitigation Measure 3.9-a(1), "Prepare and Implement a Dust Control Plan in Accordance with SJVAPCD Regulation VIII to Control Fugitive Dust Emissions," includes reducing traffic speeds to 15 miles per hour on unpaved roads, and ensuring that equipment is properly tuned and maintained before and during on-site operation. Energy would be used wisely and efficiently during project construction and operation, to the extent feasible. Furthermore, construction contractors would use the best available engineering techniques, construction and design practices, and equipment operating procedures. Finally, sources of material for construction of levee improvements close to the project location have been identified, which would minimize haul truck trip distances and, therefore, fuel consumption.

As described throughout this FEIS, without implementation of the Phase 3 Repair Project, the risk of levee failure would remain at current levels. Although a precise quantification of environmental effects associated with potential levee failure is not possible, a potential exists for a variety of significant environmental effects (see **Table ES-2** for a summary of potential effects and mitigation measures). Levee failure and the resulting emergency and reconstruction efforts could expend more energy, overall, than construction of the Phase 3 Repair Project. Thus, project implementation would preempt potentially substantial future energy consumption and would be likely to result in long-term energy conservation.

Chapter 5. Compliance with Federal Environmental Laws and Regulations

This chapter summarizes the Phase 3 Repair Project's compliance with Federal environmental laws and regulations. USACE, as the Federal lead agency under NEPA, would comply with all relevant Federal environmental laws and regulations. USACE has also considered relevant state laws and regulations in this FEIS. Applicable Federal and state laws and regulations are described in the "Regulatory Setting" subsection under each resource topic section in Chapter 3, "Affected Environment, Environmental Consequences, and Mitigation Measures."

Many of the requirements of the Federal government are codified under the United States Code (USC), as described below. Where a more common name for a law or regulation is typically used, it is listed by that name with a reference to the corresponding USC section.

5.1 National Environmental Policy Act

Full Compliance. This FEIS, which incorporates public comments on the DEIS/DEIR as appropriate, fulfills the requirements of NEPA (42 USC 4321 et seq.) and the Council on Environmental Quality's Implementing Regulations for NEPA (40 CFR Parts 1500–1508).

5.2 Farmland Protection Policy Act

Full Compliance. The Federal Farmland Protection Policy Act is regulated by the Natural Resources Conservation Service (NRCS). The purpose of this act is to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to ensure 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. NRCS is authorized to review Federal projects to determine whether a project is regulated under the act and establish the farmland conversion impact rating for the project. Coordination with NRCS was completed on February 3, 2015 for the Phase 3 Repair Project (including submittal and approval of Form NRCS-CPA-106, the Farmland Conservation Impact Rating for Corridor Type Projects), as discussed in Section 3.2, "Agricultural Resources," and provided in **Appendix C**.

Implementation of Alternative 1, Alternative 2, and the Requester's Preferred Alternative would require converting areas of farmland within the RD 17 Levee Seepage Repair Project (LSRP) area to nonagricultural uses. The Phase 3 Repair Project complies with the Federal Farmland Protection Policy Act because RD 17 would provide compensation for unavoidable direct conversion and infrastructure that would support the continuation of agricultural uses (i.e., access roads, farmable seepage berms), both of which are consistent with state and regional planning efforts that protect farmland from development on a regional scale.

5.3 Uniform Relocation Assistance and Real Property Acquisition Policies Act

Partial Compliance. All or portions of some parcels within the Phase 3 Repair Project footprint would need to be acquired for project construction. Federal, state, and local government agencies, and others receiving Federal financial assistance for public programs and projects that require the acquisition of real property, must comply with the policies and provisions set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended in 1987 (42 USC Section 4601 et seq.) (Uniform Act), and implementing regulation, 49 Code of Federal Regulations Part 24. Relocation advisory services, moving costs reimbursement, replacement housing, and reimbursement for related expenses and rights of appeal are provided in the Uniform Act.

5.4 Federal Earthquake Hazards Reduction Act

Full Compliance. The closest active fault to the Phase 3 Repair Project area is located approximately 25 miles to the west, as shown in **Table 3.4-1**. Because no active faults are within or proximately close to the Phase 3 Repair Project area, the risk of ground rupture caused by a fault is low. In addition, geotechnical investigations of repairs to reduce levee seepage are designed in consideration of the longevity of the levee system, including secondary seismic hazards, such as shaking, liquefaction, subsidence, and seiches.

5.5 Clean Water Act

Partial Compliance. USACE and RD 17 would ensure that the Phase 3 Repair Project complies with the Clean Water Act (CWA) (22 USC 1251 et seq.), including Sections 404, 401, and 402. As described in Section 3.6, “Biological Resources,” implementation of Alternative 1, Alternative 2, or the Requester’s Preferred Alternative would require an individual permit from USACE under Section 404 of the CWA for the discharge of fill into waters of the United States, including wetlands. USACE verified a wetland delineation submitted for Phase 3 of the LSRP on November 3, 2009 (preliminary jurisdictional determination form was issued by USACE on November 10, 2009), and three supplemental wetland delineations were prepared. The first supplemental delineation was submitted on January 22, 2010 (preliminary jurisdictional determination was issued by USACE on April 9, 2010). The second supplemental wetland delineation was submitted on September 16, 2010 (preliminary jurisdictional determination was issued by USACE on October 7, 2010). The third supplemental wetland delineation was submitted on April 4, 2014 (preliminary jurisdictional determination was issued by USACE on April 7, 2014). Copies of the USACE preliminary jurisdictional determinations are provided in **Appendix E**.

On May 27, 2014, RD 17 submitted an application for an individual permit under Section 404 to USACE; the application was subsequently withdrawn. On March 21, 2017, RD 17 submitted an application for Regional General Permit (RGP) 8 to USACE for activities at elements Ib and Ie associated with the 2017 Emergency Flood Response Construction Project. On April 6, 2017, USACE authorized use of RGP 8. On April 2, 2019, RD 17 submitted a preconstruction notification under Nationwide Permit (NWP) 13 (Bank Stabilization) for activities at element IVa and element Va–VIa.1 associated with the Requester’s Preferred Alternative. This FEIS will be used to support USACE’s NWP authorization at elements IVa and Va–VIa.1.

A Section 401 Water Quality Certification for activities associated with implementation of the Phase 3 Repair Project is required as a condition of Section 404. RD 17 submitted a 401 water quality certification application to the regional water quality control board (RWQCB). On October 20, 2014, the RWQCB issued a Section 401 water quality certification. Because the Requester's Preferred Alternative would result in the ground disturbance of more than 1 acre, RD 17 is required to obtain a construction-related National Pollutant Discharge Elimination System permit, through the development of a storm water pollution prevention plan and incorporation of best management practices. Water quality issues are discussed in Section 3.5, "Hydrology and Water Quality."

5.6 Rivers and Harbors Appropriation Act of 1899, As Amended

Partial Compliance. Under Section 14 of the Rivers and Harbors Appropriation Act (33 USC 408, commonly referred to as Section 408), temporary or permanent alteration, occupation, or use of any public works, including levees, for any purpose is only allowable with the permission of the Secretary of the Army. Under 33 USC 408, any proposed levee modification requires a determination by the Secretary that the proposed alteration, permanent occupation, or use of a Federal project will not be injurious to the public interest and will not impair the usefulness of the levee. The authority to make this determination and approve modifications to Federal works has been delegated to the Chief of Engineers.

In 2017, Phase 3 Repair Project work performed as part of the Emergency Flood Response Construction Project did not result in temporary or permanent alteration of the levees. Therefore, Section 408 authorization was not required. However, the Phase 3 Repair Project work associated with the 2019 Categorical Permissions Construction Project did involve temporary and permanent alteration of the levees. Section 408 authorization was granted for this work under Central Valley Flood Protection Board Permit No. 18980-1. This FEIS will be used to support USACE's decision whether to grant permission for the remaining Phase 3 Repair Project, the Requester's Preferred Alternative, pursuant to Section 408.

The San Joaquin River is a navigable waterway, and therefore is considered to be a Section 10 water under the Rivers and Harbors Appropriation Act; however, implementation of the Phase 3 Repair Project as proposed would not obstruct the navigability of the San Joaquin River (i.e., no structures would be placed below the mean high tide line). Consequently, RD 17 is not applying for a permit under Section 10 of the Rivers and Harbors Appropriation Act.

5.7 Executive Order 11990, Protection of Wetlands

Full Compliance. This order directs 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 projects. The Phase 3 Repair Project has been designed to avoid and minimize effects on wetlands. Analysis of wetlands is presented in Section 3.6, "Biological Resources," and a copy of the USACE Jurisdictional Determination is included in **Appendix E**. Implementation of the Phase 3 Repair Project as proposed would provide no-net-loss of the aquatic resource function and services through RD 17's proposed compensatory mitigation. Wetlands and other waters of the United States would be compensated as described in Section 3.6.4, "Effects and Mitigation Measures." In 2017, RD 17 purchased 0.55 credits of Floodplain Mosaic Wetlands and 0.15 credits of Floodplain Riparian habitat at Cosumnes Floodplain Mitigation Bank as required by the RGP 8 authorization and CWA Section 401 Water Quality Certification. The compensatory mitigation covers all of the potential impacts to waters of the U.S. and State associated with the 2017 Flood Response Emergency Construction Project, the 2019 Categorical Permission Construction Project, and Requester's Preferred Alternative (remaining preferred repairs for the Phase 3 Repair Project). See **Appendix I** for all permits issued to date for the Phase 3 Repair Project.

5.8 Endangered Species Act of 1973, as Amended

Full Compliance. Section 7 of the Federal Endangered Species Act (ESA) requires Federal agencies, in consultation with U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), to ensure that their actions do not jeopardize the continued existence of endangered or threatened species, or result in the destruction or significant modification of the critical habitat of these species.

RD 17's consultant submitted a draft biological assessment to USFWS and NMFS in December 2010. NMFS provided its preliminary comments on January 3, 2011, indicating that the removal of shaded riverine aquatic habitat would limit recovery of federally listed fish species and have effects on essential fish habitat (EFH). USFWS preliminary comments, received on January 26, 2011, indicated that consultation for all Federal species affected by the proposed project would require Section 7 consultation with USACE (*see* the USFWS and NMFS biological opinions in **Appendix J** for a complete description of the consultation history).

To ensure that the Phase 3 Repair Project is in full compliance, USACE submitted a letter dated February 27, 2015, requesting to initiate formal consultation with USFWS and NMFS on the Requester's Preferred Alternative. A final biological assessment was submitted to USFWS and NMFS in March 2015. Letters of insufficiency were received from NMFS, dated July 7, 2015, and USFWS, dated October 2, 2015, and a revised final biological assessment was submitted on August 21, 2017 to USFWS and NMFS with responses to comments. USACE submitted an updated biological assessment to USFWS and NMFS on August 21, 2018. USFWS issued a biological opinion for effects to valley elderberry longhorn beetle and riparian brush rabbit on April 16, 2019 (USFWS 2019), and NMFS issued a biological opinion for anadromous fish on February 21, 2019 (NMFS 2019). Correspondence related to ESA consultation is provided in **Appendix J**. Federal listed species are discussed in Section 3.6, "Biological Resources."

5.9 Fish and Wildlife Coordination Act of 1934, as Amended

Partial Compliance. This act requires Federal agencies to consult with USFWS, NMFS, and the California Department of Fish and Wildlife (CDFW) before undertaking projects that control or modify surface water. The consultation is intended to promote conservation of wildlife resources by preventing loss of or damage to fish and wildlife, and to provide for the development and improvement of these resources in connection with water projects. USFWS, NMFS, and CDFW are authorized to conduct surveys and investigations to determine the potential damages and the measures required to prevent losses. Recommendations of USFWS, NMFS, and CDFW typically are integrated into reports seeking permission to construct a project or to modify plans for previously authorized projects. This act requires USACE to incorporate justifiable means for the benefit of wildlife that should be adopted to obtain maximum overall project benefits. USACE has coordinated with USFWS, NMFS, and CDFW to determine the potential effects of the Phase 3 Repair Project on fish and wildlife in the Phase 3 Repair Project area. These agencies reviewed the DEIS/DEIR and have provided comments (see **Appendix B**) that are addressed in this FEIS. Comments have also been received from USFWS and NMFS through the ESA Section 7 consultation process (see **Appendix J**). These comments have also been addressed in this FEIS. RD 17 provided USFWS, NMFS, and CDFW with a copy of the FEIR for review and comment. USACE is providing USFWS and NMFS with copies of this FEIS for review and comment.

5.10 Migratory Bird Treaty Act of 1918

Partial Compliance. The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the United States, Canada, Japan, Mexico, and Russia, to provide protection for migratory birds as defined in 16 USC 715j. Most effects resulting from the proposed project are anticipated to be short-term direct disturbances to migratory birds, which likely would temporarily avoid the construction area. Compliance with the MBTA is being addressed by RD 17 implementing mitigation measures to prevent construction activities from resulting in take of migratory birds, as discussed in Section 3.6, "Biological Resources" (see Mitigation Measures 3.6-g, 3.6-h, and 3.6-i.). Additionally, the U.S. Department of the Interior issued a memorandum concluding that take under "the MBTA's prohibition on pursuing, hunting, taking, capturing, killing, or attempting to do the same applies only to direct and affirmative purposeful actions that reduce migratory birds, their eggs, or their nests, by killing or capturing, to human control" (U.S. Department of the Interior 2017).

5.11 Magnuson-Stevens Fishery Conservation and Management Act

Full Compliance. The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) establishes a management system for national marine and estuarine fishery resources. This legislation requires that all Federal agencies consult with NMFS regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect EFH. Under the Magnuson-Stevens Act, effects on habitat managed under the Pacific Salmon Fishery Management Plan also must be considered. The Magnuson-Stevens Act states that consultation regarding EFH should be consolidated, where appropriate, with the interagency consultation, coordination, and environmental review procedures required by other Federal statutes, such as NEPA, the Fish and Wildlife Coordination Act, the CWA, and the ESA. The Phase 3 Repair Project Biological Assessment identified EFH for Central Valley fall- and late fall–run Chinook salmon. Fall-run EFH includes migration, holding, and rearing habitat for the San Joaquin River. Late fall–run EFH includes opportunistic/intermittent spawning, holding, and rearing habitat for the San Joaquin River. NMFS issued a biological opinion for effects on anadromous fish and EFH on February 21, 2019 (NMFS 2019).

5.12 Wild and Scenic Rivers Act

Full Compliance. The Wild and Scenic Rivers Act (16 USC Section 1271 et seq.) establishes a National Wild and Scenic Rivers System for the protection of rivers with important scenic, recreational, fish and wildlife, and other values. Rivers are classified as wild, scenic, or recreational. The act designates specific rivers for inclusion in the system and prescribes the methods and standards by which additional rivers may be added. The San Joaquin River is not included in the National Wild and Scenic Rivers System. No Wild and Scenic Rivers are in the Phase 3 Repair Project vicinity.

5.13 National Historic Preservation Act of 1966, as Amended

Full Compliance. The National Historic Preservation Act (NHPA) (16 USC 470 et seq.) requires Federal agencies to take into account the effects of Federal undertakings on historic properties. Section 106 of the NHPA describes the process for identifying and evaluating historic properties; for assessing the effects of Federal actions on historic properties; and for consulting to avoid, reduce, or minimize significant effects. The term historic properties refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). This process does not require historic properties to be preserved but ensures that the decisions of Federal agencies concerning the treatment of these places result from meaningful consideration of cultural and historic values and the options available to protect the properties.

Under these requirements, the Area of Potential Effects (APE) of the selected project is inventoried and evaluated to identify historical, archeological, or traditional cultural properties that have been placed on the NRHP and those that the agency and the State Historic Preservation Officer (SHPO) agree are eligible for listing on the NRHP. If the project is determined to have an effect on such properties, the agency must consult with SHPO and the Advisory Council on Historic Preservation to develop alternatives or mitigation measures. Compliance with these and other provisions of the NHPA is required as a process separate from, but concurrent with, NEPA.

The evaluation of cultural resources presented in this FEIS complies with the NHPA. Research (i.e., literature and archival research) and field surveys in the APE are summarized in Section 3.7, “Cultural Resources.” Based on the completed cultural resources investigation, no historic or cultural resources exist in the Phase 3 Repair Project area that are eligible for listing on the NRHP. These findings were originally documented in a confidential cultural resources inventory report to the California SHPO and in a letter dated April 6, 2011, and the SHPO concurred with the findings documented in this report. After SHPO concurrence in 2011, the project design changed. To ensure that the Phase 3 Repair Project is in full compliance with Section 106 of the NHPA, an addendum to the confidential cultural resources inventory report was prepared and USACE reopened consultation with the California SHPO in a letter dated February 17, 2015. In a letter dated April 1, 2015, the SHPO concurred with the findings documented in the addendum report.

5.14 Clean Air Act of 1963

Full Compliance. Construction of the Phase 3 Repair Project falls under the jurisdiction of the San Joaquin Valley Air Pollution Control District (SJVAPCD). The district determines whether project emission levels significantly affect air quality, based on Federal standards established by the U.S. Environmental Protection Agency (EPA) and California Air Resource Board (CARB). The district first would issue a permit to construct, followed by a permit to operate, which would be evaluated to determine whether all facilities have been constructed in accordance with the authority to construct permit.

EPA classifies air basins (i.e., distinct geographic regions) as “attainment,” “nonattainment,” or “maintenance” for each criteria pollutant, based on whether or not the national ambient air quality standards have been achieved. Some air basins have not received sufficient analysis for certain criteria air pollutants and are designated as “unclassified” for those pollutants. SJVAPCD and CARB are the responsible agencies for providing attainment plans and for demonstrating attainment of these standards in the project area.

The San Joaquin Valley is designated as extreme nonattainment with respect to the 8-hour ozone standard (2015 standard), moderate nonattainment for fine particulate matter with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$), serious maintenance for coarse particulate matter with an aerodynamic diameter of 10 micrometers or less (PM_{10}), and attainment or unclassified for all other criteria pollutants. The estimated emissions from construction of the Requester's Preferred Alternative would not exceed SJVAPCD's regional thresholds. In addition, mitigation is in place that would require all construction activities to adhere to dust control measures, limiting fugitive dust emissions. Therefore, project-related emissions are not anticipated to contribute to an exceedance of the national or California ambient air quality standards and would not affect the existing attainment status of the region.

USACE and RD 17 have prepared a general conformity applicability analysis for the Requester's Preferred Alternative that shows emissions would be below *de minimis* thresholds. Therefore, USACE and RD 17 have determined that the project would have no significant effects on the future air quality of the area and would be in compliance with the Clean Air Act (CAA). In addition, based on the analysis presented in Section 3.9, "Air Quality," and Section 3.10, "Climate Change," the Phase 3 Repair Project would comply with the requirements set forth in the CAA (42 USC 1857 et seq., as amended and recodified in 42 USC 7401 et seq.) and the California Clean Air Act, and would be consistent with regional goals established in SJVAPCD's air quality attainment plan for all nonattainment pollutants.

5.15 Resource Conservation and Recovery Act

Full Compliance. As discussed in Section 3.15, "Hazards and Hazardous Materials," a database search was completed. At the time of release of the Notice of Intent/Notice of Preparation for the DEIS/DEIR, no sites in the Phase 3 Repair Project area were on the Cortese List. The database search was updated in September 2019, and still no sites within the Phase 3 Repair Project area are on the Cortese List.

5.16 Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Full Compliance. Executive Order 12898 requires all Federal agencies to identify and address, as appropriate, disproportionately high and significant human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Anticipated effects from the proposed project were reviewed to determine whether minority or low-income neighborhoods would be disproportionately affected by the Phase 3 Repair Project. The project would reduce the flood risk for low income and minority populations within RD 17, and no adverse effects associated with environmental justice or social equity are anticipated, as discussed in Section 3.16, "Environmental Justice."

5.17 Executive Order 11988, Floodplain Management

Full Compliance. Executive Order 11988 requires USACE to provide leadership and take action to (1) avoid development in the base (1-in-100 annual event) floodplain (unless such development is the only practicable alternative); (2) reduce the hazards and risk associated with floods; (3) minimize the effect of floods on human safety, health, and welfare; and (4) restore and preserve the natural and beneficial values of the base floodplain.

To comply with this executive order, the policy of USACE is to formulate projects which, to the extent possible, avoid or minimize significant effects associated with use of the without-project floodplain, and avoid inducing development in the existing floodplain unless no practicable alternative exists. The Phase 3 Repair Project would provide increased stability to existing levees in selected areas that have been determined to require reinforcement. This would indirectly support growth by providing levee improvements that are needed to avoid a development moratorium under SB5, thereby inducing development in the area protected by the RD 17 levee system. That development would be consistent with adopted local growth management plans and with the state's emerging State Plan of Flood Control. A more complete discussion of the Executive Order 11988 analysis is provided in Chapter 4, "Cumulative and Growth-Inducing Effects and Other Statutory Requirements." USACE permission for local improvement of the levee is not prohibited by EO 11988; however, any future recommendations regarding investment in levee improvements through the USACE civil works program would also require the consideration of residual risks, including potential increased economic losses and loss of life due to induced floodplain development.

5.18 Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance

Full Compliance. Executive Order 13514 requires Federal agencies to set a 2020 greenhouse gas emissions reduction target; increase energy efficiency, reduce fleet petroleum consumption, conserve water, and reduce waste; support sustainable communities; and leverage Federal purchasing power to promote environmentally responsible products and technologies. USACE is requiring lower emission-producing equipment for use in construction.

Chapter 6. Consultation and Coordination

This chapter summarizes public and agency involvement activities undertaken by USACE and RD 17 that have been conducted to date for this project and that satisfy NEPA requirements for public scoping and agency consultation and coordination. Because the NEPA and California Environmental Quality Act (CEQA) environmental review processes were conducted jointly up through release and public review of the DEIS/DEIR, this chapter also summarizes public involvement conducted as part of compliance with CEQA. Native American consultation activities also are described.

6.1 Public Involvement under NEPA and CEQA

6.1.1 Notice of Intent, Notice of Preparation, and Scoping Meeting

USACE published the Notice of Intent (NOI) to prepare the Phase 3 Repair Project EIS in the *Federal Register* on April 23, 2010. RD 17 filed the Notice of Preparation (NOP) of the Phase 3 Repair Project EIR with the State Clearinghouse and released it publicly on April 23, 2010. In addition to the State Clearinghouse's distribution of the NOP to potentially interested state agencies, copies of the NOP were mailed to a distribution list of approximately 75 recipients, including Federal, state, regional, and local agencies; nonprofit and private organizations; homeowners associations; partnerships; businesses; and individual residents in the Phase 3 Repair Project area to solicit input as to the scope and content of the DEIS/DEIR (see Chapter 9, "List of Recipients"). A copy of the NOI is provided in **Appendix A1**.

A joint NEPA/CEQA public scoping meeting was held on May 11, 2010, from 2 p.m. to 5 p.m. at the City Council Chambers, Lathrop City Hall in Lathrop, California, to brief interested parties on the Phase 3 Repair Project and obtain the views of agency representatives and the public on the scope and content of the DEIS/DEIR. **Appendix A2** provides copies of the public outreach materials from the May 11, 2010, scoping meeting.

No oral or written comments were received during the scoping meeting. Written comments that were later received from agencies and individuals are provided in **Appendix A3**.

6.1.2 DEIS/DEIR

In accordance with NEPA and CEQA review requirements, the DEIS/DEIR was distributed for public and agency review and comment on September 9, 2011 for a 45-day period. The distribution gave interested parties an opportunity to express their views regarding the significant environmental effects and other aspects of the Phase 3 Repair Project, and ensured that information pertinent to permits and approvals was provided to the decision makers at USACE, RD 17, NEPA cooperating agencies, and CEQA responsible and trustee agencies. The document was made available for public review at the following locations:

- USACE, Sacramento District Office, 1325 J Street, Sacramento, California
- Stockton–San Joaquin County Library, Weston Ranch Branch, 1453 West French Camp Road, Stockton, California

- Stockton–San Joaquin County Library, Lathrop Branch, 15461 7th Street, Lathrop, California

In addition, the document was posted on USACE's website at http://www.spk.usace.army.mil.

Two public meetings were held on Thursday, October 13, 2011, from 2 p.m. to 4 p.m. and from 5 p.m. to 7 p.m. in the Lathrop City Council Chambers located at Lathrop City Hall, 390 Towne Centre Drive, Lathrop, California, to receive input from agencies and the public on the DEIS/DEIR.

Following consideration of the comments, a Final Environmental Impact Report (FEIR) was prepared in compliance with CEQA and this FEIS has been prepared in compliance with NEPA to respond to comments on the DEIS/DEIR. The FEIR was certified in 2016. This FEIS constitutes a reprint of the DEIS/DEIR and includes minor modifications to the Phase 3 Repair Project as a result of engineering and design refinements, actions that have been implemented since publication of the DEIS/DEIR, and text changes/clarifications. The comment letters received regarding the DEIS/DEIR and the responses to those comments are provided in **Appendix B** of this FEIS. A total of 13 comment letters were received.

USACE will circulate this FEIS for 30 days before taking action on the project and issuing its Record of Decision. The Record of Decision will identify USACE's decision regarding the alternatives considered, address substantive comments received on this FEIS, and determine whether the project complies with Sections 408 and 404.

6.2 Section 106 Compliance and Native American Consultation Pursuant to Executive Order 13175

USACE is the lead agency for Native American consultation under Section 106 of the National Historic Preservation Act (16 U.S. Code Section 470f); consultation with federally recognized tribes on a government-to-government basis is required by Section 106. On February 1, 2011, RD 17 prepared and submitted to USACE a report providing an inventory, evaluation, and finding of effect for resources within the area of potential effects. The report also summarized consultation efforts with Native American representatives. The report made a finding of no historic properties affected. In a letter dated April 6, 2011, the State Historic Preservation Officer (SHPO) concurred with the findings documented in the report (OHP 2011). Since the SHPO concurrence letter was issued, there have been minor design changes for the project. AECOM, on behalf of RD 17, prepared an addendum to the Cultural Resources Inventory Report in September 2014, and in a letter dated February 17, 2015, USACE reopened consultation with SHPO. In a letter dated April 1, 2015, SHPO concurred with the findings documented in the addendum report (OHP 2015). The Native American Heritage Commission was contacted on March 20, 2014, and at the time of publication of this FEIS, had not replied. In compliance with Executive Order 13175, USACE conducted government to government consultation with potentially affected tribes. On May 16, 2011, USACE sent letters to affected tribes requesting additional information about locations or archaeological sites and areas of traditional cultural value or concern within the described Phase 3 Repair Project area. Because of changes to the project footprint, AECOM sent letters to the affected tribes informing them of the changes on May 28, 2014. To date, no additional information concerning these types of resources have been received. Native American correspondence and the SHPO concurrence letters are included in **Appendix F**.

6.3 Endangered Species Act Consultation

On May 14, 2010, USACE, Sacramento District Regulatory Branch mailed a request for technical assistance to the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) related to consultation under Section 7 of the Endangered Species Act for the RD 17 Levee Seepage Repair Project (LSRP). A response letter from NMFS was received on June 11, 2010, indicating that future Section 7 consultation for the RD 17 LSRP would include possible effects of the Phase 3 Repair Project on the federally listed threatened Central Valley steelhead and Southern distinct population segment of North American green sturgeon. The Phase 3 Repair Project also is within the boundaries of critical habitat designated for Central Valley steelhead and Southern distinct population segment of North American green sturgeon.

Representatives from USFWS and NMFS attended a meeting with USACE and the applicant on August 24, 2010. USFWS indicated that future Section 7 consultation would be required, and NMFS reiterated its opinion from the June 11, 2010, letter. USFWS and NMFS provided recommendations on a mitigation strategy to offset potential project effects on federally listed species, such as riparian brush rabbit, and shaded riverine aquatic habitat.

USACE submitted the draft Biological Assessment (BA) to USFWS and NMFS in December 2010. NMFS provided its preliminary comments on January 3, 2011, indicating that the removal of shaded riverine aquatic habitat would limit recovery of federally listed fish species and would have potential effects on essential fish habitat. USFWS preliminary comments, received on January 26, 2011, indicate that consultation for all Federal species potentially affected by the Phase 3 Repair Project would require Section 7 consultation or coverage under a programmatic agreement with USACE. On March 1, 2011, USACE, USFWS, NMFS, and the consulting biologist conducted a tour of the proposed action area. On February 27, 2014, the consulting biologist received a letter providing a species list from USFWS.

To ensure that the Phase 3 Repair Project is in full compliance, USACE submitted a letter dated February 27, 2015, requesting to initiate formal consultation with USFWS and NMFS on the Requester’s Preferred Alternative. A final BA was submitted to USFWS and NMFS in March 2015. Letters of insufficiency were received from NMFS, dated July 7, 2015, and USFWS, dated October 2, 2015, and a revised final BA was submitted on March 8, 2017, to USFWS and NMFS with responses to comments. Because RD 17 would avoid effects on waterside vegetation under the Requester’s Preferred Alternative, the revised final BA addressed potential effects and mitigation measures associated with valley elderberry longhorn beetle and riparian brush rabbit, but not listed fish species or shaded riverine aquatic habitat. Critical habitat in the action area has been designated for delta smelt, Central Valley steelhead, and green sturgeon; however, none would be affected by the Requester’s Preferred Alternative. USACE submitted a draft conceptual Mitigation Monitoring Plan for proposed habitat mitigation within the element IVc setback area on January 12, 2018, and received comments on February 27, 2018. A second revised final BA was then submitted by USACE to USFWS and NMFS on August 21, 2018. USFWS issued a Biological Opinion for effects to valley elderberry longhorn beetle and riparian brush rabbit on April 16, 2019 (USFWS 2019), and NMFS issued a Biological Opinion and Essential Fish Habitat Response for effects to anadromous fish on February 21, 2019 (NMFS 2019). Correspondence related to Endangered Species Act consultation is provided in **Appendix J**. Federal listed species are discussed in Section 3.6, “Biological Resources.”

6.4 Coordination with Other Federal, State, and Regional Agencies

Chapter 5, "Compliance with Federal Environmental Laws and Regulations," describes the project's compliance with applicable Federal laws and regulations, including consultation to date with various agencies. **Table 6-1** briefly summarizes the status of the permits and resource agency coordination activities for construction of the Requester's Preferred Alternative for the Phase 3 Repair Project. A copy of the USACE 404 preliminary jurisdictional determinations are included in **Appendix E. Appendix I** includes copies of all of the permits issued to date for Phase 3 Repair Project work. All correspondence, including the biological assessments, can be found in **Appendix J**, "Endangered Species Act Consultation Administrative Record."

Table 6-1. Phase 3 Repair Project Resource Agency Coordination

Agency	Permit/Authorization/Approval	Status
USACE	Section 408 Permission	Anticipated spring/summer 2021
USACE	Section 404 Permit	Anticipated spring/summer 2021
Central Valley RWQCB	Section 401 Water Quality Certification	Received fall 2014
CDFW	Section 1602 Streambed Alteration Agreement	Received fall 2016; extension granted summer 2019
USFWS and NMFS	Biological Opinion (1) USFWS concurrence with USACE determination that the project may affect and is likely to adversely affect valley elderberry longhorn beetle and riparian brush rabbit. The project is not likely to jeopardize the continued existence of these species. (2) NMFS concurrence with USACE determination that the project may affect and is likely to adversely affect Central Valley spring-run Chinook salmon Evolutionarily Significant Unit, California Central Valley steelhead Distinct Population Segment, and Southern Distinct Population Segment of the North American green sturgeon, and is not likely to destroy or adversely modify the designated critical habitats for steelhead and green sturgeon. The project is not likely to jeopardize the continued existence of these species.	Received spring 2019
CDFW, RWQCB, USACE, USFWS and NMFS	MMP	Anticipated spring/summer 2021
Central Valley RWQCB	Section 402 NPDES Permit	Anticipated spring/summer 2021

Notes: CDFW = California Department of Fish and Wildlife; MMP = Mitigation and Monitoring Plan; NMFS = National Marine Fisheries Service; NPDES = National Pollutant Discharge Elimination System; RWQCB = Regional Water Quality Control Board; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service.
Source: Data provided by Ascent Environmental in 2019

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Chapter 8. List of Preparers

This FEIS was prepared by Ascent Environmental and GEI Consultants in association with AECOM under the direction of the U.S. Army Corps of Engineers, with assistance from Kjeldsen, Sinnock & Neudeck; ENGEO; and MacKay & Somps.

The following individuals prepared sections of the FEIS, provided significant background materials, or reviewed all or portions of the document.

U.S. Army Corps of Engineers, Sacramento District

Name	Title	Experience
Tanis Toland	Environmental Resources Branch, Environmental Manager	28 years
Kevin Lee	Flood Protection and Navigation, 408 Project Manager	11 years
Lisa Clay, Esq.	Assistant District Counsel	30 years
Peck Ha	Regulatory Project Manager	20 years

Reclamation District 17

Name	Qualifications and Experience	Participation
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Ascent Environmental

Name	Qualifications and Experience	Participation
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Andrea L. Shephard, Ph.D.[1]	B.S., Biology; Ph.D., Biological Oceanography 24 years of experience	FEIS Project Manager, Introduction and Statement of Purpose and Need, Alternatives, Transportation and Circulation, Environmental Justice, Cumulative and Growth-Inducing Effects, Other Statutory Requirements, Consultation and Coordination
Cori Resha, J.D.[2]	B.A., Environmental Economics; J.D. 15 years of experience	Approach to Environmental Analysis, Hazards and Hazardous Materials, Consultation and Coordination

1 Also managed preparation of the DEIS/DEIR and the FEIR while employed at AECOM and GEI Consultants, respectively.
2 Also helped prepare the DEIS/DEIR while employed at AECOM.

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GEI Consultants

Name	Qualifications and Experience	Participation
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AECOM (DEIS/DEIR Contractor)

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Kyle Bickler, P.E.	B.S., Civil Engineering, M.S., Civil Engineering 14 years of experience	Hydraulic Modeling
Matthew Swanson, P.E.	Diploma of Civil and Structural Technology; B.S., Civil Engineering 17 years of experience	Geotechnical Modeling
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Name	Qualifications	Participation
Christopher W. Guenther, P.E.	B.S., Civil Engineering 17 years of experience	Civil Design Engineer

Chapter 9. List of Recipients

The following Federal, State, and local agencies organizations will receive either a copy of the Final EIS or a notification of the document's availability. Individuals who may be affected by the project or have expressed interest through the public involvement process will also be notified. The notification will provide the location of hard copies and a web address for accessing an electronic version. Comments received during the 30-day public and agency comment period will be reviewed and considered prior to making a Federal decision on the Requester's Preferred Alternative and preparing the Record of Decision.

9.1 Government Departments and Agencies

9.1.1 U.S. Government

- Federal Emergency Management Agency, Region IX
- Federal Highway Administration
- National Marine Fisheries Service
- U.S. Department of the Interior
- U.S. Environmental Protection Agency
- U.S. Natural Resources Conservation Service, Stockton Service Center
- U.S. Fish and Wildlife Service

9.1.2 Native American Contacts

- Native American Heritage Commission
- Northern Valley Yokuts Tribe
- Southern Sierra Miwuk Nation

9.1.3 State of California

- California Department of Boating and Waterways
- California Department of Conservation
- California Department of Fish and Wildlife, Regions 2 and 3
- California Department of Toxic Substances Control
- California Department of Transportation, District 10
- California Department of Transportation, Planning
- California Department of Water Resources
- California Public Utilities Commission
- California Regional Water Quality Control Board, Central Valley Region
- California Resources Agency
- California State Lands Commission
- Central Valley Flood Protection Board
- Delta Protection Commission
- Delta Stewardship Council
- Office of Emergency Services
- Office of Historic Preservation, State Historic Preservation Officer
- State Water Resources Control Board, Water Quality

9.1.4 Regional, County, City, and Other Local Agencies

- City of Lathrop, Community Development Department
- City of Lathrop, Public Works Department
- City of Manteca, Planning Division of the Community Development Department
- City of Stockton, Community Development Department
- San Joaquin Area Flood Control Agency
- San Joaquin Council of Governments, Project Development/Habitat Planning
- San Joaquin County, Community Development Department
- San Joaquin County Flood Control and Water Conservation District
- San Joaquin County, Office of Emergency Services
- San Joaquin County Resource Conservation District
- San Joaquin Regional Transit District, Planning Division
- San Joaquin River Conservancy
- San Joaquin Valley Air Pollution Control District
- Stockton-San Joaquin County Public Library, Lathrop Branch
- Stockton-San Joaquin County Public Library, Weston Ranch Branch

9.2 Nonprofit Organizations, Partnerships, Private Organizations, and Businesses

- Baird Lands, Inc.
- Beck Properties, Inc.
- Califia, LLC
- HCW Lathrop Investors, LLC
- Richland Planned Communities, Inc.
- Rosi Cerri Foundation
- TCN Properties, LP
- Terra Ranch, LLC
- Union Pacific Railroad

9.3 Individual Property Owners

Names withheld for privacy

Chapter 10. Index

Chapter 11. Glossary

100-year flood	A flood that has a 1 percent or greater annual probability of occurring. A levee with Federal Emergency Management Agency accreditation provides protection for the base flood (100-year) event, based on certification provided by a civil engineer.
200-year flood	A flood that has a 0.5 percent or greater annual probability of occurring. Both state policy and recently enacted state legislation (Senate Bill [SB] 5) call for 200-year (0.5-percent annual probability) flood protection to be the minimum level of protection for urban and urbanizing areas in the Central Valley. SB 5 requires that the 200-year protection be consistent with criteria used or developed by the California Department of Water Resources. SB 5 sets a target date of 2025 for all urban and urbanizing areas protected by state/Federal project levees to achieve 200-year flood protection and calls for building limitations after 2015 if adequate progress toward achieving this standard is not met. Design event analysis results, as a measure of system performance, are given as the expected (mean) frequency of the maximum event that can be safely passed through the reservoir, spillway, and downstream leveed system with a set (e.g., 3 feet) freeboard above the computed (expected) water surface profile. Design event analysis is not the same as the analysis procedure used by the U.S. Army Corps of Engineers (USACE) as a basis for determining Federal interest in a project or for USACE certification for the Federal Emergency Management Agency's National Flood Insurance Program. USACE defines system performance according to the levee system's ability to contain a specified frequency event (e.g., 1-percent event) with a high level of assurance (i.e., Conditional Non-Exceedance Probability = 90%) and includes consideration of system uncertainties.
500-year flood	A flood that has a 0.2 percent or greater annual probability of occurring.
affected environment	The existing environment of the area affected (baseline) by the alternatives under consideration.
alternative	Alternative action that could reasonably accomplish the project purpose and need.
annual exceedance probability	The likelihood that a specified magnitude of flood would be exceeded in any year.

blanket drain	A blanket drain consists of a layer of sand and drain rock and has filter fabric placed between the soil and rock layer to avoid migration of the soil into the rock. It is installed horizontally over a relatively large areal extent.
chimney drain	A chimney drain consists of a layer of sand and drain rock and has filter fabric placed between the soil and rock layer to avoid migration of the soil into the rock. The chimney drain is much like a seepage berm (see definition below) but is placed directly on the landside slope of a levee. The chimney drain conveys through seepage flows to a seepage berm, which is located at the landside base of a levee.
crown	The top of a levee.
cutoff wall	An engineered low-permeability feature constructed underground to reduce the flow of water through permeable soils (sands and gravels) in flood damage reduction facilities. A trench is typically excavated within the levee or levee foundation area using a modified backhoe to reach down to less permeable foundation soils (silts and clays) under the levee footprint. The trench is backfilled by blending the excavated soil with minerals (typically bentonite clay) that increase the length of time for water to travel through the subsurface.
deep soil mixing method	A wet soil mixing method used to install cutoff walls. This soil mix method uses an in situ soil treatment and improvement technology to mechanically blend the in situ soil with cementitious materials using a hollow stem auger and paddle arrangement. The intent of this soil mixing method is to achieve improved soil properties. The cemented material that is produced generally has a higher strength, lower permeability, and lower compressibility than the native ground.
ditch	A channel to convey water for irrigation or drainage.
dryland levee	A dryland levee is an overland earthen berm. Under almost all conditions, water does not come into contact with a dryland levee. It functions as a flood control feature only if water leaves the banks of waterways and inundates lands.
encroachment	Anything that is built or grows within the Federal project levee right-of-way and is not part of the levee system. Encroachments may obstruct visibility or prevent access for inspection of a levee from crown to toe on both the waterside and the landside of a levee.
expressway	A controlled access, divided arterial highway for through traffic, the intersections of which are usually separated from other roadways by differing grades.

flood hazard area	An area that does not meet the minimum level of flood protection required by Federal or state law, whichever is more stringent.
hydraulics	The study and computation of the characteristics (e.g., depth [water surface elevation], velocity, slope) of water flowing in a stream or river.
jurisdictional waters of the United States	Waters under the USACE's jurisdiction, such as wetlands or other navigable waters, as determined when USACE issues jurisdictional determinations under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899.
landside	Describes an area (location) on the landside of the levee.
levee	A large dike or artificial embankment typically constructed of earthen materials, often having an access road along the top, that is designed as part of a system to protect land from floods.
levee height	The height of the levee measured from the surface of the water, or the surface of the adjacent ground, to the top of the levee.
seepage	The movement of water through small cracks, pores, or interstices of a material into or out of a body of surface or subsurface water.
seepage berm	A seepage berm consists of layers of sand, rock, and filter fabric and acts as a cap, controlling seepage flow below the berm surface and allowing the flow to reach an exit location in such a way that the undermining of levee soils is reduced or eliminated, thereby preventing boils and piping.
setback levee	A setback levee is a new levee constructed behind an existing levee.
shaded riverine aquatic habitat	This is the nearshore aquatic habitat occurring at the interface between a river and adjacent woody riparian habitat. The principal attributes of this cover type are (1) an adjacent bank composed of natural, eroding substrates supporting riparian vegetation that either overhang or protrude into the water and (2) water that contains variable amounts of woody debris, such as leaves, logs, branches, and roots, and has variable depths, velocities, and currents.
through seepage	Through seepage is the movement of water through the visible levee prism when high-flow conditions exist on the waterside of a levee.
toe	Where a levee slope meets the ground.
toe drain	A toe drain is a below-grade, perforated pipe surrounded by a layer of sand and drain rock used to safely collect and convey seepage water away from a levee and seepage berm.

under seepage	Under seepage occurs below the visible (aboveground) levee prism and is caused by the buildup of water pressure in the subsurface foundation soils when high river stages are present on the waterside of the levee.
variance request	In the context of the RD 17 Levee Seepage Repair Project, a variance request is a request for an exception to comply with USACE's vegetation management standards for levees, floodwalls, embankment dams, and appurtenant structures. USACE levee guidance requires the removal of vegetation greater than 2 inches in diameter from the levee slopes and from within 15 feet of the waterside and landside levee toes (USACE 2009). USACE revised the procedures for obtaining a variance from these standards. If a variance request is submitted, it must ensure that the safety, structural integrity, and functionality of the system are retained and that accessibility for maintenance, inspection, monitoring, and flood-fighting are retained. RD 17 has not yet decided if it will request a vegetation management variance for the Phase 3 Project.
waterside	Describes an area (location) on the waterside of a levee.

Appendix A. Public Outreach and Involvement

A.1 NEPA Notice of Intent

SAFEGUARDS:

Secured by a series of guarded pedestrian gates and checkpoints. Access to facilities is limited to security-cleared personnel and escorted visitors only. With the facilities themselves, access to paper and computer printouts are controlled by limited-access facilities and lockable containers. Access to electronic means is controlled by computer password protection.

RETENTION AND DISPOSAL:

Records are periodically reviewed for retention. Records having no evidential, informational, or historical value or not required to be permanently retained are destroyed. Visitor passes and campus access files are destroyed when 15 years old. Physical security compromise reports are destroyed 10 years from time of incident. Files relating to exercise of police functions are destroyed when three years old. Reports relating to arrests are destroyed when two years old. Routine police investigations and Guard Service Control files are destroyed when one year old. Destruction is by pulping, burning, shredding, or erasure or destruction of magnetic media.

SYSTEM MANAGER(S) AND ADDRESS:

Associate Director for Security & Counterintelligence, National Security Agency/Central Security Service, Ft. George G. Meade, MD 20755–6000.

NOTIFICATION PROCEDURE:

Individuals seeking to determine whether information about themselves is contained in this system should address written inquiries to the National Security Agency/Central Security Service, Freedom of Information Act/Privacy Act Office, 9800 Savage Road, Ft. George G. Meade, MD 20755–6000.

Written inquiries should contain the individual's full name, Social Security Number (SSN) and mailing address.

RECORD ACCESS PROCEDURES:

Individuals seeking access to information about themselves contained in this system should address written inquiries to the National Security Agency/Central Security Service, Freedom of Information Act/Privacy Act Office, 9800 Savage Road, Ft. George G. Meade, MD 20755–6000.

Written inquiries should contain the individual's full name, Social Security Number (SSN) and mailing address.

CONTESTING RECORD PROCEDURES:

The NSA/CSS rules for contesting contents and appealing initial determinations are published at 32 CFR part 322 or may be obtained by written request addressed to the National Security Agency/Central Security Service, Freedom of Information Act/Privacy Act Office, 9800 Savage Road, Ft. George G. Meade, MD 20755–6000.

RECORD SOURCE CATEGORIES:

Individuals themselves; victims, witnesses, investigators, Security Protective Force, and other Federal or State agencies and organizations.

EXEMPTIONS CLAIMED FOR THE SYSTEM:

Investigatory material compiled for law enforcement purposes, other than material within the scope of subsection 5 U.S.C. 552a(j)(2), may be exempt pursuant to 5 U.S.C. 552a(k)(2). However, if an individual is denied any right, privilege, or benefit for which he would otherwise be entitled by Federal law or for which he would otherwise be eligible, as a result of the maintenance of such information, the individual will be provided access to the information exempt to the extent that disclosure would reveal the identity of a confidential source. **Note:** When claimed, this exemption allows limited protection of investigative reports maintained in a system of records used in personnel or administrative actions.

Records maintained solely for statistical research or program evaluation purposes and which are not used to make decisions on the rights, benefits, or entitlement of an individual except for census records which may be disclosed under 13 U.S.C. 8, may be exempt pursuant to 5 U.S.C. 552a(k)(4).

Investigatory material compiled solely for the purpose of determining suitability, eligibility, or qualifications for Federal civilian employment, military service, Federal contracts, or access to classified information may be exempt pursuant to 5 U.S.C. 552a(k)(5), but only to the extent that such material would reveal the identity of a confidential source. This provision allows protection of confidential sources used in background investigations, employment inquiries, and similar inquiries that are for personnel screening to determine suitability, eligibility, or qualifications.

An exemption rule for this exemption has been promulgated in accordance with requirements of 5 U.S.C. 553(b)(1), (2) and (3), (c) and (e) and published in 32 CFR part 322. For additional information contact Ms. Anne Hill, Privacy Act Officer, NSA/CSS Freedom of Information Act/Privacy Act Office, 9800 Savage Road, Suite 6248, Ft. George G. Meade, MD 20766–6248.

[FR Doc. 2010–9393 Filed 4–22–10; 8:45 am]

BILLING CODE 5001–06–P

DEPARTMENT OF DEFENSE

Department of the Army; U.S. Army Corps of Engineers

Notice of Intent To Prepare an Environmental Impact Statement/Environmental Impact Report for Phase 3 of Reclamation District No. 17 100-Year Levee Seepage Area Project, San Joaquin County, CA

AGENCY: Department of the Army, U.S. Army Corps of Engineers; DoD.

ACTION: Notice of Intent.

SUMMARY: The action being taken is the preparation of an environmental impact statement/environmental impact report (EIS/EIR) for Phase 3 of Reclamation District No. 17's (RD 17) 100-year Levee Seepage Area Project (LSAP). To implement Phase 3 of the LSAP, RD 17 is requesting permission from the U.S. Army Corps of Engineers pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. 408, referred to as "Section 408") for alteration of Federal project levees and Section 404 of the Clean Water Act (33 U.S.C. 1344) for placement of fill into jurisdictional waters of the United States. Under Section 408, the Chief of Engineers may grant permission to alter an existing Federal project if it is not injurious to the public interest and does not impair the usefulness of the project. Portions of the RD 17 levee system including the section of levee along the south bank of French Camp Slough, along the east bank of the San Joaquin River, and along the northerly bank of Walthall Slough are Federal project levees. Therefore, Section 408 permission is required for structural improvements to these portions of the RD 17 levee system and would be issued to the Central Valley Flood Protection Board. Under Section 404, the District Engineer permits the discharge of dredged or fill material into waters of the United States if the discharge meets the requirements of the Environmental Protection Agency's 404(b)(1) guidelines and is not contrary to the public interest. As the landside levee improvements would result in a discharge of fill material into waters of the United States, permission under Section 404 is needed and would be issued directly to RD 17. RD 17 is located in San Joaquin County, California in the cities of Stockton, Lathrop, and Manteca.

DATES: A public scoping meeting will be held on May 11, 2010, from 2 p.m. until 5 p.m. (*see* **ADDRESSES**). Send written comments by May 24, 2010.

ADDRESSES: Public Scoping Meeting, City Council Chambers, Lathrop City

Hall, 390 Towne Centre Drive, Lathrop, CA. Send written comments and suggestions concerning this study to Ms. Sarah Ross, U.S. Army Corps of Engineers, Sacramento District, Attn: Planning Division (CESPK–PD–RA), 1325 J Street, Sacramento, CA 95814–2922. Requests to be placed on the mailing list should also be sent to this address.

FOR FURTHER INFORMATION CONTACT: Questions about the proposed action and EIS/EIR should be addressed to Ms. Sarah Ross at (916) 557–5256, by e-mail *Sarah.R.Ross@usace.army.mil,* or by mail (*see* **ADDRESSES**).

SUPPLEMENTARY INFORMATION:

1. *Proposed Action.* The U.S. Army Corps of Engineers is preparing an EIS/EIR to analyze the impacts of the work proposed by RD 17 to implement Phase 3 of the LSAP. The overall purpose of the LSAP is to reduce the risk of flooding by implementing improvements to portions of the approximately 19-mile RD 17 levee system to meet applicable Federal and State design recommendations for levees protecting urban areas. Phase 3 is a component of the LSAP proposed by RD 17 and would construct landside improvements to 23 subreaches of 10 levee reaches involving approximately 8.4 miles of the RD 17 levee system starting near the southern boundary of the city of Stockton, through the city of Lathrop, and to the southern boundary of the city of Manteca.

2. *Alternatives.* The EIS/EIR will consider several alternatives for reducing flood damage. Alternatives analyzed during the investigation will consist of a combination of one or more measures to reduce the risk of flooding. These measures include installing cutoff walls, constructing seepage berms, and constructing setback levees.

3. *Scoping Process.*

a. A public scoping meeting will be held on May 11, 2010, to present information to the public and to receive comments from the public. This meeting will begin a process to solicit input from the public as well as Federal, State, and local agencies concerned with Phase 3 of the LSAP.

b. Significant issues to be analyzed in depth in the EIS/EIR include effects on agricultural resources; land use; geology and soils; hydrology and hydraulics; water quality; biological resources (*i.e.,* fisheries, vegetation and wildlife resources, special-status species, and wetlands and other waters of the United States); cultural resources; transportation and circulation; air quality; noise; visual resources; utilities and service systems; hazards and hazardous materials; socioeconomics, population, and housing; and environmental justice. The EIS/EIR will also evaluate the cumulative effects of the proposed LSAP (including past LSAP Phases 1 and 2) and other related projects in the study area.

c. The U.S. Army Corps of Engineers is consulting with the State Historic Preservation Officer to comply with the National Historic Preservation Act; the U.S. Fish and Wildlife Service and the National Marine Fisheries Service to provide a biological opinion; and with the U.S. Fish and Wildlife Service to provide a Fish and Wildlife Coordination Act report.

d. A 45-day public review period will be provided for individuals and agencies to review and comment on the draft EIS/EIR. All interested parties are encouraged to respond to this notice and provide a current address if they wish to be notified of the draft EIS/EIR circulation.

4. *Availability.* The draft EIS/EIR is scheduled to be available for public review and comment in fall 2010.

Dated: April 15, 2010.

Thomas Chapman,

Colonel, U.S. Army, District Commander.

[FR Doc. 2010–9447 Filed 4–22–10; 8:45 am]

BILLING CODE 3720–58–P

DEPARTMENT OF DEFENSE

Department of the Army

[Docket ID USA–2010–0006]

Privacy Act of 1974; System of Records

AGENCY: Department of the Army, DoD.

ACTION: Notice to alter a system of records.

SUMMARY: Department of the Army is proposing to alter a system of records notices in its existing inventory of record systems subject to the Privacy Act of 1974, (5 U.S.C. 552a), as amended.

DATES: This proposed action will be effective without further notice on May 24, 2010 unless comments are received which result in a contrary determination.

ADDRESSES: You may submit comments, identified by docket number and title, by any of the following methods:

• *Federal Rulemaking Portal: http://www.regulations.gov.* Follow the instructions for submitting comments.

• *Mail:* Federal Docket Management System Office, 1160 Defense Pentagon, Washington, DC 20301–1160.

Instructions: All submissions received must include the agency name and docket number for this **Federal Register** document. The general policy for comments and other submissions from members of the public is to make these submissions available for public viewing on the Internet at *http://www.regulations.gov* as they are received without change, including any personal identifiers or contact information.

FOR FURTHER INFORMATION CONTACT: Mr. Leroy Jones at (703) 428–6185.

SUPPLEMENTARY INFORMATION: Department of the Army notices for systems of records subject to the Privacy Act of 1974 (5 U.S.C. 552a), as amended, have been published in the **Federal Register** and are available from the Department of the Army, Privacy Office, U.S. Army Records Management and Declassification Agency, 7701 Telegraph Road, Casey Building, Suite 144, Alexandria, VA 22325–3905.

The proposed system report, as required by 5 U.S.C. 552a(r) of the Privacy Act of 1974, as amended, was submitted on April 9, 2010, to the House Committee on Government Reform, the Senate Committee on Homeland Security and Governmental Affairs, and the Office of Management and Budget (OMB) pursuant to paragraph 4c of Appendix I to OMB Circular No. A–130, "Federal Agency Responsibilities for Maintaining Records About Individuals" (February 20, 1996; 61 FR 6427).

Dated: April 19, 2010.

Mitchell S. Bryman,

Alternate OSD Federal Register Liaison Officer, Department of Defense.

A0600–8–101

SYSTEM NAME:

Military and Civilian Out-Processing Files (May 11, 2004; 69 FR 26080)

* * * * *

CHANGES:

SYSTEM NAME:

Delete entry and replace with "Installation Support Module Records."

SYSTEM LOCATION:

Delete entry and replace with "For systems maintained by Program Executive Office Enterprise Information Systems:

Project Director for Installation Management Systems—Army 200 Stovall Street, Alexandria, Virginia, 22332–6200.

For application and database servers that support the Installation Support Modules system:

A.2 Public Outreach Materials for May 11, 2010 Scoping Meeting

RD 17 100-Year Levee Seepage Area Project: Phase 3

Joint EIS/EIR Scoping Meeting

May 11, 2010

AECOM

US Army Corps of Engineers®
Sacramento District

Meeting Agenda

- Welcome and Introductions
- Meeting Objective
- Project Background
- Project Alternatives
- Scoping and NEPA/CEQA Process
- Public Comments and Input

Welcome and Introductions

Sean Bechta, AECOM

Andrea Shephard, AECOM

Claire Marie Turner, USACE

Sarah Ross, USACE

Chris Neudeck, KSN, RD 17 Engineer

Joe Tootle, ENGEO

Meeting Objective

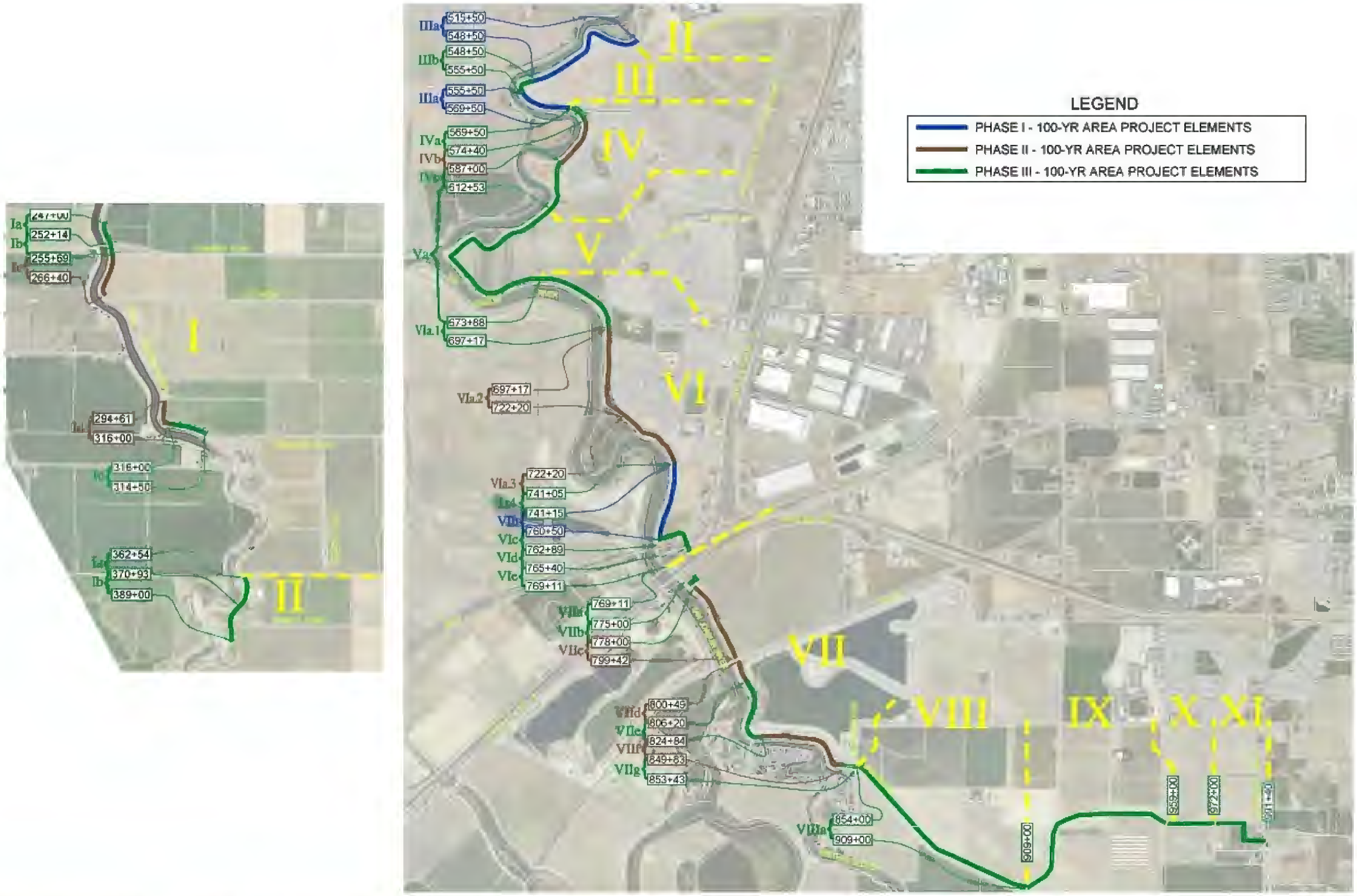
- Seek public/agency input on the scope and content of the EIS/EIR

Project Background

- FEMA Accreditation
- DWR Concerns
- Phases 1 and 2
- Phase 3
  - DWR Early Implementation Program (Prop 1e)
  - 104 Credit / USACE 408 Permission

RD 17 100-Year Levee Seepage Area Project

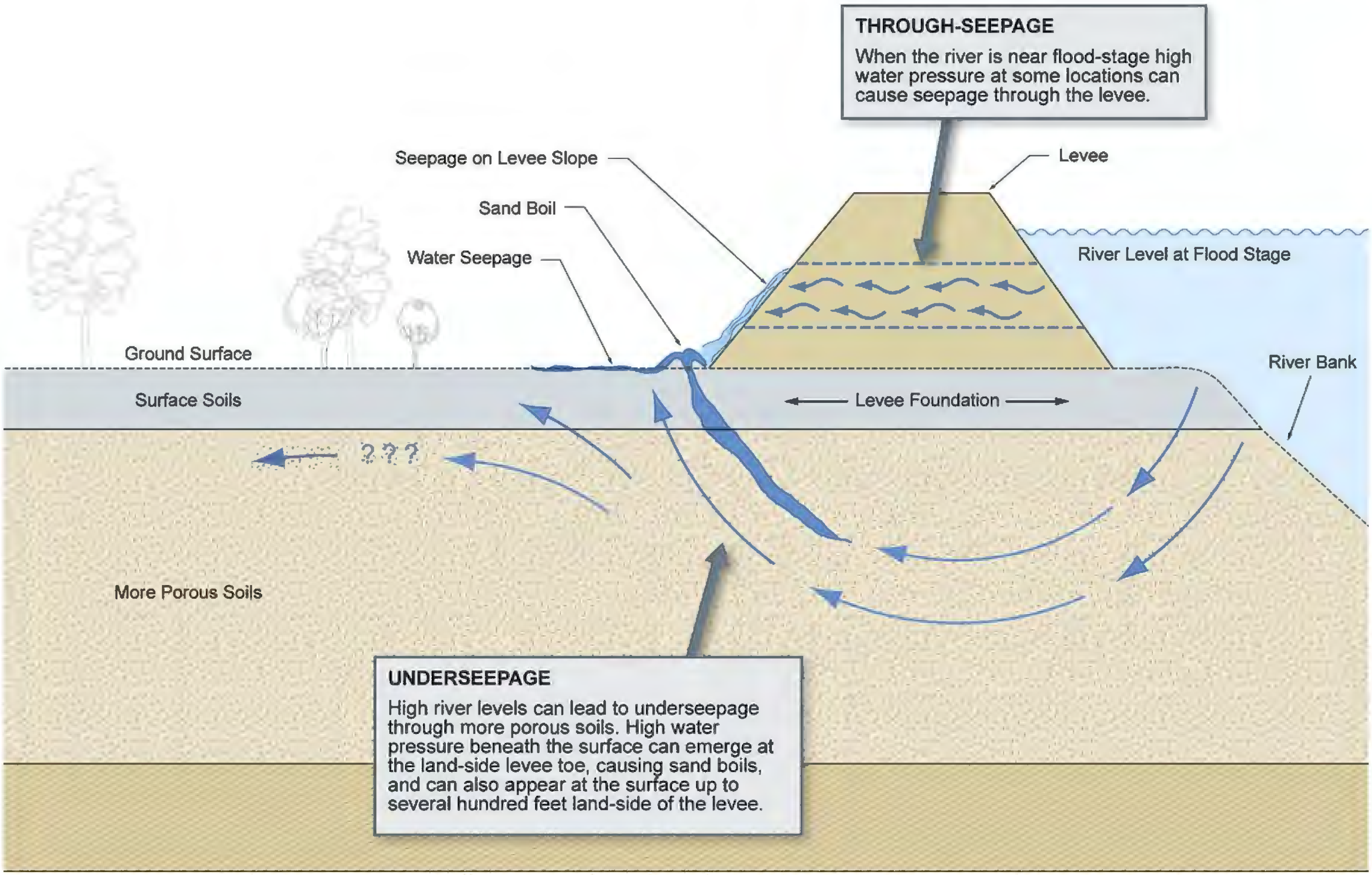
RD 17 100-Year Levee Seepage Area Project



Project Objectives

- Increase levee resistance to seepage
- Provide seepage exit gradients < 0.5 at 100-yr water surface elevation
- Implement USACE levee vegetation management recommendations

Underseepage and Through-Seepage



Seepage Remediation

- Underseepage
  - Seepage berm
  - Seepage berm with toe drain
  - Cutoff wall
- Through-seepage
  - Blanket drain
  - Chimney drain
- Setback Levee*

Project Alternatives

No-Action Alternative

- No Project Construction
- Potential Levee Failure

Action Alternatives

- Minimum Disturbance
- Maximum Disturbance

Remove waterside levee vegetation

Request variance to keep waterside levee vegetation

Table 1
RD 17 LSAP Phase 3 EIS/EIR Action Alternatives

Reach	Alternative 1 Minimum Disturbance	Alternative 2 Maximum Disturbance
Ia	seepage berm	seepage berm
Ib	seepage berm and chimney drain	seepage berm and chimney drain
Ie	seepage berm and chimney drain	seepage berm and chimney drain
IIa	cutoff wall	cutoff wall
IIb	**cutoff wall**	**setback levee**
IIIa	chimney drain	chimney drain
IIIb	seepage berm and chimney drain	seepage berm and chimney drain
IVa	seepage berm and chimney drain	seepage berm and chimney drain
IVc	**cutoff wall**	**seepage berm and chimney drain** **or** **setback levee**
Va	**cutoff wall**	**seepage berm and chimney drain**
VIa.1	**cutoff wall**	**seepage berm**
VIa.4	seepage berm and chimney drain	seepage berm and chimney drain
VIb	Chimney or blanket drain	chimney or blanket drain
VIcde	**place fill in location of existing parking lot**	**setback levee**
VIIb	seepage berm	seepage berm
VIIe	cutoff wall	cutoff wall
VIIg	seepage berm and fill	seepage berm and fill
VIIIa	landside seepage berm	landside seepage berm
IXa	landside seepage berm	landside seepage berm
Xa	landside seepage berm	landside seepage berm
XIa	landside seepage berm	landside seepage berm

Note: Bolded text indicates that the proposed method for reducing flood risk for the reach is different in each of the alternatives.
Source: Data provided by AECOM in 2010 based on information provided by Kjeldsen Sinnock Neudeck, Inc.

Purpose of Scoping

- Inform public and agencies
- Receive public/agency input
- Help identify environmental effects to be evaluated
- Help identify assessment methods

Opportunities for Public Input

1. Today's Scoping Meeting
2. NOI/NOP Comment Period
   (April 23 – May 24, 2010)
3. Draft EIS/EIR 45-Day Public Review Period
   (Dec 2010/Jan 2011)

Environmental Review Process

NEPA	**CEQA**
Notice of Intent	Notice of Preparation

Scoping

Draft EIS/EIR

NEPA	CEQA
EPA Filing/Federal Register Notice	Notice of Completion/Notice of Availability
Agency/Public Review	State Clearinghouse/Public Review
Response to Comments/ Final EIS	Response to Comments/ Final EIR
EPA Filing/FR Notice/Agency and Public review	Commenting Agency Review
Project Decision- Record of Decision	Certification
	Project Decision-Findings, Overriding considerations, Mitigation Monitoring
	Notice of Determination

Issues Areas to be Addressed

- Air Quality and Climate Change
- Agricultural Resources
- Land Use, Socioeconomics, and Population & Housing
- Noise
- Recreation
- Vision Resources
- Utilities and Public Services
- Hazards and Hazardous Materials
- Geology, Soils, Minerals, and Paleontological Resources
- Hydrology and Water Quality
- Terrestrial and Aquatic Biological Resources
- Cultural Resources
- Transportation and Circulation
- Environmental Justice
- Cumulative Effects
- Growth-Inducement

How Do You Participate?

1. Present your views today. Please focus on the scope of the project.

   Project Elements and Alternatives
   Environmental Effects and Mitigation

2. Provide written comments on this scoping meeting or the NOP tonight or to RD 17 by 4 pm, Monday, May 24, 2010.

   Dante Nomellini, Sr., RD 17, PO Box 1461, Stockton, CA 95201
   Fax: (209) 465-3956 Email: ngmplcs@pacbell.net

3. Review and comment on the Draft EIS/EIR.
4. Contact RD 17 throughout the process.

RECLAMATION DISTRICT NO. 17

Scoping Meeting for the
Phase 3 of the 100-year Levee Seepage Area Project
Sign-In Sheet
Tuesday, May 11, 2010
2:00 p.m. to 5:00 p.m.

Please list your name, any agency or organization you represent, mailing address, and telephone number and/or e-mail address.

Name	Organization	Mailing Address	Telephone Number and/or E-Mail Address
CHRISTOPHER H. NEUDECK	KSN INC/RD 17	P.O. BOX 844 STKN CA 95204	2099460268 CNEUDECK@KSNINC.COM
TERRY HERSHEY	US ARMY CORPS OF ENGINEERS	1325 J STREET, SACRAMENTO, CA 95814	THERESA.M.HERSHEY@USACE.ARMY.MIL

2

RECLAMATION DISTRICT NO. 17

Scoping Meeting for the
Phase 3 of the 100-year Levee Seepage Area Project
Sign-In Sheet
Tuesday, May 11, 2010
2:00 p.m. to 5:00 p.m.

Please list your name, any agency or organization you represent, mailing address, and telephone number and/or e-mail address.

Name	Organization	Mailing Address	Telephone Number and/or E-Mail Address
Claire Marie Turner	USACE	1325 J Street Sacramento, CA 95814	claire.marie.turner @usace.army.mil

3

RECLAMATION DISTRICT NO. 17

Scoping Meeting for the
Phase 3 of the 100-year Levee Seepage Area Project
Sign-In Sheet
Tuesday, May 11, 2010
2:00 p.m. to 5:00 p.m.

Please list your name, any agency or organization you represent, mailing address, and telephone number and/or e-mail address.

Name	Organization	Mailing Address	Telephone Number and/or E-Mail Address
B. Calcagno	Calcagno Ranches	8707 Country Club Blvd Stkn	465-2006
Barry O'Regan	Peterson Brustad	119 E Weber Ave. Stockton 95202	209 323 9864
Cary Keaten	City of Lathrop	390 Towne Centre Dr, Lathrop CA	209-952-0025
Sarah Ross	USACE	1325 J STREET, SACRAMENTO, CA 95814	sarah.c.ross@usace.army.mil
Martin Harris	TUFF Boy	3870 W Yosemite	858 4131

A.3 Comment Letters

Stanislaus County

CHIEF EXECUTIVE OFFICE
Richard W. Robinson
Chief Executive Officer

Patricia Hill Thomas
Chief Operations Officer/
Assistant Executive Officer

Monica Nino-Reid
Assistant Executive Officer

Stan Risen
Assistant Executive Officer

1010 10th Street, Suite 6800, Modesto, CA 95354
P.O. Box 3404, Modesto, CA 95353-3404
Phone: 209.525.6333 Fax 209.544.6226

STANISLAUS COUNTY ENVIRONMENTAL REVIEW COMMITTEE

June 7, 2010

Dante Nomellini, Sr.
Nomellini, Grilli & McDaniel
PO Box 1461
Stockton, CA 95201

SUBJECT: **ENVIRONMENTAL REFERRAL – RECLAMATION DISTRICT NO. 17 – PHASE 3 OF THE RD 17 100-YEAR LEVEE SEEPAGE AREA PROJECT**

Mr. Nomellini:

The Stanislaus County Environmental Review Committee (ERC) has reviewed the subject project and has no comments at this time.

The ERC appreciates the opportunity to comment on this project.

Sincerely,

Christine Almen

Christine Almen, Senior Management Consultant
Environmental Review Committee

cc: ERC Members

May 24, 2010

Dante Nomellini, Sr.
Nomellini, Grilli & McDaniel
P.O. Box 1461
Stockton, CA 95201-1461

Subject: Comments on Proposed Project

Project: NOP for the Phase 3 of the RD 17 100-Year Levee Seepage Area

District CEQA Reference No: 20100239

Dear Mr. Nomellini:

The San Joaquin Valley Unified Air Pollution Control District (District) has reviewed the Notice of Preparation (NOP) for the Phase 3 of the RD 17 100-Year Levee Seepage Area project. The proposed project includes various levee improvements along 8.4 miles of the RD 17 levee system to meet Federal and State design recommendations for levees protecting urban areas. The District offers the following comments:

District Comments

1) The District recommends that any preliminary and final environmental review of the project's potential impact on air quality include the following:

   1a) A description of the regulatory environment and existing air quality conditions impacting the area. Information on the District's attainment status can be found on the District's web page at: http://valleyair.org/aqinfo/attainment.htm.

   1b) A description of the project, including a discussion of existing and post-project emissions.

      i) The discussion should include emissions from short-term activities such as construction, and emissions from long-term activities, such as operational, and area wide emission sources. Emissions from permitted (stationary sources) and non-permitted (mobile sources) sources should be analyzed separately. The project should be considered to have a significant adverse impact on air quality if emissions from either source exceed the following amounts: 10 tons per year of oxides of nitrogen (NOx), 10 tons per year of reactive organic gases (ROG), or 15 tons per year particulate matter of 10 microns or less in size (PM10).

ii) A discussion of whether the project would result in a cumulatively considerable net increase of any criteria pollutant or precursor for which the San Joaquin Valley Air Basin is in non-attainment.

2) If the project is located near residential/ sensitive receptors, the proposed project should be evaluated to determine the health impact of Toxic Air Contaminants (TACs) to the near-by receptors.

2a) Prior to conducting a Health Risk Assessment (HRA), an applicant may perform a prioritization on all sources of emissions to determine if it is necessary to conduct an HRA. A prioritization is a screening tool used to identify projects that may have significant health impacts. If the project has a prioritization score of 10 or more, the project has the potential to exceed the District's significance threshold for health impacts of 10 in a million. Information on conducting a prioritization can be obtained from the District by contacting Mr. Leland Villalvazo, Supervising Air Quality Specialist, at: hramodeler@valleyair.org.

2b) If the prioritization score indicates that toxic air contaminants (TACs) are a concern, the District recommends that a Health Risk Assessment (HRA) be performed. If an HRA is to be performed, it is recommended that the project proponent contact the District to review the proposed modeling approach. Please contact Mr. Leland Villalvazo, Supervising Air Quality Specialist, at hramodeler@valleyair.org. Additional information on TACs can be found on the District's Air Quality Modeling page at: http://www.valleyair.org/busind/pto/Tox_Resources/AirQualityMonitoring.htm

3) A discussion of whether the project would create nuisance odors.

4) A discussion of the methodology, model assumptions, inputs and results used in characterizing the project's impact on air quality.

5) A discussion of all existing District regulations that apply to the project.

5a) Based on information provided to the District, the proposed project would equal or exceed 9,000 square feet. Therefore, the District concludes that the proposed project is subject to District Rule 9510 (Indirect Source Review).

District Rule 9510 is intended to mitigate a project's impact on air quality through project design elements or by payment of applicable off-site mitigation fees. Any applicant subject to District Rule 9510 is required to submit an Air Impact Assessment (AIA) application to the District no later than applying for final discretionary approval, and to pay any applicable off-site mitigation fees before issuance of the first building permit. If approval of the subject project constitutes the last discretionary approval by your agency, the District recommends that demonstration of compliance with District Rule 9510, including payment of all applicable fees before issuance of the first building permit, be made a condition of project approval. Information about how to comply with District Rule 9510 can be found online at: http://www.valleyair.org/ISR/ISRHome.htm.

5b) The proposed project may be subject to District Rules and Regulations, including: Regulation VIII, (Fugitive PM10 Prohibitions), Rule 4102 (Nuisance), and Rule 4641 (Cutback, Slow Cure, and Emulsified Asphalt, Paving and Maintenance Operations). The above list of rules is neither exhaustive nor exclusive. To identify other District rules or regulations that apply to this project or to obtain information about District permit requirements, the applicant is strongly encouraged to contact the District's Small Business Assistance Office at (209) 557-6446. Current District rules can be found on the District's website at: www.valleyair.org/rules/1ruleslist.htm.

6) A discussion of all feasible measures that will reduce air quality impacts.

7) The District recommends that a copy of the District's comments be provided to the project proponent.

If you have any questions or require further information, please call Jessica Willis at (559) 230-5818.

Sincerely,

David Warner
Director of Permit Services

Jessica R. Willis

Arnaud Marjollet
Permit Services Manager

DW:jw

cc: File

San Joaquin Valley Air Pollution Control District

Frequently Asked Questions Regarding Indirect Source Review

Q: What is the purpose of Indirect Source Review (ISR)?

A: As land development and population in the San Joaquin Valley continues to increase, so will indirect air emissions that negatively effect air quality. The emissions are called indirect because they don't come directly from a smokestack, like traditional industry emissions; but rather the emissions are indirectly caused by this growth in population. As a consequence, the San Joaquin Valley Air Pollution Control District (District) adopted Indirect Source Review (Rule 9510) to reduce the impacts of growth in emissions from all new land development in the San Joaquin Valley.

Q: When is a project subject to ISR?

A: A project is subject to ISR if all of the following are applicable:

- The project received its final discretionary approval from the land use agency on or after **March 1, 2006**
- The project meets or exceeds the following District applicability thresholds:

- 2,000 square feet commercial
- 20,000 square feet medical office
- 10,000 square feet governmental
- 25,000 square feet light industrial
- 39,000 square feet general office
- 20,000 square feet recreation space
- 100,000 square feet heavy industrial
- 9,000 square feet educational
- 50 residential units
- 9,000 square feet of space not included in the list

- The project's primary functions are not subject to District Rule 2201 (New and Modified Stationary Source Review Rule), or District Rule 2010 (Permits Required).

For more information on the applicability of ISR regarding a specific project, please contact the District at (559) 230-6000 or visit the District's website at http://www.valleyair.org/ISR/ISRHome.htm.

Q: For the purposes of Rule 9510, what is final discretionary approval?

A: A decision by a public agency that requires the exercise of judgment or deliberation when the public agency or body decides to approve or disapprove a particular development project, as distinguished from situations where the public agency merely has to determine whether there has been conformity with applicable statutes, ordinances, or regulations. Examples of discretionary approvals include Tentative Tract Maps, Site Plans, and Conditional Use Permits. A building permit would be an example of a ministerial approval.

Q: What pollutants does ISR target?

A: The ISR rule looks to reduce the growth in NO_x and PM_{10} emissions associated with the construction and operation of new development projects in the San Joaquin Valley. The rule requirement is to reduce construction NO_x and PM_{10} emissions by 20% and 45%, respectively, as well as reducing operational NO_x and PM_{10} emissions by 33.3% and 50%, respectively, when compared to unmitigated projects.

Q: What are NO_x and PM_{10}?

A: Nitrogen oxide (NO_x) is an ozone precursor, or principal component of ozone. Ozone is a colorless, odorless reactive gas comprised of three oxygen atoms. It is found naturally in the earth's stratosphere, where it absorbs the ultraviolet component of incoming solar radiation that can be harmful to life. Ozone is also found near the earth's surface, where pollutants emitted from society's activities react in the presence of sunlight to form ozone. Hot sunny weather with stagnant wind conditions favors ozone formation, so the period from May through September is when high ozone levels tend to occur in the San Joaquin Valley Air Basin.

Particulate matter (PM) is a generic term used to describe a complex group of air pollutants that vary in composition. PM_{10} particles have a diameter of 10 microns (micrometers) or less. The sources of PM can vary from wind blown dust particles to fine particles directly emitted from combustion processes, or may be formed from chemical reactions occurring in the atmosphere.

Q: What is URBEMIS?

A: URBEMIS (**Urban Emissions**) is a computer modeling program that estimates construction, area source and operational emissions of NO_x and PM_{10} from potential land uses. This program uses the most recent approved version of relevant Air Resources Board (ARB) emissions models and emission factors.

Q: How can a project's emissions be reduced to lessen the impact on air quality (On-site emissions reductions)?

A: A project's emissions can be reduced by incorporating District approved mitigation measures. These include, but are not limited to, the following:

- Bicycle lanes throughout the project
- Proximity to existing or planned bus stops
- Proximity to existing or planned local retail
- Eliminate woodstoves and fireplaces from the project
- Cleaner fleet construction vehicles
- Energy efficiency beyond Title 24 requirements

For more information on additional measures that help reduce emissions, please contact the District at (559) 230-6000 or by visiting the District's website at http://www.valleyair.org/ISR/ISROnSiteMeasures.htm

Q: What will I receive from the District once the Air Impact Assessment (AIA) has been approved?

A: When the AIA is approved the applicant will receive an approval letter, along with the following:

- Off-site emissions estimator worksheet (see below)
- Fee estimator worksheet (see below)
- Monitoring and Reporting Schedule (MRS), if applicable
- Project invoice, if applicable

Q: What is the Off-site Emissions Estimator Worksheet?

A: This Excel worksheet uses the project's total tons of NO_x and PM_{10} as calculated using URBEMIS and compares the unmitigated emissions against the mitigated emissions, determining whether the reduction in emissions is sufficient to satisfy the rule. If the reduction is not sufficient, the required off-site emission reductions are calculated using the District's off-site emission reduction equations, which can be found on the District's website at http://www.valleyair.org/rules/currntrules/r9510.pdf (Sections 7.0 through 7.1.2.2)

Q: What is the Fee Estimator Worksheet?

A: The Fee Estimator is an Excel worksheet used to calculate the total dollar amount of off-site fees that must be paid to the District in order to cover the District's cost of obtaining the required off-site emission reductions, and therefore fulfill the rule requirement. This fee amount is derived by multiplying the total tons of off-site reductions by the applicable rate.

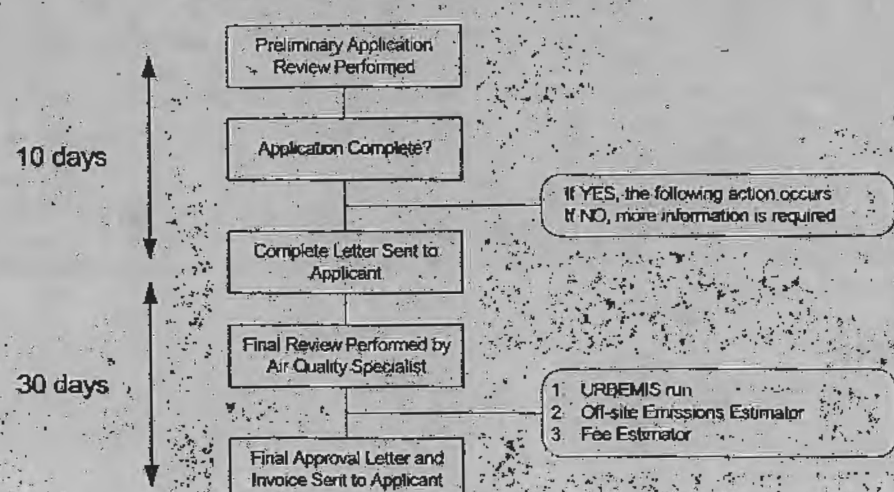
Q: Why are mitigation fees collected, and how are they used by the District?

A: When a development project cannot reduce its NO_x and PM_{10} emissions to the level required by the rule, then the difference must be mitigated through the payment of a fee. The monies collected from this fee will be used by the District to reduce emissions in the San Joaquin Valley on behalf of the project, with the goal of offsetting the emissions increase from the project by decreasing emissions elsewhere. More specifically, the fees received by the District are used in the District's existing Emission Reduction Incentive Program (ERIP) to fund emission reduction projects.

Q: How can additional information on the Indirect Source Review Program be found?

A: Additional information can be found by visiting the District's website at http://www.valleyair.org/ISR/ISRHome.htm or by calling the District at (559) 230-6000.

ISR Processing Flow Chart



1990 E. GETTYSBURG AVENUE, FRESNO, CA 93726-0244 / (559) 230-6000 TEL. / www.valleyair.org

California Natural Resources Agency
DEPARTMENT OF FISH AND GAME
North Central Region
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670
(916) 358-2900
http://www.dfg.ca.gov

LD 17

ARNOLD SCHWARZENEGGER, Governor
John McCamman, Director

RECEIVED
MAY 20 20__
BY:

May 17, 2010

Dante Nomellini
Reclamation District No. 17
P.O. Box 1461
Stockton,CA 95201-1461

Dear Mr. Nomellini:

The Department of Fish and Game (DFG) has reviewed the Notice of Preparation of a draft Environmental Impact Report (DEIR) for Phase three of Reclamation District 17 100-year levee Seepage Area project (project) (SCH #2010042073). The project consists of a plan to construct seepage berms, setback levees, and slurry cutoff walls to increase the levees resistance to under seepage and through seepage, and to implement United Stated Army Corps of Engineers (USACE) levee vegetation management recommendations. The project involves an 8.4 mile section of the San Joaquin River's east levee, portions of the levee along the northern bank of Walthal Slough, and the dryland levee extending easterly form Walthall Slough to South Airport Way. The project is generally located south of Lathrop in San Joaquin County.

Wildlife habitat resources consist of vegetation on and adjacent to the levee sections in question. Significant natural resources include habitat for sensitive species. California Natural Diversity Database (CNDDB) files contain numerous records for sensitive species in the project area. We recommend that the DEIR discuss and provide adequate mitigation for the following concerns:

1. The project's impact upon fish and wildlife and their habitat.

2. The project's impact upon significant habitat such as wetlands including riparian habitat. The project should be designed so that impacts to wetlands are avoided. Mitigation should be provided for unavoidable impacts based upon the concept of no net loss of wetland habitat values or acreage.

3. The project's impact to special status species including species which are state and federal listed as threatened and endangered.

4. The project's growth inducing and cumulative impacts upon fish, wildlife, water quality and vegetative resources.

5. The DEIR should provide an analysis of specific alternatives which reduce impacts to fish, wildlife, water quality and vegetation.

6. The DEIR should contain an evaluation of the proposed projects consistency with the applicable land use plans, such as General Plans, Specific Plans, Watershed Master Plans, Habitat Conservation Plans, etc.

The DEIR should consider and analyze whether implementation of the proposed project will result in reasonably foreseeable potentially significant impacts subject to regulation by the DFG under Section 1600 et seq. of the Fish and Game Code. In general, such impacts result whenever a proposed project involves work undertaken in or near a river, stream, or lake that flows at least intermittently through a bed or channel, including ephemeral streams and water courses. Impacts triggering regulation by the DFG under these provisions of the Fish and Game Code typically result from activities that:

- Divert, obstruct, or change the natural flow or the bed, channel or bank of any river, stream, or lake;

- Use material from a streambed; or

- Result in the disposal or deposition of debris, waste, or other material where it may pass into any river stream, or lake.

In the event implementation of the proposed project involves such activities, and those activities will result in reasonably foreseeable substantial adverse effects on fish or wildlife, a Lake or Streambed Alteration Agreement (LSAA) will be required by the DFG. Because issuance of a LSAA is subject to review under the California Environmental Quality Act (CEQA), the DEIR should analyze whether any potentially mitigation measures will avoid or substantially reduce impacts requiring a LSAA from the DFG.

This project will have an impact to fish and/or wildlife habitat. Assessment of fees under Public Resources Code Section 21089 and as defined by Fish and Game Code Section 711.4 is necessary. Fees are payable by the project applicant upon filing of the Notice of Determination by the lead agency.

Pursuant to Public Resources Code Sections 21092 and 21092.2, the DFG requests written notification of proposed actions and pending decisions regarding this project. Written notifications should be directed to this office.

Thank you for the opportunity to review this project. If the DFG can be of further assistance, please contact Mr. Dan Gifford, Staff Environmental Scientist, telephone (209) 369-8851 or, myself at telephone (916) 358-2919.

Sincerely,

Jeff Drongesen

Jeff Drongesen
Acting Environmental Program Manager

ec: Jeff Drongesen
Dan Gifford
Department of Fish and Game
North Central Region

jdronge@dfg.ca.gov
dgifford@dfg.ca.gov

cc: Susan Jones
U.S. Fish and Wildlife Service
2800 Cottage Way, Room W2605
Sacramento, CA 92825-1888

STATE OF CALIFORNIA – THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, GOVERNOR

CENTRAL VALLEY FLOOD PROTECTION BOARD
3310 El Camino Ave., Rm. 151
SACRAMENTO, CA 95821
(916) 574-0609 FAX: (916) 574-0682
PERMITS: (916) 574-0685 FAX: (916) 574-0682

RECEIVED
APR 30 2010
BY:

April 28, 2010

Dante Nomellini, Sr.
Nomellini, Grilli & McDaniel
P.O. Box 1461
Stockton, CA 95201-1461

Dear Mr. Nomellini:

Notice of Preparation of an Environmental Impact Report
Phase 3 of the RD 17 100 Year Levee Seepage Area Project

Staff for the Central Valley Flood Protection Board has reviewed the subject document and provides the following comments:

The proposed project is located within the jurisdiction of the Central Valley Flood Protection Board (Formerly known as The Reclamation Board). The Board is required to enforce standards for the construction, maintenance and protection of adopted flood control plans that will protect public lands from floods. The jurisdiction of the Board includes the Central Valley, including all tributaries and distributaries of the Sacramento River and the San Joaquin River, and designated floodways (Title 23 California Code of Regulations (CCR), Section 2).

A Board permit is required prior to starting the work within the Board's jurisdiction for the following:

- The placement, construction, reconstruction, removal, or abandonment of any landscaping, culvert, bridge, conduit, fence, projection, fill, embankment, building, structure, obstruction, encroachment, excavation, the planting, or removal of vegetation, and any repair or maintenance that involves cutting into the levee (CCR Section 6);

- Existing structures that predate permitting or where it is necessary to establish the conditions normally imposed by permitting. The circumstances include those where responsibility for the encroachment has not been clearly established or ownership and use have been revised (CCR Section 6);

- Vegetation plantings will require the submission of detailed design drawings; identification of vegetation type; plant and tree names (i.e. common name and scientific name); total number of each type of plant and tree; planting spacing and irrigation method that will be within the project area; a complete vegetative management plan for maintenance to prevent the interference with flood control, levee maintenance, inspection and flood fight procedures (Title 23, California Code of Regulations CCR Section 131).

The permit application and Title 23 CCR can be found on the Central Valley Flood Protection Board's website at http://www.cvfpb.ca.gov/. Contact your local, federal and state agencies, as other permits may apply.

If you have any questions please contact me at (916) 574-0651 or by email jherota@water.ca.gov.

Sincerely,

James Herota
Staff Environmental Scientist
Floodway Protection Section

cc:

Governor's Office of Planning and Research
State Clearinghouse
1400 Tenth Street, Room 121
Sacramento, CA 95814

STATE OF CALIFORNIA
FACSIMILE COVER
10-2A-0049 (NEW 10/92)

ATTENTION:		FROM:	
Dante John Nomellini		Kathy Selsor Department of Transportation 1976 East Charter Way Stockton, CA 95205	
UNIT/COMPANY: Reclamation District 17		DATE: 4/27/10	TOTAL PAGES (Including Cover Page)
		FAX # (Include Area Code) (209) 948-7194	ATSS FAX 8-423-7194
DISTRICT/CITY PO Box 1461 Stockton, CA 95201		PHONE # (& Area Code) (209) 948-7190	ATSS 8-423-7190
PHONE # (& Area Code) (209) 465-5883	FAX # (& Area Code) (209) 465-3956	ORIGINAL DISPOSITION: Destroy ☐ Return ☐ Call for Pickup ☐	

COMMENTS:

SJ-Various
SCH# 2010042073
Phase 3-RD 17 100-Yeae Levee Seepage Project

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
P.O. BOX 2048 STOCKTON, CA 95201
(1976 E. CHARTER WAY/1976 E. DR. MARTIN
LUTHER KING JR. BLVD. 95205)
TTY: California Relay Service (800) 735-2929
PHONE (209) 941-1921
FAX (209) 948-7194

Flex your power!
Be energy efficient!

April 27, 2010

10-SJ-Various
SCH#2010042073
Phase-3 100-year
Levee Seepage Project

Dante John Nomellini
Reclamation District 2126
235 east Weber Avenue
Stockton, CA 95202

Dear Mr. Nomellini:

The California Department of Transportation (Department) appreciates the opportunity to have reviewed the Initial Study/Proposed Mitigated Negative Declaration for the proposed Phase-3 100 year Levee Seepage Project.

We have no comments at this time.

If you have any questions or would like to discuss our comments in more detail, please contact Kathy Selsor at (209) 948-7190 (e-mail: kathy_selsor@dot.ca.gov) or me at (209) 941-1921.

Sincerely,

Kathy Selsor for

TOM DUMAS, CHIEF
OFFICE OF METROPOLITAN PLANNING

cc: SMorgan CA Office of Planning and Research

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

ARNOLD SCHWARZENEGGER
GOVERNOR

CYNTHIA BRYANT
DIRECTOR

Notice of Preparation

April 22, 2010

To: Reviewing Agencies

Re: Phase 3 of the Reclamation District No. 17 (RD 17) 100 - Year Levee Seepage Area Project (LSAP)
SCH# 2010042073

Attached for your review and comment is the Notice of Preparation (NOP) for the Phase 3 of the Reclamation District No. 17 (RD 17) 100 - Year Levee Seepage Area Project (LSAP) draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Dante Nomellini
Reclamation District No. 17
P.O. Box 1461
Stockton, CA 95201-1461

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott Morgan
Acting Director

Attachments
cc: Lead Agency

Document Details Report
State Clearinghouse Data Base

SCH# 2010042073
Project Title Phase 3 of the Reclamation District No. 17 (RD 17) 100 - Year Levee Seepage Area Project (LSAP)
Lead Agency Reclamation District No. 17

Type **NOD** Notice of Determination

Description Phase 3 of the LSAP proposes landside levee improvements along approximately 8.4 miles of the RD 17 levee system in San Joaquin County, California, including portions of the San Joaquin River east levee, portions of the levee along the northerly bank of Walthall Slough, and the Dryland levee extending easterly from Walthall Slough to ~ South Airport Way, to meet applicable Federal and State design recommendations for levees protecting urban areas. Project objectives are to construct seepage berms, setback levees, and slurry cutoff walls where needed to increase the levee's resistance to underseepage and through-seepage; to provide seepage exit gradients of less than 0.5 at the water surface elevation associated with a flood event with a 0.01 annual exceedance probability; and to implement USACE levee vegetation management recommendations.

Filing Agency Contact

Name Dante Nomellini
Agency Reclamation District No. 17
Phone 209-465-5883 ***Fax***
email
Address P.O. Box 1461
City Stockton ***State*** CA ***Zip*** 95201-1461

Project Location

County San Joaquin
City Stockton, Lathrop, Manteca
Region
Cross Streets Howard, Bowman & Manila Roads, River Isl Pkway, S. Airport Wy, Hwya 120/I-5, Woodward
Lat / Long Ave
Parcel No. 37° 46' 52" N / 121° 16' 19" W
Township 33 parcels ***Range*** ***Section*** ***Base***

Approved by

Acting as ☐ Lead Agency ☐ Responsible Agency ***Approval Date*** / /

Determinations

1. The project ☐ will ☐ will not have a significant effect on the environment.
2. ☐ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☐ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures ☐ were ☐ were not made a condition of the approval of the project.
4. A Statement of Overriding Considerations ☐ was ☐ was not adopted for this project.
5. Findings ☐ were ☐ were not made pursuant to the provisions of CEQA.

Final EIR Available at

Date Received 04/22/2010

Note: Blanks in data fields result from insufficient information provided by lead agency.

County: San Joaquin SCH# 2010042073

Resources Agency

- [x] **Resources Agency**
  Nadell Gayou
- [x] **Dept. of Boating & Waterways**
  Mike Sotelo
- [ ] **California Coastal Commission**
  Elizabeth A. Fuchs
- [ ] **Colorado River Board**
  Gerald R. Zimmerman
- [x] **Dept. of Conservation**
  Rebecca Salazar
- [ ] **California Energy Commission**
  Eric Knight
- [ ] **Cal Fire**
  Allen Robertson
- [x] **Central Valley Flood Protection Board**
  James Herota
- [ ] **Office of Historic Preservation**
  Wayne Donaldson
- [x] **Dept of Parks & Recreation**
  Environmental Stewardship Section
- [ ] **California Department of Resources, Recycling & Recovery**
  Sue O'Leary
- [ ] **S.F. Bay Conservation & Dev't. Comm.**
  Steve McAdam
- [x] **Dept. of Water Resources**
  Resources Agency
  Nadell Gayou
- [ ] ______________
  Conservancy

Fish and Game

- [ ] **Depart. of Fish & Game**
  Scott Flint
  Environmental Services Division
- [ ] **Fish & Game Region 1**
  Donald Koch
- [ ] **Fish & Game Region 1E**
  Laurie Harnsberger
- [x] **Fish & Game Region 2**
  Jeff Drongesen
- [ ] **Fish & Game Region 3**
  Charles Armor
- [ ] **Fish & Game Region 4**
  Julie Vance
- [ ] **Fish & Game Region 5**
  Don Chadwick
  Habitat Conservation Program
- [ ] **Fish & Game Region 6**
  Gabrina Gatchel
  Habitat Conservation Program
- [ ] **Fish & Game Region 6 I/M**
  Brad Henderson
  Inyo/Mono, Habitat Conservation Program
- [ ] **Dept. of Fish & Game M**
  George Isaac
  Marine Region

Other Departments

- [ ] **Food & Agriculture**
  Steve Shaffer
  Dept. of Food and Agriculture
- [ ] **Depart. of General Services**
  Public School Construction
- [ ] **Dept. of General Services**
  Anna Garbeff
  Environmental Services Section
- [ ] **Dept. of Public Health**
  Bridgette Binning
  Dept. of Health/Drinking Water

Independent Commissions,Boards

- [x] **Delta Protection Commission**
  Linda Flack
- [ ] **Cal EMA (Emergency Management Agency)**
  Dennis Castrillo
- [ ] **Governor's Office of Planning & Research**
  State Clearinghouse
- [x] **Native American Heritage Comm.**
  Debbie Treadway
- [x] **Public Utilities Commission**
  Leo Wong
- [ ] **Santa Monica Bay Restoration**
  Guangyu Wang
- [x] **State Lands Commission**
  Marina Brand
- [ ] **Tahoe Regional Planning Agency (TRPA)**
  Cherry Jacques

Business, Trans & Housing

- [ ] **Caltrans - Division of Aeronautics**
  Sandy Hesnard
- [ ] **Caltrans - Planning**
  Terri Pencovic
- [x] **California Highway Patrol**
  Scott Loetscher
  Office of Special Projects
- [ ] **Housing & Community Development**
  CEQA Coordinator
  Housing Policy Division

Dept. of Transportation

- [ ] **Caltrans, District 1**
  Rex Jackman
- [ ] **Caltrans, District 2**
  Marcelino Gonzalez
- [ ] **Caltrans, District 3**
  Bruce de Terra
- [ ] **Caltrans, District 4**
  Lisa Carboni
- [ ] **Caltrans, District 5**
  David Murray
- [ ] **Caltrans, District 6**
  Michael Navarro
- [ ] **Caltrans, District 7**
  Elmer Alvarez
- [ ] **Caltrans, District 8**
  Dan Kopulsky
- [ ] **Caltrans, District 9**
  Gayle Rosander
- [x] **Caltrans, District 10**
  Tom Dumas
- [ ] **Caltrans, District 11**
  Jacob Armstrong
- [ ] **Caltrans, District 12**
  Chris Herre

Cal EPA

Air Resources Board

- [ ] Airport Projects
  Jim Lerner
  - [ ] Transportation Projects
    Douglas Ito
  - [ ] Industrial Projects
    Mike Tollstrup
- [ ] **State Water Resources Control Board**
  Regional Programs Unit
  Division of Financial Assistance
- [ ] **State Water Resources Control Board**
  Student Intern, 401 Water Quality Certification Unit
  Division of Water Quality
- [ ] **State Water Resouces Control Board**
  Steven Herrera
  Division of Water Rights
- [ ] **Dept. of Toxic Substances Control**
  CEQA Tracking Center
- [ ] **Department of Pesticide Regulation**
  CEQA Coordinator

Regional Water Quality Control Board (RWQCB)

- [ ] **RWQCB 1**
  Cathleen Hudson
  North Coast Region (1)
- [ ] **RWQCB 2**
  Environmental Document Coordinator
  San Francisco Bay Region (2)
- [ ] **RWQCB 3**
  Central Coast Region (3)
- [ ] **RWQCB 4**
  Teresa Rodgers
  Los Angeles Region (4)
- [x] **RWQCB 5S**
  Central Valley Region (5)
  - [ ] **RWQCB 5F**
    Central Valley Region (5)
    Fresno Branch Office
  - [ ] **RWQCB 5R**
    Central Valley Region (5)
    Redding Branch Office
- [ ] **RWQCB 6**
  Lahontan Region (6)
  - [ ] **RWQCB 6V**
    Lahontan Region (6)
    Victorville Branch Office
- [ ] **RWQCB 7**
  Colorado River Basin Region (7)
- [ ] **RWQCB 8**
  Santa Ana Region (8)
- [ ] **RWQCB 9**
  San Diego Region (9)
- [ ] **Other** ______________

Last Updated on 03/24/10

Appendix B. Responses to Comments on the DEIS/DEIR

Appendix B. Responses to Comments on the DEIS/DEIR

B.1 Master Responses

The U.S. Army Corps of Engineers (USACE) and Reclamation District 17 (RD 17) have provided the following responses to environmental issues raised in multiple comments on the draft environmental impact statement/environmental impact report (DEIS/DEIR) for the Phase 3–Reclamation District 17 Levee Seepage Repair Project (LSRP), hereinafter referred to as the Phase 3 Repair Project. These responses are referred to as "master responses" because they address numerous comments concerning the same or very similar topics. These responses are organized by topic to provide a more comprehensive response than may be possible in responding to individual comments.

All individual comments on environmental issues, along with individual responses to these comments, are presented below in Section B.2, "Individual Responses." In that section, the reader is referred back to these master responses as appropriate.

B.1.1 Master Response 1: Vegetation Encroachment and Variance Request

Numerous comments on the DEIS/DEIR addressed the issue of vegetation encroachment and variance request. The issue relates to Engineering Technical Letter (ETL) 1110-2-571, which USACE issued in 2009 and updated in 2014 with ETL 110-2-583 (USACE 2009, 2014). The ETL updated USACE's vegetation management standards for levees requiring the removal of all vegetation, with the exception of perennial grasses, on levee slopes and within 15 feet of the waterside and landside levee toes.

In September 2011, USACE issued a DEIS/DEIR on the Phase 3 Repair Project. The DEIS/DEIR considered the following two options for complying with ETL 1110-2-571:

- full implementation of USACE ETL 1110-2-571, which would involve removing all vegetation other than perennial grasses from the levee slopes and within 15 feet of the waterside and landside levee toes, and

- acquisition of a variance from USACE ETL 1110-2-571, which would involve obtaining permission from USACE Headquarters to retain existing vegetation on the lower two-thirds of the waterside levee slope and within 15 feet of the waterside levee toe; all other levee vegetation would be removed in accordance with existing USACE policy.

These two options were designed to meet Public Law (PL) 84-99, which authorizes USACE to provide rehabilitation assistance for levees as long as the system is operated and maintained to acceptable or minimally acceptable standards.

USACE now offers non-Federal sponsors (e.g., RD 17) the ability to adopt a System Wide Improvement Framework (SWIF) plan to temporarily extend PL 84-99 rehabilitation eligibility while they correct unacceptable operation and maintenance deficiencies, including vegetation encroachments, as part of a broader, systemwide improvement to their levee systems. For RD 17, the SWIF would need to comply with the Central Valley Flood Protection Plan (CVFPP). The SWIF requires the non-Federal sponsor to develop and submit a plan, which generally is a comprehensive, long-term approach. RD 17 is developing such a plan. In the interim, RD 17 is continuing its current practices for managing vegetation encroachments, which involve retaining all vegetation on the lower two-thirds of the waterside levee slope and within 15 feet from the waterside levee toe, trimming and maintaining vegetation on the upper one-third of the waterside levee slope, and removing all other levee vegetation in accordance with the CVFPP vegetation management policy. These current vegetation management practices are equivalent to vegetation management that would be performed under the second option above: acquisition of a variance from USACE ETL 1110-2-571. Consequently, USACE does not consider the removal of waterside vegetation in the Final Environmental Impact Statement (FEIS).

B.1.2 Master Response 2: Preferred Alternative

Following the public release of the DEIS/DEIR, RD 17 identified a preferred alternative, hereafter referred to as the Requester's Preferred Alternative. The Requester's Preferred Alternative, as extracted from Section 1.9.4 "Requester's Preferred Alternative," of the FEIS, is as follows:

> As originally proposed for this alternative, levee seepage would be addressed by drained seepage berms with chimney drains and toe drains at seven of the 19 elements (Ia, Ib, Ie, IIIb, IVa, VIIb, and VIIg), by a chimney drain in an existing seepage berm at one element (IIIa), by a setback levee with a seepage berm and cutoff walls at one element (IVc), and by cutoff walls at the remaining 10 elements (IIab, Va–VIa.1, VIa.4, VIb, VIcde, and VIIe). The Requester's Preferred Alternative also would include retaining vegetation on the waterside slope, managing this vegetation in compliance with the existing RD 17 vegetation management strategy, and removing landside levee vegetation, except perennial grasses, as previously evaluated in the September 2011 DEIS/DEIR.

B.2 Individual Responses

This appendix presents the comment letters received on the DEIS/DEIR and USACE's and RD 17's individual responses to significant environmental issues raised in those comments. Each letter, as well as each individual comment within the letter, has been given a number for cross-referencing. Responses are sequenced to reflect the order of comments within each letter.

Table B-1 lists all parties that submitted comments on the DEIS/DEIR for the Phase 3 Repair Project during the public review period.

Table B-1. List of Commenters

Letter #	Commenter	Date of Comment(s)
Federal Agencies (F)		
F1	National Oceanic and Atmospheric Administration, National Marine Fisheries Service	October 7, 2011
F2	U.S. Environmental Protection Agency, Region IX	November 21, 2011
F3	U.S. Fish and Wildlife Service	October 24, 2011
State Agencies (S)		
S1	California Department of Transportation	October 14, 2011
S2	California Governor's Office of Planning and Research	October 25, 2011
S3	California State Lands Commission	October 24, 2011
S4	Central Valley Flood Protection Board	October 24, 2011
S5	Central Valley Regional Water Quality Control Board	October 15, 2011
S6	Native American Heritage Commission	September 16, 2011
Local Agencies (L)		
L1	Oakwood Lake Water District	October 24, 2011
L2	San Joaquin County Environmental Health Department	October 25, 2011
L3	San Joaquin Valley Air Pollution Control District	October 24, 2011
L4	Stanislaus County Environmental Review Committee	September 23, 2011

Letter F1

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814-4700

OCT 7 2011

John Suazo
Department of Army
U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Dear Mr. Suazo:

This is in response to your September 23, 2011, letter requesting technical assistance and comments from NOAA's National Marine Fisheries Service (NMFS) for the draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) on Phase 3-Reclamation District (RD) 17 100-Year Levee Seepage Area Project. The draft EIS/EIR has been prepared by the U.S. Army Corps of Engineers (Corps) in accordance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The draft EIS/EIR evaluates the potential environmental impacts of Phase 3 of the proposed RD 17 100-Year Levee Seepage Area Project (LSAP), also referred to as the Phase 3 Project. The regional setting of the Phase 3 Project is portions of the San Joaquin River east levee, portions of the levee along the north bank of Walthall Slough, and along the dry land levee extending east from Walthall Slough to approximately South Airport Way. The north end of the Phase 3 Project is adjacent to the City of Stockton and the south end of the Phase 3 Project is near the town of Lathrop and west of Manteca.

The overall purpose of the proposed Phase 3 Project is to implement levee improvements in 23 LSAP elements affecting 8.4 miles of the approximately 19-mile RD 17 levee system. RD 17 has initiated this effort in cooperation with the California Department of Water Resources (DWR), the California Central Valley Flood Protection Board (CVFPB), and the Corps with the aim or reducing the risk of flooding during a 100-year event.

The Federal lead for the proposed Phase 3 Project is the Corps, and the state lead is RD 17. DWR and the CVFPB are cooperating agencies. In addition to completing an EIS/EIR, the lead agencies will also be fulfilling requirements as for Section 14 of the Rivers and Harbors Act (known as Section 408), and Section 404 of the Clean Water Act, and the Federal and state Endangered Species Acts.

NMFS has reviewed the information provided with your September 23, 2011, letter. As stated on page 5-4 of the draft EIS/EIR, under Section 7, the USACE must consult with NMFS to ensure that the proposed Phase 3 Project will not jeopardize endangered or threatened species, or 1 destroy or adversely modify designated critical habitat, as designated by the Federal Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). If the proposed Phase 3 Project "may affect" a listed species or critical habitat, the lead agency is required to prepare a biological assessment (BA). In response to the BA, NMFS will issue a biological opinion with a determination on the impacts of the proposed project on listed species and critical habitat. Additionally, the Magnuson-Stevens Fishery Conservation and Management Act requires all Federal agencies to consult with NMFS regarding all action or proposed actions that my adversely affect essential fish habitat. As the project progresses, it is anticipated that the project applicant will continue to seek out consultation as required under ESA. cont. 1

Some comments on the draft EIS/EIR (found below) are general in nature, others relate to specific language in the draft EIS/EIR, and some are editorial.

VEGETATION REMOVAL AND VARIANCE COMMENTS

Central Valley levee vegetation has significant ecosystem importance. Vegetation along many levees provides critical fishery habitat and is ecologically significant to numerous ESA listed and protected species. Protection and enhancement of the riparian corridors is necessary for the survival and recovery of listed salmonids. 2

The draft EIS/EIR contains language in certain alternatives that emphasizes that the proposed Phase 3 Project will result in a direct loss of vegetation as a result of implementing the Corps vegetation policy. NMFS agrees that this would lead to a significant impact. NMFS recommends pursuing a formal vegetation variance or project alternatives (such as setback levees) that avoid the removal of waterside vegetation.

STANDARDIZED ASSESSMENT METHODOLOGY (SAM) COMMENTS

If any waterside vegetation will be removed as part of the proposed Phase 3 Project, NMFS recommends that prior to and during the process of any construction that the project applicant use the standardized assessment methodology (SAM) to evaluate the response to habitat features affected by bank protection projects. SAM is a modeling and tracking tool developed by Stillwater Sciences and was originally used for Corps Sacramento River Bank Protection Project (SRBPP). The SAM evaluates bank protection alternatives affecting threatened and endangered fish species. By identifying and quantifying the response of fish species to habitat conditions over time, users can determine necessary measures to avoid, minimize, or fully compensate for fish impacts for various life stages.

SAM has been used at numerous levee sites along the mainstem Sacramento River and San Joaquin River. Modeling outcome revealed long-term habitat losses and demonstrated the need for commensurate compensation measures and habitat enhancement such as: installing in-stream wood material for habitat complexity, planting riparian vegetation to stabilize the bank, and provide a source of shade and cover for channel margin habitat. 3

MITIGATION COSTS

Chapter 2 of the draft EIS/EIR contains an analysis of costs for various alternatives and proposed Phase 3 Project options, including those that were considered but eliminated from further consideration. In this analysis, and elsewhere in the draft EIS/EIR, there is no discussion on potential mitigation costs. This is short sighted, as mitigation costs can be significant and can play a major role in overall project costs. Implementation of the ETL that will result in large- 4
scale vegetation removal will have a high mitigation cost when compared to alternatives that maintain baseline vegetation conditions. For full disclosure, this should be included in the analysis as part of the final EIS/EIR.

ALTERNATIVES

The rationale for dismissing an alternative from detailed analysis should fall into one of three categories:

(1) The alternative does not meet the purpose and need of the project;
(2) The alternative does not decrease impacts on any resources; or
(3) The alternative is not reasonable because it is infeasible, illegal, etc.

The alternatives discussed in the draft EIS/EIR that include option 1, full implementation of the ETL, do not meet the above criteria in that the alternative does not decrease impacts on any resources. If these alternatives with option 1 included substantial areas of setback levee it is 5
possible that resource impacts could be decreased to less than significant or perhaps be considered beneficial. The current discussion in the draft EIS/EIR offers little detail regarding how the project applicant will mitigate for resource impacts from implementation of the ETL. To ensure full disclosure, the final EIS/EIR should include a thorough mitigation plan in the event of full implementation of the ETL. More specifically, how does the project applicant propose to replace vegetation removed as part of the ETL with in-place and in-kind mitigation?

NMFS feels the current discussion of the Environmentally Preferred Alternative that occurs on pages ES-9 and 2-45 is insufficient. An Environmentally Preferred Alternative is an alternative that causes the least damage to the biological and physical environment. It also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources. The use of Alternative 1 as the Environmentally Preferred Alternative does not meet these 6
criteria as the potential for Option 1, full ETL compliance, contradicts the definition of an Environmentally Preferred Alternative.

NMFS believes that the potential exists to integrate setback levees along a substantial percentage of the 8.4 miles of levee repairs proposed as part of the Phase 3 Project. The explanation for eliminating setback levees from further discussion lacks sufficient detail, including a full cost-benefit analysis. Setback levees will potentially eliminate mitigation costs, reduce future costs in 7
the event of a flood, reduce time and money spent during consultation with the resource agencies, and reduce future maintenance costs. Setback levees also provide other benefits, such as increase in recreational opportunities.

Additionally, based on the aerials provided in Chapter 2 and the discussion in section 3.2 Agricultural Resources of the draft EIS/EIR, a large percentage of the levee system is surrounded by farmland, much of it defined as 'prime farmland' including parcels that are subject to Williamson Act Contracts. The construction of setback levees can help preserve farmland as they will eliminate the possibility of future development. There are a number of examples in the Central Valley that demonstrate farming and floodplain habitat and coincide; examples can be found in the Yolo Bypass. The preservation of farmland as a benefit (including an economic benefit) of setback levees should be analyzed as part of the final EIS/EIR. Section 3.2 of the draft EIS/EIR identifies a number of significant (some defined as significant and unavoidable) impacts to agricultural resources. The inclusion of an alternative that emphasizes the construction of setback levees should be explored as a method to eliminate these impacts. 8

The project applicant should fully explore funding opportunities to pay for the initial costs of constructing setback levees. An alternative that includes extensive setback levees should be considered for the Environmentally Preferred Alternative. The final EIS/EIR should include a detailed discussion on the reason why or why not this Environmentally Preferred Alternative is chosen as the Preferred Alternative. 9

SETBACK LEVEES

Chapter 2 contains an analysis of costs for various alternatives and proposed Phase 3 Project options, including those that were considered but eliminated from further consideration. A number of the alternatives eliminated from further consideration included construction of setback levees. NMFS acknowledges that the initial cost of setback levees is normally more costly than in-place levee repairs. However, setback levees eliminate most if not all of the mitigation costs. Also, setback levees can reduce the overall flood risk of an area, potentially leading to a huge costs savings in the event of a flood. NMFS encourages the project applicant to further explore the possibility of setback levees as part of the proposed Phase 3 Project. As these levees are a part of the statewide system for flood control, the possibility of funds being available for the construction of setback levees should be fully explored. The Central Valley Flood Protection Plan (CVFPP) will emphasize system wide improvements to flood control. The inclusion of setback levees as an integral part of the proposed Phase 3 Project should be fully explored in accordance to the CVFPP scheduled for 2012 release. 10

SPECIFIC COMMENTS

Throughout the document it is stated that without the levee repairs and upgrades flood risk will continue. While NMFS agrees with this statement, it is important to note that even with the improvements that are a part of the proposed Phase 3 Project, there will still be potential flooding and risk of levee failure in the proposed project area; this should be clearly stated in the final EIS/EIR. 11

Page ES-3: The final paragraph discusses the release of the CVFPP in 2012 and discusses certain details of the California's Central Valley Flood System Improvement Framework (Framework). It is unclear what the project applicant intends to do with these documents and plans. Need to clarify potential strategy for use of the CVFPP and the Framework. 12

Page ES-4: The draft EIS/EIR states that RD 17 has not yet decided to apply for a formal vegetation variance. This decision and the reasons for the decision should be clarified in the final EIS/EIR. 13

Pages ES-4 and ES-6: Under NEPA, alternatives need to fulfill the proposed project purpose and need while practicably minimizing and avoiding significant effects. On page ES-6, one of the options to be analyzed with the alternatives is full implementation of the ETL 1110-2-571 that will remove most if not all waterside vegetation. Absent of constructing an approved amount of setback levees to open floodplain habitat as part of the proposed Phase 3 Project, this will lead to un-mitigable impacts to federally listed species and designated critical habitat. Therefore, NMFS questions this option as practicable for inclusion in the draft EIS/EIR, even to be used as a bookend to analyze impacts. 14

Page ES-7: Table 2-1 should be labeled as Table ES-1. 15

Page ES-19: In table ES-2, there is discussion regarding mitigation for loss of shaded riverine aquatic (SRA) habitat functions. NMFS supports this discussion; however, there is logic confusion regarding the project applicant willingness to compensate for loss of SRA with in-kind on-site mitigation. This seems contradictory to the willingness to explore a project option that will include removal of vegetation to comply with the ETL. NFMS requests additional explanation on the logic behind this mitigation proposal while not committing to a vegetation variance and willing to explore the possibility of complying with the ETL. 16

This is discussed in further detail on pages 3.6-36 and 3.6-37 of the draft EIS/EIR. Again, the project applicant presents a willingness to compensate for loss of waterside vegetation with on-site and in-kind mitigation. This seems counterintuitive with the lack of a variance proposal and willingness to comply with vegetation removal as described as part of the ETL. 17

Page 1-2: The term 'in about 1989' is used. This seems odd, RD 17 should have more exact information regarding the time period. 18

Page 2-1: The description on the vegetation variance is not technically correct. Obtaining a vegetation variance is complying with the ETL, not getting 'an exemption' to not comply with the ETL. A vegetation variance is more appropriately described as another method of complying with the ETL. 19

Page 2-1: The following phrase is found on page 2-1:

> "…all (landside and waterside) levee vegetation removed from all levee elements…" 20

Aside from inclusion of setback levees this is not a practicable alternative, thus should not be included in the discussion, even as an analysis bookend.

Page 2-3: In section 2.1.2, there is discussion regarding alternatives screening. This section should include specific language from NEPA guidelines to explain how alternatives (aside from no project and no action) need to fulfill most or all of the purpose and need while practicably avoiding and minimizing significant environmental impacts. 21

Page 2-11: In elements Va-Vla.1 there is a setback levee that is eliminated from consideration due to hydrology impacts involving the Old River. NMFS would like further information regarding the locations of the setback levees that were eliminated from consideration as part of these elements. Was there just one location considered? Was there a setback levee analyzed that 22
was located closer in proximity to the San Joaquin River? This is seen visually on page 2-21. Based on this aerial, there are many potential locations for a setback levee. It seems unlikely that all locations would have a deleterious impact to the hydrology.

Page 2-18: In the CEQA No Project section there is mention that the provisions of the pre-2012 Framework would be the vegetation management scenario. NMFS is requesting more information on what is meant by this description and why this assumption is being used. The 23
statement "pre-2012 Framework" implies the existence of a 2012 Framework.

This documents NMFS comments on the draft EIS/EIR. NMFS comments to the draft EIS/EIR are intended to help guide the development of the final EIS/EIR and future ESA Consultations. If you have any questions regarding this correspondence contact Mike Hendrick. Mike Hendrick may be reached by telephone at (916) 930-3605 or by e-mail at Michael.Hendrick@noaa.gov.

Sincerely,

Maria Rea

Maria Rea
Supervisor, Central Valley Office

cc: Copy to file – ARN 151422SWR2010SA00186
NMFS-PRD, Long Beach, California

F1-1 NMFS issued its biological opinion (BO) for the Phase 3 Repair Project on February 21, 2019.See FEIS Section 6.3, “Endangered Species Act Consultation,” for a summary of consultation with the National Marine Fisheries Service (NMFS) as required under the Federal Endangered Species Act (ESA). **Appendix J** of the FEIS contains all Endangered Species Act correspondence, including the BOs from NMFS and U.S. Fish and Wildlife Service (USFWS). Requester

F1-2 See Master Response 1 in Section B.1.1, “Vegetation Encroachment and Variance Request.”

F1-3 Mitigation Measure 3.6-b requires RD 17 to reduce impacts on woodland habitat. As part of this mitigation measure, if Alternative 2 is selected, USACE is required to consult or coordinate with USFWS and NMFS under the Federal ESA and with the California Department of Fish and Wildlife (CDFW) under the California Endangered Species Act (CESA) regarding potential impacts of the loss of waterside vegetation habitat on Federally listed and state-listed fish species. As stated in the text of the mitigation measure, RD 17 would implement any additional measures developed through the ESA and CESA consultation processes. As part of the ESA and CESA consultation processes, RD 17 may use the Standard Assessment Model to evaluate the response of focal species to habitat features affected by bank protection projects. The use of the Standard Assessment Model or other assessment models and methodologies may be determined during the ESA and CESA consultation processes. The Requester’s Preferred Alternative would not result in the loss of any shaded riverine aquatic (SRA) habitat. Under Mitigation Measure 3.6-b, RD 17 would compensate for the removal of riparian and other woodland habitat by restoring riparian habitat in the proposed setback levee area in element IVc. Between 25 feet from the landside toe of the existing levee and 15 feet from the waterside toe of the new setback levee are approximately 4.52 acres that would be restored as riparian habitat. The restored riparian habitat would consist of willows, cottonwoods, valley oaks, wild rose, California blackberry, and grasses.

F1-4 Estimating mitigation costs without a plan is difficult and risky. Factors that can have a large impact on costs include well development (if there is not an existing water source), preplanting site preparation (e.g., grading, leveling, weed management), type of irrigation system (and whether there is an irrigation system), and duration of the maintenance period. The mitigation costs need to be grounded in an understanding of mitigation site constraints and conditions. For example, what is the nearest water source, and where is it located? Is the water table close to the surface? Is there a floodway hydraulic threshold that may limit the extent, density (roughness), or pattern of planting areas? Will the mitigation site plan require a separate Floodway Encroachment Permit application process with the Central Valley Flood Protection Board (CVFPB)? Will there be costs for mechanically transplanting existing trees and elderberry shrubs? Because of all these uncertainties, mitigation costs are not typically included in EIS/EIRs. Also, vegetation removal in compliance with the ETL has been eliminated from further consideration under all of the Alternatives as explained in Section 2.3.2, “Alternatives Eliminated from Further Consideration,” under the heading “Waterside Vegetation Removal.”

F1-5 The alternatives evaluated meet the purpose and need for the Phase 3 Repair Project. Under both the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), it is permissible to include an alternative that may not decrease any impacts. The DEIS/DEIR evaluated a full range of alternatives at an equal level of detail. All of the alternatives are considered feasible, and all could meet the Phase 3 Repair Project need and objectives. The FEIS identifies and evaluates the Requester’s Preferred Alternative. Other alternatives that were considered infeasible and eliminated from further consideration in the FEIS are discussed in Section 2.3.2 of the FEIS. As discussed in Master Response 1, “Vegetation Encroachment and Variance Request,” compliance with the ETL is no longer under consideration and is not evaluated in the FEIS. Therefore, a thorough plan for mitigating vegetation removal as a result of ETL implementation has not been included in the FEIS.

F1-6 NEPA requires that an “environmentally preferable alternative” be identified in the Record of Decision (ROD). The environmentally preferable alternative is the alternative that would have the least environmentally damaging impacts. However, NEPA does not require the lead agency to adopt the environmentally preferable alternative.

F1-7 RD 17 has explored the possibility of constructing large setback levees at bends in the river and constructing backup levee setbacks and determined that there would be no cost advantage to implementing setback levees. The foundation soils in potential setback areas are no better than the foundation soils at the location of the existing levees; therefore, the cost of implementing setback levees would always be greater because seepage controls would still have to be included, along with construction of the setback and the acquisition of additional land. NEPA allows an alternative to be considered infeasible based on cost and economic factors. Also, in the case of the Phase 3 Repair Project, RD 17 is the project proponent, not USACE; therefore, RD 17 would bear the costs of the Phase 3 Repair Project. Although RD 17 is exploring funding options with the state, the alternatives proposed are necessarily constrained by what is potentially feasible for RD 17 based on the potential available funding.

F1-8 The response to comment F1-7 describes why implementing large setback levees would be infeasible for RD 17 to implement. The significant and unavoidable impacts on agricultural resources are footprint related and would not be avoided by constructing large setback levees. In fact, greater impacts associated with loss of farmland would be anticipated with construction of large, continuous setback levees because in addition to the footprint impacts of the seepage controls that would be required, there would be additional footprint impacts associated with the setback levee itself relative to where fix-in-place options would be considered. Future development is disclosed as a potential impact in Section 4.2, “Growth Inducement,” but it is not a specific impact of the Phase 3 Repair Project.

F1-9 As previously stated in the response to comment F1-7, RD 17 is exploring funding options with the state. The alternatives carried forward in this analysis reflect what is potentially feasible based on available funding. Constructing large lengths of setback levees would be economically infeasible. Section 2.3.2, “Alternatives Eliminated from

Further Consideration," has been modified to include an explanation of why extensive setback levees were not considered feasible.

F1-10 See the response to comment F1-7. RD 17 has explored the possibility of constructing large setback levees at bends in the river and constructing backup levee setbacks, and there would be no advantage cost-wise because the foundation soils in potential setback areas are no better than the foundation soils at the location of the existing levees, which means the cost of implementing setbacks would always be greater because seepage controls would still have to be included, along with the costs of building the setback and acquisition of additional land. Furthermore, the ability of RD 17 to acquire right-of-way is questionable. It is unlikely the landowners would be willing sellers and the cost to acquire the land through condemnation would be infeasible for RD 17.

F1-11 The goal of the Phase 3 Repair Project is to reduce the risk of flooding during a 100-year flood event. This wording has been used in place of previous wording throughout the FEIS. The Phase 3 Repair Project would not eliminate the risk of flooding.

F1-12 See Master Response 1, "Vegetation Encroachment and Variance Request," above, regarding a revised approach for the vegetation encroachment and variance request. The Phase 3 Repair Project is not intended to meet the goal of the CVFPP, which is 200-year flood protection for urbanized and urbanizing areas. It is intended only to meet the under and through seepage criteria for 100-year flood risk reduction in the immediate near term. Future projects independent of this one will be proposed by RD 17 to meet the CVFPP goals.

F1-13 See Master Response 1, "Vegetation Encroachment and Variance Request," above, regarding a revised approach for the vegetation encroachment and variance request.

F1-14 Full implementation of the ETL is no longer considered under any of the alternatives, as discussed in Section 2.3.2, "Alternatives Eliminated from Further Consideration."

F1-15 The text has been corrected in the FEIS.

F1-16 As stated in the FEIS, implementing the Phase 3 Repair Project would not result in the loss of SRA habitat because RD 17 would not remove waterside vegetation. See Master Response 1, "Vegetation Encroachment and Variance Request," above, regarding a revised approach for the vegetation encroachment and variance request.

F1-17 See the response to comment F1-16, above.

F1-18 The word "about" has been removed. The improvements were made in 1988 and 1989. This information has been incorporated into the sentence.

F1-19 As stated in Master Response 1, "Vegetation Encroachment and Variance Request," above, RD 17 would comply with USACE policies by developing a SWIF plan.

F1-20 Consideration and evaluation of removal of all waterside vegetation has been removed from the EIS. See Master Response 1, "Vegetation Encroachment and Variance Request."

F1-21 The following text was added to Section 2.2 of the FEIS, "National Environmental Policy Act Requirements for Evaluation of Alternatives":

An alternative is considered reasonable if it meets the purpose and need and is practical or feasible from a technical and economic standpoint and using common sense (CEQ 1981). F1-22 RD 17 applied for and currently is receiving financial assistance through the Early Implementation Program (EIP) for the LSRP, which includes the Phase 3 Repair Project (the subject of the EIS. RD 17 and the state entered into a funding agreement (No. 4600008720) through which funding is being made available for the LSRP under the State-Federal Flood Control System Modification Program under Chapter 1.699 (commencing with Section 5096.800) of Division 5 of the California Public Resources Code and Division 43 (commencing with Section 75001) of the California Public Resources Code.

The EIP Guidelines that address funding require that applicants proposing fix-in-place levee projects must demonstrate that it is infeasible to move or set back the levee and/or that no significant flood risk management benefits exist to moving the levee. The EIP Guidelines require funding applicants to evaluate and describe any potentially viable setback levee alternatives to fix-in-place alternatives.

In March 2009, to support its EIP funding request, RD 17 evaluated 10 locations for potential setback levees (RD 17 2009). These 10 proposed locations were determined through a coordinated effort between the California Department of Water Resources (DWR) and RD 17 to comply with the provisions of the EIP. It should be noted that although there may be additional potential locations for setback levees within the RD 17 system, only those setback levees within the scope of work of the LSRP were included because there is no nexus for repair work outside the LSRP scope.

The conclusion of that evaluation was that seven of the 10 locations were not viable for setback levees; however, three of the locations were worthy of further consideration. DWR concurred with this conclusion. The seven setback locations that were not viable were eliminated from further consideration primarily because of the impacts on the cities, land acquisition complications, and cost considerations. The report "Supplemental Analysis of Setback Levee Alternatives," dated March 13, 2009, was prepared as part of the evaluation and included with the EIP funding request referenced in the FEIS. This report was considered during the preparation of the FEIS.

As part of the preparation of the EIS, the three remaining locations were evaluated in the DEIS/DEIR to determine whether a setback levee would be appropriate to include in the Requester's Preferred Alternative. Based on the environmental analysis, only one setback levee, at element IVc, has been retained in the Requester's Preferred Alternative.

F1-23 See Master Response 1, "Vegetation Encroachment and Variance Request," above, regarding a revised approach for the vegetation encroachment and variance request.

Letter F2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

November 21, 2011

John Suazo
U.S. Army Corps of Engineers
Sacramento District, 10th Floor
1325 J Street, (CESPK-PD-R)
Sacramento, CA 95814

Subject: Draft Environmental Impact Statement for Phase 3 of the proposed Reclamation District 17 100-Year Levee Seepage Area Project, San Joaquin County, California, (CEQ #20110301).

Dear Mr. Suazo:

The U.S. Environmental Protection Agency (EPA) is providing comments on the Draft Environmental Impact Statement (DEIS) for Phase 3 of the proposed Reclamation District 17 100-Year Levee Seepage Area Project (Project). Our review, pursuant to the National Environmental Policy Act, Council on Environmental Quality regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act. These comments were also prepared under the authority of, and in accordance with, the provisions of the Federal Guidelines promulgated at 40 CFR 230 under Section 404(b)(1) of the Clean Water Act (CWA).

The San Joaquin River, one of California's major rivers, is essential to the health of the San Francisco Bay-Delta watershed. Depleted flows, agricultural runoff/return flows, and intensive use of ground and surface water supplies in the watershed contribute to poor water quality that adversely affects aquatic life, wildlife, recreation, and other beneficial uses. While EPA strongly supports a durable flood protection system for populations and property adjacent to the project area, based on our review, of the DEIS we have rated the project as Environmental Concerns -- Insufficient Information (EC-2, see enclosed "*Summary of Rating Definitions*"). Our concerns are based on impacts to flood risk, farmland, water quality, waters of the United States, tribal artifacts, species of concern and environmental justice communities adjacent to the project area.

EPA suggests an evaluation of the river for the entire extent of RD 17-levee system. The evaluation could further identify space and suitable conditions for a range of river flows and functions, including reestablishment of floodplains and conveyance of water to wetlands. Cooperation across programs and among stakeholders will be important to achieve continuity along the RD 17-levee system and to resolve issues at the interface between the River and adjacent lands. For example, we support continued outreach to partnering organizations, landowners and other stakeholders in developing programs on seepage response, habitat conservation on adjacent lands, and appropriate mitigation of impacts. 1

Should the project proponent or the Corps foresee other phases of the Reclamation District 17, (e.g. Phase 4,5,6…), EPA recommends that the Final Environmental Impact Statement (FEIS) fully describe the location, timing, and extent of additional phases in the context of the specific impacts anticipated during Phase 3.

EPA appreciates the opportunity to review the DEIS. When the FEIS is released, please send one hard copy and four electronic copies to the address above (mail code: CED-2). If you have any questions, please contact me at (415) 972-3521, or contact James Munson, the lead reviewer for this project. James can be reached at (415) 972-3800 or munson.james@epa.gov. 2

Sincerely,

Connell Dunning

for Kathleen Martyn Goforth, Manager
Environmental Review Office

Enclosures: Summary of EPA Rating System
EPA's Detailed Comments

CC via email:
Federico Barajas, U.S. Bureau of Reclamation
Steve Culberson, U.S. Fish and Wildlife Service
Phil Isenberg, Delta Stewardship Council
Michael Jewell, U.S. Army Corps of Engineers – Sacramento District
Les Grober, State Water Resources Control Board
Luana Kiger, U.S. Department of Agriculture – Natural Resources Conservation Service
Steve Mayo, San Joaquin County Council of Governments
Molly Penberth, California Department of Conservation
Maria Rea, National Marine Fisheries Service (NOAA Fisheries Service)
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Carl Wilcox, California Department of Fish and Game

CC:
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Reggie Lewis, Chairperson, Picayune Rancheria
Ruben Barrios, Chairperson, Santa Rosa Rancheria
Nick Fonseca, Chairperson, Shingle Springs Tribal Council
Leanne Walker-Grant, Chairperson, Table Mountain Rancheria
Joe Kennedy, Chairperson, Timbisha Shoshone Tribe
Ryan Garfield, Chairman, Tule River Indian Tribe
Billie Saulque, Chairperson, U Tu Utu Gwaitu Tribal Council
Jessica Tavares, Chairperson, United Auburn Indian Community
Mary Tarango, Chairperson, Wilton Miwuk Rancheria
Marshall McKay, Chairman, Yocha Dehe Wintun Nation
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Gavin Begaye, Environmental Director, Big Sandy Rancheria
Justin Nalder, Environmental Coordinator, Bridgeport Paiute Tribe
Roselyn Lwenya, Environmental Director, Buena Vista Rancheria
Debra Grimes, Cultural Preservation Specialist, California Valley Miwok Tribe
Terry Williams, Environmental Director, Cold Springs Rancheria
Oscar Serrano, P.E., Senior Engineer, Colusa Indian Community
Cindy Smith, EPA Planner, Enterprise Rancheria of Maidu
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Allen Berna, Environmental Director, Santa Rosa Rancheria
Rhonda Dickerson, Tribal EPA Director, Shingle Springs Tribal Council
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Don Forehope, EPA Director, Timbisha Shoshone Tribe
Kerri Vera, Environmental Director, Tule River Indian Tribe
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Juanita Watterson, Environmental Director, U Tu Utu Gwaitu Tribal Council
David Sawyer, Environmental Contact, United Auburn Indian Community
Emily Reeves, Environmental Coordinator, Yocha Dehe Wintun Nation
Dante Nomellini, Sr., Nomellini, Grilli & McDaniel

SUMMARY OF EPA RATING DEFINITIONS*

This rating system was developed as a means to summarize the U.S. Environmental Protection Agency's (EPA) level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the Environmental Impact Statement (EIS).

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ). 3

ADEQUACY OF THE IMPACT STATEMENT

"Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, Policy and Procedures for the Review of Federal Actions Impacting the Environment.

EPA'S DETAILED COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) FOR PHASE 3 OF THE PROPOSED RECLAMATION DISTRICT 17 100-YEAR LEVEE SEEPAGE AREA PROJECT, SAN JOAQUIN COUNTY, CALIFORNIA, NOVEMBER 21, 2011

Purpose and Need

The purpose for the action stated in the DEIS on page 1-7 is levee improvements. Of broader interest is the restoration of the San Joaquin River. This is demonstrated by the San Joaquin River Restoration Settlement Act, part of the Omnibus Public Land Management Act of 2009, Public Law 111-11. This legislation created the San Joaquin River Restoration Program. The program intends to restore flows to the San Joaquin River from Friant Dam to the confluence of Merced River and restore a self-sustaining Chinook salmon fishery in the river while reducing or avoiding adverse water supply impacts from restoration flows. The restoration effort is lead by the U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service, the California Department of Water Resources (DWR), and the California Department of Fish and Game (CDFG). The Corps and EPA have also participated in this restoration program. 4

These agencies are also heavily involved in numerous efforts underway to secure and upgrade water supply infrastructure in the Sacramento-San Joaquin Delta, and restore aquatic habitats necessary for the recovery of special status species. Among these efforts are proceedings about water quality and beneficial uses administered by the State Water Resources Control Board, and regional planning processes spearheaded by the Delta Stewardship Council (DSC). The mandate of the DSC is to advance the "co-equal goals" of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The study area for the proposed Phase 3 project encompasses an environmentally strategic region at the junction of the lower San Joaquin River and the South Delta where new infrastructure and habitat restoration will be melded to achieve the co-equal goals. 5

Given the public/private partnerships aimed at restoring the San Joaquin River and the Delta, this NEPA process presents the Corps with a unique opportunity to simultaneously advance improved flood protection, the conservation of agricultural lands, and the restoration of aquatic resources. However, the DEIS proposes to "lock-in" levees that were previously constructed in the floodplain and are serving to channelize the eastern bank of the River and fragment the floodplain. This will increase the protection from flooding, and could induce the development of farmlands and open space in the region. EPA recommends that this project be utilized to relocate and upgrade the levee network consistent with the larger restoration efforts underway on the San Joaquin River and within the Delta. 6

The DEIS recognizes flood protection, but could go further to assist in the river restoration. The purpose and need assessment addresses the need for renovation of the San Joaquin River (River) levees, but could provide more details on the general health of the river environment in the overall RD 17 levee system. Furthermore, the DEIS does not adequately identify protection of agricultural lands as part of the purpose and need.

Recommendation:

EPA recommends that the Purpose and Need for this project be expanded to include: restoring aquatic habitats, reconnecting the San Joaquin River to its historic floodplain, and managing floodwaters in the lower San Joaquin River watershed by increasing the areal extent of floodplain dedicated to floodwater storage and groundwater recharge. 7

Alternatives

The DEIS provides a limited set of alternatives which include two action alternatives and a no action. 8
Alternative 1 represents the minimum disturbance and Alternative 2 represents maximum disturbance

scenario. The DEIS lacks an evaluation of the river for the entire extent of RD 17-levee system. Such an evaluation could further identify space and suitable conditions for a range of river flows and functions, including reestablishment of floodplains and conveying water to wetlands. We note that cooperation across programs and among stakeholders will be important to achieve continuity along the RD 17-levee system and to resolve issues at the interface between the River and adjacent lands. For example, we support continued outreach to partnering organizations, landowners and other stakeholders in developing programs on seepage response, habitat conservation on adjacent lands, and appropriate mitigation of impacts. cont. 8

Recommendations:

Include in the FEIS the following modifications to both alternatives:

1) Include measures for both restoration of the river as well as flood protection (e.g. levee improvements/setbacks and reconnecting the floodplain to the river); and 9
2) Include provisions for an easement on farmland adjacent to the levee, with a description of possible easement opportunities to ensure protection of the farmland in perpetuity. 10
3) If there will be additional phases of the proposed project (Phase 4, 5, 6....), fully describe the location, timing, and extent of additional phases in the context of the specific impacts anticipated during Phase 3. Include a description of the type and timing for additional National Environmental Policy Act (NEPA) documentation that may accompany future phases. 11

Regarding practicability of the proposed project, the FEIS should examine the cost of catastrophic flooding as a result of hydrostatic pressure confined by a non-setback levee system as proposed in Alternative 1 described on pages 1-16 of the DEIS. Page ES-3 of the DEIS states "potential structural and content value of property damages for a levee breach within the area protected by the RD 17 levee system is estimated to be greater than $900 million." 12

Flood Plain Restoration and Management

Per Flood Insurance Rate Maps (FIRM), portions of the project footprint may be in a Zone AE (100 year) with base flood elevations determined (EL 9' - EL 25')[1]. Executive Order 11988 Floodplain Management requires federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of flood plains, and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. 13

The project aims to increase the levees' resistance to underseepage and/or through-seepage (p. 3) for up to 100-year flood events by modifying levee slope and crown widths, constructing seepage berms and setback levees with seepage berms, and installing slurry cutoff walls and toe and chimney drains.

Recommendations:

EPA encourages expanding the carrying-capacity for floodwaters with levee setbacks that reconnect the historic floodplain throughout the portion of the River watershed in the project area. 14

[1] See FIRMs:
1. 06077C0605F SAN JOAQUIN UNINC&INC AREAS 10/16/2009
2. 06077C0465F SAN JOAQUIN UNINC&INC AREAS 10/16/2009
3. 06077C0620F SAN JOAQUIN UNINC&INC AREAS 10/16/2009

The FEIS should include a plan for a systematic approach to protect public safety and existing infrastructure, conserving agricultural lands and remnant habitats, and advancing the recovery of floodplain functions and ecosystem processes. The systematic approach should the following six elements: 15

1. Where the footprint of existing infrastructure constrains the design flexibility for strengthening and upgrading the existing levees, then conventional engineering approaches should be used on these levee segments/river corridors. 16
2. Where the levee network is bounded on one or both sides by agricultural lands and open space, aggressive measures should be taken to work with the farming community to relocate/set-back levees to restore floodplain function and to increase the local carrying capacity for floodwaters. 17
3. In the case of element #2 above, for the strips of land removed from agricultural production and returned to floodplain function, the government should compensate landowners for any lost agricultural revenue or property access via conservation easements funded by one or more of the programs referenced above. 18
4. The recovered floodplains should be re-vegetated with locally native plants and trees as a means to recover the riparian forest. By restoring riparian forest on the waterside of the levees, vegetation on the levees themselves can be removed according to the wishes of the Corps and RD-17, and adverse effects on the recovering riparian corridor could be avoided. This has the beneficial programmatic effect of rendering moot the Corps' controversial levee vegetation policy - Engineering Technical Letter (ETL) 1110-2-571. 19
5. Restoration of floodplains and waterbodies on the lower San Joaquin River should be linked with efforts by agencies and NGOs elsewhere in the San Joaquin River basin to establish floodplain bypasses, restore riparian corridors, reconnect remnant habitats, and conserve working landscapes, including:
    a. San Joaquin River Restoration program: http://www.restoresjr.net/ 20
    b. South Delta Flood Bypass: http://www.ens-newswire.com/ens/apr2008/2008-04-08-091.html
    c. San Joaquin River Partnership: http://www.sanjoaquinriverpartnership.org/
6. The change (increase) in flood carrying capacity afforded by the levee setbacks should be documented and counted as a benefit of the project. 21

Protection of Farmland

The DEIS does not adequately discuss protection of agricultural lands from development. San Joaquin County has experienced substantial population growth in areas such as Tracy, Manteca and Modesto. Given the location of this project, much of the area to be protected by levees is at risk of conversion from farmland to residential communities. The DEIS does not, however, acknowledge that the proposed project may induce conversion of agricultural lands and open space into residential, commercial, or industrial development. 22

Across the entire 6,345 acre envelope of agricultural land that is "subject to flooding" (p. ES-3), resource and regulatory agencies should make every effort to purchase conservation easements to conserve vital agricultural soils and remnant habitats, and to prevent development that might be induced by the proposed project. The public cost of these easements would be a fraction of the cost to human life, property, and emergency services if the area is developed and then flooded by a reasonably foreseeable storm event.

3

Recommendations:

The FEIS should acknowledge that the proposed project is likely to induce the conversion of agricultural lands and open space into residential, commercial, or industrial development. 23

Include in the FEIS a commitment by the Corps and Reclamation District No. 17 for more rigorous review and approval procedures for applications to convert agricultural land in flood prone areas to residential, commercial, or industrial development. These more rigorous procedures should apply not just to RD-17, but across the geographic region covered by the Central Valley Flood Protection Plan (see page 5, Figure 3 in the *Central Valley Flood Protection Plan*: http://www.water.ca.gov/cvfmp/docs/CVFPP-ProgressReport-201101.pdf. 24

EPA recommends that the Corps and Reclamation District No. 17 engage with the Natural Resources Conservation Service, the California Department of Conservation, San Joaquin County Council of Governments, California Department of Fish and Game, Department of Water Recourses, Fish and Wildlife Service, and non-governmental organizations to discuss purchasing conservation and flood easements across the "6,345 acres of agricultural lands that are subject to flooding" (p. 1-8). The agencies could initiate direct talks with the farming communities in the area to encourage the sale of easements, and farmers could be compensated for lost agricultural production wherever levees are relocated (setback) so historic floodplains and sub-watersheds can be reconnected to water bodies in the study area (i.e., French Camp Slough, Walthall Slough, and the San Joaquin River proper). 25

Potential sources of easement funding include:

a. NRCS Landscape Planning Program
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape
b. NRCS Bay Delta Initiative
http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/farmbill/initiatives/?&cid=stelprdb1041880
c. NRCS Buffer Initiative – California
http://www.ca.nrcs.usda.gov/programs/buffer.html
d. San Joaquin County Multi-Species Habitat Conservation and Open Space Plan 26
http://www.sjcog.org/programs-projects/Habitat_files/Habitat-Main-page.htm
e. DOC California Farmland Conservancy Program
http://www.conservation.ca.gov/dlrp/cfcp/Pages/Index.aspx
f. DFG-WCB: Riparian Habitat Conservation Program and Ecosystem Restoration on Agricultural Lands (ERAL)
http://www.wcb.ca.gov/Programs/

Water Quality

The project would impact river water quality if petroleum products or other construction-related wastes, such as cement, solvents, and/or disturbed and eroded soil, are discharged into storm water runoff and/or groundwater during project construction and operation. As a result, the proposed project could cause loss or degradation of fish and other aquatic, woodlands, and shaded riverine habitats. 27

The upper River is listed as impaired under Clean Water Act Section 303(d) and has Total Maximum Daily Loads for organophosphorus pesticides, salinity and boron, selenium, total dissolved solids, and mercury in Delta channels; the Stockton Deepwater Ship Channel downstream of the Phase 3 project is being addressed for dissolved oxygen.

4

Recommendations:

The FEIS should provide more information on how to mitigate the project's potentially significant impact on receiving water quality from storm water runoff and erosion and should commit to mitigation measures to minimize chemical introduction into the river system. We suggest soil sampling be completed preconstruction to ascertain what type of chemicals would potentially enter the river during hydrological events (e.g. storms, runoff and flooding) and or construction of the project. 28

Include a map identifying specific locations where runoff is expected and where specific design features for storm water management will be placed (revegetation, erosion control measures, etc.). 29

Include storm water performance standards for both construction site sediment control and post-construction project design standards in the FEIS. 30

FEIS should include an estimate of potential increases in storm water runoff locations and volume, and locations for specific design features to minimize discharges and dissipate energy. 31

Employ BMPs as described in Tables ES-2 and 4-3, to maintain or reduce the peak runoff discharge rates, to the maximum extent practicable, as compared to the pre-project conditions. 32

<u>Waters of the United States</u>

As part of the public review process, the Corps is required to determine whether a project complies with the Section 404(b)(1) Guidelines (40 CFR Part 230). The Section 404(b)(1) Guidelines prohibit the discharge of dredged or fill materials to waters of the United States if there is a "practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (40 CFR §230.10a). An alternative is "practicable" if it is "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes" (40 CFR §230.10(a)(2)). 33

Section 5.4 of the Draft EIS/EIR notes that a second supplemental jurisdictional wetland delineation was being prepared to account for adjustments in the Phase 3 footprint, (p. 50-3). Comments provided in this letter reflect the information provided in the Draft EIS/EIR, and supplemental comments may be provided once the second supplemental jurisdictional wetland delineation is completed.

Recommendations:

To demonstrate compliance with CWA Guidelines, the FEIS should identify and quantify measures and modifications to avoid and minimize impacts to water resources for the preferred alternative. The FEIS should report these numbers in map and table form for each impacted water and wetland feature. 34

The FEIS should include updated or revised information regarding a change to the extent of impacts to jurisdictional waters to EPA when completed. 35

<u>Consultation with Tribal Governments</u>

Executive Order 13175, Consultation and Coordination with Indian Tribal Governments (November 6, 2000), was issued in order to establish regular and meaningful consultation and collaboration with tribal 36

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officials in the development of federal policies that have tribal implications, and to strengthen the United States' government-to-government relationships with Indian tribes. As stated in Appendix B, the "absence of specific information in the sacred lands file does not indicate the absence of cultural recourses", (Letter Native American Heritage Commission dated May 24 2010). However, the location and nature of the Project highly increases the risk of disturbance tribal artifacts and sensitive sites. EPA understands that there are over thirty tribes with possible historic connections to the project area. cont. 36

Recommendations:

The FEIS should describe the process and outcome of government-to-government consultation between the Corps and each of the tribal governments affected by the project, issues that were raised (if any), and how those issues were addressed in relation to the proposed action and selection of a preferred alternative. President Obama directed all federal agencies to develop an action plan to implement this Executive Order by February 3, 2010. For more information refer to: http://www.whitehouse.gov/the-press-office/memorandum-tribal-consultation-signed-president. 37

The FEIS should comply with the Corps Tribal Consultation guidance developed under Executive Order 13175. For more information go to: http://www.usace.army.mil/CECW/TribalIssues/Documents/poa_usace_07jan10.pdf 38

National Historic Preservation Act and Executive Order 13007

The DEIS cultural resources section 3.7 does a very good job of describing the history of the Project area. The Project includes disturbance of previously undisturbed lands. Four example types of disturbance could include grading, filling, vegetation clearing, and increased vehicle traffic. There is a "possibility that significant cultural resources would be damaged" (p. 3.7-18). EPA understands that these possible significant impacts could include cultural sensitive areas and or tribal artifacts.

Consultation for tribal cultural resources is required nnder Section 106 of the National Historic Preservation Act (NHPA). Historic properties, under the NHPA, are properties that are included in the National Register of Historic Places (NRHP) or that meet the criteria for the National Register. Section 106 of the NHPA requires a federal agency, upon determining that activities under its control could affect historic properties, to consult with the appropriate SHPO/THPO. 39

Executive Order 13007, Indian Sacred Sites (May 24, 1996), requires federal land managing agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian Religious practitioners, and to avoid adversely affecting the physical integrity, accessibility, or use of sacred sites. It is important to note that a sacred site may not meet the National Register criteria for a historic property and that, conversely, a historic property may not meet the criteria for a sacred site.

Recommendations:

The FEIS should include a summary of a comprehensive Archaeological survey. This survey should list and quantify the findings of test pit analysis performed in the Project area. 40

Species of Concern

The proposed project could significantly impact species of concern and their habitats. Page 3.6-18 states that "Four of these species are Federally listed or State-listed as threatened or endangered: valley elderberry longhorn beetle, Swainson's hawk, California tiger salamander, and riparian brush rabbit." 41

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However page 5-4 indicates that adverse impacts could also occur to Central Valley steelhead and Southern distinct population segment (DPS) of North American green sturgeon. The Draft EIR/EIS proposes to mitigate for impacts to species in the project area. It does not fully quantify what direct and indirect impacts will occur to habitats adjacent to the project area. 42

Recommendation:

The FEIS should include the results of the Section 7 consultation with the United States Fish and Wildlife Service and the National Marine Fisheries Service, if appropriate. Where possible, we recommend that mitigation measures be identified for all special status species adversely affected by direct and indirect impacts of the project. 43

The DEIS indicates that comprehensive mitigation as well as compensatory mitigation plans for special status species would be implemented. The FEIS should include additional information on the proposed mitigation measures these plans would contain so that their effectiveness can be assessed and disclosed.

Environmental Justice

The DEIS identifies the project as having impacts to environmental justice communities in the contexts of tribes and the possible significant disturbance of Native American artifacts. However, the document fails to adequately address the impacts of the project on low income environmental justice communities adjacent to the project areas that could possibly be impacted by construction emissions geographic modifications, limited recreation opportunities and flood risk both during construction activities and as a final result of the project.

Recommendations: 44

The FEIS should identify all potential environmental justice communities in the project area.

The FEIS should identify the types of short- and long-term impacts likely to occur as a result of the project. We recommend quantifying impacts to all communities adjacent to the project areas that could be adversely impacted by the project.

F2-1 The cover letter from the U.S. Environmental Protection Agency (EPA) contains introductory comments that are expanded on in the detailed comments that accompanied the cover letter. Therefore, responses to comments in the cover letter are provided below.

F2-2 Thank you for your review comments. One hard copy and four electronic copies of the FEIS will be provided to Kathleen Martyn Goforth, EPA Region IX, Environmental Review Office, CED-2, 75 Hawthorne Street, San Francisco, CA 94105.

F2-3 Thank you for the “Summary of Rating Definitions.” RD 17 and USACE understand that based on EPA’s review, the DEIS/DEIR has been rated as Environmental Concerns - Insufficient Information (EC-2).

F2-4 This comment does not present an accurate summary of the purpose for the action. The purpose of the action is to implement landside levee improvements and isolated waterside levee improvements, to reduce the risk of flooding in the RD 17 service area during a 100-year flood event. More specifically, the objectives are to (1) correct levee geometry where needed to meet USACE design standards, (2) increase the levee’s resistance to under seepage and/or through seepage, and (3) provide seepage exit gradients of less than 0.5 at the water surface elevation associated with the 100-year flood event.

F2-5 Although it is true that the Phase 3 Repair Project area is at the junction of the lower San Joaquin River and the Sacramento–San Joaquin Delta, it is important to note that RD 17 and the portion of the San Joaquin River that borders RD 17 is not within the San Joaquin River Restoration Program (SJRRP) study area. The junction of the San Joaquin River and the Merced River, which is the lower boundary of the SJRRP study area, is approximately 30 miles upstream (to the south) of the southernmost extent of RD 17’s levee system.

F2-6 This recommendation is outside the scope of the RD 17 Phase 3 Repair Project. RD 17 is exploring funding options with the state. In addition, USACE authorization under Section 408 is the trigger for the EIS. As indicated in the response to comment F2-4, the purpose of and need for the Phase 3 Repair Project is to reduce the risk of flooding in the RD 17 service area during a 100-year flood event. Therefore, alternatives carried forward in this analysis reflect the purpose and need and what is potentially feasible for RD 17 to implement based on available funding. The issues raised in the comment would be better addressed by other, larger efforts that are underway (e.g., CVFPP).

F2-7 As stated previously in these responses (see the responses to comments F1-7 and F1-9), implementing this recommendation is outside the scope of the Phase 3 Repair Project, and the applicant (RD 17) has insufficient funding to expand the Phase 3 Repair Project scope as suggested.

F2-8 The RD 17 Phase 3 Repair Project has a defined scope that focuses on reducing the risk of flooding in the RD 17 service area during a 100-year flood event. RD 17 is a small agency with limited funding. The Lower San Joaquin River Feasibility Study and the Lower San Joaquin River Urban Protection Project are focused on providing 200-year flood protection. Much of the coordination suggested in EPA's comment is occurring through the CVFPP and these other efforts.

F2-9 As described in other responses (responses to comments F1-7, F1-9, F2-6, F2-7, and F2-8), implementing such measures is beyond the scope of the Phase 3 Repair Project and infeasible because of cost.

F2-10 RD 17 would contribute to the purchase of agricultural easements through participation in the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP). Some easements may be purchased adjacent to the levees. However, the location and extent of acquisitions are determined and directed by the SJMSCP Joint Powers Authority, not RD 17.

F2-11 No additional phases are associated with the RD 17 LSRP. Phase 3 is the final phase. Future efforts by the land use agencies within RD 17 include pursuing a plan to provide 200-year flood risk reduction for the communities, which would involve improvements to the RD 17 levees, but they are not part of the defined scope of the LSRP. Neither the Phase 3 Repair Project nor any component of the LSRP precludes any such future actions.

F2-12 The costs of catastrophic flooding would be spread among many individuals, organizations, and agencies, whereas the cost of implementing setback levees along the RD 17 levee system would be borne by RD 17 with financial assistance from DWR.

F2-13 This comment is noted.

F2-14 Thank you for this recommendation. Setback levees have been considered. The FEIS evaluates setback levees at six elements (IIab, IVc, and VIcde), and the Requester's Preferred Alternative includes a setback levee at element IVc. See Master Response 2, regarding the Requester's Preferred Alternative and the responses to comments F1-7 through F1-10.

F2-15 Many of the six suggested elements could be done in the setback area under consideration. The other elements are being considered in the broader planning efforts that are underway in the region (e.g., CVFPP).

F2-16 This approach is being implemented along element VIIe.

F2-17 Item 1 was considered during development of project alternatives and the screening process. However, these actions are being or will be addressed as part of other efforts (e.g., CVFPP).

F2-18 Typically, in these situations, the agency purchases the floodway land in fee-title rather than implementing the approach described in the comment because DWR needs to be able to control activities that occur in the floodway.

F2-19 See Master Response 1, "Vegetation Encroachment and Variance Request." Implementing the Phase 3 Repair Project would not result in the removal of waterside vegetation.

F2-20 Item 5 would not help accomplish the project purpose and therefore was not considered; however, these concepts are being addressed by other efforts (e.g., CVFPP).

F2-21 As indicated in the DEIS/DEIR and the FEIS, the proposed setback is not of sufficient size to provide hydrologic benefits. The setback at element IVc has been hydrologically evaluated to ensure that no unintended impacts would occur, as indicated in the text describing the situation at the junction of the San Joaquin River and the head of Old River in the discussion of "Impact 3.5c: Place Housing within a 100-Year Flood Hazard Area or Place within a 100-Year Flood Hazard Area Structures That Would Impede or Redirect Flood Flows."

F2-22 In FEIS Section 4.2.3.2, "Flood Risk Reduction Facility Repair Effects," after the last sentence in the second paragraph, additional text has been included that lists the types of environmental impacts typically associated with urban development. The new text states, "The types of environmental effects typically associated with such urban development include conversion of agricultural lands, loss of habitat, air emissions, and traffic congestion."

F2-23 To address this comment, additional text has been inserted after the second sentence in the first paragraph in FEIS Section 4.2.3.2, "Flood Risk Reduction Facility Repair Effects," to identify the lands that have been identified for future growth that are currently in agricultural production and to explain that RD 17 would contribute to the purchase of agricultural easements through participation in the SJMSCP. The additional text states, "Much of the land considered for future urban growth currently is in agricultural production. USACE and RD 17 do not influence local land use decisions, and RD 17 contributes to purchases of agricultural easements through participation in the SJMSCP."

F2-24 USACE and RD 17 have only limited authority to comment on local land use decisions and do so accordingly. Neither has local land use decision-making authority.

F2-25 This recommendation is outside the scope of the Phase 3 Repair Project and is being addressed by other programs (e.g., CVFPP). RD 17 is doing its part through participation in the SJMSCP.

F2-26 Thank you for providing these sources for consideration. As noted in the response to comment F2-23, the FEIS explains that RD 17 would contribute to the purchase of agricultural easements through participation in the SJMSCP.

F2-27 This is a correct statement of fact.

F2-28 In most of the Phase 3 Repair Project area, no new opportunities for soil-water contact would be created. Therefore, soil sampling is not needed; however, in areas where setback levees are proposed, the potential exists for new interactions between water and soil to occur. To address this issue, Mitigation Measure 3.5-a2 has been added. This mitigation measure requires implementation of Mitigation Measure 3.15-b (see Section 3.15, “Hazards and Hazardous Materials” in the FEIS), which requires RD 17 to retain a registered environmental assessor to conduct Phase I Environmental Site Assessments and, if necessary, Phase II Environmental Site Assessments and/or other appropriate testing for the Phase 3 Repair Project area and to implement recommendations in the Phase I and II Environmental Site Assessments addressing any contamination that is found before beginning ground-disturbing activities.

F2-29 The recommended maps would be prepared as part of the National Pollutant Discharge Elimination System (NPDES) Construction General Permit process (i.e., develop a storm water pollution prevention plan [SWPPP] with best management practices [BMPs]).

F2-30 The requested information is not available. These standards will be determined by the Central Valley Regional Water Quality Control Board (Central Valley RWQCB) as needed in conjunction with the permitting process.

F2-31 The recommended information on location and volume of increased stormwater runoff and design features to address runoff would be prepared as part of the NPDES Construction General Permit process (i.e., develop a SWPPP with BMPs).

F2-32 Stormwater BMPs are addressed in mitigation in Section 3.5, “Hydrology and Water Quality,” of the FEIS, and RD 17 legally is obligated to implement the mitigation measures as part of the permitting process. The specific issues raised in this comment would be addressed in the SWPPP prepared by RD 17 for the Phase 3 Repair Project.

F2-33 All of the USACE preliminary jurisdictional determinations are included in Appendix E to the FEIS.

F2-34 RD 17 would prepare the maps as part of the NPDES Construction General Permit (i.e., develop a SWPPP with BMPs) and Clean Water Act (CWA) Section 404 and 401 processes.

F2-35 Any changes in the extent of impacts on jurisdictional waters are reflected in the FEIS.

F2-36 USACE conducted government-to-government consultation with potentially affected tribes. On May 16, 2011, USACE sent letters to affected tribes, requesting additional information about locations of archaeological sites and areas of traditional cultural value or concern within the area of potential effects (APE). The Requester’s Preferred Alternative addressed in the FEIS reflects design changes that have affected the APE. Therefore, new letters to Native American representatives, including an updated map of the APE, were sent on May 28, 2014, informing them of the changes. To date, no additional information concerning these types of resources have been received by USACE.

F2-37 On May 16, 2011, and again on May 28, 2014, USACE sent government-to-government consultation letters to tribes that it determined may potentially be affected by implementation of the Phase 3 Repair Project. To date, no additional information about archaeological sites or areas of traditional cultural value or concern has become available from this consultation. Section 6.2 of the FEIS, “Section 106 Compliance and Native

American Consultation Pursuant to Executive Order 13175," describes the consultation process and summarizes the outcomes. Native American correspondence is provided in Appendix F in the FEIS.

F2-38 Please see the responses to comments F2-36 and F2-37, above.

F2-39 This comment is a correct statement of fact. USACE has consulted with the California State Historic Preservation Officer (SHPO). SHPO has concurred in a finding that implementation of the Phase 3 Repair Project would have no impact on historic properties. Based on government-to-government Native American consultation, no sacred locations have been identified that would potentially be affected by implementation of the Phase 3 Repair Project.

F2-40 A cultural resources inventory was conducted for the Phase 3 Repair Project (AECOM 2011, 2014) and includes a description of the methods and results of the investigation. The report describes the results of a cultural resource inventory that identifies cultural resources within the APE, evaluates those resources for listing in the National Register of Historic Places (NRHP), and makes a finding of effect, as required in Section 106 of the National Historic Preservation Act regulations (36 Code of Federal Regulations [CFR] Part 800).

All aspects of the cultural resource inventory were conducted in accordance with the Secretary of the Interior's Standards and Guidelines for Identification of Cultural Resources (48 CFR 44720–44723). Documentation in the cultural resources inventory followed the guidance outlined in *Instructions for Recording Historical Resources* (OHP 1995). Because archival research and review indicated that the entire APE had been surveyed for recent previous investigations conducted primarily by EDAW (now AECOM) and ECORP in recent years, it was not deemed necessary to repeat these intensive surveys. Consequently, AECOM cultural resources specialists conducted a reconnaissance-level survey intended to review the accuracy of previous studies and revisit any documented cultural resources to update existing records if necessary. This reconnaissance-level survey was conducted along the RD 17 levee and included the pedestrian examination of the levee and adjacent portions of the APE where ground-disturbing work would take place. These regions were examined on foot, with an archaeologist walking at approximately 20-meter intervals on May 12 and 13, 2008, and on July 14, 2010. Some of the sections that were surveyed are now covered with mixed commercial, residential, and agricultural development.

Two resources were identified within the APE: the Silviera Ranch Complex (P-39-004602) and the levee that forms the western boundary of the basin protected by RD 17. The Silviera Ranch Complex was previously determined ineligible for listing in the NRHP by the California Office of Historic Preservation (OHP 2007). The inventory report also recommends it as ineligible for listing in the California Register of Historical Resources (CRHR). The RD 17 levee is recommended as ineligible for listing in the NRHP and CRHR. Accordingly, the inventory report makes a finding of *no historic properties to be affected* as provided in 36 CFR Part 800.4(d)(1).

In a letter dated April 6, 2011, the California SHPO concurred with the findings of the investigation documented in the inventory report.

After SHPO concurrence in 2011, the project design changed. Most of the changes consisted of reductions in the project footprint but also included a total of approximately 10.7 acres of additional APE in three locations: elements IIIa, VIa.4 through VIIb, and VIIe. An intense survey of the expanded APE areas was conducted on March 3, March 11, and April 23, 2014. No previously unreported cultural resources were identified during the survey. The updated records search conducted for the expanded portions of the APE identified that Madruga Road extended through the southern portion of CA-SJO-3. Examination of previous investigations conducted for CA-SJO-3 revealed that CA-SJO-3 is a deeply buried site. The survey did not identify any cultural resources within the recorded boundary of CA-SJO-3 that is within the project APE. The addendum Cultural Resources Report (written for the expanded portions of the project APE) made a finding of *no historic properties to be affected*. USACE provided this addendum report to the California SHPO, and in a letter dated April 1, 2015, the SHPO concurred with the findings documented in the report.

Because of the close proximity of one resource to the APE, AECOM archaeologists conducted limited subsurface testing in the APE on March 11–12, 2014. Testing of the area consisted of six shovel test units placed in the APE and adjacent to the recorded boundary of the nearby resource. The excavation confirmed that the resource is outside the APE. At the same time, AECOM archaeologists also surveyed the APE at the location of another resource. The survey did not encounter any archaeological material or intact cultural deposits.

F2-41 This comment is a correct statement of fact.

F2-42 Fish are addressed in Section 3.6, “Biological Resources,” of the DEIS/DEIR and the FEIS. Direct impacts on special-status species are quantified and effects on Essential Fish Habitat are addressed.

F2-43 The Section 7 consultation has been completed. Mitigation measures, including compensatory mitigation, are identified in the FEIS in Section 3.6, “Biological Resources” and reasonable and prudent measures as well as nondiscretionary terms and conditions are identified in the Biological Opinions issued by USFWS and NMFS included in Appendix J of this FEIS.

F2-44 Low income and minority populations are As described in the setting discussion in Section 3.16, “Environmental Justice,” of the DEIS/DEIR, low income and minority populations are not a significant portion of the population within the vicinity of project activities and would not be disproportionately affected by construction-related effects of the Phase 3 Repair Project. Furthermore, flood protection benefits of the project would accrue to all segments of the population as discussed under Effect 3.16-a, “Potential to Result in a Disproportionately High and Adverse Environmental Effect on Minority or Low-Income Populations” in the FEIS.
Effect 3.16-a has been revised to address construction-related effects.

Letter F3

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To
08ESMF00-2012-CPA-0026

OCT 24 2011

Mr. John Suazo
U.S. Army Corps of Engineers
1325 J. Street (CESPK-PD-R)
10th Floor
Sacramento, California 95814

Subject: Comments on Draft Environmental Impact Statement/Environmental Impact Report for Phase 3 - RD 17 100-Year Levee Seepage Area Project

Dear Mr. Suazo:

This letter provides the Fish and Wildlife Service's (Service) comments on the Corps of Engineer's (Corps) Draft Environmental Impact Statement/Environmental Impact Report for Phase 3 - RD 17 100-Year Levee Seepage Area Project (DEIS/R), received in our office on September 13, 2011

GENERAL COMMENTS

The proposed project involves 8.4 miles of levee work, about 6 miles of which are along the east bank of the San Joaquin River between the cities of Lathrop and Stockton. The majority of this work involves modifications of the levee in its current location ("in place") involving seepage berms, cutoff walls, and other appurtenances. As currently designed, significant impacts of this project on fish and wildlife resources include: a) direct losses of landside habitat associated with construction; b) direct losses of land and water-side habitat associated with maintenance; c) effects of construction and maintenance on listed wildlife species, particularly the riparian brush rabbit, (habitat, migration corridors, foreclosed opportunity to restore habitat for the species); d) effects on fish species, included listed species, that depend on near shore riparian habitat; and e) 1
indirect impacts, especially from inducing the expansion of dense residential or other urban development in the vicinity of habitat. The DEIS/R does not state whether or not a levee variance to allow vegetation would be requested. At most, three short setbacks limited to 0.4 of the ~6 miles of San Joaquin mainstem work are proposed for one alternative. The vast majority of the remainder (~5.6 miles) involves fixing the levees in place where they are adjacent to the water edge, and would require maintenance with or without a variance. The DEIS/R does not evaluate why the proposed extent of setbacks, even with a variance, would be sufficient to offset habitat impacts. The DEIS/R implies the use of a habitat conservation plan to offset impacts, but that plan does not necessarily apply to Federal flood control projects such as this, and the

measures in the DEIS/R may not create habitat in locations most needed for the recovery of the listed fish and wildlife species.

Accordingly, the Service recommends the project be redesigned with much greater emphasis on preserving and restoring habitat. This should involve a different approach that minimizes fixing the current levee in place, but rather, employs the use of a levee which is continuously set back throughout the length of the project area, of varying setback width. We believe that this approach would maximize habitat at the land-water interface and create more continuous habitat, while minimizing maintenance needs and human disturbance from adjacent uses. cont. 1

SPECIFIC COMMENTS (DEIS/R pages in parentheses)

1 <u>Coordination with the Service has been substantially lacking.</u> The DEIS/R (pp. ES-8, 5-6) states that the Corps has coordinated with the Service under the Fish and Wildlife Coordination Act (FWCA), however, this coordination has been limited to a single meeting on March 1, 2011 The DEIS/R was received without other contact. Under FWCA, the Service is the Federal agency with whom the Corps must coordinate with during early planning of such projects. During the coordination process under FWCA, the Service consults other resource agencies, and conducts its own assessments so that our recommendations related to fish and wildlife considerations can be considered in project planning and impacts avoided. The Corps is required to consider our recommendations, and provide funding for their development. For this project, however, the Service has received no such funding, and has had no other prior involvement under FWCA. We recommend that funding be provided by the Corps, so that Service staff can fulfill our responsibilities, and the Corps can comply with FWCA. 2

2. <u>Factors leading to uncertainty in request for a variance to levee vegetation maintenance policy are not disclosed.</u> We note that the DEIS/R (pp. ES-4, 1-12) states that no decision has been made with respect to obtaining a variance from the Corps vegetation management standards. Based on the Service's notes from our March 1, 2011, meeting, the Corps' consultants in attendance stated that they had researched analyses related to an approved variance on the Sacramento River in the vicinity of Natomas, and believed that a much wider, 40-to-60 foot crown width levee, would be needed to obtain such a variance in the proposed project area. As the crown width in the project area is much narrower (about 20 feet), it is not clear that the variance option is feasible as currently designed. Although the Service does not recommend the in place improvement approach at all for this project area, if this approach is retained in any way, we recommend that Corps disclose whether or not a variance is being sought, for which portions of levee, and the habitat differences of all three potential design approach options (set back levee, in place improvements with variance, in place improvements without variance), for each element reach, and for the project in total. 3

3. <u>Levee vegetative maintenance impact is improperly considered a no-action condition; no mitigation for maintenance is proposed.</u> The DEIS/R (pp. 1-14 to 1-16) considers enforcement and execution of levee vegetative maintenance under Corps policies to be a 4

no-action condition for the purpose of the National Environmental Policy Act. The DEIS/R (p. 3.6-35) specifies only construction impacts to result from the project (e.g., 0.65 to 0.87 acre of waterside vegetation), presenting far larger impacts of both construction and maintenance in another section of the DEIS/R (e.g., p. 2-43; 5.97 to 6.35 acres of waterside vegetation). The DEIS/R repeatedly states (pp. 3.6-31 to 3.6-58), for each and every such impact of vegetation removal due to maintenance, that no mitigation will be provided. The Service disagrees that this is a no-action impact, and disagrees that no mitigation should be required. Currently, the levees are inconsistently maintained, and have more vegetation than specified in Corps policies. The incentive for adherence to Corps policies, as stated elsewhere in the DEIS/R (p. 1-12) is for qualification under Public Law 84-99. The major deficiencies in the current levees in the project, however, are seepage issues. These deficiencies cannot be resolved by removal of vegetation. Notwithstanding the Corps' levee maintenance policy, the Service believes that vegetation has benefits to levees; it may strengthen levees and result in lower rodent populations, and vegetation removal may actually exacerbate erosion and levee failure risks. The vegetation is also habitat for listed species. The Corps does not currently have authorization from the Service for take of listed species for its Federal action of creating and enforcing its levee maintenance policy standards. The only reasonable circumstance in which vegetation maintenance up to these standards would occur, would be if the proposed project were built, which would include obtaining any necessary take authorization from the Service and National Marine Fisheries Service. The Service considers this maintenance to be a result of the proposed project, and recommends that the Corps develop and propose mitigation measures for these impacts. cont. 4

4. <u>The proposed project does not provide adequate consideration of levee setbacks:</u> 5

a. The DEIS/R (p. 2-1) generally mentions that a "hybrid" approach may be selected, meaning some level of maintenance between: 1) removing vegetation only on the upper 1/3 of the water side of levees under a variance; and 2) no vegetation allowed on the levees or 15 feet outward of the toe on both land and water side under the Corps' Engineering Technical Letter 110-2-571 (ETL). It is clear from the vegetation figures in the DEIS/R (pp. 3.4-9 to 3.4-15), however, that existing vegetation in the project area is already patchy and sporadic in distribution, and largely narrow in width. More riparian width, and much more continuous vegetation is needed in the project area for support of fish and wildlife species, not less by any amount, either in area or in length of water interface. There is no information in the DEIS/R that would indicate that either of these maintenance options (variance or ETL) would adequately fulfill the needs of the fish and wildlife species affected, or mitigate the impacts of the project on them; 6

b. We disagree with elimination of consideration of setbacks wherever (e.g., element 1a, DEIS/R, p. 2-9) "there is no deep bend in this stretch of the river." A deep bend is not required. Although the Service would prefer a wider corridor, setbacks can be of varying widths and even a narrow setback can have substantially greater benefits than none at all. For the in place improvements proposed, many involved relatively wide seepage berms on the land side. Where infrastructure limits available land, it may be possible to design a narrow levee 7 setback with unlimited vegetation on the waterside that uses no more land than an in place modified levee with a landside berm. This option should be investigated. Where there is no adjacent urban or residential infrastructure, however, a wider setback is recommended. cont. 7

c. We disagree where the largest potential setback considered (element Va -V1a.1) was dismissed because of changes to hydraulic conditions (p. 2-11). We do not know what was considered in the reference cited in the DEIS/R (RD 17 2009), however, we believe there are numerous options that might mitigate a hydraulic change (in this case, the split between the mainstem San Joaquin and Old Rivers), for example, spurs levees perpendicular to the setback levee, retaining/breaching/raising the existing levee in addition to providing a setback levee, partial setbacks that preserve the apex of the bend across from Old River, or setbacks along Old River itself. This major opportunity should be studied further; 8

d. We disagree with the decision to eliminate from consideration a setback spanning elements IIIa-b, which together with elements IVc and Va-VIa.1 (if set back), could form a relatively long and wide habitat corridor; 9

e. As for the alternatives presented (p. 2-13), the best of these includes three short setbacks bordering roughly 500, 700, and 900 feet (~0.4 mile), one of which is a park; the remainder of the project (about 5.6 miles of work), retains the levee in its current location. As such, the maximum proposed extent of setback levees does not provide a sufficient opportunity to improve the continuity of habitat. 10

5. Setback areas should not drain completely. A minor but significant point of disagreement is mentioned in the DEIS/R (p. 2-8), where it states that levees would be designed to drain completely after high water events to prevent fish stranding. Although fish stranding may occur, natural floodplain surfaces are not topographically flat and angled to drain. For this project, fish stranding is unlikely to be a significant cause of loss given the volume of high water events, and there are significant benefits of topographic variation and lack of complete drainage. Temporary ponding can provide benefits to fish and wildlife, as well as promote diversity of plant species. Rather than promoting drainage, the Service recommends designing topographic variation onto natural floodplain surfaces in this project area. 11

6. Cost considerations versus habitat needs. Setback alternatives were typically eliminated from consideration due to cost (pp. 2-10 to 2-12). The sole basis for this cost is an electronic mail not included in the DEIS/R or appendices (Guenther 2011), and without which the Service cannot verify the rationale for eliminating alternatives. In some cases (e.g., elements 1e and IIIb), extraordinary costs were assigned for what appear to be short setbacks spanning modest areas of agricultural land. In fact, there was no depiction of what the eliminated setback options were for each of the project elements. Based on the information provided, the Service cannot agree with the cost basis for the decisions and, in any case, does not agree that cost is the sole or predominant consideration in the decision 12

of an alternative approach in this project area. Rather, much greater emphasis should be placed on improving habitat, and providing as continuous a habitat corridor as possible, throughout the project area. cont. 12

7 Information as presented appears to underestimate habitat impacts. The DEIS/R (pp. 3.6-4 to 3.6-11) discusses habitat surveys which were done and provides associated maps, referenced as "complied by AECOM in 2010." The information as presented appears to understate the impacts for several reasons. First, the figures show impacts that often divide a tree, apparently counting the portion of tree which is not in the impact area as being unimpacted when it clearly would be. Second, only the canopies of trees are counted if 13 they are separated at all, and the intervening space is called ruderal, whereas a more logical approach would be to combine the tree canopies and intervening spaces as a single polygon of larger area because it includes the habitat between trees in groups. Third, the habitat maps do not appear to extend the typing to the levee toe and 15 feet beyond that, such as is assumed to be impacted by maintenance under the ETL. All of these factors suggest underestimation of the impacts on woody vegetation habitat types.

8. San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP) do not necessarily apply to Federal Flood Control Projects. The DEIS/R (p. 3.6-3) provides a brief overview of the SJMSCP and frequently references the SJMSCP in its mitigation measures (pp. 3.6-36, 3.6-38). However, the SJMSCP does not necessarily apply to Federal flood control projects such as the proposed project. Extension of coverage to a Federal flood control project can be sought separately, but at present there is no agreement from the Service to extend coverage of this project under the SJMSCP for listed 14 species under our authority. Given the size of the proposed project, and potential effects on listed species and their needs for recovery, coverage under the SJMSCP should not be presumed. The use of in place levee modifications would permanently foreclose any future opportunity for restoration or enhancement within the project area. The DEIS/R does not provide adequate description of how the proposed mitigation would create habitat in locations likely to be needed for recovery of the listed fish and wildlife species affected, compared to habitat losses and lost opportunity for habitat restoration and enhancement which may be essential for recovery of listed species.

9. Effects on Riparian Brush Rabbit (RBR) should include losses of dispersal habitat, and losses of habitat not yet restored or occupied, but potentially necessary for recovery of the species. The DEIS/R (p. 3.6-54) identifies a potential loss of riparian brush rabbit populations that could restrict the range of RBR. However, contrary to what is implied in the DEIS/R (p. 3.6-53), a survey cannot prove absence, or discount this impact. This is especially true for this project area, because the species already is known to occur within the project boundaries. Loss of any type of habitat, whether currently occupied or not, 15 reduces the potential for dispersal between habitat patches, and the potential for future occupation. Additionally, the exact locations and quality of riparian habitat on levees vary over the long-term, depending on maintenance and the maintenance interval. These other habitat types also serve as buffers from disturbance on agricultural or urban lands. Finally, other habitat types - of currently low quality to the species - such as ruderal, are important because they have restoration potential and if restored, could benefit the persistence and

recovery of RBR. Habitat conversion in many forms and fragmentation, including that related to levee maintenance, and adjacent agriculture and urban development, have been cited as reasons for RBR decline. Although the Service has not yet designated critical habitat for RBR, it is logical to consider that habitat restoration in the immediate vicinity of known populations may be necessary for the RBR's survival and recovery. This consideration includes the project area, given the large length of mainstem San Joaquin River work (6.0 miles) involved within the restricted range of RBR. cont. 15

10. Valley Elderberry Longhorn Beetle (VELB) - comments. Contrary to the DEIS/R (p. 3.6-25), the Service does not consider Argentine ants the greatest threat to the VELB. It is an identified threat; however, we consider the scarcity of host plants, their lack of protection, and discontinuity of riparian corridors generally as the most important threat. Elsewhere (p. 3.6-43), the DEIS/R summarizes avoidance and minimization measures, and states the Corps will compensate for host plant loss in accordance with the SJMSCP The Service's preference, given the large scope of this project (6 miles of mainstem work, very sparse elderberry), and threat of habitat loss to VELB, is to recommend that elderberries be included, in a normal amount, as a component of riparian plantings in project mitigation, where appropriate. 16

11 All reliable non-California Natural Diversity Database (CNDDB) listed species records should be disclosed on figure 3.6-2b. This figure shows only CNDDB-reported RBR occurrences, however, the text (p. 3.6-27) describes two other occurrences in two reaches, and describes similar habitat in four other reaches. If known and reliable, these non-CNDDB records of RBR and other listed species should be displayed. 17

12. Swainson's Hawk - comments. The DEIS/R (p. 3.6-26) documents this species and its habitat throughout the project area. Other than a reference to the largest tree (100 inches diameter at breast height), we found no narrative information on the number of trees, age, size, or distribution. Some of the largest trees are on the land side. The species also forages widely and so losses of foraging habitat are an effect. However, the DEIS/R (p. 3.6-50) proposes only temporary avoidance measures, and does not propose any mitigation for loss of habitat in the form of planted area. Mitigation for lost habitat for this species, particularly trees used for nesting, should be described (see comment #13). 18

13. Adequacy of mitigation for Woodland and Riparian losses cannot be determined. The DEISR/R (p. 3.6-60) discloses a loss of at least 9.4 acres of land and waterside woody vegetation. The discussion states generally that the floodway area created by setback levees could provide riparian woodland and Shaded Riverine Aquatic (SRA) cover. As noted above (GENERAL COMMENTS, comments #3 and #4), these setbacks are small and confined, whereas the impacts occur throughout the 6.0 miles of San Joaquin mainstem work. In particular, SRA cover values are roughly proportionate to the interface length of land and water. No analysis of area, length, habitat values, plantings, or other features of the mitigation is included, that would allow a quantitative determination of adequacy. However, the limited setback locations and length of interface with water are of concern. 19

14. <u>Growth-inducing and cumulative impacts on fish and wildlife habitat are not calculated, but appear to be substantial.</u> The DEIS/R (pp. 4-4 to 4-10) includes mention of other projects, the completed Phase II, a number of development projects (some constructed, others pending), and other flood control projects in various stages of completion or study, in the immediate vicinity and region. Notably absent from the DEIS/R was mention of the Central Valley Flood Protection Plan, which may or may not involve additional habitat impacts, but may result in some further disturbance even if only raising of levees. No quantities of fish and wildlife habitat impacts are disclosed for these additional projects, although a few quantities in other terms indicate that the cumulative impacts are very large. The Central Lathrop Specific Plan, for example, includes a future additional 6,800 residential units and 5 million square feet of commercial adjacent to the San Joaquin River within RD 17, and identifies loss of RBR and its habitat as an impact. Although other actions cited in the DEIS/R do not so specifically identify an RBR impact, we did notice in the DEIS/R figures that dense residential housing are already adjacent to most of elements IV through VIa.4 of the Phase III project, as well as elements IVb and VIa.2 of Phase II. Although the individual impact of Phase III is in itself large, the combined impact of all residential and urban development on fish and wildlife habitat - which was not calculated or presented in the DEIS/R - is likely to be much larger. Additionally, residential projects such as these may depend on completed flood control in order to proceed. This would represent an induced impact of Phase III (the proposed project). 20

15. <u>Feasibility of mitigation for habitat losses, especially of SRA cover, may not be possible even with a variance.</u> The DEIS/R (pp. 4-16) states that there is no feasible mechanism to mitigate for SRA cover cumulative impacts because of the large incremental contribution of SRA cover losses of Phase III in an area where such vegetation is already scarce. However, at the same time, the DEIS/R asserts that the project - with mitigation measures - would not result in a significant cumulative impact without waterside vegetation removal. The term "without waterside vegetation removal" does not, however, mean that no vegetation would be removed, but rather that some vegetation may be allowed under a variance. As noted earlier in the DEIS/R (pp. 2-1) the Corps seems to anticipate that some other type of lower vegetation allowance than a variance, termed "hybrid", seems probable for this project location with its current design approach. Based on our initial review, any further loss of vegetation from construction or maintenance may render the project infeasible. Instead, given that: a) riparian and SRA cover are already very limited and discontinuous; and b) the project area is important to the survival and recovery of listed species, the Service believes that a feasible project likely will involve relatively continuous vegetation, in a wider waterside riparian corridor than the narrow band that would be associated with a variance, and with no maintenance or an absolute minimum of maintenance within that corridor. Redesign of the project with a much wider use of setback levees, is the only approach we have identified to achieve feasibility. 21

Thank you for the opportunity to comment on this project. If you have any questions, please contact Steven Schoenberg, at (916) 414-6600 if you have any questions regarding this project.

Sincerely,

Daniel Welsh
Assistant Field Supervisor

cc:
Mike Hendrick, NMFS, Sacramento, CA
Andrea Boertien, CDFG, Yountville, CA

F3-1 A continuous levee setback approach along the extents of the Phase 3 Repair Project area is not feasible because of the substantial cost implications and land acquisition difficulties.

To develop a continuous setback levee along the length of the Phase 3 Repair Project area, large amounts of land would need to be acquired adjacent to the existing levee system. The land acquisition would not be limited to the width of the setback area, the proposed levee prism, and the area required for access roads along the toe of the slope. Because the proposed levee foundation soil stratigraphy would be nearly identical to that at the existing adjacent levee, extended seepage control berms would be required at the levee toe or cutoff walls within the levee prism. In many locations, the area landside of the levee was developed previously or is planned for development, complicating the process for acquisition and increasing the cost per acre.

In addition to the increased land acquisition costs, a continuous setback levee would require substantially more imported soil to construct. As mentioned previously, seepage controls, such as landside seepage berms or cutoff walls, would still be required to address existing soil conditions. Acquiring suitable fill material from commercial sources on a per-yard basis for a project of this scope would likely be cost prohibitive. Therefore, borrow areas within the vicinity of the Phase 3 Repair Project area would need to be identified and acquired. Development of the borrow areas would have substantial impacts during construction related to noise, air quality, agriculture, land use, and biological resources, which in turn would result in substantial mitigation costs.

In March 2009, to support its EIP funding request, RD 17 evaluated 10 locations as potential sites for setback levees. These 10 locations were determined through a coordinated effort between DWR and RD 17 to comply with the provisions of the EIP. It should be noted that although there may be additional potential locations for setback levees within the RD 17 system, only those setback levees within the scope of work of the LSRP were included because there is no nexus for repair work outside the LSRP scope.

The conclusion of that evaluation was that seven of the 10 locations were not viable for setback levees; however, three of the locations were worthy of further consideration. DWR concurred with this conclusion. The seven setback locations that were not viable were eliminated from further consideration primarily because of their impacts on the cities, land acquisition complications, and cost considerations. The report prepared as part of the evaluation, *Supplemental Analysis of Setback Levee Alternatives*, dated March 13, 2009, was considered during the preparation of the DEIS/DEIR and was included as a reference. As part of the preparation of the DEIS/DEIR document, the three remaining locations were evaluated to determine whether the environmental analysis would warrant a setback levee.

This explanation has been incorporated into Section 2.3.2, “Alternatives Eliminated from Further Consideration,” of the FEIS.

F3-2 Although consultation with USFWS had not been formalized when the DEIS/DEIR was issued, USACE had previous meetings with USFWS, as well as NMFS and CDFW. Early on, some debate existed regarding which USFWS office had jurisdiction over the Phase 3 Repair Project. In early discussions with Doug Weinrich (USFWS), it was determined that the newly formed Bay-Delta Office might have jurisdiction over projects in that region. Meetings in August 2010 and January 2011 involved Brian Hansen from the Bay-Delta Office. Later, it was decided that the Sacramento office was the more appropriate office for Section 7 consultation and the development of the Fish and Wildlife Coordination Act report. The March 1, 2011, site visit, which was attended by Steve Schoenberg, from your office, as well as Brian Hansen, did not involve the entire Phase 3 Repair Project area. Regarding Section 7 consultation, a draft BA was provided to Doug Weinrich, and other input was provided on the day of the site visit. The BA was revised to reflect changes to the Phase 3 Repair Project description and other project refinements. The BA was finalized and used to initiate formal consultation for the project in March 2015. A letter of insufficiency was received from USFWS, dated October 2, 2015, and a revised final BA was submitted on March 8, 2017 with responses to comments. USACE submitted a draft conceptual Mitigation Monitoring Plan for proposed habitat mitigation within the element IVc setback area on January 12, 2018, and received comments on February 27, 2018. A second revised final BA was then submitted by USACE to USFWS on August 21, 2018. USFWS issued a Biological Opinion for effects to valley elderberry longhorn beetle and riparian brush rabbit on April 16, 2019. RD 17 also provided a copy of the FEIR to USFWS when it was issued and a copy of the FEIS is being provided by USACE to USFWS. Regarding a lack of funding to your office for activities related to the Fish and Wildlife Coordination Act, a scope of work was coordinated with your office in April 2011, and a funding request was submitted through USACE project management. However, because of limited funding in Fiscal Year 2011 and inconsistent funding resulting from multiple continuing resolutions, appropriations in Fiscal Year 2012 delayed securing this funding. Requested funding was provided in early calendar year 2012.

USACE submitted a letter dated February 27, 2015, requesting to initiate formal consultation with USFWS and NMFS on the Requester’s Preferred Alternative. A final BA was submitted to USFWS and NMFS in March 2015. Letters of insufficiency were received from NMFS, dated July 7, 2015 and from USFWS, dated October 2, 2015, and a revised final BA was prepared that will includes responses to the letters. Because RD 17 would avoid impacts on waterside vegetation with implementation of the Requester’s Preferred Alternative, the final BA addressed potential impacts and mitigation measures associated with valley elderberry longhorn beetle and riparian brush rabbit, but not listed fish species or SRA habitat. See Section 6.3, “Endangered Species Act Consultation,” of the FEIS for additional information.

Furthermore, regarding the lack of prior access to the DEIS/DEIR, USACE apologizes for this oversight. USACE and RD 17 recognize the value in USFWS’s early involvement in discussions regarding project impacts on listed species and habitat. Sacramento District environmental staff members have since continued to work closely with USFWS staff members regarding all Section 7 and Fish and Wildlife Coordination Act requirements.

F3-3 As stated above in the response to comment F3-1, creating a continuously set back levee would be economically infeasible. For reasons similar to those provided in the response to comment F3-1, a wider levee also would be economically infeasible. See Master Response 1, above, regarding vegetation encroachment and variance request. See also Master Response 2, above, regarding the Requester's Preferred Alternative.

F3-4 Under NEPA, no requirement exists to provide mitigation for the No-Action Alternative. However, the effects of the No-Action Alternative are addressed. These effects would be the same as or very similar to those of the action alternatives; therefore, the same mitigation measures would apply. See Master Response 1, above, regarding vegetation encroachment and variance request.

F3-5 This comment is addressed in the responses to comments F1-7, F1-9, F2-6, F2-7, F2-9, and F3-1.

F3-6 The vegetation maintenance options evaluated in the DEIS/DEIR and FEIS are not intended as mitigation measures for fish and wildlife species. Nevertheless, the DEIS/DEIR and FEIS analyze impacts on SRA habitat, and mitigation is provided. See the discussion of Impact 3.6-b and Mitigation Measure 3.6-b. Implementing Mitigation Measure 3.6-b would ensure that no net loss of SRA habitat function would occur.

F3-7 See the response to comment F3-1, above. Implementing a narrow levee setback or wider setback levees would result in greater impacts related to noise, air quality, agriculture, land use, and biological resources because of the larger footprint and the need for much more soil.

F3-8 Implementing a large setback levee at elements Va–VIa.1 is infeasible because building the new levee would require the purchase of a large expanse of property from an unwilling landowner.

A combination setback levee and spur levee configuration would require maintenance and land acquisition similar to that required for the full setback levee concept. It would increase the length of the constructed levees and therefore would result in both increased upfront costs and increased long-term maintenance costs.

The other option involved leaving the existing levee in place and constructing a setback levee behind it with some combination of retaining, breaching, or raising of the existing levee, which would also result in increased upfront and long-term maintenance costs. The current hydraulic conditions at the bifurcation between the mainstem San Joaquin River and Old River depend on maintaining the existing levee configuration. Any impact on the levees in this vicinity has the potential to modify the flow split and increase the water surface elevations downstream (toward the city of Stockton) on the order of several tenths of a foot. To protect the downstream system, the existing levee would need to be repaired and maintained in perpetuity to current standards for geometry, under seepage, and through seepage. Behind this levee, a setback levee would need to be constructed that meets the same standards for geometry, under seepage, and through seepage. This double-levee concept would result in both increased upfront construction costs and increased long-term maintenance costs.

Partial setback levees that preserve the apex of the bend across from Old River have complications similar to those of the alternatives discussed above because the existing levee would need to be repaired and maintained in perpetuity to current standards for geometry, under seepage, and through seepage in addition to the construction of any setback levee.

Implementing a setback levee on Old River, although potentially beneficial to the overall river system, is beyond the scope of the Phase 3 Repair Project. RD 17 has no jurisdiction over this area, and there is no nexus to use district funds for these improvements.

F3-9 Thank you for your comment. However, the comment does not provide any supporting evidence as to why the decision was inappropriate or how a setback levee in this location could be feasible.

F3-10 NEPA does not require that baseline (existing) conditions be improved. Under NEPA, the effects of the proposed action and alternatives under consideration are measured against existing conditions at the time of preparation of the EIS and future existing conditions (e.g., No-Action Alternative). Alternatives are compared against the Requester's Preferred Alternative or the Proposed Action, not against the baseline or existing conditions.

F3-11 This guidance from USFWS is contrary to guidance provided by NMFS on other, similar projects (e.g., consultation letter for the Feather River Levee Setback Project). This issue has been resolved through the Section 7 consultation process. See Appendix J in the FEIS for further information.

F3-12 RD 17, not USACE, is the project proponent, so the costs would be prohibitive. The Guenther 2011 e-mail referenced in the document included the full preliminary construction cost estimate report (*see* Attachment 1 to this appendix) and a summary table as attachments to the email. An Adobe PDF package containing the email and attachments was included in the CEQA administrative record, which was included in electronic format on CD in the copies of the DEIS/DEIR that were available for public review at USACE's Sacramento office and the Weston Ranch and Lathrop branches of the Stockton–San Joaquin County Library. The summary table is included below, and the full MacKay & Somps 2011 cost estimate report has been included as **Attachment 1** to these responses to comments. However, NEPA allows an alternative to be considered infeasible based on cost and economic factors, and there is no requirement to depict what is considered infeasible. Furthermore, as noted in the response to comment F3-10, above, there is no obligation under NEPA to make habitat improvements. Potential impacts are evaluated relative to existing (baseline) conditions, and mitigation is required when thresholds are exceeded. There is no requirement to improve conditions beyond that level.

Cost Summary - RD17 Phase III Projects

Element	Length	Seepage Berm Cost	Cutoff Wall Cost	Setback Levee Cost	Least Expensive Option
Ia	590 feet	$956,807	$2,041,000 [1]	N/A [2]	Seepage Berm
Ib	242 feet	$390,726	$1,444,000 [1]	$16,442,000	Seepage Berm
Ie	660 feet	$656,889	$2,161,000 [1]	$15,843,000	Seepage Berm
IIab	2550 feet	N/A [3]	$2,544,006	$16,007,207	Cutoff Wall
IIIa	4700 feet	$955,748	$9,089,500 [1]	$34,655,000	Through Seepage
IIIb	720 feet	$565,890	$2,263,800 [1]	$34,655,000	Seepage Berm
IVa	525 feet	$1,296,816	$2,429,000 [6]	$34,655,000	Seepage Berm
IVc	2405 feet	$2,573,504	$4,331,922	$5,211,356	Seepage Berm
Va	7950 feet	$8,023,679	$13,467,000 [7]	$40,596,000	Cutoff Wall
VIa1	1650 feet	$6,157,360 [7]	$4,069,566	$40,596,000	Cutoff Wall
VIa4	30 feet	$146,293	$1,080,000 [1]	$127,695,000	Seepage Berm
VIb	1945 feet	$432,446	$4,365,000 [1]	$22,125,000	Seepage Berm
VIcde	500 feet	$1,484,070	$1,887,000 [1]	$6,282,526	Seepage Berm
VIIb	340 feet	$286,357	$1,612,100 [1]	$14,181,000	Through Seepage
VIIe	2500 feet	N/A [4]	$2,064,748	$177,205,000	Cutoff Wall
VIIg	385 feet	$441,071	$1,689,000 [1]	$177,205,000	Seepage Berm
VIII-XI	13715 feet	$6,314,851	$23,214,000	N/A [5]	Seepage Berm

Legend:

- Phase III Cost Estimate dated February 18, 2011
- Phase III Cost Estimate dated May 12, 2010
- Costs determined using a typical unit cost developed from Phase III cost estimates and other similar projects The resulting unit price for a cutoff wall is approximately $1,715 per linear foot.
- This alternative is not feasible, see individual notes for additional information
- Costs determined by Supplemental Analysis of Setback Levee Alternatives dated March 13, 2009

Notes:

(1) The construction of a cutoff wall requires a 300' overlap both upstream and downstream of the project, effectively increasing the length by 600'. To calculate, add 600 feet to the length and multiply by a typical unit cost ($1715/LF)

(2) The San Joaquin River's curvature in this area prevents the construction of a setback levee without greatly increasing the scope of the project. In addition, there are existing high voltage powerlines and the Matthews Road bridge, that would need to be relocated

(3) The geotechnical analysis for this section concluded that due to the adjacent manmade lake, a seepage berm could not reduce the seepage gradient to an acceptable level

(4) A seepage berm would require the acquisition of the adjacent lots by condemnation. RD17 has determined that they would be unable to condemn these lots by emminent domain due to the availablity of the cutoff wall option

(5) This section of levee is not adjacent to the San Joaquin River. a setback levee would not provide any additional benefits to the river system than the existing configuration

(6) In addition to the improvements identified under note (1), this Element will require pump station improvements on the landside of the levee to conform to current ACOE and DWR standards. At this preliminary stage these improvements have been estimated at $500,000

(7) Element Va and VIa1 had be estimated as a single entity prior to the February 2011 cost estimate. the costs shown above are based on a pro-rata share of the costs based on length

Page 1 of 1

F3-13 The figures have been revised to account for riparian canopy overlap outside the Phase 3 Repair Project footprint, and in elements IIIb and IVa, some of the riparian polygons have been combined.

F3-14 This is a local flood control project for which Federal authorization is required and Federal funding is requested. The local lead agency, RD 17, has successfully used the SJMSCP for previous phases of the LSRP.

F3-15 Under NEPA, the potential effects of project and alternatives under consideration are measured against existing conditions at the time of preparation of the EIS and future existing conditions (e.g., No-Action Alternative). If an existing recovery plan identified locations important for recovery, these would be evaluated in the land use section in the discussion of consistency with adopted habitat conservation plans and natural community conservation plans. A recovery plan is a document describing the current status, threats, and intended methods for increasing rare and endangered species population sizes. As described in the FEIS, as well as in the USFWS biological opinion on page 22 (USFWS 2019), vegetation in and around the areas where landside riparian habitat would be removed is relatively open, patchy, and would be low quality for riparian brush rabbit. The USFWS biological opinion further states that [r]abbits generally have a small home range and rarely venture more than a few feet from shrub cover into small openings to forage. The FEIS and USFWS biological opinion both conclude that the setback levee would increase areas of active floodplain along the San Joaquin River, which could create new habitat that could benefit the riparian brush rabbit, including serving as refugium during high-water events, and could support more rabbits than the removed habitat.

F3-16 The last sentence in the first paragraph under the heading "Valley Elderberry Longhorn Beetle" in Section 3.6.2, "Environmental Setting," of the FEIS has been modified as follows: "Another identified threat to the valley elderberry longhorn beetle may be predation and displacement by the invasive Argentine ant (*Linepithema humile*) (Huxel 2000)." In addition, the last two bulleted items in the discussion of Mitigation Measure 3.6-e have been modified as follows:

- All elderberry shrubs with one or more stems measuring 1.0 inch or greater in diameter at ground level that cannot be retained in the project area will be transplanted to a valley elderberry longhorn beetle mitigation site (likely the French Camp Conservation Bank) during the dormant period for elderberry shrubs (November 1 to February 15) and in accordance with the requirements of the VELB [valley elderberry longhorn beetle] Framework (USFWS 2017).

- For all elderberry shrubs that cannot be retained on the project site and will be transplanted, all stems of 1 inch or greater in diameter at ground level will be counted. Compensation for removal of these stems will be provided in accordance with the VELB Framework (USFWS 2017) and through the purchase of habitat conservation credits from the French Camp Conservation Bank to offset the adverse effects of transplanting elderberry shrubs.

F3-17 As indicated in its title, Figure 3.6-2b, "CNDDB—Recorded Occurrences of Sensitive Biological Resources within 2 Miles of the Phase 3 Repair Project Area—South Half," is intended to convey the results of the California Natural Diversity Database search. It would be contrary to the intent of the figure to provide information in the figure from other sources. The information regarding additional sightings is already provided in the text, and the sources are cited. The sources are included in the administrative record, which is available on CD at USACE's Sacramento office and the Weston Ranch and Lathrop Branches of the San Joaquin County Library by request.

F3-18 Participation in the SJMSCP is voluntary for local jurisdictions and project proponents. RD 17 would be participating in the SJMSCP to mitigate impacts on species covered by the plan. The intent of the SJMSCP is to provide adequate mitigation to comply with Federal ESA and CESA regulations, and the plan was approved by USFWS and CDFW. Swainson's hawk is covered in the SJMSCP, and Mitigation Measure 3.6-h summarizes the SJMSCP measures to minimize incidental take of Swainson's hawk, including payment of development fees for establishment of habitat preserves to mitigate lost habitat for this species.

F3-19 Under NEPA, mitigation is allowed to rely on performance criteria. Mitigation Measure 3.6-b includes such performance criteria and provides for further development of the details of the mitigation through the Section 7 consultation process.

F3-20 The following text on the CVFPP has been added to Table 4-4:

> The Central Valley Flood Protection Plan (CVFPP) is a long-term planning document to address flood management challenges in areas currently protected by facilities of the State Plan of Flood Control (SPFC) as part of a systemwide investment approach for sustainable, integrated flood management. The CVFPP also considers operation and management of facilities in tributary watersheds that influence SPFC-protected areas. The CVFPP is intended to provide a foundation for prioritizing Central Valley flood risk reduction and ecosystem restoration investments, including feasibility studies on the appropriate scales—from valley-wide to project-specific. The CVFPP is to be updated every 5 years, with each update providing support for subsequent policy, program, and project implementation. Following adoption of the CVFPP in 2012, regional and state-level financing documents are to guide investments in the range of $13 billion to $16 billion during the next 20–25 years. The 2017 Central Valley Flood Protection Plan Update Draft Supplemental Program EIR was released for public review in 2017.

NEPA does not require quantification of cumulative impacts if it is clear by other means that the impact would be significant (e.g., air basin in nonattainment, species listed as threatened or endangered). As stated in Section 4.2, “Growth Inducement,” of the FEIS, the Phase 3 Repair Project would accommodate growth currently approved or identified in general and specific plans that address growth areas within the RD 17 service area, and growth potentially induced by these approved projects and general and specific plans is addressed in the environmental documents prepared for these projects and plans.

F3-21 See Master Response 1, above, regarding vegetation encroachment and variance request.

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY

ARNOLD SC

Letter S1

DEPARTMENT OF TRANSPORTATION
P.O. BOX 2048 STOCKTON, CA 95201
(1976 E. CHARTER WAY/1976 E. DR. MARTIN
LUTHER KING JR. BLVD. 95205)
TTY: California Relay Service (800) 735-2929
PHONE (209) 941-1921
FAX (209) 948-7194

Flex your power!
Be energy efficient!

October 14, 2011

10-SJ-5, PM Various
Phase 3 of RD 17 100-Year LSAP
SCH #2010042073

Dante Nomellini
Reclamation District No. 17
P.O. Box 1461
Stockton, CA 95201

Dear Mr. Nomellini,

The California Department of Transportation (Department) appreciates the opportunity to comment on the Draft Environmental Impact Report (DEIR) for the **Phase 3 of the Reclamation District No. 17 (RD 17) 100-Year Levee Seepage Area Project (LSAP)**. The overall purpose of this proposed project is to implement landside levee improvements in 23 LSAP elements affecting 8.4 miles of the approximately 19-mile RD 17 levee system. This includes portions of the San Joaquin River east levee, portions of the levee along the north bank of Walthall Slough, and along the dryland levee extending east from Walthall Slough to approximately South Airport Way.

Upon review of the project, the Department has the following comments:

1. Please provide a Traffic Management Plan and a map of planned truck haul route showing how construction vehicles will access State Highways to the project site and how traffic will be managed in and out of the project site, including the hours of construction and truck volume. The project developer should coordinate with the District Office of Traffic Management to ensure that traffic flow and safety are maintained. 1

2. The proposed project may encroach into the State's right of way (ROW) and if so would require issuance of an Encroachment Permit by the Department. As defined in CEQA section 21069, the Department would act as a Responsible Agency for projects requiring an Encroachment Permit. An application for an Encroachment Permit must include appropriate environmental studies and a copy of the environmental document adopted by the Lead Agency. These documents should identify the Department as a Responsible Agency and should include an analysis of impacts to cultural resources, biological resources, hazardous waste, and other resources mentioned above, within the State's ROW. Appropriate avoidance, minimization, and mitigation measures must be identified. 2

3. Modification, including the increase of levee height, to the San Joaquin River System will potentially impact adjacent and/or spanning infrastructure. Potential scour and substandard hydraulic efficiency around bridges will need to be analyzed and mitigated if necessary. Modified levees may impact the roads atop the levee or adjacent to the levee. Therefore, encroachments to the State's ROW may require modifications and upgrades to the drainage systems. 3

"Caltrans improves mobility across California"

If you have any questions, please contact Sinarath Pheng at (209) 942-6092 (e-mail: Sinarath_Pheng@dot.ca.gov) or myself at (209) 941-1921.

Sincerely,

Sinarath Pheng

for TOM DUMAS, CHIEF
OFFICE OF METROPOLITAN PLANNING

cc Scott Morgan, State Clearinghouse

"Caltrans improves mobility across California"

S1-1 Anticipated haul routes are discussed in the "Construction Schedule and Methods" sections presented for each of the action alternatives in Section 2.4.2, "Action Alternatives," and are shown in more detail in Figure 2-10 of the FEIS. This information would be supplemented after construction plans are in place, construction contractors have been identified, and the borrow material source has been identified. With this information, a traffic management plan and map would be prepared and provided to the California Department of Transportation (Caltrans) for review and comment. RD 17 would implement the measures outlined in the traffic management plan.

S1-2 The potential need for a Caltrans encroachment permit is identified in the "State Actions/Permits" section in Section 1.9.6, "Regulatory Requirements, Permits, Authorizations, and Approvals," of the FEIS. Permit applications and documentation would be provided as needed.

S1-3 The proposed improvements would not affect the hydrology because the levees are not being raised, and the levees would not be altered. Furthermore, RD 17 and USACE do not anticipate that any roads would be affected, except those atop the levees that simply serve as levee access; therefore, no modifications, improvements, or upgrades to roadways would be required. Also, as shown in Exhibit 2-9c of the FEIS, work would occur adjacent to the state right-of-way in this area, but construction and improvements would not occur underneath any roads.

Letter S2

STATE OF CALIFORNIA

Governor's Office of Planning and Research

State Clearinghouse and Planning Unit

RECEIVED
OCT 27 2011
BY:

Edmund G. Brown Jr.
Governor

Ken Alex
Director

October 25, 2011

Dante Nomellini
Reclamation District No. 17
P.O. Box 1461
Stockton, CA 95201-1461

Subject: Phase 3 of the Reclamation District No. 17 (RD 17) 100 - Year Levee Seepage Area Project (LSAP)
SCH#: 2010042073

Dear Dante Nomellini:

The State Clearinghouse submitted the above named Draft EIR to selected state agencies for review. On the enclosed Document Details Report please note that the Clearinghouse has listed the state agencies that reviewed your document. The review period closed on October 24, 2011, and the comments from the responding agency (ies) is (are) enclosed. If this comment package is not in order, please notify the State Clearinghouse immediately. Please refer to the project's ten-digit State Clearinghouse number in future correspondence so that we may respond promptly. 1

Please note that Section 21104(c) of the California Public Resources Code states that:

> "A responsible or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency. Those comments shall be supported by specific documentation."

These comments are forwarded for use in preparing your final environmental document. Should you need more information or clarification of the enclosed comments, we recommend that you contact the commenting agency directly.

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process.

Sincerely,

Scott Morgan

Scott Morgan
Director, State Clearinghouse

Enclosures
cc: Resources Agency

1400 TENTH STREET P.O. BOX 3044 SACRAMENTO, CALIFORNIA 95812-3044
TEL (916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

Document Details Report
State Clearinghouse Data Base

SCH#	**2010042073**
Project Title	Phase 3 of the Reclamation District No. 17 (RD 17) 100 - Year Levee Seepage Area Project (LSAP)
Lead Agency	Reclamation District 17

Type	**EIR** Draft EIR
Description	Phase 3 of the LSAP proposes landside levee improvements along approximately 8.4 miles of the RD 17 levee system in San Joaquin County, California, including portions of the San Joaquin River east levee, portions of the levee along the northerly bank of Walthall Slough, and the Dryland levee extending easterly from Walthall Slough to ~ South Airport Way, to meet applicable Federal and State design recommendations for levees protecting urban areas. Project objectives are to construct seepage berms, setback levees, and slurry cutoff walls where needed to increase the levee's resistance to underseepage and through-seepage; to provide seepage exit gradients of less than 0.5 at the water surface elevation associated with a flood event with a 0.01 annual exceedance probability; and to implement USACE levee vegetation management recommendations.

Lead Agency Contact

Name	Dante Nomellini		
Agency	Reclamation District No. 17		
Phone	209-465-5883	***Fax***	
email			
Address	P.O. Box 1461		
City	Stockton	***State*** CA	***Zip*** 95201-1461

Project Location

County	San Joaquin		
City	Stockton, Lathrop, Manteca		
Region			
Lat / Long	37° 46' 52" N / 121° 16' 19" W		
Cross Streets	Howard, Bowman & Manila Roads, River Isl Pkway, S. Airport Wy, Hwys 120/I-5, Woodward Ave		
Parcel No.	33 parcels		
Township	***Range***	***Section***	***Base***

Proximity to:

Highways	Hwy 120
Airports	0
Railways	Union Pacific Rail Road
Waterways	San Joaquin River, Walthall Slough
Schools	~ 12
Land Use	Agricultural/General; Open-space; park; variable, medium and very low density residential; res. Mossdale Village Planning Area

Project Issues	Air Quality; Archaeologic-Historic; Biological Resources; Drainage/Absorption; Flood Plain/Flooding; Forest Land/Fire Hazard; Geologic/Seismic; Minerals; Noise; Population/Housing Balance; Public Services; Recreation/Parks; Schools/Universities; Soil Erosion/Compaction/Grading; Toxic/Hazardous; Traffic/Circulation; Vegetation; Water Quality; Water Supply; Wetland/Riparian; Growth Inducing; Landuse; Cumulative Effects; Aesthetic/Visual

Reviewing Agencies	Resources Agency; Department of Conservation; Department of Fish and Game, Region 2; Office of Historic Preservation; Department of Parks and Recreation; Central Valley Flood Protection Board; Department of Water Resources; California Highway Patrol; Caltrans, District 10; Regional Water Quality Control Bd., Region 5 (Sacramento); Department of Toxic Substances Control; Native American Heritage Commission; Public Utilities Commission; State Lands Commission

Date Received 09/09/2011 ***Start of Review*** 09/09/2011 ***End of Review*** 10/24/2011

Note: Blanks in data fields result from insufficient information provided by lead agency.

S2-1 RD 17 and USACE thank the Office of Planning and Research for submitting the DEIS/DEIR to selected state agencies and for providing a copy of comments from the responding agencies. Responses to comments are presented by agency. For example, responses to Caltrans's comments are provided for letter S1, above.

Letter S3

STATE OF CALIFORNIA EDMUND G. B

CALIFORNIA STATE LANDS COMMISSION
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825-8202

CURTIS L. FOSSUM, *Executive Officer*
(916) 574-1800 FAX (916) 574-1810
California Relay Service From TDD Phone **1-800-735-2929**
from Voice Phone **1-800-735-2922**

Contact Phone: **(916) 574-1890**
Contact FAX: **(916) 574-1885**

October 24, 2011

File Ref: SCH #2010042073

Dante Nomellini, Sr.
Nomellini, Grilli & McDaniel
P.O. Box 1461
Stockton, CA 95201-1461

Subject: Draft Environmental Impact Statement / Draft Environmental Impact Report (DEIS/DEIR) for the Phase 3-RD 17 100-Year Levee Seepage Area Project, San Joaquin County

Dear Mr. Nomellini:

The California State Lands Commission (CSLC) staff has reviewed the subject DEIS/DEIR for the Phase 3-RD 17 100-Year Levee Seepage Area Project (Project), which is being prepared by Reclamation District No. 17 (RD 17) and the U.S. Army Corps of Engineers (ACOE). RD 17, as a public agency proposing to carry out a project, is the lead agency under the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.). The ACOE is the lead agency under the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 et seq.). The CSLC will act as a trustee agency because of its trust responsibility for projects that could directly or indirectly affect sovereign lands, their accompanying Public Trust resources or uses, and the public easement in navigable waters. Additionally, if the Project involves work on sovereign lands, the CSLC will act as a responsible agency. 1

CSLC Jurisdiction and Public Trust Lands

The CSLC has jurisdiction and management authority over all ungranted tidelands, submerged lands, and the beds of navigable lakes and waterways. The CSLC also has certain residual and review authority for tidelands and submerged lands legislatively granted in trust to local jurisdictions (Pub. Resources Code, §§ 6301, 6306). All tidelands and submerged lands, granted or ungranted, as well as navigable lakes and waterways, are subject to the protections of the Common Law Public Trust. 2

As general background, the State of California acquired sovereign ownership of all tidelands and submerged lands and beds of navigable lakes and waterways upon its admission to the United States in 1850. The State holds these lands for the benefit of all people of the State for statewide Public Trust purposes, which include but are not limited to waterborne commerce, navigation, fisheries, water-related recreation, habitat preservation, and open space. On tidal waterways, the State's sovereign fee ownership extends landward to the mean high tide line, except for areas of fill or artificial accretion or where the boundary has been fixed by agreement or a court. On navigable non-tidal waterways, including lakes, the State holds fee ownership of the bed of the waterway landward to the ordinary low water mark and a Public Trust easement landward to the ordinary high water mark, except where the boundary has been fixed by agreement or a court. Such boundaries may not be readily apparent from present day site inspections. cont. 2

Upon review of the information contained in the DEIS/DEIR, CSLC staff understands that the Project involves levee improvements at various locations along the landside tow of levees to increase the resistance of the levee system to under-seepage and through-seepage along the levees of the San Joaquin River and Walthall Slough. The bed of the San Joaquin River and Walthall Slough, adjacent to the proposed Project, is sovereign land under the jurisdiction of the CSLC. Any activities waterward of the ordinary high water mark, as it last naturally existed, will require a lease from the CSLC. Once the boundaries of the Project's construction area are more precisely established, contact Public Land Management Specialist Nicholas Lavoie at the contact information noted at the end of this letter for a determination from CSLC staff as to whether the Project encroaches on sovereign land and requires a CSLC lease. 3

Project Description

RD 17 proposes to implement levee improvements at sites along the landside tow of levees on the San Joaquin River and Walthall Slough to meet the RD 17's objectives as follows:

- Correct levee geometry where needed to meet USACE design standards;
- Increase the levee's resistance to underseepage and/or through-seepage; and
- Provide seepage exit gradients of less than 0.5 at the water surface elevation associated with the 100-year flood event.

CSLC staff understands that the Project could include specific combinations of the following types of levee improvements:

- Levee slope and crown width modifications;
- Construction of seepage berms and setback levees with seepage berms; and
- Installation of slurry cutoff walls and chimney drains.

For CEQA purposes, the DEIS/DEIR identifies the Minimum Footprint Alternative as the Environmentally Superior Alternative.

Environmental Review

CSLC staff requests that RD 17 consider the following comments on the Project's DEIS/DEIR:

Cultural Resources

1. The Cultural Resources section (Chapter 3.7) of the DEIS/DEIR does not consider the possibility of the presence of submerged cultural resources in the Project area, and thus may not adequately disclose the Project's impacts to nearby historic sites. The CSLC maintains a shipwrecks database, available at http://shipwrecks.slc.ca.gov, that can assist with this analysis. The database includes known and potential vessels located on the State's tide and submerged lands; however, the locations of many shipwrecks remain unknown. Please note that any submerged archaeological site or submerged historic resource that has remained in state waters for more than 50 years is presumed to be significant. 4

2. The DEIS/DEIR's description of relevant State authority over cultural resources in the Project area (Chapter 3.7.1.2) should also list the CSLC as a State agency with potential authority over the Project. Please note that the title to all abandoned shipwrecks, archaeological sites, and historic or cultural resources on or in the tide and submerged lands of California is vested in the State and under the jurisdiction of the CSLC. The recovery of objects from any submerged archaeological site or shipwreck may require a salvage permit under Public Resources Code section 6309. CSLC staff requests that RD 17 consult with Senior Staff Counsel Pam Griggs at the contact information noted at the end of this letter, should any cultural resources be discovered during construction of the proposed Project. 5

Recreation

3. In Chapter 3.12.2.1 the DEIS/DEIR states: "although fishing opportunities exist along the San Joaquin River at access points available to the public, nearly all areas of the Phase 3 Project Area and vicinity are not intended to be public access points" (p. 3.12-1). For any discretionary decision made on the Project, the CSLC will have to consider the Project's impacts to Public Trust uses, and access points that make those uses possible, of public lands such as the San Joaquin River. If a CSLC lease is required for implementation of the Project, then, the CSLC's consideration of the lease application will required detailed information on impacts to river access to determine whether or not the Project is consistent with the Public Trust. Therefore, even if access points are scarce along the stretches of river involved in the proposed Project, the DEIS/DEIR should specify if any river access points that *do* exist in the Project area will be affected by construction activities and, if so, whether or not access will be restored after construction. 6

Thank you for the opportunity to comment on the DEIS/DEIR for the Project. As a responsible and trustee agency, the CSLC may need to rely on the Final EIS/EIR for the issuance of any new lease as specified above and, therefore, we request that you consider our comments prior to adoption of the EIS/EIR. Please send additional information on the Project to the CSLC staff listed below as plans become finalized. 7 8

Please send copies of future Project-related documents or refer questions concerning environmental review to Sarah Sugar, Environmental Scientist, at (916) 574-2274 or via e-mail at Sarah.Sugar@slc.ca.gov. For questions concerning archaeological or historic resources under CSLC jurisdiction, please contact Senior Staff Counsel Pam Griggs at (916) 574-1854 or via email at Pamela.Griggs@slc.ca.gov. For questions concerning CSLC leasing jurisdiction, please contact Nicholas Lavoie, Public Land Management Specialist, at (916) 574-0452, or via email at Nicholas.Lavoie@slc.ca.gov. cont. 8

Sincerely,

Cy R. Oggins, Chief
Division of Environmental Planning
and Management

cc: Office of Planning and Research
Nicholas Lavoie, CSLC
Sarah Sugar, CSLC
Eric Milstein, CSLC

S3-1 RD 17 and USACE understand that the California State Lands Commission (CSLC) will act as a trustee agency and may also act as a responsible agency under CEQA if sovereign lands are affected by the Phase 3 Repair Project. CLSC is identified as a responsible and trustee agency in Section 1.9.5, "Regulatory Requirements, Permits, Authorizations, and Approvals," of the FEIS.

S3-2 Thank you for providing this information regarding CSLC jurisdiction and authorities.

S3-3 RD 17 and USACE understand that waterways adjacent to portions of the Phase 3 Repair Project area are sovereign lands under the jurisdiction of CSLC. RD 17 does not anticipate any work below the San Joaquin River ordinary high-water mark as verified by USACE.

S3-4 No in-water work is proposed; therefore, project activities would not encounter any submerged cultural resources. AECOM has also searched the CSLC shipwrecks database, and no recorded shipwrecks have been identified directly within the Phase 3 Repair Project area or within the river along the levees near the Phase 3 Repair Project area. Section 3.7.3.1, "Methodology," has been updated to include the search of the shipwrecks database.

S3-5 The information has been incorporated into Section 3.7.3.1 "Methodology," and RD 17 would consult with Senior Staff Counsel Pam Griggs if any cultural resources are discovered during construction of the Phase 3 Repair Project.

S3-6 One public access point to the San Joaquin River (Mossdale Crossing Regional Park) may be temporarily closed during construction along elements VIcde. The FEIS describes potential impacts on this river access point, including the boat ramp at Mossdale Crossing Regional Park, in the discussion of Impact 3.12-a. The discussion identifies the duration of the potential closure of this river access point (ramp may be closed for approximately 30 days during construction) and lists alternative access points that may be used during construction. A statement has been added to clarify that this river access point would be reopened following completion of construction at this location within the Phase 3 Repair Project area. RD 17 also would provide temporary alternative parking while the parking lot at this location is disturbed during construction. If a CSLC lease is required, RD 17 would provide additional information needed by CSLC regarding anticipated impacts on this river access point. The revised text reads as follows:

> Under all three alternatives, the parking lot associated with Mossdale Crossing Regional Park (elements VIcde) would be temporarily disrupted, potentially affecting use of the boat ramp and passive recreational opportunities for approximately 60–90 days. Temporary alternative parking would be provided for recreationalists during construction at this site. After completing construction at this site, the boat ramp and parking facilities would be reopened.

Under Alternative 1, construction activities would include installation of new utility infrastructure, placement of fill, and repaving of the facility. Although implementation of Alternative 2 or the Requester's Preferred Alternative would not require fill of Mossdale Crossing Regional Park, the parking area could be used for staging of materials and equipment. Under the Requester's Preferred Alternative, a cutoff wall would be installed within the levee at this location, and the Mossdale Crossing Regional Park parking area would be used for staging of materials and equipment. Under the Requester's Preferred Alternative, a cutoff wall would be installed within the levee at this location, and the Mossdale Crossing Regional Park parking area would be used for staging of materials and equipment during construction. Several public boat launch facilities are located within San Joaquin County that may be used while the Mossdale Crossing Regional Park boat launch facility is closed (i.e., Morelli Park in Stockton on the Deep Water Ship Channel, Buckley Cove Park in Stockton on the Deep Water Ship Channel, Dos Reis Park in the Lathrop area on the San Joaquin River, and Louis Park in Stockton on the Smith Canal). In addition, RD 17 would coordinate construction phasing, temporary parking requirements, and access to Mossdale Crossing Regional Park with San Joaquin County Parks and Recreation. Thus, this effect would be **less than significant**.

S3-7 RD 17 and USACE have considered all comments provided by CSLC. CSLC received a copy of the responses to comments prior to certification of the EIR.

S3-8 As project plans are finalized, information and questions will be forwarded to the appropriate CSLC staff members, as requested.

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY EDMUND G. BROW

Letter S4

CENTRAL VALLEY FLOOD PROTECTION BOARD
3310 El Camino Ave., Rm 151
SACRAMENTO, CA 95821
(916) 574-0609 FAX: (916) 574-0682
PERMITS: (916) 574-2380 FAX: (916) 574-0682

October 24, 2011

Mr. Dante Nomellini
Nomellini, Grilli & McDaniel
P.O. Box 1461
Stockton, California 95201-1461

Subject: Response to the Draft Environmental Impact Report Phase 3 of the Reclamation District No. 17 (RD 17) 100 - Year Levee Seepage Area Project (LSAP) SCH Number: 2010042073

Dear Mr. Nomellini,

Staff of the Central Valley Flood Protection Board has reviewed the subject document and provides the following comments:

The proposed project is located within the jurisdiction of the Central Valley Flood Protection Board. The Board is required to enforce standards for the construction, maintenance and protection of adopted flood control plans that will protect public lands from floods. The jurisdiction of the Board includes the Central Valley, including all tributaries and distributaries of the Sacramento River and the San Joaquin River, and designated floodways (Title 23 California Code of Regulations (CCR), Section 2).

A Board permit is required prior to starting the work within the Board's jurisdiction for the following:

- The placement, construction, reconstruction, removal, or abandonment of any landscaping, culvert, bridge, conduit, fence, projection, fill, embankment, building, structure, obstruction, encroachment, excavation, the planting, or removal of vegetation, and any repair or maintenance that involves cutting into the levee (CCR Section 6); 1

- Existing structures that predate permitting or where it is necessary to establish the conditions normally imposed by permitting. The circumstances include those where responsibility for the encroachment has not been clearly established or ownership and use have been revised (CCR Section 6);

- Vegetation plantings will require the submission of detailed design drawings; identification of vegetation type; plant and tree names (i.e. common name and scientific name); total number of each type of plant and tree; planting spacing and irrigation method that will be within the project area; a complete vegetative management plan for maintenance to prevent the interference with flood control, levee maintenance, inspection and flood fight procedures (CCR Section 131).

Page ES-3 shows "With issuance of Engineering Technical Letter (ETL) 1110-2-571, USACE recently updated its vegetation management standards for levees requiring the removal of all vegetation, with the exception of perennial grasses, on the levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2009)." The April 10, 2014 expiration date should be included in accordance with the USACE ETL 1110-2-571. The DEIR should address the potential impacts once the USACE ETL 1110-2-571 expires. 2

Page ES-6 shows "(1) full implementation of ETL 1110-2-571: All vegetation, other than perennial grasses, would be removed from the levee slopes and out 15 feet from the waterside and landside levee toes, or..". The statement should be revised to be accordance with ETL 1110-2-571, page 5-1 which states "All vegetation not in compliance with this ETL shall be removed." 3

Page 3.6-36 shows "Habitat restoration, enhancement, and/or replacement shall be at a location (on-site, off-site, or at an approved mitigation bank) and by methods agreeable to USFWS, NMFS, and DFG as determined during the permitting processes for Federal and California ESA, California Fish and Game Code Section 1602 (as necessary)." The statement should be revised to include the Central Valley Flood Protection Board as a permitting agency for vegetation plantings within the floodway. Vegetation requirements in accordance with Title 23, CCR Section 131 (c) states "Vegetation must not interfere with the integrity of the adopted plan of flood control, or interfere with maintenance, inspection, and flood fight procedures." 4

In accordance with CEQA Guidelines Section 15130 "Discussion of Cumulative Impacts.
(a) An EIR shall discuss cumulative impacts of a project when the project's incremental effect is cumulatively considerable, as defined in section 15065(a)(3). Where a lead agency is examining a project with an incremental effect that is not "cumulatively considerable," a lead agency need not consider that effect significant, but shall briefly describe its basis for concluding that the incremental effect is not cumulatively considerable." 5

The accumulation and establishment of woody vegetation that is not managed has a negative impact on channel capacity and increases the potential for levee over-topping. When a channel develops vegetation that then becomes habitat for wildlife, maintenance to initial baseline conditions becomes more difficult, as the removal of vegetative growth is subject to federal and state agency requirements for on-site mitigation within the floodway. 6

Hydraulic Impacts - Hydraulic impacts due to encroachments including the planting of vegetation could impede flood flows, reroute flood flows, and/or increase sediment accumulation. The DEIR should include mitigation measures for channel and levee improvements and maintenance to prevent and/or reduce hydraulic impacts. Off-site mitigation outside of the State Plan of Flood Control should be used when mitigating for vegetation removed within the project location. 7

The permit application and Title 23 CCR can be found on the Central Valley Flood Protection Board's website at http://www.cvfpb.ca.gov/. Contact your local, federal and state agencies, as other permits may apply. 8

If you have any questions, please contact me at (916) 574-0651, or via email at jherota@water.ca.gov.

Sincerely,

James Herota
Staff Environmental Scientist
Flood Projects Improvement Branch

cc: Governor's Office of Planning and Research
State Clearinghouse
1400 Tenth Street, Room 121
Sacramento, California 95814

S4-1 An application for an encroachment permit would be prepared and submitted to CVFPB before project approval.

S4-2 See Master Response 1, above, regarding vegetation encroachment and variance request.

S4-3 See Master Response 1, above, regarding vegetation encroachment and variance request.

S4-4 The fourth bulleted item in the text of Mitigation Measure 3.6-b has been revised to include CVFPB and the requirements of Title 23, California Code of Regulations Section 131(c). Furthermore, because in some circumstances, planting substantial woody vegetation in the floodway may impede flood flows and result in an increase in upstream flood elevations, the text of Mitigation Measure 3.6-b has been modified to include the following statement in the fourth bulleted item: "Restoration plantings also will not be implemented in locations or in a manner that will result in a significant increase in flood-stage elevations."

S4-5 Thank you for the comment; however, USACE sees no nexus between this statement and other comments. The comment is a statement in reference to CEQA. Please see the Final Environmental Impact Report for the Phase 3 Repair Project
(RD 17 2016).

S4-6 Inclusion of the CVFPB as a permitting agency would allow its concerns regarding future maintenance to be addressed in the selection of future mitigation sites.

S4-7 Because in some circumstances, planting substantial woody vegetation in the floodway may impede flood flows and result in an increase in upstream flood elevations, the text of Mitigation Measure 3.6-b has been modified to include the following statement in the fourth bulleted item: "Restoration plantings also will not be implemented in locations or in a manner that will result in a significant increase in flood-stage elevations." The recommendation to require off-site mitigation for vegetation removal may not be preferable because from a biological perspective, mitigation should be close to the area of effect. All of the Phase 3 Repair Project area plus the remaining RD 17 levee system, as well as areas up to 75 miles away, are within the area covered by the SPFC. Plantings outside that area would not provide adequate mitigation.

S4-8 Thank you. RD 17 would apply for permits when necessary prior to project approval.

California Regional Water Quality Control Board
Central Valley Region
Katherine Hart, Chair

Matthew Rodriquez
Secretary for Environmental Protection

11020 Sun Center Drive, #200, Rancho Cordova, California 95670-6114
(916) 464-3291 • FAX (916) 464-4645
http://www.waterboards.ca.gov/centralvalley

Edmund G. Brown Jr.
Governor

Letter S5

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e

15 October 2011

Dante Nomellini, Sr.
Reclamation District No. 17
P.O. Box 1461
Stockton, CA 95201-1461

CERTIFIED MAIL
7010 3090 0000 5044 5660

COMMENTS TO DRAFT ENVIRONMENTAL IMPACT STATEMENT/DRAFT ENVIRONMENTAL IMPACT REPORT, RECLAMATION DISTRICT NO. 17, PHASE 3-RD 17 100-YEAR LEVEE SEEPAGE AREA PROJECT, SCH NO. 2010042073, SAN JOAQUIN COUNTY

Pursuant to the State Clearinghouse's 9 September 2011 request, the Central Valley Regional Water Quality Control Board (Central Valley Water Board) has reviewed the *Draft Environmental Impact Statement/Draft Environmental Impact Report* for the Phase 3-RD 17 100-Year Levee Seepage Area Project, located in San Joaquin County.

Our agency is delegated with the responsibility of protecting the quality of surface and groundwaters of the state; therefore our comments will address concerns surrounding those issues.

Hydrology and water quality are discussed in Chapter 3, under Sections 3.5 and 3.6.

1. Regulatory Setting

__Basin Plan__

A discussion on water quality control plans is contained within Chapter 3, Sections 3.5 and 3.6 (pages 3.5-8 and 3.6-2).

The Central Valley Water Board is required to formulate and adopt Basin Plans for all areas within the Central Valley region under Section 13240 of the Porter-Cologne Water Quality Control Act. Each Basin Plan must contain water quality objectives to ensure the reasonable protection of beneficial uses, as well as a program of implementation for achieving water quality objectives with the Basin Plans. Federal regulations require each state to adopt water quality standards to protect the public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act. In California, the beneficial uses, water quality objectives, and the Antidegradation Policy are the State's water quality standards. Water quality standards are also contained in the National Toxics Rule, 40 Code of Federal Regulations (CFR) Section 131.36, and the California Toxics Rule, 40 CFR Section 131.38.

California Environmental Protection Agency

Recycled Paper

The Basin Plan is subject to modification as necessary, considering applicable laws, policies, technologies, surface and groundwater quality conditions and priorities. The original Basin Plans were adopted in 1975, and have been updated and revised periodically as required, using Basin Plan amendments. Once the Central Valley Water Board has adopted a Basin Plan amendment in noticed public hearings, it must be approved by the State Water Resources Control Board (State Water Board), Office of Administrative Law (OAL) and in some cases, the United States Environmental Protection Agency (USEPA). Basin Plan amendments only become effective after they have been approved by the OAL and in some cases, the USEPA. Every three (3) years, a review of the Basin Plan is completed that assesses the appropriateness of existing standards and evaluates and prioritizes Basin Planning issues.

For more information on the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins*, please visit our website: http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/.

The Final Environmental Impact Statement/Final Environmental Impact Report should provide an expanded discussion on the Proposed Project's consistency with the Basin Plan, in terms of protecting surface and ground water quality in, and downstream of, the project area. 1

Statement of Policy With Respect to Maintaining High Quality of Waters in California (State Water Board Resolution 68-16)
A discussion on antidegradation policy is contained within Chapter 3, Sections 3.5 (pages 3.5-1 and 3.5-3).

A key policy of California's water quality program is the State's Antidegradation Policy. This policy, formally known as the *Statement of Policy with Respect to Maintaining High Quality Waters in California* (State Water Board Resolution No. 68-16), restricts degradation of surface and ground waters. In particular, this policy protects water bodies where existing quality is higher than necessary for the protection of beneficial uses. Under the Antidegradation Policy, any actions that can adversely affect water quality in all surface and ground waters must:

1. meet Waste Discharge Requirements which will result in the best practicable treatment or control of the discharge necessary to assure that a pollution or nuisance will not occur and the highest water quality consistent with maximum benefit to the people of the State will be maintained;
2. not unreasonably affect present and anticipated beneficial use of the water; and
3. not result in water quality less than that prescribed in water quality plans and policies.

Furthermore, any actions that can adversely affect surface waters are also subject to the Federal Antidegradation Policy (40 CFR Section 131.12) developed under the Clean Water Act.

For more information on this policy, please visit our website at:
http://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/1968/rs68_016.pdf.

The Final Environmental Impact Statement/Final Environmental Impact Report should provide an expanded discussion on the Proposed Project's consistency with the State's Antidegradation Policy, in terms of protecting surface and ground water quality in, and downstream of, the project area. 2

Clean Water Act 303(d) Listed for Impaired Water Bodies
The discussion on Clean Water Act 303(d) provided in Chapter 3, Section 3.5 (pages 3.5-1 through 2, and 3.5-7) should provide a comprehensive listing of all Clean Water Act 303(d) listed for impaired water bodies within the project area.

The analysis in the Draft Environmental Impact Statement/Draft Environmental Impact Report is based on the 2006 Clean Water Act 303(d) list for impaired water bodies. Please use the 2010 Clean Water Act 303(d) list for impaired water bodies, which can be located at
http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

The Final Environmental Impact Report should provide a comprehensive list of all water bodies located within, and downstream of, the Proposed Project area which (a) are included on the 2010 Clean Water Act 303(d) list for impaired water bodies, and the constituent(s) or parameter(s) each water body or water body segment is listed for. 3

2. Permitting Requirements

Construction Storm Water General Permit
The discussion pertaining to the Construction Storm Water General Permit is provided in Chapter 3, Section 3.5 (page 3.5-2), indicating that construction activity affecting 1 acre or more needs to obtain coverage under the General Construction Activity Storm Water Permit.

Dischargers whose project disturb one or more acres of soil or where projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the General Permit for Storm Water Discharges Associated with Construction Activities (Construction General Permit), Construction General Permit Order No. 2009-009-DWQ. Construction activity subject to this permit includes clearing, grading, grubbing, disturbances to the ground, such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan.

The Construction General Permit requires under Provision XIII Post-Construction Standards, that all applicable construction activities comply with the runoff reduction requirements set forth in the Construction General Permit. All dischargers shall implement post-construction Best Management Practices to reduce pollutants in storm water discharges that are reasonably foreseeable after all construction phases have been completed at the site.

For more information on the Construction General Permit, visit the State Water Resources Control Board website at:
http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml

The Final Environmental Impact Statement/Final Environmental Impact Report should clarify that this permit is applicable to dischargers whose proposed project disturbs one or more acres of soil or a proposed project disturbs less than one acre but is part of a larger common plan of development that in total disturbs one or more acres. 4

Clean Water Act Section 404 Permit

The discussion on Clean Water Act Section 404 permits is provided in Chapter 3, Section 3.5 and 3.6.

If the project will involve the discharge of dredged or fill material in a navigable water body or wetlands, or "waters of the United States", as determined by the United States Army Corps of Engineers (USACOE), a permit pursuant to Section 404 of the Clean Water Act may be required.

If a Section 404 permit is required by the USACOE, the Central Valley Water Board will review the permit application to ensure that discharge will not violate water quality standards and/or impact waters of the State. "Waters if the State" are defined more broadly than jurisdictional "waters of the United States" and include (a) "any surface water or groundwater, including saline waters, within boundaries of the State" (California Water Code §13050(e)). Waters of the State is broadly construed to include all waters within the State's boundaries, whether private or public, including waters in both natural and artificial channels, and territorial seas.

If you have any questions regarding the Clean Water Act Section 404 permits, please contact the Regulatory Division of the Sacramento District of USACOE at (916)557-5250.

The Final Environmental Impact Statement/Final Environmental Impact Report should clarify the requirements for this permit for the proposed project in Sections 3.5 and 3.6 and in the impacts and mitigation discussion. 5

Clean Water Act Section 401 Permit – Water Quality Certification

The discussion on Clean Water Act Section 401 Water Quality Certifications is provided in Chapter 3, Section 3.5 and 3.6.

If an USACOE permit, or any other federal permit, is required for this project due to the disturbance of waters of the United States (such as streams and wetlands), then a 401 Water Quality Certification must be obtained from the Central Valley Water Board prior to initiation of project activities. The 401 Water Quality Certification must be obtained prior to initiation of project activities.

There are no waivers for 401 Water Quality Certifications. Compensatory mitigation can be required by the Central Valley Water Board for impacts to waters of the State.

The Final Environmental Impact Statement/Final Environmental Impact Report should
clarify the requirements for this permit for the proposed project in Sections 3.5 and 3.6 6
and in the impacts and mitigations discussion.

The Final Environmental Impact Statement/Final Environmental Impact Report should
clarify that there are no waivers for 401 Water Quality Certifications and compensatory
mitigation can be required by the Central Valley Water Board for impacts to waters of 7
the State.

<u>**Waste Discharge Requirements**</u>
The Draft Environmental Impact Statement/Draft Environmental Impact Report does not contain a discussion on the applicability of a Waste Discharge Requirement (WDR) when only waters of the State are impacted by the Proposed Project.

If USACOE or any other federal permitting agency, determines that <u>only</u> non-jurisdictional waters of the State (i.e., "non-federal" waters of the State) are present in the Proposed Project area, the Proposed Project will require a WDR permit to be issued by the Central Valley Water Board. Under the California Porter-Cologne Water Quality Control Act, discharges to all waters of the State, including all wetlands and other waters of the State including, but not limited to, isolated wetlands, such as vernal pools, are subject to State regulation.

For more information on the Water Quality Certification and WDR processes, visit the Central Valley Water Board website at:
<u>http://www.waterboards.ca.gov/centralvalley/water_issues/water_quality_certification/</u>

The Final Environmental Impact Statement/Final Environmental Impact Report should
clarify a WDR is applicable when the USACOE or other federal permitting agency 8
determines that only non-jurisdictional waters of the State are present in the proposed
project area.

3. General Requirements for Issuing 401 Water Quality Certifications or Waste Discharge Requirements

In order to issue a 401 Water Quality Certification or Waste Discharge Requirements
for the proposed project, the following items are required at a minimum. The Final
Environmental Impact Statement/Final Environmental Impact Report should be
expanded to include the following minimum requirements for a 401 Water Quality
Certification or Waste Discharge Requirement on any subsequent project. 9

a) A signed and dated Central Valley Regional Water Quality Control Board Section 401 Water Quality Certification Application Form, completed as instructed in each section of the form. The Section 401 Water Qualify Certification Application can is located at:
<u>http://www.waterboards.ca.gov/centralvalley/help/business_help/permit2.shtml</u>

b) A finalized project description detailing all project activities, including, but not limited to, all permanent and temporary impacts to waters of the State or waters of the United States, such as fill types and volumes, excavation types and volumes, and locations of culvert or other in-water work, diversions, dewatering, and potential habitat or water quality impacts.

c) A description of any other steps that have been or will be taken to avoid, minimize, or compensate for loss of significant adverse impacts to beneficial uses of the waters of the State by the project proponent.

d) A copy of the Notice of Determination, Draft and Final Environmental Impact Statements/Reports, Mitigation Monitoring and Reporting Plan, Resolution adopting the CEQA environmental documentation, and Statement of Overriding Consideration.

e) A copy of the signed, dated and completed Department of Fish and Game (DFG) Streambed Alteration Agreement application, including any attachments, or written correspondence/email from DFG stating this permit is not required for the proposed project.

f) A copy of the signed, dated and completed USACOE 404 permit application, including any attachments, or written correspondence from the USACOE stating this permit is not required for the Proposed Project. cont. 9

g) Wetland delineations are referenced in Chapter 3, Section 3.6 (page 3.6-18).

A copy of current or updated comprehensive wetland delineations is required. Wetland delineations should include, but not be limited to, all waters of the State and waters of the United States located within the proposed project area. Waters of the State and/or waters of the United States, may include, but not be limited to, all permanent and temporary water bodies, isolated and non-isolated waters, jurisdictional and non-jurisdictional waters such as rivers, creeks, streams, lakes, reservoirs, vernal pools, playas, potholes, wet meadows, marshes, mudflats, sandflats, fens, natural ponds, swamps, seasonal wetlands, riparian woodlands, sloughs, floodplains, and bogs located within the entire proposed project area. The wetland delineation should contain a map or series of maps covering the entire proposed project area illustrating the location(s) of all permanent and temporary impacts to waters of the State and waters of the United States.

Copies of comprehensive wetland delineations and any other documentation submitted to any state or federal agency delineating waters of the State and/or waters of the United States should be submitted as part of the 401 Water Quality Certification application package.

h) A copy of the jurisdiction wetland delineation determination letter from the USACOE.

i) Photos and maps of the proposed project site illustrating the proposed project area and any locations where permanent or temporary impacts to waters of the State or waters of the United States will occur, including, but not limited to, culvert, pipe, bridge, fill and excavation locations.

j) A minimum processing fee is required; however, additional fees in accordance with Title 23 CCR § 2200 (a)(2) may also be required. Please use the fee calculator at http://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/dredgefillfeecalculator.xls to determine the total fee.

A copy of the fee calculator sheet should be submitted with the application package and check.

Please include a check payable to the State Water Resources Control Board.

k) If compensatory mitigation is required by any state or federal agency, compliance with compensatory mitigation requirements is required, or a USACOE approved mitigation plan.

l) If the USACOE conducts an Endangered Species Section 7 consultation with the National Oceanic Atmospheric Administration fisheries and/or the United States Fish and Wildlife Service, a copy of the Biological Opinion(s) or concurrence letter(s) from these federal agencies is required. cont. 9

m) The Central Valley Regional Water Quality Control Board will require specific information on any installed, removed, replaced or abandoned culverts, pipes, bridges or other infrastructure within the proposed project area. Necessary information includes a detailed description and map of the locations of the infrastructure work, the dimensions and type of the infrastructure, and associated structure (i.e., headwalls, wingwalls, flared ends).

The type and volume (cubic yards) of fill (i.e., riprap, concrete, clean soil, asphalt), and volume of excavated material (cubic yards) below the ordinary high water mark will need to be provided and should be consistent with the map of culvert locations throughout the Proposed Project Area.

n) For any non-infrastructure work requiring fill or excavation, the volume (cubic yards) and type of material that will be installed and/or removed below the ordinary high water mark in waters of the State or waters of the United States is required. Volumes and material types should be provided for each individual impacted location within the proposed project area.

o) A pre-certification meeting at the Central Valley Water Board may be required for the proposed project.

p) The Central Valley Water Board may require additional compensatory mitigation for impacts to the waters of the State.

q) A site visit may be required for the proposed project.

If you have questions regarding these comments, please contact me at (916) 464-4745 or gsparks@waterboards.ca.gov. cont. 9

Genevieve Sparks

Genevieve (Gen) Sparks
Environmental Scientist
401 Water Quality Certification Program

cc: State Clearinghouse Unit, Governor's Office of Planning and Research, Sacramento

S5-1 The FEIS clarifies the Phase 3 Repair Project's consistency with the Bay-Delta Plan's water quality objectives in Chapter 3, Section 3.5.2.4, "Water Quality."

S5-2 The FEIS clarifies the Phase 3 Repair Project's consistency with the Antidegradation Policy in Chapter 3, Section 3.5.1.2, "State."

S5-3 The FEIS includes a list of the 2010 303(d) impaired waters located downstream and within the Phase 3 Repair Project area in Chapter 3, Section 3.5.2.4, "Water Quality."

S5-4 A sentence was added to Section 3.5.1.2 clarifying the applicability of the NPDES permit.

S5-5 Federal regulations, such as CWA Section 404, are described and discussed in Section 3.5, "Hydrology and Water Quality," of the FEIS, and also are discussed in Section 3.6, "Biological Resources."

S5-6 General requirements for CWA Section 401 water quality certification applications are discussed in Section 3.5.1.1, which states that regional water quality control boards (RWQCBs) may prescribe "measures necessary to avoid, minimize, or mitigate impacts of proposed projects on water quality." Specific impacts on waters of the United States, which are also waters of the state, are described for each alternative in Section 3.5.4, "Effects and Mitigation Measures." RD 17 anticipates submitting a CWA Section 401 water quality certification application to the Central Valley RWQCB consistent with the Requester's Preferred Alternative.

S5-7 The FEIS has been updated to reflect that all waters of the United States are also waters of the state, as provided in the wetland delineation report and subsequent amendments. Therefore, impacts on waters of the state identified in the CWA Section 401 water quality certification application will match the impacts on waters of the United States identified in the CWA Section 404 permit application. As stated in the response to comment S5-6, above, Section 3.5.1.1 of the FEIS states that RWQCBs may prescribe "measures necessary to avoid, minimize, or mitigate impacts of proposed projects on water quality." Section 3.5.1.2 of the FEIS further states that applicants who apply for a "Federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification from the state…." Consequently, this sentence indicates that RWQCBs cannot waive CWA Section 401 water quality certifications.

S5-8 As provided in the wetland delineation report and subsequent amendments, all waters of the state are also waters of the United States. Therefore, a separate waste discharge requirement is not required for the project and does not need to be identified in the FEIS.

S5-9 RD 17 applied for and received a CWA Section 401 water quality certification on October 20, 2014. The application contained the required information. Most of the information required for a CWA Section 401 water quality certification application is outside the scope of this document; therefore, it has not been included in the FEIS.

Letter S6

STATE OF CALIFORNIA Edmund G. Brown

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
(916) 657-5390 - Fax

RECEIVED SEP 19 2011 BY:

September 16, 2011

Dante Nomellini, Sr.
Reclamation District No. 17
P.O. Box 1461
Stockton, CA 95201-1461

RE: SCH# 2010042073 Phase 3 of the Reclamation District No. 17 (RD 17) 100-Year Seepage Area Project: San Joaquin County.

Dear Mr. Nomellini:

The Native American Heritage Commission (NAHC) has reviewed the Notice of Completion (NOC) referenced above. The California Environmental Quality Act (CEQA) states that any project that causes a substantial adverse change in the significance of an historical resource, which includes archeological resources, is a significant effect requiring the preparation of an EIR (CEQA Guidelines 15064(b)). To comply with this provision the lead agency is required to assess whether the project will have an adverse impact on historical resources within the area of project effect (APE), and if so to mitigate that effect. To adequately assess and mitigate project-related impacts to archaeological resources, the NAHC recommends the following actions: 1

✓ Contact the appropriate regional archaeological Information Center for a record search. The record search will determine:
- If a part or all of the area of project effect (APE) has been previously surveyed for cultural resources.
- If any known cultural resources have already been recorded on or adjacent to the APE.
- If the probability is low, moderate, or high that cultural resources are located in the APE.
- If a survey is required to determine whether previously unrecorded cultural resources are present.

✓ If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey. 2
- The final report containing site forms, site significance, and mitigation measurers should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum, and not be made available for public disclosure.
- The final written report should be submitted within 3 months after work has been completed to the appropriate regional archaeological Information Center.

✓ Contact the Native American Heritage Commission for: 3
- A Sacred Lands File Check. . **USGS 7.5 minute quadrangle name, township, range and section required.**
- A list of appropriate Native American contacts for consultation concerning the project site and to assist in the mitigation measures. **Native American Contacts List attached.**

✓ Lack of surface evidence of archeological resources does not preclude their subsurface existence. 4
- Lead agencies should include in their mitigation plan provisions for the identification and evaluation of accidentally discovered archeological resources, per California Environmental Quality Act (CEQA) §15064.5(f). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American, with knowledge in cultural resources, should monitor all ground-disturbing activities.
- Lead agencies should include in their mitigation plan provisions for the disposition of recovered artifacts, in consultation with culturally affiliated Native Americans.
- Lead agencies should include provisions for discovery of Native American human remains in their mitigation plan. Health and Safety Code §7050.5, CEQA §15064.5(e), and Public Resources Code §5097.98 mandates the process to be followed in the event of an accidental discovery of any human remains in a location other than a dedicated cemetery.

Sincerely,

Katy Sanchez

Katy Sanchez
Program Analyst
(916) 653-4040

cc: State Clearinghouse

Native American Contact List
San Joaquin County
September 16, 2011

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Southern Sierra Miwuk Nation
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209-966-6036 — Northern Valley Yokut

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North Valley Yokuts Tribe
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Linden , CA 95236 — Northern Valley Yokuts
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canutes@verizon.net

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of the statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed SCH# 2010042073 Phase 3 of the Reclamation District No. 17 (RD 17) 100-Year Levee Seepage Area Project; San Joaquin County.

Native American Contact List
San Joaquin County
September 16, 2011

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Miwok
Pauite
Northern Valley Yokut

Ione Band of Miwok Indians Cultural Committee
Ms Billie Blue, Chairperson
604 Pringle Ave, #42
Galt , CA 95632
bebluesky@softcom.net
(209) 745-7112
Miwok

Ione Band of Miwok Indians
Pamela Baumgartner, Tribal Administrator
PO Box 699
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pam@ionemiwok.org
(209) 274-6753
(209) 274-6636 Fax
Miwok

Briana Creekmore
PO Box 84
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209-298-7158
Miwok

Ione Band of Miwok Indians
Tina Reynolds, Executive Secretary
PO Box 699
Plymouth , CA 95669
tina@ionemiwok.org
(209) 274-6753
(209) 274-6636 Fax
Miwok

Southern Sierra Miwuk Nation
Les James, Spiritual Leader
PO Box 1200
Mariposa , CA 95338
209-966-3690
Miwok
Pauite
Northern Valley Yokut

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of the statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed SCH# 2010042073 Phase 3 of the Reclamation District No. 17 (RD 17) 100-Year Levee Seepage Area Project; San Joaquin County.

S6-1 This information was included already in the DEIS/DEIR. See Section 3.7, “Cultural Resources,” of the FEIS.

S6-2 A confidential cultural resources inventory report and addendum were prepared (AECOM 2011, 2014). These reports were reviewed by USACE, and then were provided by USACE to the California SHPO. The SHPO concurred with the findings documented in the report and addendum. These reports also were submitted to the Central California Information Center. Section 3.7.3.1, “Methodology,” has been updated to include a more detailed description of the cultural resources inventory report and SHPO consultation process. Section 6.2 of the FEIS has also been updated to include the results of the SHPO consultation.

S6-3 The recommended actions have been completed and are documented in Section 3.7.

S6-4 The recommended mitigation measures are identified in Section 3.7.

BOLD, POLISNER, MADDOW,
NELSON & JUDSON
A PROFESSIONAL CORPORATION
500 YGNACIO VALLEY ROAD, SUITE 325
WALNUT CREEK, CALIFORNIA 94596-3840
TELEPHONE: 925 933-7777
FACSIMILE: 925 933-7804

ROBERT B. MADDOW
CARL P.A. NELSON
CRAIG L. JUDSON

SHARON M. NAGLE
DOUGLAS E. COTY

FREDERICK BOLD, JR.
(1913-2003)

October 24, 2011

Mr. Dante Nomellini, Sr.
Nomellini, Grilli & McDaniel
P.O. Box 1461
Stockton, CA 95201-1461

Subject: Phase 3 – RD 17 100-Year Levee Seepage Area Project - Draft Environmental Impact Report SCH#2010042073

Dear Mr. Nomellini:

I am writing on behalf of the Oakwood Lake Water District ("OLWD" or "District"). OLWD is a California Water District formed to provide water and wastewater services within its jurisdictional boundaries. The District is situated immediately adjacent and contiguous to proposed Phase 3 Levee Segment VIIe. OLWD serves existing residential, commercial and industrial uses, as well as planned future development. The purpose of this letter is to request that the Draft Environmental Impact Report ("DEIR") prepared for Reclamation District No. 17's ("RD17") Phase 3 – RD 17 100-Year Levee Seepage Area Project ("Project") address several omissions affecting the interests of OLWD.

This is the first opportunity for OLWD to comment on the Project as RD 17 and the U.S. Army Corps of Engineers ("USACE") failed to provide the District with the Notice of Preparation (April 22, 2010), Notice of Completion, or notice of the Scoping Hearing (May 11, 2010). The District did, however, receive the Executive Summary and cd-rom containing the DEIR in September 2011. The District appreciates the opportunity to provide comments to further inform the efforts of RD 17 and USACE in developing the Project.

Substantively, and as discussed in more detail below, the DEIR fails to recognize or analyze the potential impacts of the proposed project on current and planned land uses by OLWD within its jurisdiction.

Impact on Current and Planned Land Uses

The proposed Project is adjacent to and contiguous to lands within the jurisdiction of OLWD. In fact, it would appear that construction activities related to Segment VIIe, as well as operations and future maintenance, could impact the District's wastewater treatment plant and potentially impact the ongoing expansion of the OLWD wastewater treatment facilities. The facilities will serve a fully entitled development of 440 single-family homes (currently under construction), an existing mobile home park, as well as possible future commercial and industrial development.

The DEIR fails to recognize or analyze the fact that the OLWD property adjacent to and contiguous with Segment 3 is fully developed and comprises facilities essential to the provision of wastewater treatment service to OLWD customers. Due to the proximity of the OLWD facilities to the proposed construction area, it would appear that a potential exists for significant impacts to these facilities and the potential for interruptions in service as a result.

The potential impacts to OLWD's wastewater treatment activities, and its ability to meet the conditions for use of its facilities, must be disclosed and analyzed in the DEIR and appropriate mitigation measures must be analyzed and adopted as necessary to ensure the continued viability of OLWD's wastewater treatment facilities.

Please feel free to contact me at (925) 933-7777 if you have any questions. The District will make available members of its technical and engineering staffs to address specific details of the facilities' operations and provide any other assistance as you may require.

Sincerely,

Douglas E. Coty

Douglas E. Coty
Attorney at Law

cc: Larry French, President, Oakwood Lake Water District
Mike Gilton, District Engineer, Oakwood Lake Water District

Sent via facsimile October 24, 2011

Letter
L1
Response

Oakwood Lake Water District
Douglas Coty, Larry French, and Mike Gilton
October 24, 2011

L1-1 The NOI/NOP was sent to adjacent landowners; however, the list did not include the Oakwood Lake Water District (OLWD). RD 17 and USACE apologize for this oversight. As indicated, OLWD was included on the mailing list for the public DEIS/DEIR, and responses to OLWD comments have been provided. OLWD was included on the mailing list for the FEIR and is included on the mailing list for the FEIS.

L1-2 Phase 3 Repair Project construction related to element VIIe would not encroach on the OLWD's wastewater treatment plant. Construction activities would be confined to the rights-of-way. The DEIS/DEIR disclosed the presence of landside development that would constrain the footprint and construction of improvements at element VIIe. See Section 2.4.2, "Action Alternatives of the FEIS."

Letter L2

San Joaquin County
Environmental Health Department
600 East Main Street
Stockton, California 95202-3029

Website: www.sjgov.org/ehd
Phone: (209) 468-3420
Fax: (209) 464-0138

DIRECTOR
Donna Heran, REHS

PROGRAM COORDINATORS
Robert McClellon, REHS
Jeff Carruesco, REHS, RDI
Kasey Foley, REHS

RECEIVED
NOV 03 2011
VALLEY RES. OFF.
CORPS OF ENGINEERS

October 25, 2011

John Suazo
U.S. Army Corps of Engineers
1325 K Street (CESPK-PD-R)
10th Floor
Sacramento, CA 95814

Subject: DEIR Phase 3-RD 17 100-Year Levee Seepage Area Project

The San Joaquin County Environmental Health Department has no comments regarding this project. 1

If you have any questions, please call Rodney Estrada, Lead Senior Registered Environmental Health Specialist, at (209) 468-0331.

Rodney Estrada
Lead Senior REHS

RE:tl

Letter
L2
Response

San Joaquin County Environmental Health Department
Rodney Estrada
October 25, 2011

L2-1 RD 17 and USACE thank the San Joaquin County Environmental Health Department for providing a letter indicating that it has no comments on the DEIS/DEIR.

Letter L3

October 24, 2011

Dante Nomellini, Sr.
Nomellini, Grilli & McDaniel
P.O. Box 1461
Stockton, CA 95201-1461

Subject: Comments on Proposed Project

Project: Phase 3 of the RD 17 100-Year Levee Seepage Area

District CEQA Reference No: 20100239

Dear Mr. Nomellini:

The San Joaquin Valley Unified Air Pollution Control District (District) has reviewed the Draft Environmental Impact Report (EIR) for the Phase 3 of the RD 17 100-Year Levee Seepage Area project. The proposed project includes various levee improvements along 8.4 miles of the RD 17 levee system to meet Federal and State design recommendations for levees protecting urban areas. The District offers the following comments:

__District Comments__

1) Based on the information provided, it appears that compliance with District Rule 9510, Indirect Source Review (Measure 3.9-a(2)) would reduce construction related emissions from the Minimum Footprint Alternative to below the District's thresholds of significance. Similarly, compliance with District Rule 9510 and the incorporation of Mitigation Measure 3.9-a(3) would reduce construction related emissions from the Maximum Footprint Alternative to below the District's thresholds of significance. As such, it appears that the project's impacts on air quality can be mitigated to a less than significant impact under either alternative. 1

2) District Rule 9510 is intended to mitigate a project's impact on air quality through project design elements or by payment of applicable off-site mitigation fees. Any applicant subject to District Rule 9510 is required to submit an Air Impact Assessment (AIA) application to the District no later than applying for final discretionary approval, and to pay any applicable off-site mitigation fees prior to any 2

earthmoving activity. Based on a review of District records, the District has not received an AIA application for this project. Therefore, if adoption and certification of the EIR constitutes the final discretionary approval by the Lead Agency, the project proponent may be in violation of District Rule 9510 requirements. In addition, please note that starting construction before receiving an approved AIA and paying the required Off-site Mitigation Fees, if any, is a violation of District regulations and is subject to enforcement action. Therefore, the District recommends that demonstration of compliance with District Rule 9510, including payment of all applicable fees before the start of construction activities, be made a condition of project approval. Information about how to comply with District Rule 9510 can be found online at: http://www.valleyair.org/ ISR/ISRHome.htm. cont. 2

3) The District recommends that a copy of the District's comments be provided to the project proponent.

If you have any questions or require further information, please call Jessica Willis at (559) 230-5818.

Sincerely,

David Warner
Director of Permit Services

Arnaud Marjollet
Permit Services Manager

DW:jw

cc: File

Letter
L3
Response

San Joaquin Valley Air Pollution Control District
David Warner and Arnaud Marjollet
October 24, 2011

L3-1 Thank you for confirming the DEIS/DEIR analysis and conclusions related to Impact 3.9-a and the associated mitigation.

L3-2 RD 17 would comply with all applicable San Joaquin Valley Air Pollution Control District (SJVAPCD) regulations. If an Air Impact Assessment is required, it would be submitted before project approval. Necessary SJVAPCD forms and fees would be paid at the appropriate time, consistent with Rule 9510.

Letter L4

Stanislaus County
Striving to be the Best

Chief Executive Officer

Patricia Hill Thomas
Chief Operations Officer/
Assistant Executive Officer

Monica Nino
Assistant Executive Officer

Stan Risen
Assistant Executive Officer

1010 10th Street, Suite 6800, Modesto, CA 95354
P.O. Box 3404, Modesto, CA 95353-3404
Phone: 209.525.6333 Fax 209.544.6226

STANISLAUS COUNTY ENVIRONMENTAL REVIEW COMMITTEE

September 23, 2011

John Suazo
Us Army Corp of Engineers
1325 J Street (CESPK-PD-R)
10TH floor
Sacramento, CA 95814

SUBJECT: **ENVIRONMENTAL REFERRAL – US ARMY CORP OF ENGINEERS – PHASE 3 OF THE RECLAMATION DISTRICT 17 100-YEAR LEVEE SEEPAGE AREA PROJECT**

Mr. Suazo:

The Stanislaus County Environmental Review Committee (ERC) has reviewed the subject project and has no comments at this time. 1

The ERC appreciates the opportunity to comment on this project.

Sincerely,

Raul Mendez, Senior Management Consultant
Environmental Review Committee

cc: ERC Members

RM:kg

Letter L4 Response

Stanislaus County, Environmental Review Committee
Raul Mendez
September 23, 2011

L4-1 RD 17 and USACE thank Stanislaus County for providing a letter indicating that it has no comments on the DEIS/DEIR.

B.3 References

AECOM. 2011. *Cultural Resources Inventory and Evaluation Report for the Phase 3 RD 17 100-Year Levee Seepage Area Project.* Sacramento, CA. Prepared for Reclamation District 17, Stockton, CA.

———. 2014. *Addendum Cultural Resources Inventory Report for the Phase 3 RD 17 100-Year Levee Seepage Area Project.* Sacramento, CA. Prepared for Reclamation District 17, Stockton, CA.

California Office of Historic Preservation. 1995 (March). *Instructions for Recording Historical Resources.* Sacramento, CA.

———. 2007. *Directory of Properties in the Historic Property Data File for San Joaquin County.* California Department of Parks and Recreation. On file, Central California Information Center of the California Historical Resources Information System, California State University, Stanislaus, Turlock, CA.

Huxel, G. 2000. The Effect of the Argentine Ant on the Threatened Valley Elderberry Longhorn Beetle. *Biological Invasions* 2:81–85.

OHP. *See* California Office of Historic Preservation.

RD 17. *See* Reclamation District 17.

Reclamation District 17. 2009 (April). *Reclamation District No. 17 Early Implementation Program Proposition 1E, Economic Analysis*. Stockton, CA.

Reclamation District 17. 2016 (June). Final Environmental Impact Report Phase 3–RD 17 Levee Seepage Repair Project (State Clearinghouse Number 2010042073). Prepared by GEI Consultants in association with AECOM. Sacramento, CA.

USACE. *See* U.S. Army Corps of Engineers.

U.S. Army Corps of Engineers. 2009 (April 10). *Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures*. Technical Letter No. 1110-2-571. Washington, DC.

———. 2014 (April 30). *Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures*. Technical Letter No. 1110-2-583. Washington, DC.

U.S. Fish and Wildlife Service. 2017. *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)*. Sacramento, CA.

U.S. Fish and Wildlife Service. 2019 (April). *Biological Opinion on Phase 3 of the Reclamation District 17 Levee Seepage Repair Project.* San Francisco Bay-Delta Fish and Wildlife Office. Sacramento, CA.

USFWS. *See* U.S. Fish and Wildlife Service.

ATTACHMENT 1

Construction Cost Estimate

ATTACHMENT 1

Preliminary Construction Cost Estimate
of
100-YR LEVEE SEEPAGE REPAIR PROJECT
PHASE III

Prepared for:
Reclamation District 17

April 27, 2009
Amended May 8, 2009[1], May 12, 2010[2], Dec 2, 2010[3], Feb 18, 2011 [4]

Prepared by:

MACKAY & SOMPS
ENGINEERS PLANNERS SURVEYORS

(1) Amended based on updated construction cost data from the SAFCA Natomas Levee Project
(2) Amended based on 30% Improvement Plan Submittal and Alternative Analysis Submittal
(3) Amended per recently available bid and construction cost data and to include plan revisions for the upcoming 60% plan submittal
(4) Amended to reflect improvements identified in the 60% plan submittal set.

100 YEAR AREA PROJECT SUMMARY

Job No. 25126.040
Preparation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

	Element #	Improvement Type	Estimated Construction and Right of Way Cost	Contingencies	Soft Costs	Total Estimated Cost
1.	ELEMENT Ia	Seepage Berm	$ 683,434	$ 170,858	$ 102,515	$ 956,807
2.	ELEMENT Ib	Seepage Berm	$ 279,090	$ 69,772	$ 41,863	$ 390,726
3.	ELEMENT Ie	Seepage Berm	$ 469,206	$ 117,302	$ 70,381	$ 656,889
4.	ELEMENT IIab	Cutoff Wall	$ 1,817,147	$ 454,287	$ 272,572	$ 2,544,006
5.	ELEMENT IIIb	Seepage Berm	$ 565,890	$ 141,473	$ 84,884	$ 565,890
6.	ELEMENT IVa	Seepage Berm	$ 926,297	$ 231,574	$ 138,945	$ 1,296,816
7.	ELEMENT IVc	Setback Levee	$ 3,722,397	$ 930,599	$ 558,360	$ 5,211,356
8.	ELEMENT Va	Seepage Berm	$ 5,731,199	$ 1,432,800	$ 859,680	$ 8,023,679
9.	ELEMENT VIa1	Cutoff Wall	$ 2,906,833	$ 726,708	$ 436,025	$ 4,069,566
10.	ELEMENT VIa 4	Seepage Berm	$ 104,495	$ 26,124	$ 15,674	$ 146,293
11.	ELEMENT VIcde	Parking Lot Fill	$ 1,060,050	$ 265,013	$ 159,008	$ 1,484,070
12.	ELEMENT VIIb	Seepage Berm	$ 204,541	$ 51,135	$ 30,681	$ 286,357
13.	ELEMENT VIIe	Cutoff Wall	$ 1,474,820	$ 368,705	$ 221,223	$ 2,064,748
14.	ELEMENT VIIg	Seepage Berm	$ 315,051	$ 78,763	$ 47,258	$ 441,071
15.	ELEMENT VIII-XI	Dryland Berm	$ 4,510,608	$ 1,127,652	$ 676,591	$ 6,314,851
16.	ELEMENT IIIa and VIb	Through Seepage	$ 991,567	$ 247,892	$ 148,735	$ 1,388,194
	ESTIMATED TOTAL INCLUDING CONTINGENCIES AND SOFT COSTS:					**$35,841,320**

Alternate Items

1	ELEMENT IVc	Seepage Berm	$ 1,838,217	$ 459,554	$ 275,733	$ 2,573,504

ELEMENT 1a

Project Type: 100 YEAR - 65' Seepage Berm
Scenario: Standard section - No Drain pipe
590 lf Station 247+00 to Station 252+90
Adjacent Property Owner: Calcagno

Job No. 25126.040
Preperation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.		Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	1.0	Acres	Agricultural Land Acquisition	30,000.00	$30,000
3.	72,880	SF	Temporary Construction Easements	1.00	$72,880
B. CONSTRUCTION ITEMS - SEEPAGE BERM					
1.	1	Job	Mobilization	25,000.00	$25,000
2.	0	EA	Demolition/Removal of Existing Structures	5,000.00	$0
3.	1.7	Acres	Clear and Grub	2,500.00	$4,250
4.	2004	Ton	Seepage Berm - 3/8-in Filter Drain Material	12.50	$25,052
5.	7215	Ton	Seepage Berm - Import Drain Rock	15.50	$111,834
6.	64936	SF	Seepage Berm - Geotextile Fabric	0.26	$16,883
7.	10021	Ton	Seepage Berm - Fill Material	7.50	$75,157
8.		Ton	Thru Seepage - 3/8-in Filter Drain Material	13.75	$0
9.		Ton	Thru Seepage - Import Drain Rock	17.05	$0
10.		SF	Thru Seepage - Geotextile Fabric	0.29	$0
11.		Ton	Thru Seepage - Fill Material	8.25	$0
12.		Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$0
13.	74052	SF	Hydro-Seeding	0.05	$3,703
14.	590	LF	Grade 20' access area at project completion	2.50	$1,475
15.	1	LS	Erosion Control Budget	20,000.00	$20,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	3	EA	Raise Levee Towers (by PG&E)	85,000.00	$255,000
2.	400	LF	Demolish Existing Irrigation Facilities	10.00	$4,000
3.	520	LF	12" Irrigation Line w/ Fittings	35.00	$18,200
4.	1	LS	Develop and Remove Access Roads	20,000.00	$20,000
5.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$683,434**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$170,858
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$102,515
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$956,807**

Notes:

1) The geotechnical engineer has indicated that the existing condition meets the through seepage exit gradient requirements and therefore no levee slope improvements are proposed at this time.
2) Due to ongoing agricultural operations, depending on the time of year that construction occurs, it may be necessary to provide temporary irrigation supply during construction to the property owner. No budget has been included.

Page 3 of 21

ELEMENT Ib

Project Type: 100 YEAR - 65' Seepage Berm
Scenario: Standard section - No Drain pipe
242 lf Station 252+90 to Station 255+32
Adjacent Property Owner: San Joaquin County

Job No. 25126.040
Preparation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.		Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.		Acres	Agricultural Land Acquisition	30,000.00	$0
3.	13,200	SF	Temporary Construction Easements	1.00	$13,200
B. CONSTRUCTION ITEMS - SEEPAGE BERM					
1.	1	Job	Mobilization	25,000.00	$25,000
2.	0	EA	Demolition/Removal of Existing Structures	7,500.00	$0
3.	1.1	Acres	Clear and Grub	3,750.00	$4,125
4.	236	Ton	Seepage Berm - 3/8-in Filter Drain Material	18.75	$4,417
5.	848	Ton	Seepage Berm - Import Drain Rock	23.25	$19,716
6.	7632	SF	Seepage Berm - Geotextile Fabric	0.39	$2,976
7.	1178	Ton	Seepage Berm - Fill Material	11.25	$13,250
8.	39	Ton	Thru Seepage - 3/8-in Filter Drain Material	20.63	$810
9.	141	Ton	Thru Seepage - Import Drain Rock	25.58	$3,615
10.	2420	SF	Thru Seepage - Geotextile Fabric	0.43	$1,038
11.	294	Ton	Thru Seepage - Fill Material	12.38	$3,644
12.	224	Ton	Aggregate Base for Levee Road (6" Thick)	45.00	$10,083
13.	47916	SF	Hydro-Seeding	0.08	$3,594
14.	242	LF	Grade 20' access area at project completion	3.75	$908
15.	1	LS	Erosion Control Budget	20,000.00	$20,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	1	LS	Habitat Fencing	5,000.00	$5,000
2.	12,962	Ton	Levee Fill 300' Wide	7.50	$97,215
3.	10	EA	Tree Removal	500	$5,000
4.	1011	Ton	Aggregate Base for Access Road (6"AB)	45.00	$45,500
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$279,090**
CONTINGENCIES AND SOFT COSTS					
1			Contingencies	25%	$69,772
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$41,863
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$390,726**

Notes:

1) No Land Acquisition Costs have been included at this time, the land is currently owned by the County and an easement is expected to be granted to the District at no cost. However, an access easement may be required from the land-owner to the south for which a temporary access easement cost has been applied.
2) Most unit costs have been inflated by 50% to reflect the relatively small size of this Element, costs may be decreased by pairing this construction project with the adjacent Element Ia project.
3) A portion of the fill area is expected to be within an environmentally sensitive area and may require mitigation, this estimate does not include any costs for enbironmental mitigation.

Page 4 of 21

ELEMENT Ie

Project Type: 100 YEAR - 65' Seepage Berm
Scenario: Standard section - No Drain pipe
660 lf Station 305+70 to Station 312+30
Adjacent Property Owner: Rodgers

Job No. 25126.040
Preperation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.		Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	1.3	Acres	Agricultural Land Acquisition	30,000.00	$39,000
3.	66,000	SF	Temporary Construction Easements	1.00	$66,000
B. CONSTRUCTION ITEMS - SEEPAGE BERM					
1.	1	Job	Mobilization	25,000.00	$25,000
2.	0	EA	Demolition/Removal of Existing Structures	5,000.00	$0
3.	2.0	Acres	Clear and Grub	2,500.00	$5,000
4.	1589	Ton	Seepage Berm - 3/8-in Filter Drain Material	12.50	$19,861
5.	5720	Ton	Seepage Berm - Import Drain Rock	15.50	$88,660
6.	51480	SF	Seepage Berm - Geotextile Fabric	0.26	$13,385
7.	7944	Ton	Seepage Berm - Fill Material	7.50	$59,583
8.	244	Ton	Thru Seepage - 3/8-in Filter Drain Material	13.75	$3,361
9.	880	Ton	Thru Seepage - Import Drain Rock	17.05	$15,004
10.	6600	SF	Thru Seepage - Geotextile Fabric	0.29	$1,888
11.	1833	Ton	Thru Seepage - Fill Material	8.25	$15,125
12.	611	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$18,333
13.	87120	SF	Hydro-Seeding	0.05	$4,356
14.	660	LF	Grade 20' access area at project completion	2.50	$1,650
15.	1	LS	Erosion Control Budget	20,000.00	$20,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	6	EA	Remove and Replace Existing Power Poles (by PG&E)	10,500.00	$63,000
2.	1	LS	Replace Irrigation Facilities	10,000.00	$10,000
3.					$0
4.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$469,206**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$117,302
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$70,361
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$656,889**

Notes:

1) Due to ongoing agricultural operations, depending on the time of year that construction occurs, it may be necessary to provide temporary irrigation supply during construction to the property owner. No budget has been included

Page 5 of 21

ELEMENT IIab

Project Type: 100 YEAR - Cutoff Wall
Scenario: Varying Depth Cutoff Wall
2470 lf Station 362+50 to Station 387+80
Adjacent Property Owner: Luckey and ROI Partners

Job No. 25126.040
Preparation Date: Feb 18, 2011
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	1.0	Acres	Partially Entitled Land Acquisition	60,000.00	$59,917
2.	0.0	Acres	Agricultural Land Acquisition	30,000.00	$0
3.	21,750	SF	Temporary Construction Easements	1.00	$21,750
B. CONSTRUCTION ITEMS - CUTOFF WALL					
1.	1	Job	Mobilization	350,000.00	$350,000
2.	1.3	Acres	Clear and Grub	2,500.00	$3,250
3.	2175	LF	Degrade Ex Levee to allow Cutoff Wall Construction	30.00	$65,250
3.	0	LF	40' Open Cut - Cutoff Wall	320.00	$0
4.	1200	LF	50' Open Cut - Cutoff Wall	400.00	$480,000
5.	975	LF	60' Open Cut - Cutoff Wall	480.00	$468,000
6.	0	LF	70' Open Cut - Cutoff Wall	560.00	$0
7.	0	LF	80' Open Cut - Cutoff Wall	640.00	$0
8.	0	LF	90' Open Cut - Cutoff Wall	720.00	$0
9.	0	LF	100' Open Cut - Cutoff Wall	800.00	$0
10.	2175	LF	Tracer Wire w/ Monuments every 500'	2.50	$5,440
11.	2175	LF	Cap Cutoff Wall with Levee Fill Material	20.00	$43,500
12.	12083	Ton	3:1 Slope - Fill Material	8.25	$99,690
13.	1933	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$58,000
14.	400	LF	Remove / Replace irrigation pipes through levee	50.00	$20,000
15.	87000	SF	Hydro-Seeding	0.05	$4,350
16.	2	LS	Erosion Control Budget	20,000.00	$40,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	6	EA	Remove and Replace Existing Power Poles (by PG&E)	10,500.00	$63,000
2.	1	LS	Remove / Replace Irrigation Facilities	20,000.00	$20,000
3.	1	LS	Remove / Repair Ex Corral Facilities	15,000.00	$15,000
4.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$1,817,147**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$454,287
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$272,572
			ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES		**$2,544,006**

Notes:

1) This estimate includes provisions to remove and relocate all the facilities that were identified during an initial site visit. Additional irrigation facilities may be identified during a subsequent meeting with the landowner that are not included in this estimate.
2) Special considerations for construction staging and timing may be necessary to accommodate the adjacent homeowner. If required by the homeowner or EIR, reduced working hours may have an impact on the overall project cost.

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ELEMENT IIIb

Project Type: 100 YEAR - 70' Seepage Berm
Scenario: Standard section - No Drain pipe
720 lf Station 548+50 to Station 555+70
Adjacent Property Owner: City of Lathrop

Job No. 25126.040
Preparation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.0	Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	0.0	Acres	Agricultural Land Acquisition	30,000.00	$0
3.	0	SF	Temporary Construction Easements	1.00	$0
B. CONSTRUCTION ITEMS - SEEPAGE BERM					
1.	1	Job	Mobilization	25,000.00	$25,000
2.	0	EA	Demolition/Removal of Existing Structures	5,000.00	$0
3.	2.3	Acres	Clear and Grub	2,500.00	$5,785
4.	1733	Ton	Seepage Berm - 3/8-in Filter Drain Material	12.50	$21,667
5.	6240	Ton	Seepage Berm - Import Drain Rock	15.50	$96,720
6.	56160	SF	Seepage Berm - Geotextile Fabric	0.26	$14,602
7.	8667	Ton	Seepage Berm - Fill Material	7.50	$65,000
8.	267	Ton	Thru Seepage - 3/8-in Filter Drain Material	13.75	$3,667
9.	960	Ton	Thru Seepage - Import Drain Rock	17.05	$16,368
10.	7200	SF	Thru Seepage - Geotextile Fabric	0.29	$2,059
11.	2000	Ton	Thru Seepage - Fill Material	8.25	$16,500
12.	667	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$20,000
13.	100800	SF	Hydro-Seeding	0.05	$5,040
14.	720	LF	Grade 20' access area at project completion	2.50	$1,800
15.	1	LS	Erosion Control Budget	20,000.00	$20,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	16	EA	Remove Existing Trees	2,500.00	$40,000
2.	1	EA	Remove and Re-Construct Access Ramps	50,000.00	$50,000
3.					$0
4.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$404,207**
CONTINGENCIES AND SOFT COSTS					
1			Contingencies	25%	$101,052
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$60,631
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$565,890**

Notes:

1) No Land Acquisition Costs have been included at this time, the land is currently owned by the City of Lathrop and the District already has a shared use agreement with the City of the limit of work.

ELEMENT IVa

Project Type: 100 YEAR - Seepage Berm 65' Wide
Scenario: Standard Section
525 lf Station 569+55 to Station 574+80
Adjacent Property Owner: City of Lathrop

Job No. 25126.040
Preparation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.0	Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	0.0	Acres	Agricultural Land Acquisition	30,000.00	$0
3.	1,000	SF	Temporary Construction Easements	1.00	$1,000
B. CONSTRUCTION ITEMS - SEEPAGE BERM					
1.	1	Job	Mobilization	25,000.00	$25,000
2.	0	EA	Demolition/Removal of Existing Structures	5,000.00	$0
3.	1.7	Acres	Clear and Grub	2,500.00	$4,218
4.	1264	Ton	Seepage Berm - 3/8-in Filter Drain Material	12.50	$15,799
5.	4550	Ton	Seepage Berm - Import Drain Rock	15.50	$70,525
6.	40950	SF	Seepage Berm - Geotextile Fabric	0.26	$10,647
7.	6319	Ton	Seepage Berm - Fill Material	7.50	$47,396
8.	194	Ton	Thru Seepage - 3/8-in Filter Drain Material	13.75	$2,674
9.	700	Ton	Thru Seepage - Import Drain Rock	17.05	$11,935
10.	5250	SF	Thru Seepage - Geotextile Fabric	0.29	$1,502
11.	1458	Ton	Thru Seepage - Fill Material	8.25	$12,031
12.	486	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$14,583
13.	73500	SF	Hydro-Seeding	0.05	$3,675
14.	525	LF	Grade 20' access area at project completion	2.50	$1,313
15.	1	LS	Erosion Control Budget	20,000.00	$20,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	2	EA	Remove and Relocate Irrigation Pump	250,000.00	$500,000
2.	800	LF	Remove and Replace Irrigation Pipes (12")	50.00	$40,000
3.	15	EA	Oak Tree removal	2,500.00	$37,500
4.	1	EA	Remove and re-construct AC Access	75,000.00	$75,000
1.	3	EA	Remove and Replace Existing Power Poles (by PG&E)	10,500.00	$31,500
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$926,297**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$231,574
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$138,945
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$1,296,816**

Notes:

1) No Land Acquisition Costs have been included at this time, the land is currently owned by the City and an easement is expected to be granted to the District at no cost. However, an access easement may be required from the land-owner to the East for which a temporary access easement cost has been applied.

2) Due to ongoing agricultural operations, depending on the time of year that construction occurs, it may be necessary to provide temporary irrigation supply during construction to the property owner. No budget has been included

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ELEMENT IVc

Project Type: 100 YEAR - Seepage Berm with Trench Drain
Scenario: Seepage Berm with Trench Drain
2405 lf Existing levee Station 586+50 to Station 607+80
Adjacent Property Owner: Silveira / City of Lathrop

Job No. 25126.040
Preparation Date: Feb 18, 2011
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.0	Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	5.8	Acres	Agricultural Land Acquisition	30,000.00	$173,915
3.	48,100	SF	Temporary Construction Easements	1.00	$48,100
B. CONSTRUCTION ITEMS - SEEPAGE BERM					
1.	1	Job	Mobilization	25,000.00	$25,000
2.	0	EA	Demolition/Removal of Existing Structures	5,000.00	$0
3.	5.8	Acres	Clear and Grub	2,500.00	$14,493
4.	5790	Ton	Seepage Berm / Drain - 3/8-in Filter Drain Material	12.50	$72,373
5.	46898	Ton	Seepage Berm / Drain- Import Drain Rock Material	15.50	$726,911
6.	187590	SF	Seepage Berm / Drain - Geotextile Fabric	0.26	$48,773
7.	28949	Ton	Seepage Berm / Drain - Fill Material	7.50	$217,118
8.	891	Ton	Thru Seepage - 3/8-in Filter Drain Material	13.75	$12,248
9.	3207	Ton	Thru Seepage - Import Drain Rock	17.05	$54,674
10.	24050	SF	Thru Seepage - Geotextile Fabric	0.29	$6,878
11.	6681	Ton	Thru Seepage - Fill Material	8.25	$55,115
12.	2227	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$66,806
13.	252525	SF	Hydro-Seeding	0.05	$12,626
14.	2405	LF	Grade 20' access area at project completion	2.50	$6,013
15.	1	LS	Erosion Control Budget	20,000.00	$20,000
15.	2405	LF	12" PVC SDR 35 Perforated Pipe	35.00	$84,175
15.	16	EA	Flow Relief Riser and Gate Valve	5,500.00	$88,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	1	BUDGE	Irrigation Facilities Replacement	85,000.00	$85,000
2.	1	LS	Develop and Remove Access Roads	20,000.00	$20,000
3.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$1,838,217**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$459,554
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$275,733
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$2,573,504**

Notes.
1) Due to ongoing agricultural operations, depending on the time of year that construction occurs, it may be necessary to provide temporary irrigation supply during construction to the property owner. No budget has been included

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ELEMENT IVc

Project Type: 100 YEAR - Setback Levee
Scenario: Setback Levee
919 lf Existing levee Station 586+50 to Station 607+80
Adjacent Property Owner: Silveira / City of Lathrop

Job No. 25126.040
Preparation Date: Feb 18, 2011
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.0	Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	11.1	Acres	Agricultural Land Acquisition	30,000.00	$333,000
3.	18,380	SF	Temporary Construction Easements	1.00	$18,380
B. CONSTRUCTION ITEMS					
1.	1	Job	Mobilization	150,000.00	$150,000
2.	4	Acres	Clear and Grub Levee Footprint	5,000.00	$20,000
3.	32675	Ton	Setback Levee - Keyway Excavation / Rehandling	15.00	$490,125
4.	16337	Ton	Setback Levee - Keyway Fill (50% Loss)	15.00	$245,055
5.	66372	Ton	Setback Levee - Fill Material	7.50	$497,790
6.	2	EA	Setback Levee - Tie into Existing Levee	200,000.00	$400,000
7.	2212	Ton	Seepage Berm - 3/8-in Filter Drain Material	12.50	$27,650
8.	7964	Ton	Seepage Berm - Import Drain Rock	15.50	$123,442
9.	71682	SF	Seepage Berm - Geotextile Fabric	0.26	$18,637
10.	11062	Ton	Seepage Berm - Fill Material	7.50	$82,965
11.	4300	Ton	Rip-Rap (18" Minus)	15.00	$64,500
12.	850	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$25,500
13.	59167	YD	Remove Existing Levee and Offhaul	15.00	$887,505
14.	155860	SF	Hydro-Seeding	0.23	$35,848
15.	8	AC	Habitat Restoration	30,000.00	$252,000
16.	1	Job	Landscaping Repair and Installation (ex City Park)	50,000.00	$50,000
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$3,722,397**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$930,599
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$558,360
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$5,211,356**

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ELEMENT Va

Project Type: 100 YEAR - Seepage Berm with Trench Drain
Scenario: Seepage Berm with Trench Drain
7950 lf Station 608+00 to Station 687+50
Adjacent Property Owner: Silveira

Job No. 25126.040
Preparation Date: Feb 18, 2011
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.0	Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	19.2	Acres	Agricultural Land Acquisition	30,000.00	$574,897
3.	159,000	SF	Temporary Construction Easements	1.00	$159,000
B. CONSTRUCTION ITEMS - SEEPAGE BERM					
1.	1	Job	Mobilization	25,000.00	$25,000
2.	0	EA	Demolition/Removal of Existing Structures	5,000.00	$0
3.	19.2	Acres	Clear and Grub	2,500.00	$47,908
4.	19139	Ton	Seepage Berm / Drain - 3/8-in Filter Drain Material	12.50	$239,236
5.	155025	Ton	Seepage Berm / Drain- Import Drain Rock Material	15.50	$2,402,888
6.	620100	SF	Seepage Berm / Drain - Geotextile Fabric	0.26	$161,226
7.	95694	Ton	Seepage Berm / Drain - Fill Material	7.50	$717,708
8.	2944	Ton	Thru Seepage - 3/8-in Filter Drain Material	13.75	$40,486
9.	10600	Ton	Thru Seepage - Import Drain Rock	17.05	$180,730
10.	79500	SF	Thru Seepage - Geotextile Fabric	0.29	$22,737
11.	22083	Ton	Thru Seepage - Fill Material	8.25	$182,188
12.	7361	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$220,833
13.	834750	SF	Hydro-Seeding	0.05	$41,738
14.	7950	LF	Grade 20' access area at project completion	2.50	$19,875
15.	1	LS	Erosion Control Budget	20,000.00	$20,000
15.	7950	LF	12" PVC SDR 35 Perforated Pipe	35.00	$278,250
15.	53	EA	Flow Relief Riser and Gate Valve	5,500.00	$291,500
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	1	BUDGE	Irrigation Facilities Replacement	85,000.00	$85,000
2.	1	LS	Develop and Remove Access Roads	20,000.00	$20,000
3.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$5,731,199**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$1,432,800
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$859,680
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$8,023,679**

Notes:
1) Due to ongoing agricultural operations, depending on the time of year that construction occurs, it may be necessary to provide temporary irrigation supply during construction to the property owner. No budget has been included

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ELEMENT VIa1

Project Type: 100 YEAR - Cutoff Wall
Scenario: Varying Depth Cutoff Wall
1850 lf Station 684+50 to Station 703+00
Adjacent Property Owner: Silveira

Job No. 25126.040
Preparation Date: Feb 18, 2011
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.0	Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	1.3	Acres	Agricultural Land Acquisition	30,000.00	$38,223
3.	37,000	SF	Temporary Construction Easements	1.00	$37,000
B. CONSTRUCTION ITEMS - CUTOFF WALL					
1.	1	Job	Mobilization	350,000.00	$350,000
2.	5.9	Acres	Clear and Grub	2,500.00	$14,860
3.	0	LF	50' DSM Cutoff Wall	650.00	$0
4.	0	LF	60' DSM Cutoff Wall	780.00	$0
5.	0	LF	70' DSM Cutoff Wall	910.00	$0
6.	540	LF	80' DSM Cutoff Wall	1,040.00	$561,600
7.	1310	LF	90' DSM Cutoff Wall	1,170.00	$1,532,700
8.	0	LF	100' DSM Cutoff Wall	1,300.00	$0
9.	0	LF	110' DSM Cutoff Wall	1,430.00	$0
10.	1850	LF	Tracer Wire w/ Monuments every 500'	2.50	$4,630
11.	1850	LF	Cap Cutoff Wall with Levee Fill Material	20.00	$37,000
12.	10278	Ton	3:1 Slope - Fill Material	8.25	$84,790
13.	1644	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$49,330
14.	800	LF	Remove / Replace irrigation pipes through levee	50.00	$40,000
15.	74000	SF	Hydro-Seeding	0.05	$3,700
16.	2	LS	Erosion Control Budget	20,000.00	$40,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	6	EA	Remove and Replace Existing Power Poles (by PG&E)	10,500.00	$63,000
2.	1	LS	Remove / Replace Irrigation Facilities	50,000.00	$50,000
					$0
					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$2,906,833**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$726,708
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$436,025
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$4,069,566**

Notes:
1) Due to ongoing agricultural operations, depending on the time of year that construction occurs, it may be necessary to provide temporary irrigation supply during construction to the property owner. No budget has been included

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ELEMENT VIa.4

Project Type: 100 YEAR - 65' Seepage Berm w/ Toe Drain
Scenario: Standard section
30 lf Station 740+95 to Station 741+05
Adjacent Property Owner: Califia LLC

Job No. 25126.040
Preparation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.1	Acres	Partially Entitled Land Acquisition	60,000.00	$6,000
2.		Acres	Agricultural Land Acquisition	30,000.00	$0
3.	600	SF	Temporary Construction Easements	1.00	$600
B. CONSTRUCTION ITEMS - SEEPAGE BERM					
1.	1	Job	Mobilization	25,000.00	$25,000
2.	0	EA	Demolition/Removal of Existing Structures	7,500.00	$0
3.	0.1	Acres	Clear and Grub	3,750.00	$375
4.	236	Ton	Seepage Berm - 3/8-in Filter Drain Material	18.75	$4,417
5.	848	Ton	Seepage Berm - Import Drain Rock	23.25	$19,716
6.	7632	SF	Seepage Berm - Geotextile Fabric	0.39	$2,976
7.	1178	Ton	Seepage Berm - Fill Material	11.25	$13,250
8.	39	Ton	Thru Seepage - 3/8-in Filter Drain Material	20.63	$810
9.	141	Ton	Thru Seepage - Import Drain Rock	25.58	$3,615
10.	300	SF	Thru Seepage - Geotextile Fabric	0.43	$129
11.	83	Ton	Thru Seepage - Fill Material	12.38	$1,031
12.	28	Ton	Aggregate Base for Levee Road (6" Thick)	45.00	$1,250
13.	4356	SF	Hydro-Seeding	0.08	$327
14.	0	LF	Grade 20' access area at project completion	3.75	$0
15.	1	LS	Erosion Control Budget	5,000.00	$5,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	1	LS	Seepage Berm Drain below Ex Pipes	20,000.00	$20,000
2.					$0
3.					$0
4.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$104,495**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$26,124
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$15,674
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$146,293**

Notes:

1) Most unit costs have been inflated by 50% to reflect the relatively small size of this Element, costs may be decreased by pairing this construction project with an adjacent project.

2) The seepage berm drain will need to be located beneath existing 48" and 18" storm drainage pipelines, it is anticipated that this work can be completed during the "dry" season, however if work is completed during the "rainy" season, temporary facilities may be required. No budget for this work has been included in this estimate.

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ELEMENT VIcde

Project Type: 100 YEAR - Fill to Highground / Seepage Berm
Scenario: Varying Fill in Parking Lot with Subdrain
500 lf Between Ex. levee Stations 764+00 and 769+00
Adjacent Property Owner: County of San Joaquin / UPRR

Job No. 25126.040
Preparation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

30% DESIGN - PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.0	Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	0.0	Acres	Agricultural Land Acquisition	30,000.00	$0
3.	70,000	SF	Temporary Construction Easements	1.00	$70,000
B. CONSTRUCTION ITEMS - PARKING LOT FILL					
1.	1	Job	Mobilization	80,000.00	$80,000
2.	1	Job	Clear and Grub / Demolition	100,000.00	$100,000
3.	4444	Ton	Furnish & Place Import Filter Material	12.50	$55,560
4.	17778	Ton	Furnish & Place Import Drain Rock Material	15.50	$275,560
5.	60000	SF	3"AC/12"AB (parking area)	4.50	$270,000
6.	1250	LF	Subdrain incl. structures & connections	45.00	$56,250
7.	190	LF	12"SD Pipe	42.00	$7,980
8.	1	EA	Field Inlet Catch Basin	2700	$2,700
9.	1	Job	Pump Station upgrades	20,000.00	$20,000
10.	2800	Ton	Fill Material for UPRR Property	8.25	$23,100
11.	1400	LF	Spill Curb and Gutter	16.00	$22,400
12.	2400	SF	3"AC/12"AB (access ramp)	4.50	$10,800
13.	3	EA	Remove / Relocate Electroliers and Wiring	5,500.00	$16,500
14.	1	Job	Landscaping and Irrigation	25,000.00	$25,000
15.	1	Job	Signing and Striping	3,500.00	$3,500
16.	90000	SF	Hydroseeding	0.23	$20,700
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$1,060,050**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$265,013
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$159,008
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$1,484,070**

Notes.

1) Although the parking lot is owned by the County and no actual land acquisition costs are anticipated, the District may be required to reimburse the County for lost revenue due to the inability to use the boat launch facility for an extended period of time, therefore the full acreage of the parking lot has been budgeted as a temporary construction easement.

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ELEMENT VIIb

Project Type: 100 YEAR - 70' Wide Seepage Berm
Scenario: Standard section - No Drain pipe
340 lf Station 775+00 to Station 778+40
Adjacent Property Owner: Hill Country

Job No. 25126.040
Preparation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.0	Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	0.4	Acres	Agricultural Land Acquisition	30,000.00	$12,000
3.	6,800	SF	Temporary Construction Easements	1.00	$6,800
B. CONSTRUCTION ITEMS - SEEPAGE BERM					
1.	1	Job	Mobilization	50,000.00	$50,000
2.	2	EA	Demolition/Removal of Existing Structures	7,500.00	$15,000
3.	1.1	Acres	Clear and Grub	3,750.00	$4,125
4.	275	Ton	Seepage Berm - 3/8-in Filter Drain Material	18.75	$5,153
5.	989	Ton	Seepage Berm - Import Drain Rock	23.25	$23,002
6.	8904	SF	Seepage Berm - Geotextile Fabric	0.39	$3,473
7.	1374	Ton	Seepage Berm - Fill Material	11.25	$15,458
8.	39	Ton	Thru Seepage - 3/8-in Filter Drain Material	20.63	$810
9.	141	Ton	Thru Seepage - Import Drain Rock	25.58	$3,615
10.	3400	SF	Thru Seepage - Geotextile Fabric	0.43	$1,459
11.	944	Ton	Thru Seepage - Fill Material	12.38	$11,688
12.	315	Ton	Aggregate Base for Levee Road (6" Thick)	45.00	$14,167
13.	47916	SF	Hydro-Seeding	0.08	$3,594
14.	340	LF	Grade 20' access area at project completion	3.75	$1,275
15.	1	LS	Erosion Control Budget	5,000.00	$5,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	481	Ton	Aggregate Base for Access Road (6"AB)	30.00	$14,444
2.	81	LF	24" RCP Storm Drain Pipe	80.00	$6,480
3.	2	EA	Storm Drain Manholes	3500	$7,000
4.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$204,541**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$51,135
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$30,681
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$286,357**

Notes:

1) Most unit costs have been inflated by 50% to reflect the relatively small size of this Element, costs may be decreased by pairing this construction project with the adjacent project.
2) A portion of this work will need to be completed within Caltrans right of way and will require an encroachment permit and additional coordination with Caltrans construction inspectors.

ELEMENT VIIe

Project Type: 100 YEAR - Cutoff Wall
Scenario: Thru-Seepage Cutoff Wall
2500 lf Station 803+00 to Station 828+00
Adjacent Property Owner: Bank of America

Job No. 25126.040
Preparation Date: Feb 18, 2011
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.0	Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	0.0	Acres	Agricultural Land Acquisition	30,000.00	$0
3.	25,000	SF	Temporary Construction Easements	1.00	$25,000
B. CONSTRUCTION ITEMS - CUTOFF WALL					
1.	1	Job	Mobilization	350,000.00	$350,000
2.	1.3	Acres	Clear and Grub	2,500.00	$3,250
3.	2500	LF	Degrade Ex Levee to allow Cutoff Wall Construction	30.00	$75,000
4.	2500	LF	40' Open Cut - Cutoff Wall	320.00	$800,000
5.	0	LF	50' Open Cut - Cutoff Wall	400.00	$0
6.	0	LF	60' Open Cut - Cutoff Wall	480.00	$0
7.	0	LF	70' Open Cut - Cutoff Wall	560.00	$0
8.	0	LF	80' Open Cut - Cutoff Wall	640.00	$0
9.	0	LF	90' Open Cut - Cutoff Wall	720.00	$0
10.	0	LF	100' Open Cut - Cutoff Wall	800.00	$0
11.	2500	LF	Tracer Wire w/ Monuments every 500'	2.50	$6,250
12.	2500	LF	Cap Cutoff Wall with Levee Fill Material	20.00	$50,000
13.	3472	Ton	3:1 Slope - Fill Material	8.25	$28,650
14.	2222	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$66,670
15.	0	LF	Remove / Replace irrigation pipes through levee	50.00	$0
16.	100000	SF	Hydro-Seeding	0.05	$5,000
17.	1	LS	Erosion Control Budget	40,000.00	$40,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	1	LS	Remove and Replace Existing Fences	25,000.00	$25,000
2.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$1,474,820**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$368,705
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$221,223
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$2,064,748**

Notes:

1) This estimate includes provisions to remove and relocate all the facilities that were identified during a site vis
2) Special considerations for construction staging and timing may be necessary to accommodate the adjacent homeowner. If required by the homeowner or EIR, reduced working hours may have an impact on the overall project cost.
3) Due to the relationship between the homes adjacent to levee and the existing levee prism, it will not be feasible to expand the levee to meet the USACE's expanded levee prism in all locations. If required, the District would need to acquire several residences directly adjacent to the levee which may increase costs significantly.
4) A budget for temporary access easements has been provided to access the roadways within the existing mobile home park, depending on the ultimate agreement with the property owners, this quantity and price is subject to revision.

ELEMENT VIIg

Project Type: 100 YEAR - Seepage Berm Fill with Trench Drain
Scenario: Fill to High Ground
385 lf Station 849+65 to Station 853+50
Adjacent Property Owner: Baird

Job No. 25126.040
Preparation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.4	Acres	Partially Entitled Land Acquisition	60,000.00	$24,000
2.	0.0	Acres	Agricultural Land Acquisition	30,000.00	$0
3.	20,000	SF	Temporary Construction Easements	1.00	$20,000
B. CONSTRUCTION ITEMS - SEEPAGE BERM					
1.	1	Job	Mobilization	25,000.00	$25,000
2.	0	EA	Demolition/Removal of Existing Structures	7,500.00	$0
3.	0.4	Acres	Clear and Grub	3,750.00	$1,500
4.	927	Ton	Seepage Berm - 3/8-in Filter Drain Material	18.75	$17,378
5.	3337	Ton	Seepage Berm - Import Drain Rock	23.25	$77,578
6.	30030	SF	Seepage Berm - Geotextile Fabric	0.39	$11,712
7.	4634	Ton	Seepage Berm - Fill Material	11.25	$52,135
8.	143	Ton	Thru Seepage - 3/8-in Filter Drain Material	20.63	$2,941
9.	513	Ton	Thru Seepage - Import Drain Rock	25.58	$13,129
10.	3850	SF	Thru Seepage - Geotextile Fabric	0.43	$1,652
11.	1069	Ton	Thru Seepage - Fill Material	12.38	$13,234
12.	356	Ton	Aggregate Base for Levee Road (6" Thick)	45.00	$16,042
13.	17424	SF	Hydro-Seeding	0.08	$1,307
14.	385	LF	Grade 20' access area at project completion	3.75	$1,444
15.	1	LS	Erosion Control Budget	5,000.00	$5,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	2	EA	Remove and Replace Existing Power Poles (by PG&E)	10,500.00	$21,000
2.	1	LS	Remove and Replace Irrigation Facilities	10,000.00	$10,000
3.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$315,051**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$78,763
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$47,258
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$441,071**

Notes:

1) Most unit costs have been inflated by 50% to reflect the relatively small size of this Element and difficulty accessir the construction site, these additional costs may be decreased by pairing this construction project with an adjacent Element project.

2) Some fill is anticipated adjacent to an existing retaining wall. This wall is anticipated to stay in place, additional costs will need to budgeted if it is anticipated to be removed.

3) Due to ongoing agricultural operations, depending on the time of year that construction occurs it may be necessary to provide temporary irrigation facilities to the property owner.

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ELEMENT VIII-XI

Project Type: 100 YEAR - Dryland Levee Improvement
Scenario: 50' Wide Seepage Berm
13715' Station 854+25 to Station 991+40
Adjacent Property Owner: Baird

Job No. 25126.040
Preparation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.		Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	18.0	Acres	Agricultural Land Acquisition	30,000.00	$540,000
3.	137,150	SF	Temporary Construction Easements	1.00	$137,150
B. CONSTRUCTION ITEMS - DRYLAND LEVEE					
1.	1	Job	Mobilization	80,000.00	$80,000
2.	0	EA	Demolition/Removal of Existing Structures	5,000.00	$0
3.	40.0	Acres	Clear and Grub	2,500.00	$100,000
4.	25398	Ton	Seepage Berm - 3/8-in Filter Drain Material	12.50	$317,477
5.	91433	Ton	Seepage Berm - Import Drain Rock	15.50	$1,417,217
6.	822900	SF	Seepage Berm - Geotextile Fabric	0.26	$213,954
7.	126991	Ton	Seepage Berm - Fill Material	7.50	$952,431
8.	12699	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$380,972
9.	1742400	SF	Hydro-Seeding	0.05	$87,120
10.	13715	LF	Grade 20' access area at project completio	2.50	$34,288
11.	1	LS	Erosion Control Budget	100,000.00	$100,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	1	LS	Remove and Replace Existing Power Poles (by PG&E)	50,000.00	$50,000
2.	1	LS	Remove and Replace Irrigation Facilities	100,000.00	$100,000
3.					$0
4.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$4,510,608**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$1,127,652
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$676,591
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$6,314,851**

Notes:

1) Due to ongoing agricultural operations, depending on the time of year that construction occurs it may be necessa to provide temporary irrigation facilities to the property owner.

2) Budgets have been included for both removal and relocation of PG&E facilities and Irrigation facilities. At this time extent of these relocations have not been identified, quantities will be refined during the plan preparation process.

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ELEMENT IIIa

Project Type: 100 YEAR - Through Seepage
Scenario: Chimney Drain
4700 lf Station 515+50 to 548+50 and Station 555+50 to 569+50
Adjacent Property Owner: City of Lathrop

Job No. 25126.040
Preparation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.0	Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	0.0	Acres	Agricultural Land Acquisition	30,000.00	$0
3.	0	SF	Temporary Construction Easements	1.00	$0
B. CONSTRUCTION ITEMS - SEEPAGE BERM					
1.	1	Job	Mobilization	25,000.00	$25,000
2.	0	EA	Demolition/Removal of Existing Structures	5,000.00	$0
3.	4.3	Acres	Clear and Grub	2,500.00	$10,790
4.	1741	Ton	Thru Seepage - 3/8-in Filter Drain Material	13.75	$23,935
5.	6267	Ton	Thru Seepage - Import Drain Rock	17.05	$106,847
6.	47000	SF	Thru Seepage - Geotextile Fabric	0.29	$13,442
7.	13056	Ton	Thru Seepage - Fill Material	8.25	$107,708
8.	4352	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$130,556
9.	188000	SF	Hydro-Seeding	0.05	$9,400
10.	1	LS	Erosion Control Budget	20,000.00	$20,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	4700	LF	Connect Drain Rock to Ex Berm	50.00	$235,000
2.					$0
3.					$0
4.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$682,677**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$170,669
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$102,402
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$955,748**

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ELEMENT VIb

Project Type: 100 YEAR - Through Seepage
Scenario: Chimney Drain
1945 lf Station 741+05 to 760+50
Adjacent Property Owner: TCN Properties / Queirolo / RD17

Job No. 25126.040
Preparation Date: Dec 02, 2010
Print Date: Feb 18, 2011
Prepared by MacKay and Somps

PRELIMINARY CONSTRUCTION COST ESTIMATE
For the RD17 EIP based on DRAFT 60% Improvement Plans

ITEM	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
A. RIGHT OF WAY ACQUISITION					
1.	0.0	Acres	Partially Entitled Land Acquisition	60,000.00	$0
2.	0.0	Acres	Agricultural Land Acquisition	30,000.00	$0
3.	0	SF	Temporary Construction Easements	1.00	$0
B. CONSTRUCTION ITEMS - SEEPAGE BERM					
1.	1	Job	Mobilization	25,000.00	$25,000
2.	0	EA	Demolition/Removal of Existing Structures	5,000.00	$0
3.	1.8	Acres	Clear and Grub	2,500.00	$4,465
4.	720	Ton	Thru Seepage - 3/8-in Filter Drain Material	13.75	$9,905
5.	2593	Ton	Thru Seepage - Import Drain Rock	17.05	$44,216
6.	19450	SF	Thru Seepage - Geotextile Fabric	0.29	$5,563
7.	5403	Ton	Thru Seepage - Fill Material	8.25	$44,573
8.	1801	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	$54,028
9.	77800	SF	Hydro-Seeding	0.05	$3,890
10.	1	LS	Erosion Control Budget	20,000.00	$20,000
C. ELEMENT SPECIFIC CONSTRUCTION ITEMS					
1.	1945	LF	Connect Drain Rock to Ex Berm	50.00	$97,250
2.					$0
3.					$0
4.					$0
			RIGHT OF WAY AND CONSTRUCTION ITEMS SUBTOTAL		**$308,890**
CONTINGENCIES AND SOFT COSTS					
1.			Contingencies	25%	$77,222
2.			Soft Costs (Planning, Design, Plan Check, Inspection, ROW consultants, etc.)	15%	$46,333
ESTIMATED TOTAL INCLUDING MISCELLANEOUS AND CONTINGENCIES					**$432,446**

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Cost Data

	Unit		Unit Cost	
A.	**RIGHT OF WAY ACQUISITION**			
1	Acres	Partially Entitled Land Acquisition	60,000.00	
2.	Acres	Agricultural Land Acquisition	30,000.00	
3.	SF	Temporary Construction Easements	1.00	
B.	**CONSTRUCTION ITEMS - SEEPAGE BERM**			
1.	Job	Mobilization	25,000.00	
2.	EA	Demolition/Removal of Existing Structures	5,000.00	
3	Acres	Clear and Grub	2,500.00	
4.	Ton	Seepage Berm - 3/8-in Filter Drain Material	12.50	
5	Ton	Seepage Berm - Import Drain Rock Material	15.50	
6.	SF	Seepage Berm - Geotextile Fabric	0.26	
7	Ton	Seepage Berm - Fill Material	7.50	
8.	Ton	Thru Seepage - 3/8-in Filter Drain Material	13.75	
9.	Ton	Thru Seepage - Import Drain Rock Material	17.05	
10.	SF	Thru Seepage - Geotextile Fabric	0.29	
11	Ton	Thru Seepage - Fill Material	8.25	
12.	Ton	Aggregate Base for Levee Road (6" Thick)	30.00	
13.	SF	Hydro-Seeding	0.05	
14	LF	Grade 20' access area at project completion	2.50	
15.	LS	Erosion Control Budget	20,000.00	
B.	**CONSTRUCTION ITEMS - CUTOFF WALL**			
1	Job	Mobilization	350,000.00	
3	Acres	Clear and Grub	2,500.00	
2	LF	50' DSM Cutoff Wall	650.00	$13 per sf
3.	LF	60' DSM Cutoff Wall	780.00	$13 per sf
4.	LF	70' DSM Cutoff Wall	910.00	$13 per sf
5.	LF	80' DSM Cutoff Wall	1,040.00	$13 per sf
6	LF	90' DSM Cutoff Wall	1,170.00	$13 per sf
7.	LF	100' DSM Cutoff Wall	1,300.00	$13 per sf
8	LF	110' DSM Cutoff Wall	1,430.00	$13 per sf
9	LF	Tracer Wire w/ Monuments every 500'	2.50	
10.	LF	Cap Cutoff Wall with Levee Fill Material	20.00	
11.	Ton	3:1 Slope - Fill Material	8.25	
12	Ton	6" AB on Levee Crown	30.00	
13.	LF	Remove / Replace irrigation pipes through levee	50.00	
14.	SF	Hydro-Seeding	0.05	
15	LS	Erosion Control Budget	20,000.00	

Overall Notes:

1) Based on recommendations by the geotechnical engineer and an analysis of the phase one and two projects, the following conversion factors were utilized to calculate pay quantities:
   a. 3/8" Filter Drain Material - 2.0 tons / cy
   b. Drain Rock Material - 1.8 tons / cy
   c. Seepage Berm Fill - 2.0 tons / cy
   d. Filter Fabric neat quantities were increased by 20% to account for losses during the installation process
2) Overall the unit costs have been reduced from the 5/8/09 estimate. The amended unit cost data for seepage berm and earthwork line items were developed from the Phase II bid results. During the September 2009 bid, 9 bids were received for Element VIIc - the high and low bids were ignored and the average of the remaining bids was calculated to develop the unit units shown above

Appendix C. Form NRCS-CPA-106: Farmland Conversion Impact Rating for Corridor-Type Projects

U.S. DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service

NRCS-CPA-106
(Rev. 1-91)

FARMLAND CONVERSION IMPACT RATING FOR CORRIDOR TYPE PROJECTS

PART I *(To be completed by Federal Agency)*	3. Date of Land Evaluation Request 1/15/15	4. Sheet 1 of 1
1. Name of Project **Phase 3 RD17 Levee Seepage Repair Project**	5. Federal Agency Involved **U.S. Army Corps of Engineers, Sacrament**	
2. Type of Project **Repair of levee seepage deficiencies**	6. County and State **San Joaquin County, CA**	
PART II *(To be completed by NRCS)*	1. Date Request Received by NRCS **1/16/15**	2. Person Completing Form **F. Ye**
3. Does the corridor contain prime, unique statewide or local important farmland? (If no, the FPPA does not apply - Do not complete additional parts of this form). YES ☑ NO ☐		4. Acres Irrigated **453,980** / Average Farm Size 204 ac
5. Major Crop(s) **corn, asparagus, wheat**	6. Farmable Land in Government Jurisdiction Acres: **492,032** % **54.9**	7. Amount of Farmland As Defined in FPPA Acres: 620, 070 % **69**
8. Name Of Land Evaluation System Used **CA Storie Index**	9. Name of Local Site Assessment System **None**	10. Date Land Evaluation Returned by NRCS **2/2/15**

PART III *(To be completed by Federal Agency)*	Maximum Points	Alternative Corridor For Segment ________ Corridor A	Corridor B	Corridor C	Corridor D
A. Total Acres To Be Converted Directly		45.9	86.7	177.1	
B. Total Acres To Be Converted Indirectly, Or To Receive Services					
C. Total Acres In Corridor		59.7	101.8	184.6	
PART IV *(To be completed by NRCS) Land Evaluation Information*					
A. Total Acres Prime And Unique Farmland		28.4	52.9	122.5	
B. Total Acres Statewide And Local Important Farmland		31.3	49	62.1	
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted		<0.01%	<0.01%	<0.01%	
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value		N/A	N/A	N/A	
PART V *(To be completed by NRCS) Land Evaluation Information Criterion Relative value of Farmland to Be Serviced or Converted (Scale of 0 - 100 Points)*		67	67	68	
PART VI *(To be completed by Federal Agency) Corridor Assessment Criteria (These criteria are explained in 7 CFR 658.5(c))*	Maximum Points				
1. Area in Nonurban Use	15	14	14	14	
2. Perimeter in Nonurban Use	10	9	9	9	
3. Percent Of Corridor Being Farmed	20	0	0	0	
4. Protection Provided By State And Local Government	20	20	20	20	
5. Size of Present Farm Unit Compared To Average	10	3	3	3	
6. Creation Of Nonfarmable Farmland	25	0	0	0	
7. Availablility Of Farm Support Services	5	5	5	5	
8. On-Farm Investments	20	5	5	5	
9. Effects Of Conversion On Farm Support Services	25	0	0	0	
10. Compatibility With Existing Agricultural Use	10	0	0	0	
TOTAL CORRIDOR ASSESSMENT POINTS	160	56	56	56	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland (From Part V)	100	67	67	68	0
Total Corridor Assessment (From Part VI above or a local site assessment)	160	56	56	56	0
TOTAL POINTS *(Total of above 2 lines)*	260	123	123	124	0

1. Corridor Selected:	2. Total Acres of Farmlands to be Converted by Project:	3. Date Of Selection:	4. Was A Local Site Assessment Used?
Corridor A (Applicant's Preferred Alternative)	45.9		YES ☐ NO ☑

5. Reason For Selection:

The Applicant's Preferred Alternative would meet the purpose and objectives of the proposed project with the least number of environmentally damaging impacts.

Signature of Person Completing this Part:	DATE
Jenifer King, AECOM	**1/15/15**

NOTE: Complete a form for each segment with more than one Alternate Corridor

Clear Form

CORRIDOR - TYPE SITE ASSESSMENT CRITERIA

The following criteria are to be used for projects that have a linear or corridor - type site configuration connecting two distant points, and crossing several different tracts of land. These include utility lines, highways, railroads, stream improvements, and flood control systems. Federal agencies are to assess the suitability of each corridor - type site or design alternative for protection as farmland along with the land evaluation information.

(1) How much land is in nonurban use within a radius of 1.0 mile from where the project is intended?
More than 90 percent - 15 points
90 to 20 percent - 14 to 1 point(s)
Less than 20 percent - 0 points

(2) How much of the perimeter of the site borders on land in nonurban use?
More than 90 percent - 10 points
90 to 20 percent - 9 to 1 point(s)
Less than 20 percent - 0 points

(3) How much of the site has been farmed (managed for a scheduled harvest or timber activity) more than five of the last 10 years?
More than 90 percent - 20 points
90 to 20 percent - 19 to 1 point(s)
Less than 20 percent - 0 points

(4) Is the site subject to state or unit of local government policies or programs to protect farmland or covered by private programs to protect farmland?
Site is protected - 20 points
Site is not protected - 0 points

(5) Is the farm unit(s) containing the site (before the project) as large as the average - size farming unit in the County ?
(Average farm sizes in each county are available from the NRCS field offices in each state. Data are from the latest available Census of Agriculture, Acreage or Farm Units in Operation with $1,000 or more in sales.)
As large or larger - 10 points
Below average - deduct 1 point for each 5 percent below the average, down to 0 points if 50 percent or more below average - 9 to 0 points

(6) If the site is chosen for the project, how much of the remaining land on the farm will become non-farmable because of interference with land patterns?
Acreage equal to more than 25 percent of acres directly converted by the project - 25 points
Acreage equal to between 25 and 5 percent of the acres directly converted by the project - 1 to 24 point(s)
Acreage equal to less than 5 percent of the acres directly converted by the project - 0 points

(7) Does the site have available adequate supply of farm support services and markets, i.e., farm suppliers, equipment dealers, processing and storage facilities and farmer's markets?
All required services are available - 5 points
Some required services are available - 4 to 1 point(s)
No required services are available - 0 points

(8) Does the site have substantial and well-maintained on-farm investments such as barns, other storage building, fruit trees and vines, field terraces, drainage, irrigation, waterways, or other soil and water conservation measures?
High amount of on-farm investment - 20 points
Moderate amount of on-farm investment - 19 to 1 point(s)
No on-farm investment - 0 points

(9) Would the project at this site, by converting farmland to nonagricultural use, reduce the demand for farm support services so as to jeopardize the continued existence of these support services and thus, the viability of the farms remaining in the area?
Substantial reduction in demand for support services if the site is converted - 25 points
Some reduction in demand for support services if the site is converted - 1 to 24 point(s)
No significant reduction in demand for support services if the site is converted - 0 points

(10) Is the kind and intensity of the proposed use of the site sufficiently incompatible with agriculture that it is likely to contribute to the eventual conversion of surrounding farmland to nonagricultural use?
Proposed project is incompatible to existing agricultural use of surrounding farmland - 10 points
Proposed project is tolerable to existing agricultural use of surrounding farmland - 9 to 1 point(s)
Proposed project is fully compatible with existing agricultural use of surrounding farmland - 0 points

Appendix D. Hydraulic Analysis of Setback Levee Alternatives

D.1 January 2010 Hydraulic Analysis of Reach IVc and Reaches IIa and IIb Levee Setback Alternatives

HYDRAULIC REPORT

RECLAMATION DISTRICT NO. 17
MOSSDALE TRACT

LEVEE SETBACK ALTERNATIVES STUDY
REACH IV-c, and REACHES II-a and II-b
San Joaquin County, California

Submitted to:

Mr. Dante Nomellini
Reclamation District No. 17
P.O. Box 1461
Stockton, CA 95201

January 19, 2010
Revised April 14, 2010
Project No. 5747.000.000

- Expect Excellence -

ENGEO INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
WATER RESOURCES
CONSTRUCTION SERVICES

Project No.
5747.000.000

January 19, 2010
Revised April 14, 2010

Mr. Dante Nomellini
Reclamation District No. 17
P.O. Box 1461
Stockton, CA 95201

Subject: Reclamation District No. 17 - Mossdale Tract
Levee Setback Alternatives Study – Reach IV-c and Reaches II-a and II-b
San Joaquin County, California

HYDRAULIC ANALYSIS OF PROPOSED SAN JOAQUIN RIVER LEVEE SETBACK ALTERNATIVES

Reference: Army Corps of Engineers Sacramento and San Joaquin River Basins Comprehensive Study dated 1992.

Dear Mr. Nomellini:

We are pleased to present to you the results of our analysis on the proposed San Joaquin River levee setback alternatives near Lathrop in San Joaquin County, California. The purpose of our study was to consider geomorphic or hydraulic impacts that may result from two levee setback scenarios. One levee setback along Reach IV-c (Alternative 1) and another along the boundary of Reaches II-a and II-b (Alternative 2). In order to analyze the hydraulic impacts, we utilized the HEC-RAS computer modeling program to conduct an unsteady flow analysis for each levee setback location. The results from the modeling allowed us to predict the peak flow and velocity rate changes if the setback levees were to be implemented. This report includes an account of both the computer modeling theory and input parameters as well as the results of our analysis.

If you have any questions regarding this study, please feel free to contact us.

Very truly yours,

ENGEO Incorporated

Jonathan Buck
jb/jt/jf: hydro

Josef J. Tootle

REGISTERED PROFESSIONAL ENGINEER
JOSEF TOOTLE
No. 2677
Exp. 6/30/2010
GEOTECHNICAL
STATE OF CALIFORNIA

TABLE OF CONTENTS

1.0 INTRODUCTION

At your request, we have completed our study of two levee setback alternatives for the easterly (right bank) levee abutting the San Joaquin River for a portion of the San Joaquin River near Lathrop, California. The two levee setback locations are denoted as Alternative 1 for Reach IV-c and Alternative 2 for the portion of levee setback at the boundary of Reaches II-a and II-b. Levee Setback Alternative 1 and Alternative 2 are located approximately 4 and 8 miles downstream of the Mossdale Landing river gage, respectively.

The intent of this report is to consider geomorphic or hydraulic impacts that might result with the implementation of the setback levee alternatives described herein. The setback levee alternatives for this area have been developed based on our discussions with Reclamation District 17 (RD-17) engineer Kjeldsen Sinnock Neudeck (KSN) and the project civil engineers, MacKay and Somps, Inc (M&S). The purpose of the analysis is to evaluate the potential hydraulic impacts of the proposed levee setbacks on the river channel and flow characteristics upstream and downstream of the setback locations.

2.0 SETTING

The RD-17 levees are constructed on the east (right) bank of the San Joaquin River. The setback levees studied herein are located to the north (downstream) of the Old River/San Joaquin River bifurcation, which is located approximately 2½ miles to the north of the Mossdale Landing river gage. The lands to the north and west of the San Joaquin River/Old River bifurcation are used for agriculture. In recent years, a significant portion of the lands immediately to the east of the river has been converted from agricultural use to residential and commercial development. The reach of the river relevant to the studies conducted herein is shown on Figure 1.

3.0 LEVEE SETBACK ALTERNATIVES

3.1 SETBACK ALTERNATIVE 1 (REACH IV-c)

Levee setback Alternative 1 would create a setback levee located at a large bend in the river approximately between Stations 608+00 and 587+00 and rebuild the levee so that the inboard area would eventually become unprotected from flood flows as shown on Figure 2. The total length of the setback levee is approximately 865 feet. For purposes of hydraulic modeling, the top of levee was set at the same elevation as the existing levee.

3.2 SETBACK ALTERNATIVE 2 (REACHES II-a AND II-b)

Setback Alternative 2 would begin approximately at Station 394+00 and continue approximately to Station 363+00. Alternative 2 spans the portion of levee currently at the boundary of Reaches II-a and II-b; thus the proposed setback is within two Reach designations. Similar to Alternative 1, the setback levee would thus contain an inboard area that would remain unimproved until the setback levee would become the primary landside protection for the fluvial system. Top of levee elevations were set at the same crest elevation as the existing levee. A plan view of setback Alternative 2 is shown on Figure 3.

4.0 GEOMORPHIC ANALYSIS

Our geomorphic analysis included a review of surficial mapping by Atwater (1982), a previous study by William Lettis Associates (WLA, 2007), 1915 USGS topographic map for the Lathrop quadrangle and aerial photography flown between 1979 and 2003.

Within the study area and to the north, the San Joaquin River splits into several distributary channels as it enters the Sacramento – San Joaquin Delta. Prior to levee construction in the late 1800s, the distributary channels flowed into and through tidal marshes. According to Atwater (1982) and WLA (2003), the modern San Joaquin River system flows along the western edge of older alluvial fan deposits. The modern river channels and floodplains are underlain by Holocene alluvium consisting of stream channel deposits (sands and silts) and overbank deposits (sands, silts and clays). The distribution of Holocene alluvium and the morphology of the river channels have been influenced over the last several thousand years by rising sea levels and tidal effects from the adjacent Delta.

On the 1915 topographic map, the locations of the main channel of the San Joaquin River and the reaches in which this study is conducted appear to be essentially the same as the modern condition, although the original levees were widened and raised in the 1960s. Review of aerial photographs flown between 1979 and 2003 shows that the channel morphology and levee conditions have remained relatively stable over the last three decades. Modifications to the levee system during that time have included local maintenance of riprap levee toe protection, repairs of local areas of sloughing, and construction of seepage berms on the landside of the RD17 levees at several locations.

5.0 HYDRAULIC ANALYSIS

The purpose of the hydraulic analysis is to estimate the magnitude of peak discharges and velocities at the proposed levee setback locations and document changes that would occur to the river hydraulics upstream and downstream if the levee setback alternatives were constructed. To conduct the analysis effectively, we used the Hydrologic Engineering Center – River Analysis System (HEC-RAS) program developed by the Army Corps of Engineers (USACE).

5.1 BASIS OF MODEL

In order to use the computer models in our study, we acquired existing cross-sectional data for the subject portion of the San Joaquin River. Data was available from a previous UNET (One-Dimensional Unsteady Flow Through a Full Network of Open Channels) model of the river published by The United States Army Corps of Engineers in their 1992 Comprehensive Study of the San Joaquin River. It should be noted that the very conservative assumption used in this model is that levees along the San Joaquin River would overtop without failing in cases where levee crest elevations were not sufficient to contain the 100- or 200-year water surface elevations. The hydrographs in the model are based on synthetic hydrologic analysis using a storm centering at the Vernalis station. Our opinion is that the model is very conservative in terms of both hydraulic and hydrologic assumptions and is appropriate for this impact assessment because impacts created by the setback levees would generally be more pronounced by using conservative hydrology and hydraulic assumptions.

From this data, we extracted cross-section survey information in the area of our study, as well as computed 100-year and 200-year hydrographs for locations upstream and downstream of the proposed setbacks. The geometry information used in the models continues approximately 3 miles downstream of the furthest downstream setback levee, and approximately 1½ miles upstream of the nearest setback levee analyzed. The cross sections used in this HEC-RAS study are shown on Figure 1.

5.2 HEC-RAS DESIGN MODELS

We used the HEC-RAS program to run an unsteady one-dimensional model of the study location. Our fluvial hydraulic analysis of the drainage course was performed using the HEC-RAS Version 4.1 computer program published by the USACE. HEC-RAS performs one-dimensional hydraulic analyses for natural channels and is intended for calculating water surface profiles and velocities in steady, gradually varied flow conditions. In order to document changes in floodplain storage and subsequent potential downstream impacts if proposed set-back levee configurations were constructed within the meandering river geometry of the study reach, an unsteady HEC-RAS model was selected to model potential impacts. The HEC-RAS unsteady flow analysis is based on the solution of the momentum and continuity equations, as well as St. Venant's equations. Energy losses consist of friction losses based on Manning's equation, as well as expansion and contraction losses, where applicable. HEC-RAS is limited, though, in computing flow in more than one spatial direction, as it is a one-dimensional model.

The input parameters for our HEC-RAS model were taken from the USACE UNET 1992 Comprehensive Study model. For existing conditions, we inputted the river cross sections and Manning values. The Manning's 'n' values we selected were 0.055 for the overbanks and 0.048 for the channel. The overbank value is the same as what was used in the USACE 1992 Comprehensive study, and the original channel value was 0.058 in the Comprehensive Study. The channel value is as large as could be set without overtopping of the levees for a 200-year recurrence interval event. We inputted the 19-day, 100-year and 200-year hydrographs at the upstream boundary of the river cross sections from the 1992 USACE Comprehensive Study. A normal depth boundary condition was set at the station furthest downstream normal depth and slope of 0.0005 ft/ft.

HEC-RAS cross sections are shown on Figure 1. The reaches have been labeled according to the numerical designations provided in the UNET cross-section data information. The river stations are denoted with ".30" in the HEC-RAS model to clearly identify the stations as being for Reach 30. For example, Station 74 is identified as Station 74.30 in the HEC-RAS model.

For levee set-back scenarios identified as Alternative 1 (Reach IV-c) and Alternative 2 (Reaches II-a and II-b) it was necessary to modify a selected number of cross-sections to capture the new levee configuration. Modifications included moving the existing levee adjacent to the shore of the river out across the floodplain in accordance with the proposed scenarios. Every effort was made to keep cross-section geometry perpendicular to the path of flow. As with the existing conditions model, we inputted the 100-year and 200-year hydrographs provided by the USACE.

Lastly, we are providing a regional analysis of the effect of the levee setbacks on the flow bifurcation at the Old River distributary upstream of the proposed setback levees. The input parameters for our HEC-RAS model were taken from the USACE UNET 1992 Comprehensive Study model, without reducing the Manning's 'n' values. Because of limitations in the HEC-RAS 4.1 version, the splitting of flows at the distributary do not match the published flow rates in the USACE Comprehensive Study for both the Old River and San Joaquin River systems downstream of the split. The results of this analysis should therefore be used only as an indicator of potential impacts caused by the proposed levee setbacks, and not for design level considerations.

6.0 QUANTITATIVE RESULTS

Tables 1 and 2 below contain both the measured flow data and the calculated flow data, respectively. Table 3 shows the calculated maximum water surface elevations for furthest downstream river station. Tables 4 and 5 show the calculated flow data and maximum water surface elevations for the regional analysis that includes the bifurcation at the Old River distributary upstream of the proposed setback levees.

It should be noted that the results being presented herein are from an uncalibrated model and should be used for comparison purposes only.

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TABLE 1

Calculated Peak Flow Rates (100- and 200-year recurrence interval hydrograph) for the San Joaquin River, Reach 30, Station 74.

SOURCE	REACH	CALCULATED 100-YEAR PEAK FLOW RATES (cfs)	CALCULATED 200-YEAR PEAK FLOW RATES (cfs)
United States Army Corps of Engineers 1992 Comprehensive Study	San Joaquin River immediately downstream of Old River bifurcation	12,051	17,479

TABLE 2
Modeled Peak Flow Rates at River Reach 30, Station 30 – San Joaquin River Only Study (approximate location of Weston Ranch)

MODELED PEAK FLOWS (cfs)				
Flow Rate	**Existing Condition**	**Alternative 1 (Reach IV-c)**	**Alternative 2 (Reaches II-a and II-b)**	**Alternatives 1 and 2**
Reach 30 – 100-Year Recurrence Interval	12,035	12,032	12,031	12,029
Reach 30 – 200-Year Recurrence Interval	17,403	17,403	17,399	17,392

TABLE 3
Modeled Water Surface Elevations for San Joaquin River, Reach 30, Station 30 – San Joaquin River Only Study (approximate location of Weston Ranch)

MODELED WATER SURFACE ELEVATIONS (FT - NGVD 29)				
Flow Rate	**Existing Condition**	**Alternative 1 (Reach IV-c)**	**Alternative 2 (Reaches II-a and II-b)**	**Alternatives 1 and 2**
Reach 30 – 100-Year Recurrence Interval	5.51	5.50	5.50	5.50
Reach 30 – 200-Year Recurrence Interval	9.34	9.34	9.34	9.33

TABLE 4
Modeled Peak Flow Rates for San Joaquin River, Reach 30, Station 30 – Regional Study including the Old River bifurcation (approximate location of Weston Ranch)

MODELED PEAK FLOWS WITH BIFURCATION (cfs)				
Flow Rate	**Existing Condition**	**Alternative 1 (Reach IV-c)**	**Alternative 2 (Reaches II-a and II-b)**	**Alternatives 1 and 2**
Reach 30 – 100-Year Recurrence Interval	9,962	10,066	10,047	10,156
Reach 30 – 200-Year Recurrence Interval	13,179	13,329	13,297	13,791

TABLE 5
Modeled Water Surface Elevations for San Joaquin River, Reach 30, Station 30 – Regional Study including the Old River bifurcation (approximate location of Weston Ranch)

MODELED WATER SURFACE ELEVATIONS WITH BIFURCATION (FT - NGVD 29)				
Flow Rate	**Existing Condition**	**Alternative 1 (Reach IV-c)**	**Alternative 2 (Reaches II-a and II-b)**	**Alternatives 1 and 2**
Reach 30 – 100-Year Recurrence Interval	5.51	5.60	5.59	5.69
Reach 30 – 200-year Recurrence Interval	8.34	8.47	8.44	8.57

Appendix C contains the HEC-RAS output files and graphical output that depicts changes in water surface elevation and flow for the Regional Study along the reach of the San Joaquin River where the setback levees are proposed. Note that the stationing labels in the HEC-RAS output files have .30 attached to the station number to identify the station as being from Reach 30.

7.0 CONCLUSION

Based on the results of our hydraulic modeling, we conclude the following:

1. The hydraulic results for the levee setback alternatives appear to demonstrate that the studied levee setbacks have negligible effect on the maximum flows and water surface elevations calculated in our study at their respective proposed locations.

2. In general, the main benefit of a levee setback is a localized reduction of water surface elevations at the levee setback location. However, the setbacks studied herein would not significantly alter water elevations in order to create this benefit.

3. Results indicate from the regional study that adding the levee setback may slightly increase peak flow rates in the San Joaquin River downstream of the project area, which in turn may slightly increase water surface elevations downstream of the junction with the Old River distributary due to the addition of floodplain storage.

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We also suggest that further hydraulic modeling be performed if the configuration of any of the setback levees is altered to confirm that any new geometry would not result in adverse downstream impacts to the hydraulics of the San Joaquin River. Once a final alignment is selected, additional modeling should be performed to verify floodplain roughness based on restoration activities and to analyze expansion and contraction scour issues at the beginning and end of any proposed floodplain.

FIGURES

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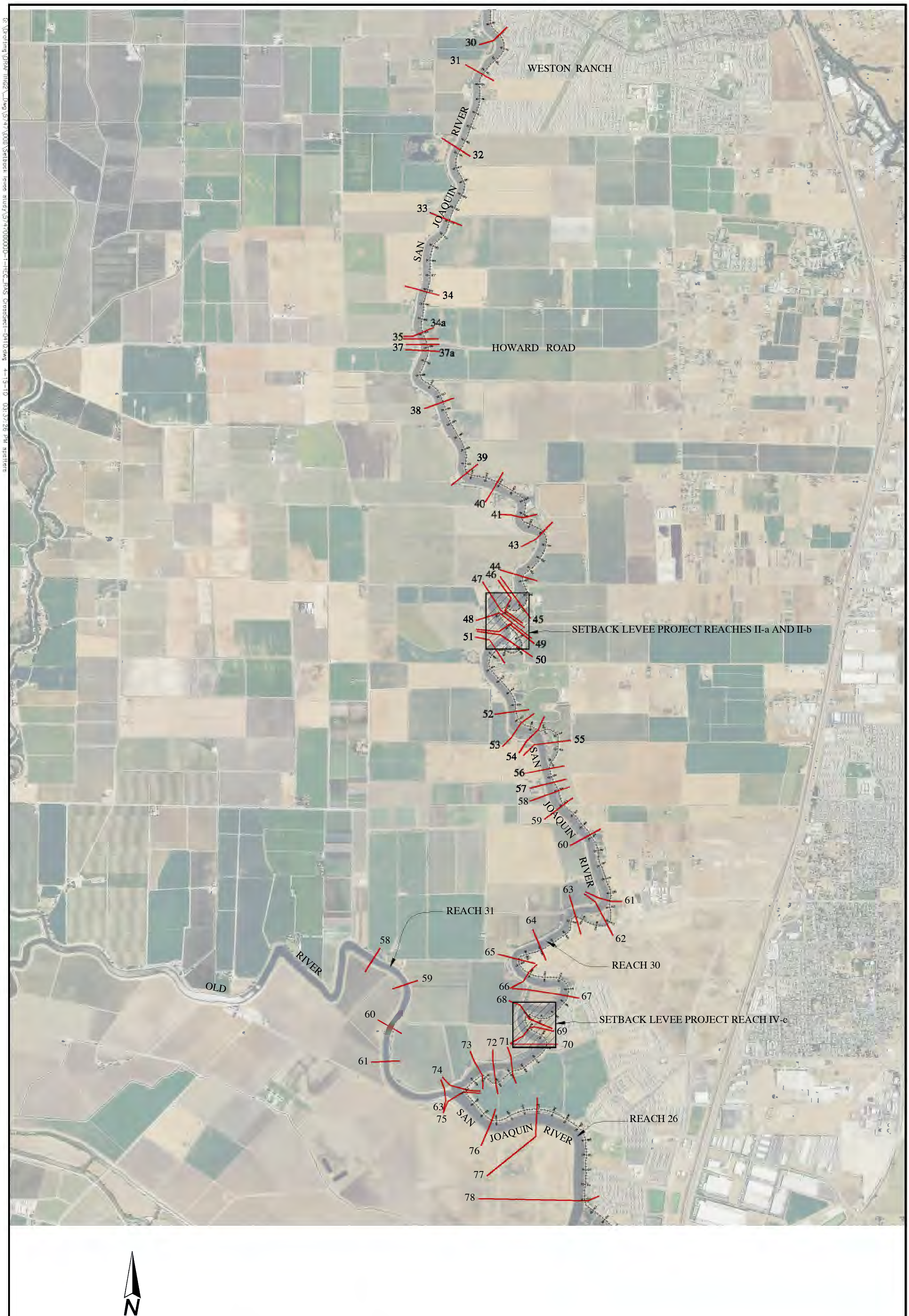

BASE MAP SOURCE: USDA NAIP, 2009

ENGEO Expect Excellence	APPROXIMATE LOCATIONS OF HEC RAS CROSS SECTIONS SAN JOAQUIN LEVEE SETBACK STUDY LATHROP, CALIFORNIA	PROJECT NO.: 5747.000.000 DATE: APRIL 2010 DRAWN BY: PC CHECKED BY: JT	FIGURE NO 1

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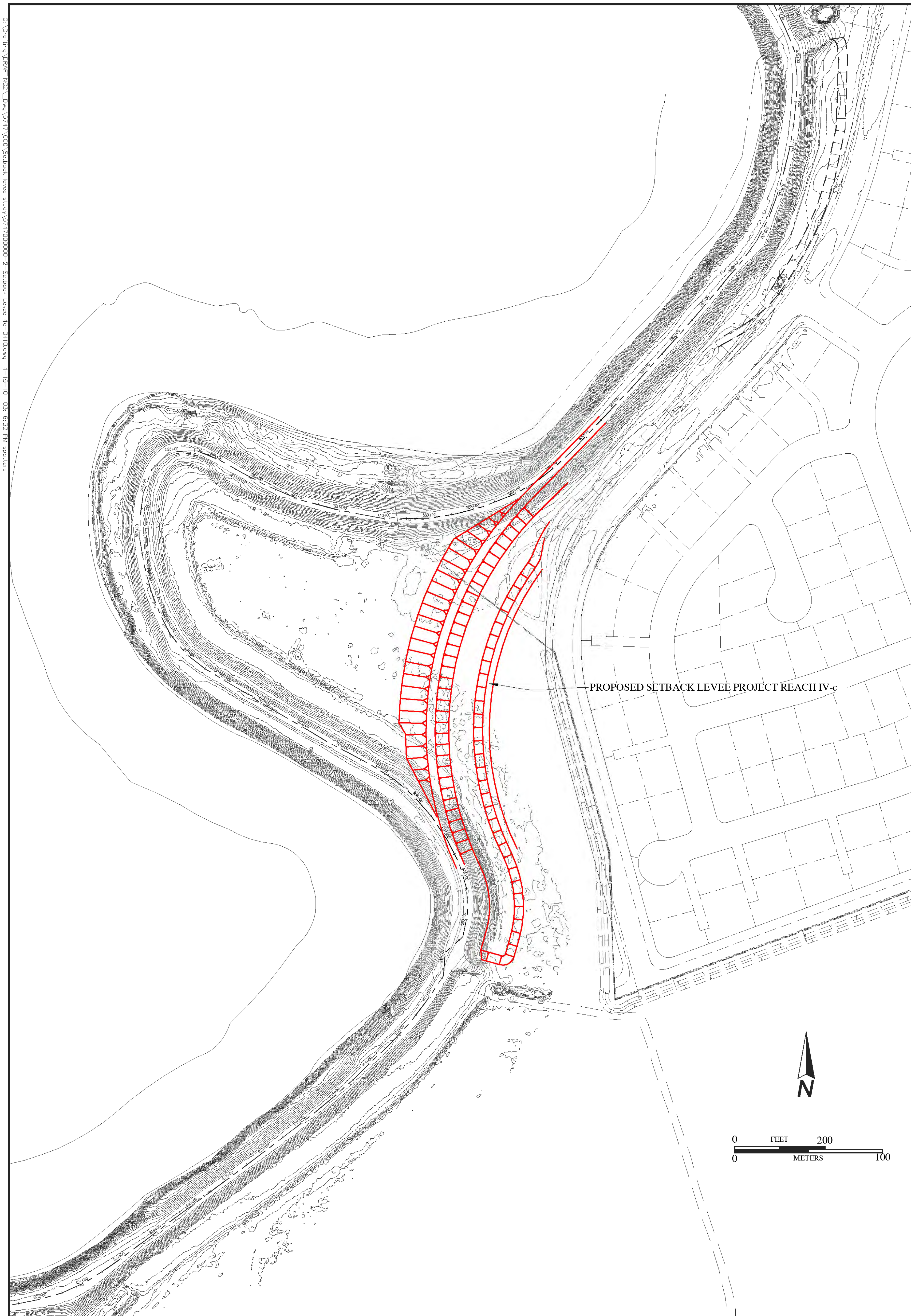

BASE MAP SOURCE: MACKAY AND SOMPS

ENGEO Expect Excellence	SETBACK LEVEE PROJECT REACH IV-c SAN JOAQUIN LEVEE SETBACK STUDY LAPTHOP, CALIFORNIA	PROJECT NO.: 5747.000.000 DATE: APRIL 2010 DRAWN BY: PC CHECKED BY: JT	FIGURE NO 2

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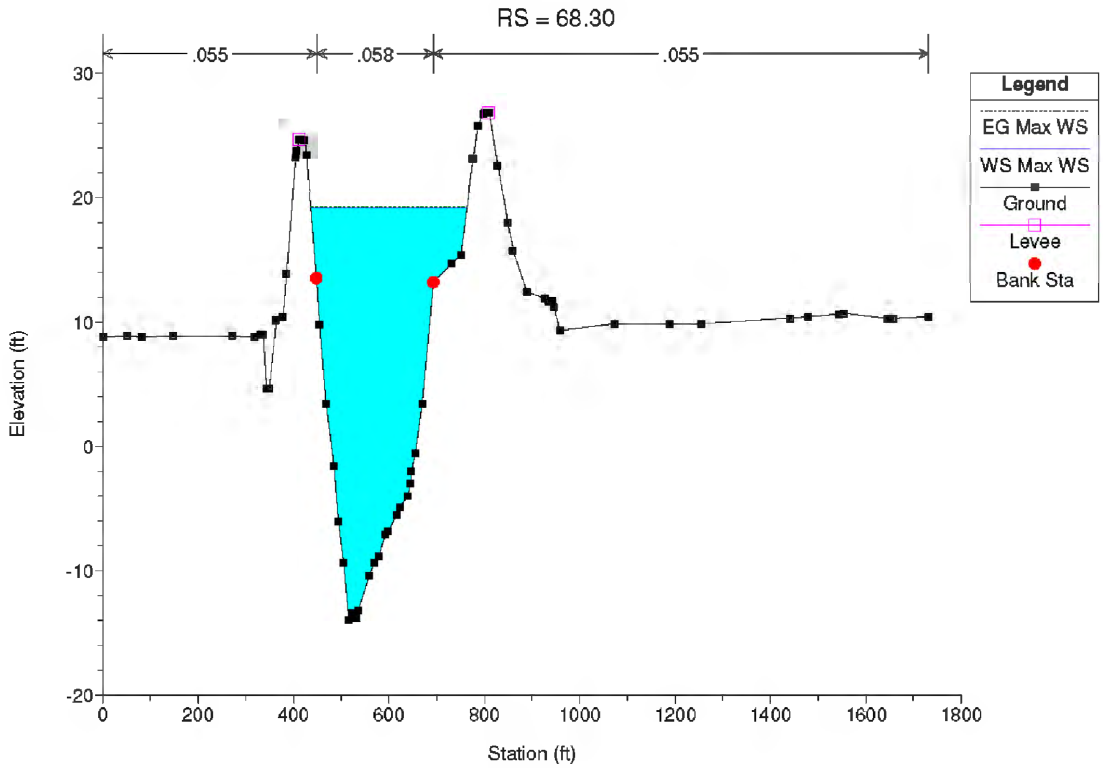

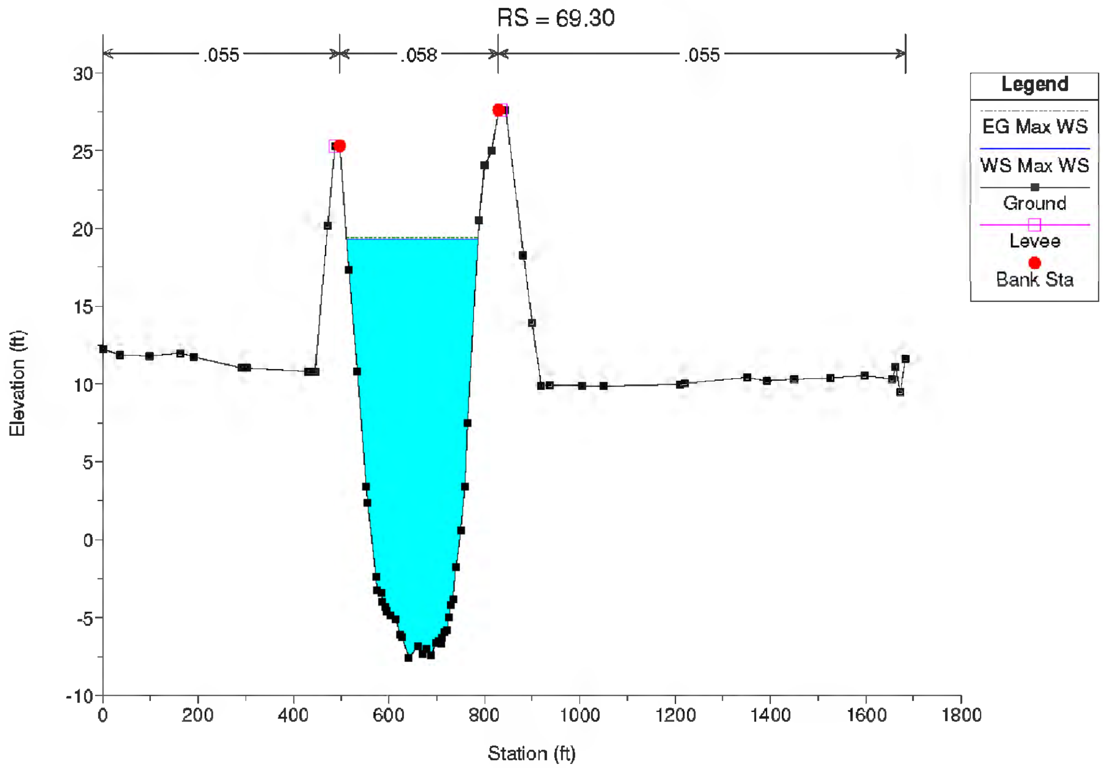

NO SCALE

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HEC-RAS EXISTING CROSS SECTIONS
SETBACK LEVEE PROJECT REACH IV-c
SAN JOAQUIN LEVEE SETBACK STUDY
LAPTHOP, CALIFORNIA

PROJECT NO.: 5747.000.000	FIGURE NO.
DATE: APRIL 2010	2A
DRAWN BY: SRP	CHECKED BY: JB

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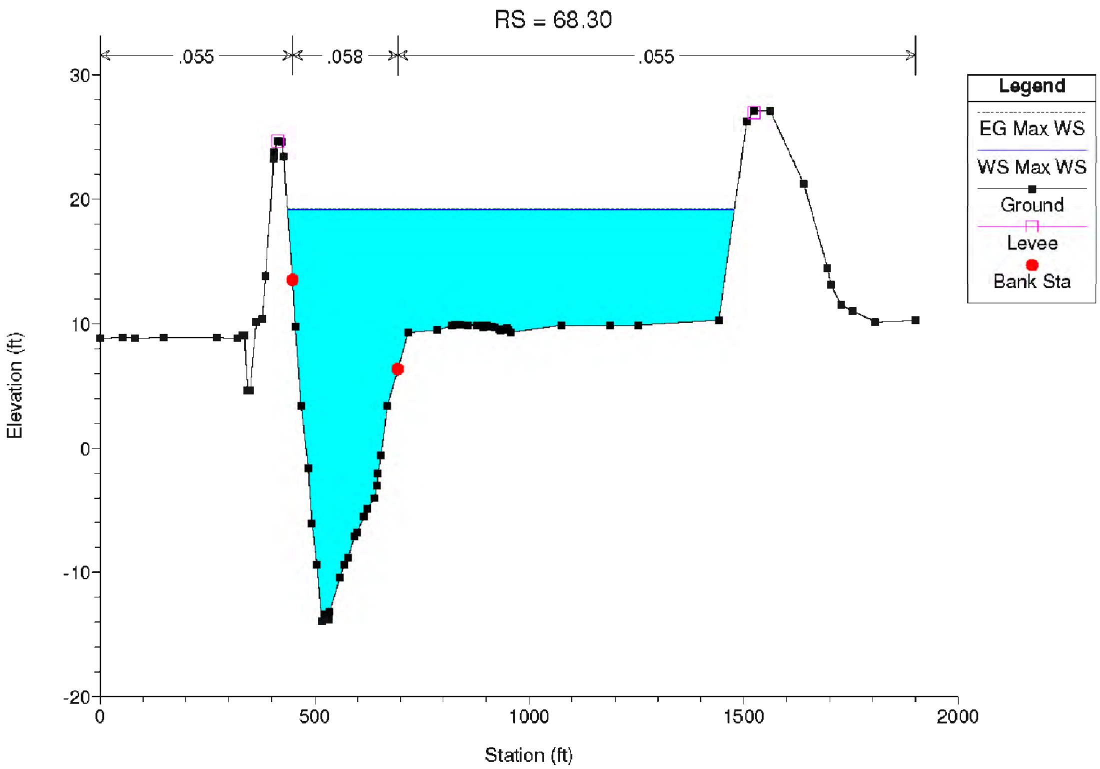

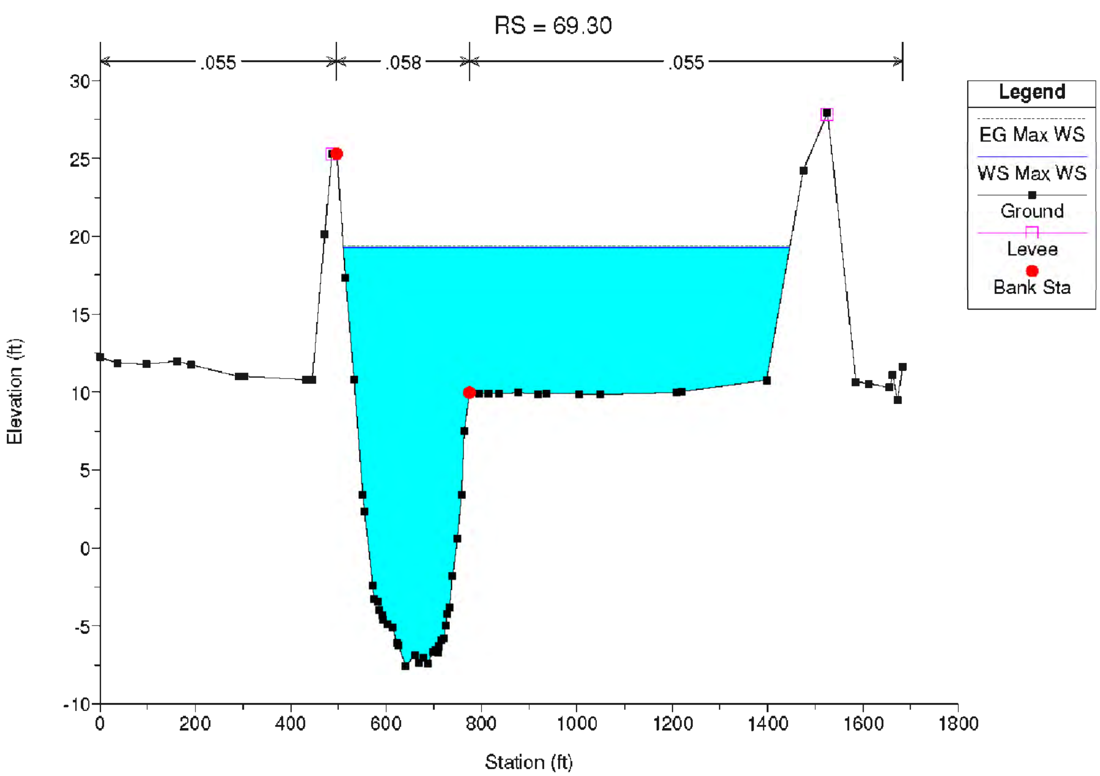

NO SCALE

ENGEO Expect Excellence

HEC-RAS PROPOSED SETBACK CROSS SECTIONS
SETBACK LEVEE PROJECT REACH IV-c
SAN JOAQUIN LEVEE SETBACK STUDY
LAPTHOP, CALIFORNIA

PROJECT NO.: 5747.000.000	FIGURE NO. 2B
DATE: APRIL 2010	
DRAWN BY: SRP	CHECKED BY: JB

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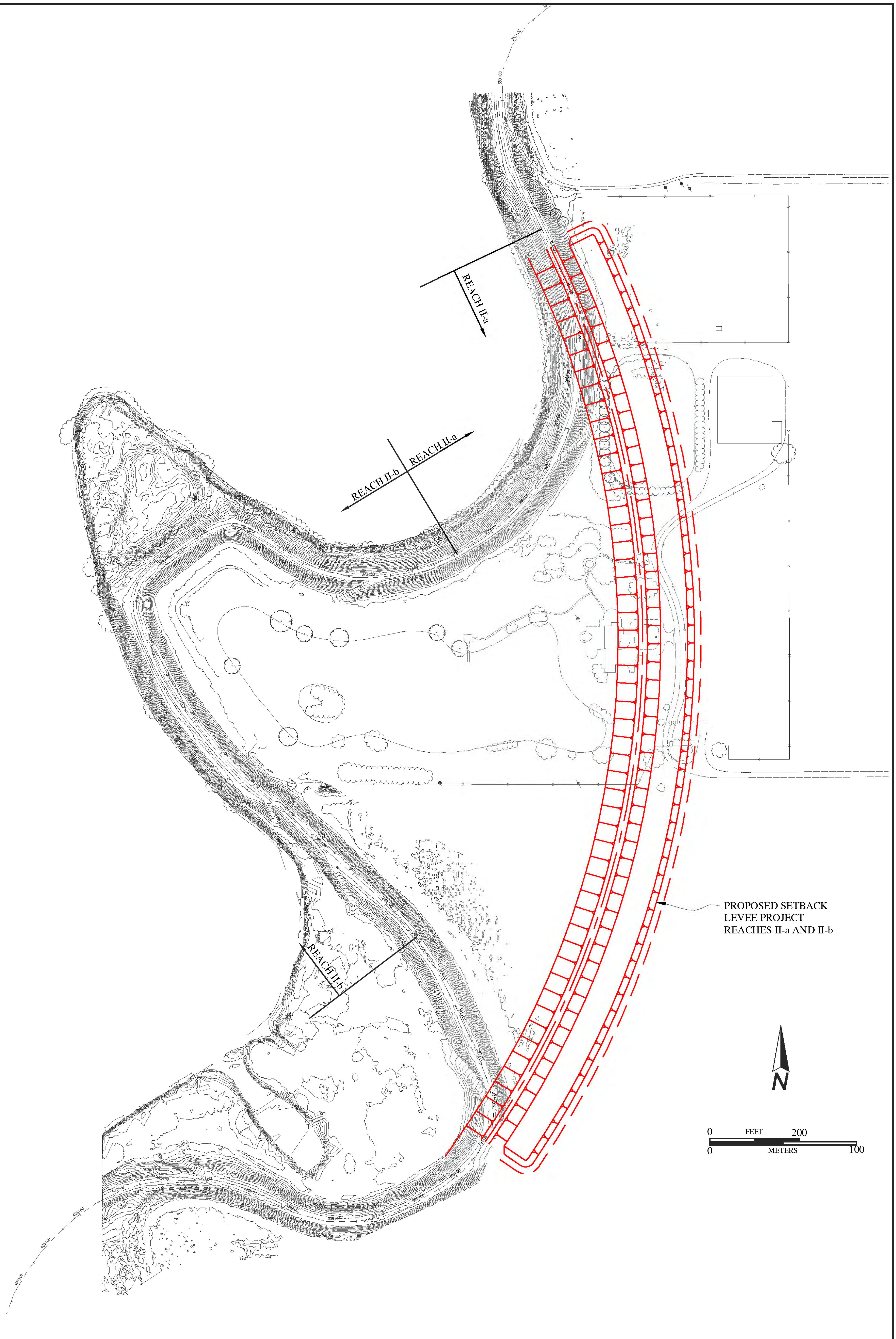
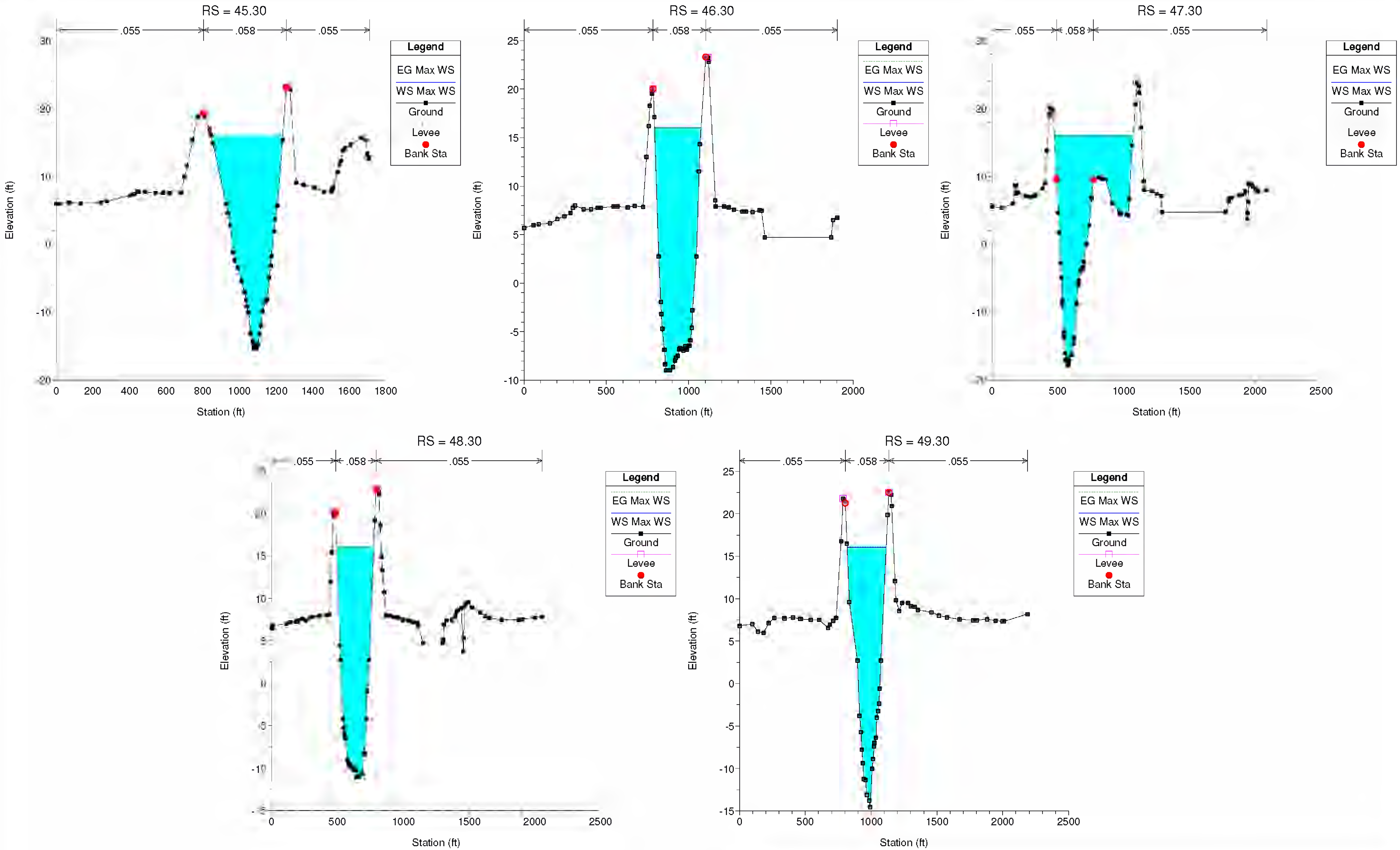


BASE MAP SOURCE: MACKAY AND SOMPS

ENGEO Expect Excellence	SETBACK LEVEE PROJECT REACHES II-a AND II-b SAN JOAQUIN LEVEE SETBACK STUDY LAPTHOP, CALIFORNIA	PROJECT NO.: 5747.000.000 DATE: APRIL 2010 DRAWN BY: PC CHECKED BY: JT	FIGURE NO 3

ORIGINAL FIGURE PRINTED IN COLOR



NO SCALE

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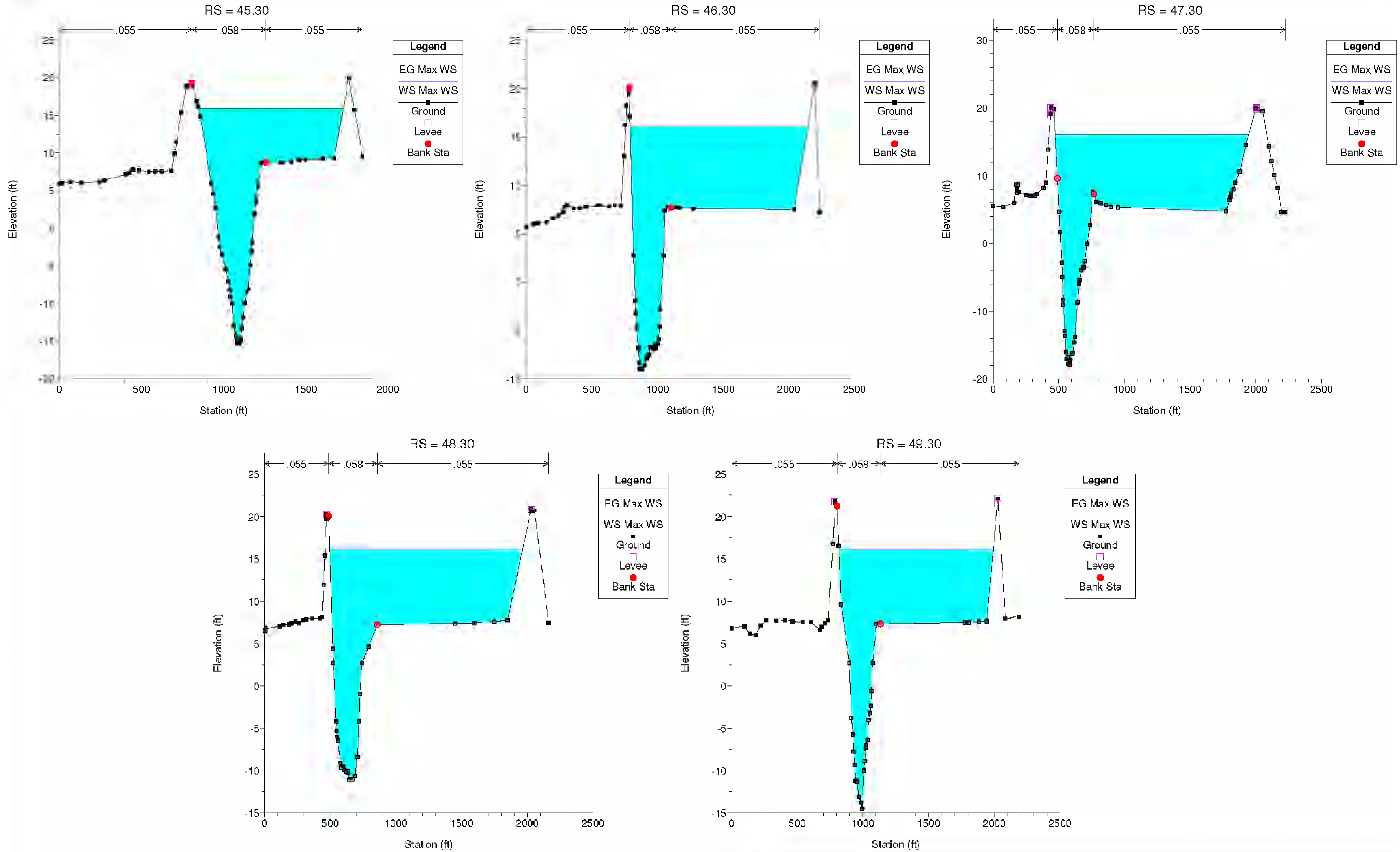
HEC-RAS EXISTING CROSS SECTIONS
SETBACK LEVEE PROJECT REACHES II-a AND II-b
SAN JOAQUIN LEVEE SETBACK STUDY
LAPTHOP, CALIFORNIA

PROJECT NO.: 5747.000.000	
DATE: APRIL 2010	
DRAWN BY: SRP	CHECKED BY: JB

FIGURE NO. 3A



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ENGEO Expect Excellence	HEC-RAS PROPOSED SETBACK CROSS SECTIONS SETBACK LEVEE PROJECT REACHES II-a AND II-b SAN JOAQUIN LEVEE SETBACK STUDY LAPTHOP, CALIFORNIA	PROJECT NO.: 5747.000.000 DATE: APRIL 2010 DRAWN BY: SRP CHECKED BY: JB	FIGURE NO. 3B

APPENDIX A

HEC-RAS OUTPUT

Existing Geometry 100-Year Hydrograph
Existing Geometry 200-Year Hydrograph
Alternative 1 Geometry 100-Year Hydrograph
Alternative 1 Geometry 200-Year Hydrograph
Alternative 2 Geometry 100-Year Hydrograph
Alternative 2 Geometry 200-Year Hydrograph
Alternatives 1 & 2 Geometry 100-Year Hydrograph
Alternatives 1 & 2 Geometry 200-Year Hydrograph

APPENDIX A

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                    HEC-RAS Version 4.1.0 Jan 2010
                     U.S. Army Corps of Engineers
                    Hydrologic Engineering Center
                          609 Second Street
                          Davis, California

     X     X  XXXXXX    XXXX        XXXX       XX      XXXX
     X     X  X        X    X       X   X     X  X    X
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Project File : SJReach30.prj
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Project in English units



PLAN DATA

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           Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.g01

           Flow Title    :
           Flow File     :

Plan Description:
Existing Levee Geometry with 100 Year Hydrograph


Plan Summary Information:
Number of:  Cross Sections =   48    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
30	74.30	Max WS	12047.00	-25.70	16.56		16.59	0.000043	1.48	8124.40	400.34	0.06
30	73.30	Max WS	12041.00	-3.00	16.43		16.50	0.000153	2.17	5557.21	405.57	0.10
30	72.30	Max WS	12040.99	-8.13	16.38		16.44	0.000118	2.10	7043.86	655.73	0.09
30	71.30	Max WS	12040.98	-5.30	16.27		16.36	0.000139	2.41	5165.08	417.57	0.10
30	70.30	Max WS	12040.94	-15.81	16.17		16.23	0.000079	1.90	6786.41	484.75	0.08
30	69.30	Max WS	12040.91	-7.58	16.04		16.15	0.000162	2.61	4607.94	260.92	0.11
30	68.30	Max WS	12040.88	-13.93	15.93		16.03	0.000122	2.46	4984.27	308.76	0.10
30	67.30	Max WS	12040.69	-10.24	15.84		15.87	0.000078	1.80	9800.01	1325.16	0.08
30	66.30	Max WS	12040.49	-12.13	15.56		15.69	0.000189	2.92	4117.42	216.77	0.12
30	65.30	Max WS	12040.44	-15.39	15.42		15.54	0.000188	2.82	4267.46	238.84	0.12
30	64.30	Max WS	12040.37	-6.27	15.26		15.37	0.000166	2.57	4691.88	278.90	0.11
30	63.30	Max WS	12040.24	-16.14	14.96		15.08	0.000171	2.77	4346.46	230.97	0.11
30	62.30	Max WS	12040.09	-8.52	14.91		14.97	0.000092	2.00	7492.27	773.95	0.08
30	61.30	Max WS	12040.03	-9.67	14.82		14.92	0.000170	2.61	4687.23	335.79	0.11
30	60.30	Max WS	12039.78	-12.20	14.44		14.55	0.000172	2.64	4552.80	266.19	0.11
30	59.30	Max WS	12039.62	-6.87	14.22		14.32	0.000166	2.55	4730.01	285.90	0.11
30	58.30	Max WS	12039.54	-9.16	14.14		14.23	0.000169	2.34	5149.46	362.40	0.11
30	57.30	Max WS	12039.49	-9.58	14.07		14.17	0.000169	2.55	4713.04	286.79	0.11
30	56.30	Max WS	12039.42	-8.87	13.99		14.09	0.000163	2.59	4645.00	267.78	0.11
30	55.30	Max WS	12039.20	-8.00	13.91		13.97	0.000108	2.15	6818.01	723.68	0.09
30	54.30	Max WS	12039.07	-16.48	13.82		13.92	0.000155	2.51	5150.53	450.28	0.11
30	53.30	Max WS	12038.93	-6.77	13.74		13.83	0.000146	2.43	5673.11	483.47	0.10
30	52.30	Max WS	12038.80	-13.58	13.61		13.72	0.000183	2.74	4391.12	252.99	0.12
30	51.30	Max WS	12038.40	-14.52	13.07		13.21	0.000208	3.00	4138.93	280.40	0.12
30	50.30	Max WS	12035.87	-14.20	13.06		13.13	0.000116	2.19	6715.32	711.06	0.09
30	49.30	Max WS	12035.87	-14.57	12.93		13.06	0.000231	2.84	4240.13	278.96	0.13
30	48.30	Max WS	12035.86	-11.09	12.85		12.95	0.000155	2.56	4696.60	265.26	0.11
30	47.30	Max WS	12035.86	-17.87	12.82		12.88	0.000092	2.06	6858.59	578.56	0.08
30	46.30	Max WS	12035.85	-9.00	12.67		12.79	0.000185	2.70	4457.28	266.49	0.12
30	45.30	Max WS	12035.85	-15.34	12.65		12.73	0.000136	2.21	5456.14	354.85	0.10
30	44.30	Max WS	12035.83	-13.45	12.47		12.58	0.000178	2.62	4588.45	280.20	0.11
30	43.30	Max WS	12035.80	-15.10	12.12		12.25	0.000216	2.89	4166.32	252.76	0.13
30	41.30	Max WS	12035.78	-13.85	11.84		12.00	0.000253	3.22	3740.86	214.31	0.14
30	40.30	Max WS	12035.74	-9.71	11.53		11.65	0.000222	2.81	4284.19	278.43	0.13
30	39.30	Max WS	12035.70	-18.13	11.23		11.38	0.000246	3.19	3776.11	214.66	0.13
30	38.30	Max WS	12035.61	-10.67	10.63		10.76	0.000224	2.94	4096.02	248.04	0.13
30	37.301	Max WS	12035.52	-14.26	10.07		10.23	0.000265	3.21	3748.32	225.23	0.14
30	37.30	Max WS	12035.51	-16.74	10.03		10.18	0.000251	3.13	3845.31	228.16	0.13
30	36.302	Max WS	12035.50	-17.10	10.00		10.15	0.000378	3.18	3784.12	229.05	0.14
30	36.301	Max WS	12035.50	-17.10	9.99		10.15	0.000378	3.18	3782.75	229.02	0.14
30	36.30	Max WS	12035.50	-17.10	9.98		10.14	0.000378	3.18	3781.04	228.98	0.14
30	35.30	Max WS	12035.50	-17.58	9.97		10.12	0.000239	3.05	3941.11	235.91	0.13
30	34.301	Max WS	12035.49	-15.03	9.92		10.07	0.000250	3.15	3821.09	224.98	0.13
30	34.30	Max WS	12035.42	-13.40	9.48		9.66	0.000311	3.37	3573.78	226.18	0.15
30	33.30	Max WS	12035.29	-14.57	8.57		8.78	0.000355	3.65	3298.43	202.30	0.16
30	32.30	Max WS	12035.17	-16.60	7.43		7.68	0.000481	4.03	2983.53	197.17	0.18
30	31.30	Max WS	12035.03	-20.45	6.22		6.46	0.000425	3.93	3063.38	189.75	0.17
30	30.30	Max WS	12034.95	-17.40	5.51	-5.90	5.75	0.000501	3.94	3054.59	218.05	0.19

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                    HEC-RAS Version 4.1.0 Jan 2010
                     U.S. Army Corps of Engineers
                    Hydrologic Engineering Center
                          609 Second Street
                          Davis, California

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PROJECT DATA
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Project File : SJReach30.prj
Run Date and Time: 4/14/2010 2:01:00 PM

Project in English units

PLAN DATA

Plan Title: Existing
Plan File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.p01

Geometry Title: Existing
Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.g01

Flow Title   :
Flow File   :

Plan Description:
Existing Levee Geometry with 200 Year Hydrograph

Plan Summary Information:

Number of:	Cross Sections =	48	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculation tolerance = 0.01
    Maximum number of iterations   = 20
    Maximum difference tolerance   = 0.3
    Flow tolerance factor   = 0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
30	74.30	Max WS	17456.00	-25.70	20.88		20.93	0.000051	1.76	9912.35	427.56	0.06
30	73.30	Max WS	17455.57	-3.00	20.75		20.83	0.000144	2.34	7463.91	463.20	0.10
30	72.30	Max WS	17455.28	-8.13	20.72		20.78	0.000090	2.15	9947.12	681.93	0.08
30	71.30	Max WS	17454.63	-5.30	20.62		20.72	0.000129	2.69	7037.83	445.51	0.10
30	70.30	Max WS	17452.38	-15.81	20.54		20.61	0.000085	2.09	9153.16	573.58	0.08
30	69.30	Max WS	17437.22	-7.58	20.38		20.52	0.000176	3.02	5780.60	279.70	0.12
30	68.30	Max WS	17437.21	-13.93	20.26		20.39	0.000128	2.87	6372.69	332.45	0.10
30	67.30	Max WS	17437.08	-10.24	20.21		20.24	0.000047	1.62	15662.03	1353.89	0.06
30	66.30	Max WS	17436.93	-12.13	19.91		20.09	0.000216	3.42	5094.96	233.11	0.13
30	65.30	Max WS	17436.88	-15.39	19.75		19.92	0.000209	3.26	5347.24	259.46	0.13
30	64.30	Max WS	17436.56	-6.27	19.61		19.75	0.000175	2.93	5953.74	301.25	0.12
30	63.30	Max WS	17435.99	-16.14	19.25		19.41	0.000210	3.22	5417.71	269.32	0.13
30	62.30	Max WS	17435.54	-8.52	19.24		19.29	0.000071	2.04	10945.72	820.51	0.08
30	61.30	Max WS	17435.33	-9.67	19.12		19.25	0.000160	2.95	6195.12	364.77	0.11
30	60.30	Max WS	17433.95	-12.20	18.78		18.92	0.000184	3.03	5754.17	287.79	0.12
30	59.30	Max WS	17433.11	-6.87	18.54		18.67	0.000173	2.90	6011.79	307.49	0.12
30	58.30	Max WS	17432.97	-9.16	18.48		18.58	0.000158	2.57	6782.68	391.35	0.11
30	57.30	Max WS	17432.89	-9.58	18.39		18.52	0.000177	2.90	6004.87	310.92	0.12
30	56.30	Max WS	17432.78	-8.87	18.30		18.44	0.000175	2.99	5836.12	284.52	0.12
30	55.30	Max WS	17432.43	-8.00	18.26		18.32	0.000084	2.19	10049.89	761.62	0.08
30	54.30	Max WS	17432.22	-16.48	18.17		18.28	0.000136	2.73	7167.24	477.52	0.10
30	53.30	Max WS	17431.99	-6.77	18.11		18.20	0.000122	2.60	7863.65	520.22	0.10
30	52.30	Max WS	17431.79	-13.58	17.94		18.10	0.000197	3.15	5530.83	272.38	0.12
30	51.30	Max WS	17421.96	-14.52	17.40		17.57	0.000204	3.43	5401.16	303.12	0.13
30	50.30	Max WS	17421.91	-14.20	17.43		17.49	0.000088	2.22	9864.48	731.58	0.08
30	49.30	Max WS	17421.87	-14.57	17.28		17.43	0.000228	3.17	5503.48	303.34	0.13
30	48.30	Max WS	17421.83	-11.09	17.18		17.32	0.000168	2.96	5888.12	284.54	0.11
30	47.30	Max WS	17421.77	-17.87	17.18		17.24	0.000080	2.21	9437.18	605.26	0.08
30	46.30	Max WS	17421.69	-9.00	17.01		17.16	0.000196	3.08	5656.29	288.42	0.12
30	45.30	Max WS	17421.65	-15.34	17.00		17.10	0.000141	2.45	7104.30	405.67	0.10
30	44.30	Max WS	17421.54	-13.45	16.80		16.93	0.000188	2.97	5863.15	308.64	0.12
30	43.30	Max WS	17404.92	-15.10	16.45		16.61	0.000227	3.28	5313.22	276.63	0.13
30	41.30	Max WS	17406.91	-13.85	16.13		16.34	0.000280	3.70	4705.10	235.34	0.15
30	40.30	Max WS	17403.53	-9.71	15.82		15.97	0.000220	3.15	5521.23	298.29	0.13
30	39.30	Max WS	17403.52	-18.13	15.48		15.69	0.000273	3.68	4728.97	233.20	0.14
30	38.30	Max WS	17403.47	-10.67	14.84		15.02	0.000236	3.36	5177.21	264.98	0.13
30	37.301	Max WS	17403.41	-14.26	14.24		14.45	0.000287	3.69	4720.81	242.87	0.15
30	37.30	Max WS	17403.40	-16.74	14.20		14.40	0.000271	3.61	4826.49	244.25	0.14
30	36.302	Max WS	17403.40	-17.10	14.16		14.37	0.000422	3.64	4777.70	248.13	0.15
30	36.301	Max WS	17403.40	-17.10	14.16		14.36	0.000423	3.64	4776.03	248.10	0.15
30	36.30	Max WS	17403.40	-17.10	14.15		14.35	0.000423	3.65	4773.96	248.06	0.15
30	35.30	Max WS	17403.39	-17.58	14.13		14.33	0.000260	3.50	4965.79	256.35	0.14
30	34.301	Max WS	17403.39	-15.03	14.07		14.27	0.000274	3.63	4793.02	242.95	0.14
30	34.30	Max WS	17403.33	-13.40	13.60		13.83	0.000328	3.83	4548.44	246.58	0.16
30	33.30	Max WS	17403.21	-14.57	12.61		12.89	0.000387	4.19	4149.83	219.51	0.17
30	32.30	Max WS	17403.08	-16.60	11.39		11.71	0.000505	4.58	3797.90	214.00	0.19
30	31.30	Max WS	17402.94	-20.45	10.08		10.40	0.000472	4.55	3823.66	204.54	0.19
30	30.30	Max WS	17402.85	-17.40	9.34	-4.19	9.65	0.000500	4.44	3917.81	232.05	0.19

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                    U.S. Army Corps of Engineers
                   Hydrologic Engineering Center
                         609 Second Street
                         Davis, California

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PROJECT DATA
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Project File : SJReach30.prj
Run Date and Time: 4/14/2010 1:36:46 PM

Project in English units

PLAN DATA

Plan Title: Alternative 1
Plan File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.p03

Geometry Title: Alternative 1
Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.g02

Flow Title   :
Flow File   :

Plan Description:
Alternative 1 Geometry with 100 year Hydrograph

```
Plan Summary Information:
Number of:  Cross Sections =   48    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
30	74.30	Max WS	12041.00	-25.70	16.43		16.46	0.000044	1.49	8071.58	399.51	0.06
30	73.30	Max WS	12040.93	-3.00	16.29		16.37	0.000156	2.19	5502.82	402.71	0.10
30	72.30	Max WS	12040.87	-8.13	16.24		16.30	0.000123	2.12	6954.58	654.91	0.09
30	71.30	Max WS	12040.79	-5.30	16.13		16.22	0.000143	2.43	5107.09	416.42	0.10
30	70.30	Max WS	12040.62	-15.81	16.03		16.09	0.000080	1.92	6718.20	476.70	0.08
30	69.30	Max WS	12040.48	-7.58	15.99		16.03	0.000087	1.95	8389.68	908.36	0.08
30	68.30	Max WS	12040.21	-13.93	15.93		15.97	0.000061	1.76	9682.01	1021.55	0.07
30	67.30	Max WS	12039.62	-10.24	15.83		15.87	0.000078	1.80	9797.12	1325.14	0.08
30	66.30	Max WS	12039.22	-12.13	15.56		15.69	0.000189	2.92	4116.94	216.76	0.12
30	65.30	Max WS	12039.14	-15.39	15.42		15.54	0.000188	2.82	4266.93	238.83	0.12
30	64.30	Max WS	12039.02	-6.27	15.26		15.36	0.000166	2.57	4691.25	278.89	0.11
30	63.30	Max WS	12038.80	-16.14	14.96		15.08	0.000171	2.77	4345.92	230.95	0.11
30	62.30	Max WS	12038.57	-8.52	14.91		14.97	0.000092	2.00	7490.47	773.92	0.08
30	61.30	Max WS	12038.47	-9.67	14.82		14.92	0.000170	2.61	4686.45	335.77	0.11
30	60.30	Max WS	12038.11	-12.20	14.44		14.55	0.000172	2.64	4552.16	266.17	0.11
30	59.30	Max WS	12034.70	-6.87	14.22		14.32	0.000166	2.54	4729.35	285.89	0.11
30	58.30	Max WS	12034.69	-9.16	14.14		14.23	0.000169	2.34	5148.63	362.38	0.11
30	57.30	Max WS	12034.68	-9.58	14.07		14.17	0.000169	2.55	4712.39	286.78	0.11
30	56.30	Max WS	12034.67	-8.87	13.98		14.09	0.000163	2.59	4644.41	267.77	0.11
30	55.30	Max WS	12034.64	-8.00	13.90		13.97	0.000108	2.15	6816.42	723.66	0.09
30	54.30	Max WS	12034.62	-16.48	13.82		13.92	0.000155	2.51	5149.55	450.27	0.11
30	53.30	Max WS	12034.59	-6.77	13.74		13.83	0.000146	2.43	5672.07	483.45	0.10
30	52.30	Max WS	12034.56	-13.58	13.60		13.72	0.000183	2.74	4390.58	252.98	0.12
30	51.30	Max WS	12034.46	-14.52	13.07		13.21	0.000208	3.00	4138.39	280.39	0.12
30	50.30	Max WS	12034.41	-14.20	13.06		13.13	0.000116	2.19	6713.93	711.05	0.09
30	49.30	Max WS	12034.37	-14.57	12.93		13.06	0.000231	2.84	4239.58	278.95	0.13
30	48.30	Max WS	12034.34	-11.09	12.85		12.95	0.000155	2.56	4696.08	265.25	0.11
30	47.30	Max WS	12034.29	-17.87	12.81		12.87	0.000092	2.06	6857.44	578.55	0.08
30	46.30	Max WS	12034.23	-9.00	12.67		12.78	0.000185	2.70	4456.75	266.48	0.12
30	45.30	Max WS	12034.21	-15.34	12.65		12.73	0.000136	2.21	5455.43	354.83	0.10
30	44.30	Max WS	12034.14	-13.45	12.47		12.57	0.000178	2.62	4587.89	280.19	0.11
30	43.30	Max WS	12034.03	-15.10	12.12		12.24	0.000216	2.89	4165.81	252.75	0.13
30	41.30	Max WS	12033.96	-13.85	11.84		12.00	0.000253	3.22	3740.42	214.30	0.14
30	40.30	Max WS	12033.85	-9.71	11.52		11.65	0.000222	2.81	4283.62	278.42	0.13
30	39.30	Max WS	12033.77	-18.13	11.22		11.38	0.000246	3.19	3775.66	214.65	0.13
30	38.30	Max WS	12033.56	-10.67	10.63		10.76	0.000224	2.94	4095.51	248.03	0.13
30	37.301	Max WS	12033.38	-14.26	10.07		10.23	0.000265	3.21	3747.85	225.22	0.14
30	37.30	Max WS	12033.36	-16.74	10.03		10.18	0.000251	3.13	3844.84	228.15	0.13
30	36.302	Max WS	12033.36	-17.10	10.00		10.15	0.000378	3.18	3783.65	229.04	0.14
30	36.301	Max WS	12033.36	-17.10	9.99		10.15	0.000378	3.18	3782.27	229.01	0.14
30	36.30	Max WS	12033.35	-17.10	9.98		10.14	0.000378	3.18	3780.57	228.97	0.14
30	35.30	Max WS	12033.35	-17.58	9.97		10.11	0.000239	3.05	3940.62	235.90	0.13
30	34.301	Max WS	12033.33	-15.03	9.91		10.07	0.000250	3.15	3820.63	224.97	0.13
30	34.30	Max WS	12033.20	-13.40	9.48		9.65	0.000311	3.37	3573.31	226.17	0.15
30	33.30	Max WS	12032.98	-14.57	8.57		8.77	0.000355	3.65	3298.01	202.30	0.16
30	32.30	Max WS	12032.76	-16.60	7.43		7.68	0.000481	4.03	2983.13	197.16	0.18
30	31.30	Max WS	12032.55	-20.45	6.22		6.46	0.000424	3.93	3063.00	189.74	0.17
30	30.30	Max WS	12032.41	-17.40	5.50	-5.90	5.74	0.000501	3.94	3054.16	218.04	0.19

```
                    HEC-RAS Version 4.1.0 Jan 2010
                     U.S. Army Corps of Engineers
                    Hydrologic Engineering Center
                          609 Second Street
                          Davis, California

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PROJECT DATA
Project Title: SJ Reach 30
Project File : SJReach30.prj
Run Date and Time: 4/14/2010 2:01:40 PM

Project in English units

PLAN DATA

Plan Title: Alternative 1
Plan File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.p03

Geometry Title: Alternative 1
Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.g02

Flow Title :
Flow File :

Plan Description:
Alternative 1 Geometry with 200 year Hydrograph

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Plan Summary Information:
Number of:  Cross Sections =   48    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
30	74.30	Max WS	17437.00	-25.70	20.70		20.75	0.000052	1.77	9835.36	426.42	0.07
30	73.30	Max WS	17436.96	-3.00	20.57		20.65	0.000148	2.36	7378.89	461.74	0.10
30	72.30	Max WS	17436.93	-8.13	20.54		20.59	0.000093	2.17	9820.92	680.81	0.09
30	71.30	Max WS	17436.81	-5.30	20.42		20.53	0.000133	2.71	6952.15	444.19	0.10
30	70.30	Max WS	17436.30	-15.81	20.34		20.41	0.000089	2.11	9039.45	572.33	0.08
30	69.30	Max WS	17436.05	-7.58	20.31		20.35	0.000064	1.88	12396.48	943.97	0.07
30	68.30	Max WS	17435.81	-13.93	20.27		20.31	0.000046	1.73	14173.71	1048.46	0.06
30	67.30	Max WS	17435.30	-10.24	20.21		20.24	0.000047	1.62	15660.22	1353.88	0.06
30	66.30	Max WS	17434.94	-12.13	19.91		20.09	0.000216	3.42	5094.65	233.11	0.13
30	65.30	Max WS	17434.85	-15.39	19.75		19.92	0.000209	3.26	5346.90	259.46	0.13
30	64.30	Max WS	17434.40	-6.27	19.61		19.75	0.000175	2.93	5953.32	301.24	0.12
30	63.30	Max WS	17433.59	-16.14	19.25		19.41	0.000210	3.22	5417.35	269.31	0.13
30	62.30	Max WS	17433.03	-8.52	19.24		19.29	0.000071	2.04	10944.62	820.50	0.08
30	61.30	Max WS	17432.76	-9.67	19.12		19.25	0.000160	2.95	6194.64	364.76	0.11
30	60.30	Max WS	17431.18	-12.20	18.78		18.92	0.000184	3.03	5753.76	287.79	0.12
30	59.30	Max WS	17430.24	-6.87	18.54		18.67	0.000173	2.90	6011.37	307.48	0.12
30	58.30	Max WS	17430.09	-9.16	18.48		18.58	0.000158	2.57	6782.14	391.34	0.11
30	57.30	Max WS	17429.99	-9.58	18.39		18.52	0.000177	2.90	6004.45	310.91	0.12
30	56.30	Max WS	17429.88	-8.87	18.30		18.44	0.000175	2.99	5835.74	284.51	0.12
30	55.30	Max WS	17420.63	-8.00	18.26		18.32	0.000084	2.19	10048.87	761.61	0.08
30	54.30	Max WS	17420.63	-16.48	18.17		18.28	0.000136	2.73	7166.65	477.51	0.10
30	53.30	Max WS	17420.62	-6.77	18.11		18.20	0.000122	2.60	7863.04	520.21	0.10
30	52.30	Max WS	17420.60	-13.58	17.94		18.10	0.000197	3.15	5530.56	272.37	0.12
30	51.30	Max WS	17420.48	-14.52	17.40		17.57	0.000204	3.43	5400.86	303.11	0.13
30	50.30	Max WS	17420.42	-14.20	17.43		17.49	0.000088	2.22	9863.74	731.58	0.08
30	49.30	Max WS	17420.36	-14.57	17.27		17.43	0.000228	3.17	5503.17	303.34	0.13
30	48.30	Max WS	17420.31	-11.09	17.18		17.32	0.000168	2.96	5887.84	284.53	0.11
30	47.30	Max WS	17420.23	-17.87	17.18		17.24	0.000080	2.21	9436.56	605.25	0.08
30	46.30	Max WS	17420.13	-9.00	17.01		17.16	0.000196	3.08	5656.01	288.41	0.12
30	45.30	Max WS	17420.09	-15.34	17.00		17.10	0.000141	2.45	7103.89	405.65	0.10
30	44.30	Max WS	17419.95	-13.45	16.80		16.93	0.000188	2.97	5862.84	308.64	0.12
30	43.30	Max WS	17403.69	-15.10	16.44		16.61	0.000227	3.28	5312.70	276.62	0.13
30	41.30	Max WS	17401.84	-13.85	16.13		16.34	0.000280	3.70	4704.74	235.34	0.15
30	40.30	Max WS	17401.79	-9.71	15.82		15.97	0.000220	3.15	5520.78	298.28	0.13
30	39.30	Max WS	17401.74	-18.13	15.48		15.69	0.000273	3.68	4728.62	233.19	0.14
30	38.30	Max WS	17401.61	-10.67	14.84		15.02	0.000236	3.36	5176.81	264.97	0.13
30	37.301	Max WS	17401.48	-14.26	14.24		14.45	0.000287	3.69	4720.44	242.86	0.15
30	37.30	Max WS	17401.47	-16.74	14.19		14.40	0.000271	3.61	4826.12	244.25	0.14
30	36.302	Max WS	17401.46	-17.10	14.16		14.37	0.000422	3.64	4777.33	248.12	0.15
30	36.301	Max WS	17401.46	-17.10	14.15		14.36	0.000423	3.64	4775.66	248.09	0.15
30	36.30	Max WS	17401.46	-17.10	14.15		14.35	0.000423	3.65	4773.59	248.05	0.15
30	35.30	Max WS	17401.46	-17.58	14.13		14.32	0.000260	3.50	4965.40	256.34	0.14
30	34.301	Max WS	17401.44	-15.03	14.07		14.27	0.000274	3.63	4792.65	242.94	0.14
30	34.30	Max WS	17401.34	-13.40	13.60		13.83	0.000328	3.83	4548.07	246.57	0.16
30	33.30	Max WS	17401.16	-14.57	12.61		12.88	0.000387	4.19	4149.50	219.50	0.17
30	32.30	Max WS	17400.97	-16.60	11.39		11.71	0.000505	4.58	3797.58	214.00	0.19
30	31.30	Max WS	17400.77	-20.45	10.08		10.40	0.000472	4.55	3823.36	204.53	0.19
30	30.30	Max WS	17400.64	-17.40	9.34	-4.19	9.65	0.000500	4.44	3917.47	232.04	0.19

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                     U.S. Army Corps of Engineers
                    Hydrologic Engineering Center
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                          Davis, California

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Project File : SJReach30.prj
Run Date and Time: 4/14/2010 1:39:09 PM

Project in English units

PLAN DATA

Plan Title: Alternative 2
Plan File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.p04

Geometry Title: Alternative 2
Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.g04

Flow Title   :
Flow File   :

Plan Description:
Alternative 2 Geometry with 100 Year Hydrograph

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Plan Summary Information:
Number of:  Cross Sections =   48    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
30	74.30	Max WS	12041.00	-25.70	16.45		16.48	0.000044	1.49	8080.13	399.65	0.06
30	73.30	Max WS	12040.96	-3.00	16.32		16.39	0.000156	2.18	5511.62	403.17	0.10
30	72.30	Max WS	12040.92	-8.13	16.27		16.32	0.000122	2.12	6969.05	655.04	0.09
30	71.30	Max WS	12040.87	-5.30	16.16		16.25	0.000143	2.43	5116.49	416.88	0.10
30	70.30	Max WS	12040.76	-15.81	16.05		16.11	0.000079	1.92	6729.20	477.07	0.08
30	69.30	Max WS	12040.70	-7.58	15.92		16.03	0.000165	2.63	4576.37	260.37	0.11
30	68.30	Max WS	12040.64	-13.93	15.81		15.91	0.000125	2.47	4946.26	308.08	0.10
30	67.30	Max WS	12040.29	-10.24	15.71		15.75	0.000082	1.83	9630.31	1324.32	0.08
30	66.30	Max WS	12039.94	-12.13	15.43		15.56	0.000193	2.94	4088.30	216.26	0.12
30	65.30	Max WS	12039.87	-15.39	15.28		15.41	0.000192	2.84	4234.55	238.18	0.12
30	64.30	Max WS	12039.76	-6.27	15.12		15.23	0.000170	2.59	4652.27	278.16	0.11
30	63.30	Max WS	12039.55	-16.14	14.81		14.93	0.000174	2.79	4312.04	230.00	0.11
30	62.30	Max WS	12039.33	-8.52	14.76		14.82	0.000095	2.03	7375.55	768.60	0.08
30	61.30	Max WS	12039.23	-9.67	14.66		14.77	0.000175	2.63	4635.84	334.76	0.11
30	60.30	Max WS	12034.59	-12.20	14.28		14.39	0.000177	2.67	4509.22	265.37	0.11
30	59.30	Max WS	12034.57	-6.87	14.05		14.16	0.000171	2.57	4681.35	285.05	0.11
30	58.30	Max WS	12034.56	-9.16	13.97		14.06	0.000176	2.37	5086.65	361.24	0.11
30	57.30	Max WS	12034.55	-9.58	13.89		14.00	0.000174	2.58	4662.75	285.81	0.11
30	56.30	Max WS	12034.53	-8.87	13.81		13.91	0.000168	2.62	4597.37	267.09	0.11
30	55.30	Max WS	12034.47	-8.00	13.72		13.79	0.000113	2.18	6685.93	721.94	0.09
30	54.30	Max WS	12034.44	-16.48	13.64		13.73	0.000162	2.54	5067.17	449.12	0.11
30	53.30	Max WS	12034.39	-6.77	13.56		13.64	0.000152	2.47	5581.89	481.81	0.11
30	52.30	Max WS	12034.35	-13.58	13.41		13.53	0.000189	2.77	4342.39	252.11	0.12
30	51.30	Max WS	12034.18	-14.52	12.86		13.00	0.000217	3.04	4079.32	279.29	0.13
30	50.30	Max WS	12034.11	-14.20	12.84		12.91	0.000123	2.23	6562.03	710.04	0.09
30	49.30	Max WS	12033.98	-14.57	12.82		12.86	0.000105	1.86	8898.59	1144.98	0.09
30	48.30	Max WS	12033.76	-11.09	12.78		12.81	0.000066	1.53	11009.31	1415.01	0.07
30	47.30	Max WS	12033.53	-17.87	12.76		12.78	0.000038	1.33	13412.65	1421.41	0.05
30	46.30	Max WS	12033.28	-9.00	12.71		12.75	0.000088	1.77	9707.73	1306.96	0.08
30	45.30	Max WS	12033.15	-15.34	12.66		12.71	0.000114	1.96	7180.70	826.83	0.09
30	44.30	Max WS	12032.97	-13.45	12.47		12.57	0.000178	2.62	4587.52	280.18	0.11
30	43.30	Max WS	12032.82	-15.10	12.11		12.24	0.000216	2.89	4165.48	252.74	0.13
30	41.30	Max WS	12032.73	-13.85	11.84		12.00	0.000253	3.22	3740.14	214.29	0.14
30	40.30	Max WS	12032.58	-9.71	11.52		11.65	0.000222	2.81	4283.25	278.42	0.13
30	39.30	Max WS	12032.47	-18.13	11.22		11.38	0.000246	3.19	3775.38	214.64	0.13
30	38.30	Max WS	12032.21	-10.67	10.62		10.76	0.000224	2.94	4095.18	248.03	0.13
30	37.301	Max WS	12031.98	-14.26	10.07		10.23	0.000265	3.21	3747.55	225.22	0.14
30	37.30	Max WS	12031.96	-16.74	10.03		10.18	0.000251	3.13	3844.53	228.15	0.13
30	36.302	Max WS	12031.95	-17.10	9.99		10.15	0.000378	3.18	3783.34	229.03	0.14
30	36.301	Max WS	12031.94	-17.10	9.99		10.15	0.000378	3.18	3781.97	229.00	0.14
30	36.30	Max WS	12031.94	-17.10	9.98		10.14	0.000378	3.18	3780.26	228.97	0.14
30	35.30	Max WS	12031.93	-17.58	9.97		10.11	0.000239	3.05	3940.30	235.89	0.13
30	34.301	Max WS	12031.91	-15.03	9.91		10.07	0.000250	3.15	3820.33	224.97	0.13
30	34.30	Max WS	12031.75	-13.40	9.48		9.65	0.000311	3.37	3573.01	226.16	0.15
30	33.30	Max WS	12031.48	-14.57	8.57		8.77	0.000355	3.65	3297.75	202.29	0.16
30	32.30	Max WS	12030.87	-16.60	7.42		7.68	0.000481	4.03	2982.87	197.15	0.18
30	31.30	Max WS	12030.87	-20.45	6.22		6.46	0.000424	3.93	3062.77	189.74	0.17
30	30.30	Max WS	12030.86	-17.40	5.50	-5.90	5.74	0.000501	3.94	3053.90	218.04	0.19

```
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                     U.S. Army Corps of Engineers
                    Hydrologic Engineering Center
                          609 Second Street
                          Davis, California

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PROJECT DATA
Project Title: SJ Reach 30
Project File : SJReach30.prj
Run Date and Time: 4/14/2010 2:02:20 PM

Project in English units



PLAN DATA

Plan Title: Alternative 2
Plan File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.p04

           Geometry Title: Alternative 2
           Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.g04

           Flow Title    :
           Flow File     :

Plan Description:
Alternative 2 Geometry with 200 Year Hydrograph


Plan Summary Information:
Number of:  Cross Sections =   48    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
30	74.30	Max WS	17456.00	-25.70	20.73		20.78	0.000052	1.77	9850.27	426.65	0.06
30	73.30	Max WS	17455.52	-3.00	20.60		20.69	0.000147	2.36	7395.25	462.02	0.10
30	72.30	Max WS	17455.19	-8.13	20.57		20.63	0.000093	2.17	9845.19	681.03	0.09
30	71.30	Max WS	17437.10	-5.30	20.46		20.57	0.000132	2.71	6968.55	444.44	0.10
30	70.30	Max WS	17437.06	-15.81	20.38		20.45	0.000088	2.10	9061.25	572.57	0.08
30	69.30	Max WS	17437.03	-7.58	20.21		20.36	0.000180	3.04	5735.06	279.01	0.12
30	68.30	Max WS	17437.00	-13.93	20.10		20.23	0.000131	2.89	6317.64	331.55	0.10
30	67.30	Max WS	17436.81	-10.24	20.04		20.07	0.000049	1.64	15434.43	1352.78	0.06
30	66.30	Max WS	17436.62	-12.13	19.73		19.92	0.000221	3.45	5054.18	232.45	0.13
30	65.30	Max WS	17436.56	-15.39	19.57		19.74	0.000214	3.29	5300.88	258.61	0.13
30	64.30	Max WS	17436.19	-6.27	19.42		19.55	0.000180	2.96	5895.30	300.25	0.12
30	63.30	Max WS	17435.53	-16.14	19.05		19.21	0.000215	3.25	5363.38	267.44	0.13
30	62.30	Max WS	17435.04	-8.52	19.04		19.09	0.000074	2.07	10778.43	818.41	0.08
30	61.30	Max WS	17434.81	-9.67	18.92		19.05	0.000166	2.98	6119.74	363.38	0.11
30	60.30	Max WS	17433.32	-12.20	18.53		18.68	0.000191	3.07	5684.21	286.58	0.12
30	59.30	Max WS	17432.41	-6.87	18.30		18.43	0.000179	2.94	5935.42	306.25	0.12
30	58.30	Max WS	17432.27	-9.16	18.23		18.33	0.000164	2.61	6684.13	389.66	0.11
30	57.30	Max WS	17432.18	-9.58	18.14		18.27	0.000183	2.94	5925.70	309.49	0.12
30	56.30	Max WS	17432.07	-8.87	18.04		18.18	0.000181	3.02	5762.70	283.52	0.12
30	55.30	Max WS	17421.04	-8.00	18.00		18.06	0.000088	2.23	9850.46	759.17	0.08
30	54.30	Max WS	17421.04	-16.48	17.90		18.02	0.000142	2.77	7040.58	475.85	0.11
30	53.30	Max WS	17421.02	-6.77	17.84		17.93	0.000129	2.65	7723.96	517.99	0.10
30	52.30	Max WS	17420.99	-13.58	17.67		17.83	0.000205	3.19	5456.26	271.16	0.13
30	51.30	Max WS	17420.82	-14.52	17.10		17.28	0.000214	3.48	5310.67	301.55	0.13
30	50.30	Max WS	17420.73	-14.20	17.13		17.19	0.000094	2.27	9644.85	730.17	0.09
30	49.30	Max WS	17420.58	-14.57	17.12		17.15	0.000063	1.67	13899.54	1181.43	0.07
30	48.30	Max WS	17420.32	-11.09	17.10		17.12	0.000040	1.39	17263.58	1482.72	0.06
30	47.30	Max WS	17420.05	-17.87	17.09		17.10	0.000027	1.28	19702.22	1489.34	0.05
30	46.30	Max WS	17419.76	-9.00	17.06		17.08	0.000052	1.57	15518.08	1367.95	0.06
30	45.30	Max WS	17419.61	-15.34	17.01		17.06	0.000085	1.90	10936.50	901.36	0.08
30	44.30	Max WS	17419.38	-13.45	16.80		16.93	0.000188	2.97	5862.69	308.64	0.12
30	43.30	Max WS	17402.67	-15.10	16.44		16.61	0.000227	3.28	5312.40	276.61	0.13
30	41.30	Max WS	17400.68	-13.85	16.13		16.34	0.000280	3.70	4704.53	235.33	0.15
30	40.30	Max WS	17400.62	-9.71	15.81		15.97	0.000220	3.15	5520.51	298.28	0.13
30	39.30	Max WS	17400.56	-18.13	15.48		15.69	0.000273	3.68	4728.41	233.19	0.14
30	38.30	Max WS	17400.42	-10.67	14.84		15.02	0.000236	3.36	5176.58	264.97	0.13
30	37.301	Max WS	17400.27	-14.26	14.24		14.45	0.000287	3.69	4720.22	242.85	0.15
30	37.30	Max WS	17400.26	-16.74	14.19		14.40	0.000271	3.61	4825.91	244.24	0.14
30	36.302	Max WS	17400.25	-17.10	14.16		14.37	0.000422	3.64	4777.10	248.12	0.15
30	36.301	Max WS	17400.25	-17.10	14.15		14.36	0.000423	3.64	4775.43	248.09	0.15
30	36.30	Max WS	17400.25	-17.10	14.14		14.35	0.000423	3.65	4773.36	248.05	0.15
30	35.30	Max WS	17400.25	-17.58	14.13		14.32	0.000260	3.50	4965.17	256.34	0.14
30	34.301	Max WS	17400.23	-15.03	14.07		14.27	0.000274	3.63	4792.44	242.94	0.14
30	34.30	Max WS	17400.12	-13.40	13.60		13.83	0.000328	3.83	4547.85	246.56	0.16
30	33.30	Max WS	17399.92	-14.57	12.61		12.88	0.000387	4.19	4149.31	219.50	0.17
30	32.30	Max WS	17399.72	-16.60	11.39		11.71	0.000505	4.58	3797.40	213.99	0.19
30	31.30	Max WS	17399.50	-20.45	10.08		10.40	0.000472	4.55	3823.18	204.53	0.19
30	30.30	Max WS	17399.37	-17.40	9.34	-4.19	9.65	0.000500	4.44	3917.27	232.04	0.19

```
                        HEC-RAS Version 4.1.0 Jan 2010
                         U.S. Army Corps of Engineers
                        Hydrologic Engineering Center
                              609 Second Street
                              Davis, California

            X     X  XXXXXX    XXXX        XXXX       XX      XXXX
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Project File : SJReach30.prj
Run Date and Time: 4/14/2010 1:39:48 PM

Project in English units



PLAN DATA

Plan Title: Alternative 1 and 2
Plan File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.p05

           Geometry Title: Alternative 1 and 2
           Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.g03

           Flow Title    :
           Flow File     :

Plan Description:
Alternative 1 and 2 Geometry with 100 Year Hydrograph


Plan Summary Information:
Number of:  Cross Sections =   48    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
30	74.30	Max WS	12041.00	-25.70	16.32		16.35	0.000045	1.50	8026.77	398.80	0.06
30	73.30	Max WS	12040.89	-3.00	16.18		16.26	0.000149	2.21	5457.99	381.18	0.10
30	72.30	Max WS	12040.81	-8.13	16.13		16.19	0.000127	2.15	6878.67	654.21	0.10
30	71.30	Max WS	12040.69	-5.30	16.01		16.11	0.000147	2.45	5058.12	410.45	0.10
30	70.30	Max WS	12040.46	-15.81	15.91		15.96	0.000081	1.93	6660.54	474.74	0.08
30	69.30	Max WS	12040.27	-7.58	15.87		15.91	0.000090	1.97	8278.23	907.32	0.08
30	68.30	Max WS	12039.91	-13.93	15.81		15.85	0.000063	1.78	9555.06	1020.78	0.07
30	67.30	Max WS	12039.12	-10.24	15.71		15.74	0.000082	1.83	9626.18	1324.30	0.08
30	66.30	Max WS	12038.58	-12.13	15.42		15.56	0.000193	2.95	4087.61	216.25	0.12
30	65.30	Max WS	12038.48	-15.39	15.28		15.40	0.000192	2.84	4233.78	238.16	0.12
30	64.30	Max WS	12033.78	-6.27	15.12		15.22	0.000170	2.59	4651.37	278.14	0.11
30	63.30	Max WS	12033.75	-16.14	14.81		14.93	0.000174	2.79	4311.33	229.98	0.11
30	62.30	Max WS	12033.71	-8.52	14.76		14.82	0.000095	2.03	7373.18	768.48	0.08
30	61.30	Max WS	12033.69	-9.67	14.66		14.77	0.000175	2.63	4634.82	334.74	0.11
30	60.30	Max WS	12033.59	-12.20	14.27		14.38	0.000177	2.67	4508.43	265.35	0.11
30	59.30	Max WS	12033.51	-6.87	14.05		14.15	0.000171	2.57	4680.47	285.03	0.11
30	58.30	Max WS	12033.47	-9.16	13.97		14.06	0.000176	2.37	5085.53	361.22	0.11
30	57.30	Max WS	12033.44	-9.58	13.89		13.99	0.000174	2.58	4661.86	285.79	0.11
30	56.30	Max WS	12033.40	-8.87	13.80		13.91	0.000168	2.62	4596.52	267.08	0.11
30	55.30	Max WS	12033.27	-8.00	13.72		13.79	0.000113	2.18	6683.58	721.88	0.09
30	54.30	Max WS	12033.19	-16.48	13.63		13.73	0.000162	2.54	5065.69	449.10	0.11
30	53.30	Max WS	12033.10	-6.77	13.55		13.64	0.000152	2.47	5580.28	481.79	0.11
30	52.30	Max WS	12033.02	-13.58	13.41		13.53	0.000189	2.77	4341.54	252.10	0.12
30	51.30	Max WS	12032.73	-14.52	12.86		13.00	0.000217	3.04	4078.32	279.27	0.13
30	50.30	Max WS	12032.62	-14.20	12.84		12.91	0.000123	2.23	6559.45	710.03	0.09
30	49.30	Max WS	12032.41	-14.57	12.82		12.86	0.000105	1.86	8894.39	1144.95	0.09
30	48.30	Max WS	12032.07	-11.09	12.78		12.81	0.000063	1.62	11003.18	1414.94	0.07
30	47.30	Max WS	12031.72	-17.87	12.76		12.78	0.000038	1.33	13409.36	1421.38	0.05
30	46.30	Max WS	12031.34	-9.00	12.71		12.74	0.000088	1.77	9704.69	1306.92	0.08
30	45.30	Max WS	12031.15	-15.34	12.66		12.71	0.000114	1.96	7178.77	826.80	0.09
30	44.30	Max WS	12030.87	-13.45	12.46		12.57	0.000178	2.62	4586.87	280.17	0.11
30	43.30	Max WS	12030.64	-15.10	12.11		12.24	0.000216	2.89	4164.88	252.73	0.13
30	41.30	Max WS	12029.09	-13.85	11.84		12.00	0.000253	3.22	3739.64	214.28	0.14
30	40.30	Max WS	12029.08	-9.71	11.52		11.64	0.000222	2.81	4282.61	278.41	0.13
30	39.30	Max WS	12029.08	-18.13	11.22		11.38	0.000246	3.19	3774.90	214.63	0.13
30	38.30	Max WS	12029.04	-10.67	10.62		10.76	0.000224	2.94	4094.66	248.02	0.13
30	37.301	Max WS	12029.00	-14.26	10.07		10.23	0.000265	3.21	3747.10	225.21	0.14
30	37.30	Max WS	12028.99	-16.74	10.02		10.18	0.000251	3.13	3844.07	228.14	0.13
30	36.302	Max WS	12028.99	-17.10	9.99		10.15	0.000377	3.18	3782.88	229.02	0.14
30	36.301	Max WS	12028.99	-17.10	9.99		10.14	0.000378	3.18	3781.50	228.99	0.14
30	36.30	Max WS	12028.99	-17.10	9.98		10.14	0.000378	3.18	3779.80	228.96	0.14
30	35.30	Max WS	12028.99	-17.58	9.97		10.11	0.000239	3.05	3939.83	235.88	0.13
30	34.301	Max WS	12028.98	-15.03	9.91		10.06	0.000250	3.15	3819.88	224.96	0.13
30	34.30	Max WS	12028.95	-13.40	9.48		9.65	0.000311	3.37	3572.56	226.15	0.15
30	33.30	Max WS	12028.88	-14.57	8.56		8.77	0.000355	3.65	3297.37	202.28	0.16
30	32.30	Max WS	12028.80	-16.60	7.42		7.68	0.000481	4.03	2982.53	197.14	0.18
30	31.30	Max WS	12028.72	-20.45	6.22		6.46	0.000424	3.93	3062.44	189.73	0.17
30	30.30	Max WS	12028.66	-17.40	5.50	-5.90	5.74	0.000501	3.94	3053.52	218.03	0.19

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                     U.S. Army Corps of Engineers
                    Hydrologic Engineering Center
                          609 Second Street
                          Davis, California

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PROJECT DATA
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Project File : SJReach30.prj
Run Date and Time: 4/14/2010 2:03:32 PM

Project in English units



PLAN DATA

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           Geometry Title: Alternative 1 and 2
           Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30.g03

           Flow Title    :
           Flow File     :

Plan Description:
Alternative 1 and 2 Geometry with 200 Year Hydrograph


Plan Summary Information:
Number of:  Cross Sections =   48    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
30	74.30	Max WS	17437.00	-25.70	20.55		20.60	0.000053	1.78	9772.05	425.49	0.07
30	73.30	Max WS	17436.87	-3.00	20.41		20.50	0.000152	2.39	7308.84	460.54	0.11
30	72.30	Max WS	17436.76	-8.13	20.38		20.44	0.000096	2.20	9716.72	679.89	0.09
30	71.30	Max WS	17436.50	-5.30	20.26		20.38	0.000136	2.74	6881.10	443.09	0.10
30	70.30	Max WS	17435.48	-15.81	20.18		20.24	0.000091	2.13	8944.70	571.29	0.08
30	69.30	Max WS	17434.99	-7.58	20.15		20.19	0.000067	1.91	12240.09	942.62	0.07
30	68.30	Max WS	17434.53	-13.93	20.11		20.14	0.000047	1.76	13998.53	1047.42	0.06
30	67.30	Max WS	17433.58	-10.24	20.04		20.07	0.000049	1.64	15430.88	1352.77	0.06
30	66.30	Max WS	17432.94	-12.13	19.73		19.91	0.000221	3.45	5053.58	232.44	0.13
30	65.30	Max WS	17432.81	-15.39	19.57		19.74	0.000214	3.29	5300.22	258.60	0.13
30	64.30	Max WS	17432.13	-6.27	19.42		19.55	0.000180	2.96	5894.46	300.24	0.12
30	63.30	Max WS	17430.96	-16.14	19.05		19.21	0.000215	3.25	5362.67	267.42	0.13
30	62.30	Max WS	17430.21	-8.52	19.03		19.09	0.000074	2.07	10776.23	818.39	0.08
30	61.30	Max WS	17429.86	-9.67	18.91		19.05	0.000166	2.98	6118.79	363.36	0.11
30	60.30	Max WS	17418.71	-12.20	18.53		18.68	0.000191	3.06	5683.40	286.57	0.12
30	59.30	Max WS	17418.69	-6.87	18.29		18.43	0.000179	2.94	5934.61	306.23	0.12
30	58.30	Max WS	17418.68	-9.16	18.22		18.33	0.000164	2.61	6683.14	389.64	0.11
30	57.30	Max WS	17418.68	-9.58	18.13		18.27	0.000183	2.94	5924.95	309.48	0.12
30	56.30	Max WS	17418.67	-8.87	18.04		18.18	0.000181	3.02	5762.04	283.51	0.12
30	55.30	Max WS	17418.62	-8.00	17.99		18.06	0.000088	2.23	9848.66	759.15	0.08
30	54.30	Max WS	17418.59	-16.48	17.90		18.01	0.000142	2.77	7039.46	475.84	0.11
30	53.30	Max WS	17418.54	-6.77	17.84		17.93	0.000129	2.65	7722.73	517.97	0.10
30	52.30	Max WS	17418.51	-13.58	17.67		17.82	0.000205	3.19	5455.62	271.15	0.13
30	51.30	Max WS	17418.32	-14.52	17.10		17.28	0.000214	3.48	5309.94	301.54	0.13
30	50.30	Max WS	17418.23	-14.20	17.12		17.19	0.000094	2.27	9643.05	730.16	0.09
30	49.30	Max WS	17418.07	-14.57	17.12		17.15	0.000063	1.67	13896.61	1181.41	0.07
30	48.30	Max WS	17417.79	-11.09	17.10		17.12	0.000040	1.46	17259.15	1482.67	0.06
30	47.30	Max WS	17417.50	-17.87	17.08		17.10	0.000027	1.28	19698.88	1489.31	0.05
30	46.30	Max WS	17417.18	-9.00	17.05		17.08	0.000052	1.57	15514.99	1367.92	0.06
30	45.30	Max WS	17417.03	-15.34	17.01		17.06	0.000085	1.90	10934.46	901.31	0.08
30	44.30	Max WS	17416.79	-13.45	16.79		16.93	0.000188	2.97	5861.99	308.62	0.12
30	43.30	Max WS	17399.42	-15.10	16.44		16.61	0.000227	3.28	5311.12	276.59	0.13
30	41.30	Max WS	17396.41	-13.85	16.12		16.34	0.000280	3.70	4703.66	235.31	0.15
30	40.30	Max WS	17396.25	-9.71	15.81		15.96	0.000220	3.15	5519.41	298.26	0.13
30	39.30	Max WS	17396.12	-18.13	15.48		15.69	0.000273	3.68	4727.55	233.17	0.14
30	38.30	Max WS	17395.81	-10.67	14.84		15.01	0.000236	3.36	5175.59	264.95	0.13
30	37.301	Max WS	17395.52	-14.26	14.24		14.45	0.000287	3.69	4719.32	242.84	0.15
30	37.30	Max WS	17395.50	-16.74	14.19		14.39	0.000271	3.61	4825.00	244.22	0.14
30	36.302	Max WS	17395.49	-17.10	14.16		14.36	0.000422	3.64	4776.18	248.10	0.15
30	36.301	Max WS	17395.48	-17.10	14.15		14.36	0.000423	3.64	4774.51	248.07	0.15
30	36.30	Max WS	17395.48	-17.10	14.14		14.35	0.000423	3.64	4772.44	248.03	0.15
30	35.30	Max WS	17395.47	-17.58	14.13		14.32	0.000260	3.50	4964.22	256.32	0.14
30	34.301	Max WS	17395.45	-15.03	14.06		14.27	0.000274	3.63	4791.54	242.92	0.14
30	34.30	Max WS	17395.24	-13.40	13.60		13.83	0.000328	3.83	4546.93	246.55	0.16
30	33.30	Max WS	17394.89	-14.57	12.61		12.88	0.000387	4.19	4148.50	219.48	0.17
30	32.30	Max WS	17394.54	-16.60	11.38		11.71	0.000505	4.58	3796.62	213.98	0.19
30	31.30	Max WS	17394.18	-20.45	10.07		10.40	0.000472	4.55	3822.45	204.52	0.19
30	30.30	Max WS	17393.96	-17.40	9.34	-4.20	9.64	0.000500	4.44	3916.44	232.02	0.19

APPENDIX B

REVIEW COMMENTS

BOSC, M. Archer, dated March 25, 2010

APPENDIX B

RECLAMATION DISTRICT NO. 17- MOSSDALE - PHASE III
LEVEE SEEPAGE PROJECT

EXTERNAL REVIEW

	REVIEWER & PHONE #	RESPONDENT & PHONE # (DO NOT Edit This Column)	LOCATION in Report/Doc.	COMMENT	CLOSED Y / N	DATE MM/DD/YY	(NEEDED ONLY IF NOT CLOSING COMMENT) BACK CHECK COMMENT	RESPONSE	CONCUR	NON-CONCUR	FIO
1	BOSC M. Archer (916) 456-4400		General	Review of "Hydraulic Report; Reclamation District No. 17, Mossdale Tract; Levee Setback Alternatives Study, Reach IV-c, and Reaches II-a and II-b," ENGEO, January 19, 2010		3/25/10					
2	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 2, Section 5.0, 1st para.	What is meant by "estimate the distribution of peak discharges"?		3/25/10		This has been clarified or reworded in the reissued report.			
3	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 2, Section 5.0, 1st para.	Purpose of the analysis should be to determine impacts upstream, downstream and at the project, not just downstream of the project.		3/25/10		This reissued report includes the HEC-RAS output files all river stations analyzed upstream, downstream, and at the project location.			
	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 2, Section 5.0, 1st para.	Change "ACOE" to "USACE" to be consistent with abbreviation used later in report.		3/25/10		Completed			
4	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 2, Section 5.0, 2st para.	Describe what UNET is.		3/25/10		Completed			
5	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 2, Section 5.0, 2st para.	Regarding 100-year and 200-year input hydrographs: Rather than "published" I believe it would be more correct to refer to these as computed by the USACE UNET model. Also, need to note the levee performance assumption (levees overtop without failing in this case) associated with the source UNET simulations.		3/25/10		Completed			
6	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 3, Section 5.1, 2nd paragraph	With regard to the Manning's n values, recommend noting the values in the USACE UNET model and if changed in the ENGEO model providing reason for the change.		3/25/10		Completed			
7	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 3, Section 5.1, 3rd paragraph	States "HEC-RAS cross sections are shown in Figure 1", but Figure 1 also shows cross sections not in the RAS model (cross sections upstream of the San Joaquin R - Old R split).		3/25/10		This report includes a HEC-RAS model with cross sections upstream of the San Joaquin - Old River split; therefore, no change was necessary.			
8	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 3, Section 5.1, 4th paragraph	Show plots of modified cross sections showing both with and without setback condition (see enclosed example). Include figures similar to Figs. 2 and 3 that show locations of modified cross sections.		3/25/10		We created Figures 2A and 2B for levee setback Alternative 1, and Figures 3A and 3B for levee setback Alternative 2.			
9	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 3, Section 6.0, 1st para.	First line says that Table 1 shows "measured" flow data. This flow data is not measured, but was computed by USACE UNET model, and should be referred to as such.		3/25/10		Completed			
10	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 4, Table 1	Recommend changing "empirical" to "estimated" or "computed" in table title.		3/25/10		Completed			
11	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 4, Tables 1 and 2	Recommend rounding flow values to nearest 10 cfs. Flow values at best are an estimate so showing to the nearest 1 cfs, let alone hundredths, implies a false sense of precision.		3/25/10		Rounding the to the nearest 10 cfs will hide the small changes in results; however, we did round to nearest 1 cfs			
12	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 4, Table 3	Recommend showing water surface elevations at several locations: upstream, at, and downstream of setbacks. Need to include note that since the computed elevations are from an uncalibrated model that they should be used only for comparison purposes.		3/25/10		The HEC-RAS output files included in the appendices provide results for all river stations included in the analysis			
13	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 4, Section 7, bullet item 1	What is meant by "proportional"? I don't understand the second sentence; what does the flows being "substantial enough" have to do with how negligible the effects of the setbacks are?. It would be simpler to just state that the studied levee setbacks have negligible effect on the maximum flows and water surface elevations. No velocity data has been provided so should not be included in statement.		3/25/10		Completed			
14	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Pg. 4, Section 7, bullet item 2	I don't understand this bullet point. First, the San Joaquin River is both upstream and downstream of the setbacks. What are the "redistributions in peak flow rates" that are referred to? Not sure what is meant by "hydraulic benefits", but generally with a levee setback the main benefit would be a localized rduction with water surface elevation at the setback, and no info is provided that would show this. Comment #12 would provide some of this info, but also recommend providing maximum water surface profile plots.		3/25/10		Completed, see Appendix C			
	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Appendix A	Cross section station numbers in Appendix tables do not match those in Figure 1. I assume 74.30 appendix is same as 74 in Figure 1, etc, but needs to be clarified in report.		3/25/10		Completed			

RECLAMATION DISTRICT NO. 17- MOSSDALE - PHASE III
LEVEE SEEPAGE PROJECT

EXTERNAL REVIEW

	REVIEWER & PHONE #	RESPONDENT & PHONE # (DO NOT Edit This Column)	LOCATION in Report/Doc.	COMMENT	CLOSED Y / N	DATE MM/DD/YY	(NEEDED ONLY IF NOT CLOSING COMMENT) BACK CHECK COMMENT	RESPONSE	CONCUR	NON-CONCUR	FIO
15	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	General	Levee setbacks by themselves generally have localized impact on water surface elevation and negligible impact on flow. However, if there is a flow split near the setback, the change in water surface elevation can affect the flow split, which can affect water surface elevations at other locations. For this reason, due to the proximity of the Alternative 1 setback to the San Joaquin R - Old R split, the hydraulic model needs to include the split so that those potential impacts can be determined. Additionally, the San Joaquin R upstream boundary and Old R downstream boundary need to be sufficiently far from the split so that the split is not influenced by the boundary condtions.		3/25/10		Completed			
16	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	General	It needs to be noted in the report that the results being presented are from an uncalibrated model and should be used only for comparison purposes and not for estimating absolute water surface elevations.		3/25/10		Completed			
17	BOSC M. Archer (916) 456-4400	Jon Buck (925) 395-2543	Hydraulic Model	Based on Figures 1 and 2 it appears that cross sections 68 and 69 should be modified to represent the Alternative 1 setback, however in the model only cross section 68 has been modified.		3/25/10		Completed			

APPENDIX C

HEC-RAS OUTPUT FOR REGIONAL STUDY WITH BIFURCATION

Existing Geometry 100-Year Hydrograph
Existing Geometry 200-Year Hydrograph
Alternative 1 Geometry 100-Year Hydrograph
Alternative 1 Geometry 200-Year Hydrograph
Alternative 2 Geometry 100-Year Hydrograph
Alternative 2 Geometry 200-Year Hydrograph
Alternatives 1 & 2 Geometry 100-Year Hydrograph
Alternatives 1 & 2 Geometry 200-Year Hydrograph
Chart for Maximum Water Surface Elevation Vs. River Station, 100-Year Hydrograph
Chart for Maximum Flow Vs. River Station, 100-Year Hydrograph

APPENDIX C

```
                     HEC-RAS Version 4.1.0 Jan 2010
                      U.S. Army Corps of Engineers
                     Hydrologic Engineering Center
                           609 Second Street
                           Davis, California

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        X     X  X        X            X  X     X    X        X
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Project in English units



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           Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.g01

           Flow Title    :
           Flow File     :

Plan Description:
Existing Levee Geometry with 100 Year Hydrograph


Plan Summary Information:
Number of:  Cross Sections =   58    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
26	78	Max WS	48277.00	-13.77	18.26		18.89	0.000297	6.44	7773.63	362.12	0.23
26	77	Max WS	48276.85	-9.30	17.26		17.81	0.000291	5.98	8359.28	442.56	0.23
26	76	Max WS	48276.75	-22.76	16.68		17.34	0.000292	6.58	7754.95	388.95	0.23
26	75	Max WS	48276.62	-8.24	16.50		16.94	0.000235	5.35	9433.91	518.22	0.20
30	74.30	Max WS	9973.26	-25.70	16.50		16.53	0.000044	1.23	8101.39	399.98	0.05
30	73.30	Max WS	9973.17	-3.00	16.38		16.43	0.000154	1.80	5538.23	404.57	0.09
30	72.30	Max WS	9973.10	-8.13	16.33		16.37	0.000109	1.66	7012.25	655.44	0.07
30	71.30	Max WS	9973.01	-5.30	16.23		16.30	0.000140	2.00	5149.40	417.35	0.08
30	70.30	Max WS	9972.82	-15.81	16.12		16.16	0.000078	1.57	6763.37	481.29	0.06
30	69.30	Max WS	9972.72	-7.58	16.01		16.08	0.000163	2.17	4599.43	260.77	0.09
30	68.30	Max WS	9972.63	-13.93	15.90		15.96	0.000123	2.04	4972.81	308.55	0.08
30	67.30	Max WS	9972.08	-10.24	15.79		15.81	0.000071	1.42	9739.94	1324.86	0.06
30	66.30	Max WS	9971.55	-12.13	15.54		15.63	0.000190	2.42	4113.28	216.70	0.10
30	65.30	Max WS	9971.44	-15.39	15.40		15.48	0.000189	2.34	4262.07	238.73	0.10
30	64.30	Max WS	9971.28	-6.27	15.23		15.30	0.000167	2.13	4683.39	278.74	0.09
30	63.30	Max WS	9970.98	-16.14	14.93		15.01	0.000172	2.30	4340.24	230.79	0.09
30	62.30	Max WS	9970.68	-8.52	14.87		14.91	0.000087	1.61	7459.34	772.69	0.07
30	61.30	Max WS	9966.21	-9.67	14.79		14.86	0.000171	2.16	4677.84	335.60	0.09
30	60.30	Max WS	9966.19	-12.20	14.41		14.49	0.000173	2.19	4545.21	266.04	0.09
30	59.30	Max WS	9966.15	-6.87	14.19		14.26	0.000167	2.11	4720.80	285.74	0.09
30	58.30	Max WS	9966.12	-9.16	14.11		14.17	0.000171	1.94	5135.73	362.15	0.09
30	57.30	Max WS	9966.10	-9.58	14.04		14.11	0.000170	2.12	4703.55	286.60	0.09
30	56.30	Max WS	9966.07	-8.87	13.95		14.03	0.000164	2.15	4636.25	267.66	0.09
30	55.30	Max WS	9965.98	-8.00	13.86		13.91	0.000104	1.74	6787.91	723.30	0.07
30	54.30	Max WS	9965.93	-16.48	13.79		13.85	0.000155	2.07	5135.75	450.08	0.09
30	53.30	Max WS	9965.86	-6.77	13.71		13.77	0.000140	1.97	5656.92	483.18	0.08
30	52.30	Max WS	9965.80	-13.58	13.58		13.66	0.000184	2.27	4385.10	252.88	0.10
30	51.30	Max WS	9965.58	-14.52	13.05		13.15	0.000208	2.48	4134.03	280.31	0.10
30	50.30	Max WS	9965.49	-14.20	13.03		13.07	0.000111	1.77	6690.43	710.89	0.07
30	49.30	Max WS	9965.41	-14.57	12.92		13.00	0.000232	2.35	4234.76	278.86	0.11
30	48.30	Max WS	9965.35	-11.09	12.82		12.89	0.000155	2.13	4689.43	265.14	0.09
30	47.30	Max WS	9965.26	-17.87	12.78		12.82	0.000088	1.67	6836.93	578.35	0.07
30	46.30	Max WS	9965.15	-9.00	12.65		12.73	0.000186	2.24	4451.29	266.40	0.10
30	45.30	Max WS	9965.10	-15.34	12.62		12.67	0.000137	1.83	5443.89	354.48	0.08
30	44.30	Max WS	9964.97	-13.45	12.44		12.52	0.000179	2.18	4581.25	280.03	0.09
30	43.30	Max WS	9964.76	-15.10	12.10		12.19	0.000217	2.39	4161.24	252.65	0.10
30	41.30	Max WS	9964.64	-13.85	11.83		11.94	0.000253	2.67	3738.48	214.25	0.11
30	40.30	Max WS	9964.45	-9.71	11.50		11.59	0.000223	2.33	4277.35	278.32	0.10
30	39.30	Max WS	9964.30	-18.13	11.21		11.32	0.000247	2.64	3772.98	214.60	0.11
30	38.30	Max WS	9963.94	-10.67	10.60		10.70	0.000225	2.44	4089.93	247.94	0.11
30	37.301	Max WS	9963.63	-14.26	10.06		10.17	0.000267	2.66	3744.11	225.17	0.12
30	37.30	Max WS	9963.60	-16.74	10.01		10.11	0.000252	2.59	3840.42	228.09	0.11
30	36.302	Max WS	9963.59	-17.10	9.98		10.09	0.000379	2.64	3779.54	228.95	0.11
30	36.301	Max WS	9963.58	-17.10	9.97		10.08	0.000379	2.64	3778.17	228.93	0.11
30	36.30	Max WS	9963.58	-17.10	9.96		10.07	0.000380	2.64	3776.47	228.89	0.11
30	35.30	Max WS	9963.57	-17.58	9.95		10.05	0.000240	2.53	3935.44	235.79	0.11
30	34.301	Max WS	9963.54	-15.03	9.89		10.00	0.000251	2.61	3816.30	224.89	0.11
30	34.30	Max WS	9963.32	-13.40	9.46		9.59	0.000312	2.79	3570.17	226.10	0.12
30	33.30	Max WS	9962.34	-14.57	8.56		8.70	0.000356	3.02	3296.70	202.27	0.13
30	32.30	Max WS	9962.32	-16.60	7.43		7.61	0.000481	3.34	2984.64	197.19	0.15
30	31.30	Max WS	9962.29	-20.45	6.23		6.39	0.000425	3.25	3063.72	189.76	0.14
30	30.30	Max WS	9962.27	-17.40	5.51	-6.67	5.67	0.000501	3.26	3055.06	218.06	0.15
31	63.31	Max WS	38303.36	-7.20	16.50		17.74	0.000425	9.07	4552.52	290.72	0.35
31	62.31	Max WS	38303.30	-9.10	16.30		17.30	0.000352	8.10	4967.16	301.51	0.32
31	61.31	Max WS	38303.24	-9.34	15.24		16.80	0.000540	10.16	3961.36	231.95	0.40
31	60.31	Max WS	38303.19	-9.87	14.26		16.07	0.000686	10.88	3638.27	216.87	0.44
31	59.31	Max WS	38303.14	-15.24	13.40		15.12	0.000569	10.64	3758.12	209.11	0.41
31	58.31	Max WS	38303.08	-6.90	13.05	4.38	14.35	0.000505	9.23	4293.27	260.44	0.38

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                         HEC-RAS Version 4.1.0 Jan 2010
                          U.S. Army Corps of Engineers
                         Hydrologic Engineering Center
                               609 Second Street
                               Davis, California

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Project in English units

PLAN DATA

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Geometry Title: Existing
Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.g01

Flow Title   :
Flow File   :

Plan Description:
Existing Levee Geometry with 200 Year Hydrograph

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Plan Summary Information:
Number of:  Cross Sections =   58    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
26	78	Max WS	63866.00	-13.77	21.69		22.53	0.000330	7.42	9044.51	377.40	0.25
26	77	Max WS	63846.84	-9.30	20.64		21.34	0.000310	6.79	9899.11	468.18	0.24
26	76	Max WS	63837.81	-22.76	19.96		20.83	0.000332	7.61	9063.38	409.74	0.25
26	75	Max WS	63828.67	-8.24	19.82		20.38	0.000250	6.06	11195.56	544.72	0.21
30	74.30	Max WS	13443.22	-25.70	19.82		19.85	0.000051	1.42	9463.21	420.89	0.05
30	73.30	Max WS	13437.55	-3.00	19.70		19.76	0.000151	1.92	6981.71	454.87	0.09
30	72.30	Max WS	13433.73	-8.13	19.66		19.70	0.000086	1.68	9228.82	675.54	0.07
30	71.30	Max WS	13429.18	-5.30	19.56		19.64	0.000132	2.18	6572.87	438.28	0.08
30	70.30	Max WS	13421.30	-15.81	19.46		19.50	0.000086	1.69	8536.50	559.53	0.07
30	69.30	Max WS	13417.69	-7.58	19.32		19.41	0.000177	2.45	5487.30	275.21	0.10
30	68.30	Max WS	13414.04	-13.93	19.20		19.28	0.000129	2.31	6022.67	326.64	0.08
30	67.30	Max WS	13396.89	-10.24	19.13		19.14	0.000045	1.27	14197.21	1346.77	0.05
30	66.30	Max WS	13380.97	-12.13	18.86		18.98	0.000214	2.76	4853.39	229.18	0.11
30	65.30	Max WS	13378.10	-15.39	18.70		18.81	0.000207	2.63	5077.68	254.47	0.10
30	64.30	Max WS	13374.06	-6.27	18.53		18.62	0.000176	2.38	5630.89	295.69	0.10
30	63.30	Max WS	13367.11	-16.14	18.19		18.29	0.000205	2.60	5136.44	259.44	0.10
30	62.30	Max WS	13352.99	-8.52	18.14		18.18	0.000070	1.62	10052.07	809.23	0.06
30	61.30	Max WS	13346.37	-9.67	18.05		18.14	0.000164	2.38	5808.66	357.57	0.09
30	60.30	Max WS	13335.31	-12.20	17.66		17.75	0.000185	2.45	5435.65	282.23	0.10
30	59.30	Max WS	13329.23	-6.87	17.43		17.51	0.000175	2.35	5671.68	301.91	0.10
30	58.30	Max WS	13326.10	-9.16	17.35		17.42	0.000163	2.10	6345.07	383.79	0.09
30	57.30	Max WS	13324.16	-9.58	17.27		17.36	0.000178	2.35	5660.23	304.67	0.10
30	56.30	Max WS	13321.84	-8.87	17.18		17.27	0.000175	2.41	5520.74	280.19	0.10
30	55.30	Max WS	13314.38	-8.00	17.12		17.16	0.000084	1.75	9186.49	751.49	0.07
30	54.30	Max WS	13309.96	-16.48	17.04		17.11	0.000139	2.20	6632.42	470.45	0.09
30	53.30	Max WS	13305.10	-6.77	16.98		17.03	0.000121	2.07	7279.57	510.81	0.08
30	52.30	Max WS	13300.97	-13.58	16.83		16.93	0.000197	2.54	5230.77	267.45	0.10
30	51.30	Max WS	13288.44	-14.52	16.29		16.41	0.000205	2.75	5069.32	297.32	0.10
30	50.30	Max WS	13284.02	-14.20	16.29		16.33	0.000088	1.77	9034.27	726.23	0.07
30	49.30	Max WS	13280.17	-14.57	16.16		16.27	0.000231	2.57	5170.01	296.90	0.11
30	48.30	Max WS	13277.38	-11.09	16.07		16.16	0.000167	2.38	5573.01	279.57	0.09
30	47.30	Max WS	13272.98	-17.87	16.04		16.08	0.000078	1.75	8751.92	597.76	0.07
30	46.30	Max WS	13268.11	-9.00	15.90		15.99	0.000195	2.49	5338.89	282.00	0.10
30	45.30	Max WS	13266.03	-15.34	15.87		15.93	0.000141	1.99	6653.87	390.58	0.09
30	44.30	Max WS	13260.10	-13.45	15.68		15.77	0.000188	2.40	5522.68	301.31	0.10
30	43.30	Max WS	13251.74	-15.10	15.32		15.42	0.000228	2.65	5003.72	270.61	0.11
30	41.30	Max WS	13247.14	-13.85	15.02		15.16	0.000277	2.98	4447.54	229.91	0.12
30	40.30	Max WS	13240.22	-9.71	14.69		14.79	0.000223	2.55	5187.56	293.07	0.11
30	39.30	Max WS	13234.94	-18.13	14.37		14.51	0.000270	2.96	4473.45	228.38	0.12
30	38.30	Max WS	13223.37	-10.67	13.73		13.84	0.000235	2.71	4884.29	260.50	0.11
30	37.301	Max WS	13213.78	-14.26	13.15		13.28	0.000283	2.96	4457.22	237.36	0.12
30	37.30	Max WS	13212.92	-16.74	13.10		13.23	0.000268	2.90	4560.57	239.20	0.12
30	36.302	Max WS	13212.55	-17.10	13.06		13.20	0.000415	2.93	4507.87	243.10	0.12
30	36.301	Max WS	13212.48	-17.10	13.06		13.19	0.000416	2.93	4506.27	243.07	0.12
30	36.30	Max WS	13212.40	-17.10	13.05		13.18	0.000416	2.93	4504.29	243.03	0.12
30	35.30	Max WS	13212.03	-17.58	13.03		13.15	0.000258	2.82	4685.95	250.93	0.11
30	34.301	Max WS	13211.18	-15.03	12.97		13.10	0.000271	2.92	4529.00	238.20	0.12
30	34.30	Max WS	13182.55	-13.40	12.52		12.67	0.000326	3.08	4283.71	241.21	0.13
30	33.30	Max WS	13182.06	-14.57	11.56		11.73	0.000381	3.36	3920.63	214.79	0.14
30	32.30	Max WS	13181.18	-16.60	10.37		10.58	0.000500	3.68	3581.58	209.66	0.16
30	31.30	Max WS	13180.01	-20.45	9.08		9.29	0.000461	3.64	3621.18	200.71	0.15
30	30.30	Max WS	13179.23	-17.40	8.34	-5.50	8.54	0.000500	3.57	3688.03	228.20	0.16
31	63.31	Max WS	50385.45	-7.20	19.82		21.30	0.000425	10.02	5546.35	308.93	0.36
31	62.31	Max WS	50381.12	-9.10	19.66		20.86	0.000352	8.98	6015.14	324.36	0.33
31	61.31	Max WS	50376.76	-9.34	18.43		20.38	0.000559	11.39	4725.71	246.51	0.41
31	60.31	Max WS	50373.20	-9.87	17.37		19.63	0.000700	12.18	4328.09	226.31	0.46
31	59.31	Max WS	50368.93	-15.24	16.40		18.62	0.000619	12.12	4401.93	219.20	0.43
31	58.31	Max WS	50364.63	-6.90	16.20	6.38	17.80	0.000507	10.27	5130.70	271.47	0.39

```
                          HEC-RAS Version 4.1.0 Jan 2010
                           U.S. Army Corps of Engineers
                          Hydrologic Engineering Center
                                609 Second Street
                                Davis, California

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PROJECT DATA
Project Title: SJ Reach 30 with Bifurcation
Project File : SJReach30withBi.prj
Run Date and Time: 4/13/2010 12:52:40 PM

Project in English units



PLAN DATA

Plan Title: Alternative 1
Plan File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.p03

           Geometry Title: Alternative 1
           Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.g02

           Flow Title    :
           Flow File     :

Plan Description:
Alternative 1 Geometry with 100 year Hydrograph


Plan Summary Information:
Number of:  Cross Sections =   58    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
26	78	Max WS	48277.00	-13.77	18.23		18.87	0.000298	6.45	7765.32	362.02	0.23
26	77	Max WS	48276.77	-9.30	17.23		17.78	0.000292	5.99	8347.18	442.11	0.23
26	76	Max WS	48276.61	-22.76	16.65		17.32	0.000293	6.59	7743.49	388.76	0.23
26	75	Max WS	48276.44	-8.24	16.47		16.91	0.000237	5.36	9417.98	518.00	0.20
31	63.31	Max WS	38198.09	-7.20	16.47		17.70	0.000425	9.06	4543.58	290.56	0.35
31	62.31	Max WS	38198.00	-9.10	16.27		17.27	0.000352	8.09	4957.94	301.32	0.32
31	61.31	Max WS	38197.92	-9.34	15.21		16.77	0.000540	10.15	3954.69	231.82	0.40
31	60.31	Max WS	38197.86	-9.87	14.23		16.04	0.000686	10.87	3632.28	216.79	0.44
31	59.31	Max WS	38197.79	-15.24	13.37		15.09	0.000568	10.62	3752.64	209.02	0.41
31	58.31	Max WS	38197.71	-6.90	13.02	4.36	14.32	0.000504	9.21	4286.11	260.35	0.38
30	74.30	Max WS	10078.35	-25.70	16.47		16.50	0.000045	1.25	8089.10	399.79	0.05
30	73.30	Max WS	10078.24	-3.00	16.35		16.40	0.000158	1.82	5524.52	403.85	0.09
30	72.30	Max WS	10078.15	-8.13	16.30		16.33	0.000112	1.68	6989.08	655.23	0.07
30	71.30	Max WS	10078.03	-5.30	16.20		16.26	0.000144	2.02	5133.47	417.12	0.09
30	70.30	Max WS	10077.78	-15.81	16.08		16.12	0.000080	1.59	6743.46	478.28	0.06
30	69.30	Max WS	10077.57	-7.58	16.04		16.07	0.000079	1.54	8438.97	908.81	0.06
30	68.30	Max WS	10077.16	-13.93	15.99		16.01	0.000055	1.38	9741.42	1021.91	0.05
30	67.30	Max WS	10076.29	-10.24	15.90		15.93	0.000070	1.41	9889.21	1325.60	0.06
30	66.30	Max WS	10075.70	-12.13	15.66		15.75	0.000191	2.44	4137.72	217.12	0.10
30	65.30	Max WS	10075.58	-15.39	15.51		15.60	0.000190	2.35	4288.95	239.26	0.10
30	64.30	Max WS	10075.40	-6.27	15.35		15.42	0.000167	2.14	4714.76	279.33	0.09
30	63.30	Max WS	10070.39	-16.14	15.04		15.13	0.000172	2.31	4366.02	231.51	0.09
30	62.30	Max WS	10070.38	-8.52	14.98		15.02	0.000087	1.61	7545.96	774.80	0.07
30	61.30	Max WS	10070.37	-9.67	14.90		14.97	0.000170	2.17	4715.32	336.35	0.09
30	60.30	Max WS	10070.31	-12.20	14.52		14.60	0.000173	2.20	4574.78	266.60	0.09
30	59.30	Max WS	10070.25	-6.87	14.30		14.37	0.000167	2.12	4752.49	286.29	0.09
30	58.30	Max WS	10070.21	-9.16	14.22		14.28	0.000170	1.95	5175.99	362.89	0.09
30	57.30	Max WS	10070.19	-9.58	14.15		14.22	0.000170	2.13	4735.36	287.22	0.09
30	56.30	Max WS	10070.16	-8.87	14.06		14.14	0.000165	2.16	4665.91	268.09	0.09
30	55.30	Max WS	10070.04	-8.00	13.98		14.02	0.000103	1.74	6868.69	724.32	0.07
30	54.30	Max WS	10069.98	-16.48	13.90		13.97	0.000154	2.08	5186.02	450.78	0.09
30	53.30	Max WS	10069.90	-6.77	13.82		13.88	0.000139	1.98	5711.18	484.16	0.08
30	52.30	Max WS	10069.83	-13.58	13.69		13.77	0.000184	2.28	4413.40	253.39	0.10
30	51.30	Max WS	10069.57	-14.52	13.17		13.26	0.000208	2.49	4165.37	280.90	0.10
30	50.30	Max WS	10069.47	-14.20	13.14		13.18	0.000110	1.77	6770.49	711.42	0.07
30	49.30	Max WS	10069.38	-14.57	13.03		13.11	0.000232	2.36	4266.08	279.48	0.11
30	48.30	Max WS	10069.31	-11.09	12.94		13.01	0.000156	2.13	4719.18	265.64	0.09
30	47.30	Max WS	10069.20	-17.87	12.89		12.93	0.000088	1.67	6902.13	578.97	0.07
30	46.30	Max WS	10069.08	-9.00	12.76		12.84	0.000186	2.25	4481.25	266.84	0.10
30	45.30	Max WS	10069.02	-15.34	12.73		12.78	0.000137	1.84	5483.85	355.68	0.08
30	44.30	Max WS	10068.87	-13.45	12.55		12.63	0.000180	2.18	4612.70	280.77	0.09
30	43.30	Max WS	10068.65	-15.10	12.21		12.30	0.000217	2.40	4189.43	253.29	0.10
30	41.30	Max WS	10068.51	-13.85	11.94		12.05	0.000254	2.68	3762.21	214.80	0.11
30	40.30	Max WS	10068.30	-9.71	11.61		11.70	0.000223	2.34	4308.12	278.83	0.10
30	39.30	Max WS	10068.14	-18.13	11.32		11.43	0.000248	2.65	3796.54	215.07	0.11
30	38.30	Max WS	10067.75	-10.67	10.71		10.80	0.000225	2.45	4116.79	248.38	0.11
30	37.301	Max WS	10067.41	-14.26	10.16		10.27	0.000267	2.67	3768.22	225.54	0.12
30	37.30	Max WS	10067.38	-16.74	10.12		10.22	0.000252	2.60	3864.83	228.44	0.11
30	36.302	Max WS	10067.36	-17.10	10.08		10.19	0.000380	2.65	3804.04	229.44	0.11
30	36.301	Max WS	10067.36	-17.10	10.08		10.19	0.000381	2.65	3802.66	229.42	0.11
30	36.30	Max WS	10067.36	-17.10	10.07		10.18	0.000381	2.65	3800.95	229.38	0.11
30	35.30	Max WS	10067.35	-17.58	10.05		10.15	0.000241	2.54	3960.65	236.31	0.11
30	34.301	Max WS	10067.32	-15.03	10.00		10.11	0.000252	2.62	3840.30	225.35	0.11
30	34.30	Max WS	10066.23	-13.40	9.57		9.69	0.000313	2.80	3594.12	226.62	0.12
30	33.30	Max WS	10066.21	-14.57	8.67		8.81	0.000357	3.03	3317.70	202.66	0.13
30	32.30	Max WS	10066.17	-16.60	7.53		7.71	0.000481	3.35	3004.65	197.62	0.15
30	31.30	Max WS	10066.11	-20.45	6.32		6.49	0.000426	3.27	3082.42	190.13	0.14
30	30.30	Max WS	10066.08	-17.40	5.60	-6.63	5.77	0.000501	3.27	3076.39	218.43	0.15

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                         Hydrologic Engineering Center
                               609 Second Street
                               Davis, California

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PROJECT DATA
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Project File : SJReach30withBi.prj
Run Date and Time: 4/13/2010 4:41:32 PM

Project in English units



PLAN DATA

Plan Title: Alternative 1 200 year
Plan File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.p06

           Geometry Title: Alternative 1
           Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.g02

           Flow Title    :
           Flow File     :

Plan Description:
Alternative 1 Geometry with 200 year Hydrograph


Plan Summary Information:
Number of:  Cross Sections =   58    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
26	78	Max WS	63866.00	-13.77	21.66		22.50	0.000331	7.43	9031.11	377.24	0.25
26	77	Max WS	63846.41	-9.30	20.60		21.30	0.000312	6.81	9879.82	467.87	0.24
26	76	Max WS	63837.15	-22.76	19.91		20.79	0.000334	7.62	9045.03	409.45	0.25
26	75	Max WS	63827.76	-8.24	19.77		20.33	0.000252	6.07	11170.26	544.29	0.21
31	63.31	Max WS	50212.19	-7.20	19.77		21.25	0.000425	10.01	5532.00	308.66	0.36
31	62.31	Max WS	50207.74	-9.10	19.61		20.82	0.000352	8.97	6000.05	324.03	0.33
31	61.31	Max WS	50203.27	-9.34	18.39		20.33	0.000559	11.38	4714.71	246.30	0.41
31	60.31	Max WS	50199.61	-9.87	17.33		19.58	0.000700	12.16	4318.14	226.18	0.46
31	59.31	Max WS	50195.21	-15.24	16.36		18.57	0.000619	12.10	4392.39	219.05	0.43
31	58.31	Max WS	50190.80	-6.90	16.16	6.36	17.75	0.000507	10.26	5118.38	271.30	0.39
30	74.30	Max WS	13615.57	-25.70	19.77		19.81	0.000052	1.44	9443.66	420.60	0.05
30	73.30	Max WS	13609.89	-3.00	19.65		19.71	0.000157	1.96	6958.68	454.47	0.09
30	72.30	Max WS	13605.96	-8.13	19.61		19.65	0.000090	1.71	9193.63	675.23	0.07
30	71.30	Max WS	13601.26	-5.30	19.51		19.58	0.000137	2.22	6548.56	437.90	0.09
30	70.30	Max WS	13593.11	-15.81	19.40		19.44	0.000089	1.72	8503.34	558.64	0.07
30	69.30	Max WS	13586.51	-7.58	19.37		19.39	0.000061	1.48	11505.93	936.26	0.06
30	68.30	Max WS	13574.06	-13.93	19.33		19.35	0.000042	1.35	13184.91	1042.59	0.05
30	67.30	Max WS	13549.33	-10.24	19.27		19.29	0.000044	1.27	14387.99	1347.70	0.05
30	66.30	Max WS	13533.08	-12.13	19.00		19.12	0.000214	2.77	4885.75	229.71	0.11
30	65.30	Max WS	13530.15	-15.39	18.85		18.95	0.000208	2.65	5113.51	255.14	0.10
30	64.30	Max WS	13526.04	-6.27	18.67		18.76	0.000176	2.38	5672.39	296.41	0.10
30	63.30	Max WS	13518.95	-16.14	18.33		18.43	0.000206	2.61	5172.41	260.73	0.10
30	62.30	Max WS	13504.59	-8.52	18.28		18.32	0.000069	1.62	10164.87	810.67	0.06
30	61.30	Max WS	13497.85	-9.67	18.19		18.28	0.000163	2.39	5858.36	358.50	0.09
30	60.30	Max WS	13486.60	-12.20	17.80		17.89	0.000186	2.46	5474.69	282.91	0.10
30	59.30	Max WS	13480.42	-6.87	17.57		17.65	0.000175	2.36	5713.28	302.60	0.10
30	58.30	Max WS	13477.23	-9.16	17.49		17.56	0.000163	2.11	6398.08	384.72	0.09
30	57.30	Max WS	13475.26	-9.58	17.41		17.50	0.000179	2.36	5702.24	305.43	0.10
30	56.30	Max WS	13472.90	-8.87	17.32		17.41	0.000176	2.42	5559.28	280.72	0.10
30	55.30	Max WS	13465.32	-8.00	17.25		17.29	0.000083	1.75	9290.49	752.65	0.07
30	54.30	Max WS	13460.83	-16.48	17.18		17.25	0.000138	2.21	6697.57	471.31	0.09
30	53.30	Max WS	13455.89	-6.77	17.11		17.17	0.000121	2.07	7350.57	511.97	0.08
30	52.30	Max WS	13451.68	-13.58	16.97		17.07	0.000197	2.55	5267.78	268.06	0.10
30	51.30	Max WS	13438.89	-14.52	16.43		16.55	0.000205	2.76	5110.39	298.04	0.10
30	50.30	Max WS	13434.38	-14.20	16.43		16.47	0.000087	1.77	9135.18	726.88	0.07
30	49.30	Max WS	13430.45	-14.57	16.30		16.41	0.000231	2.58	5211.15	297.67	0.11
30	48.30	Max WS	13427.62	-11.09	16.21		16.29	0.000168	2.39	5611.68	280.18	0.09
30	47.30	Max WS	13423.15	-17.87	16.18		16.22	0.000078	1.75	8834.95	598.67	0.07
30	46.30	Max WS	13418.21	-9.00	16.03		16.13	0.000195	2.50	5377.93	282.80	0.10
30	45.30	Max WS	13416.10	-15.34	16.01		16.07	0.000141	2.00	6708.06	392.21	0.09
30	44.30	Max WS	13410.09	-13.45	15.82		15.91	0.000188	2.41	5564.30	302.22	0.10
30	43.30	Max WS	13401.56	-15.10	15.45		15.56	0.000228	2.66	5040.89	271.34	0.11
30	41.30	Max WS	13396.86	-13.85	15.16		15.30	0.000277	2.99	4478.90	230.58	0.12
30	40.30	Max WS	13389.80	-9.71	14.82		14.93	0.000223	2.56	5227.46	293.70	0.11
30	39.30	Max WS	13384.41	-18.13	14.51		14.65	0.000270	2.97	4504.34	228.96	0.12
30	38.30	Max WS	13372.56	-10.67	13.86		13.98	0.000236	2.72	4919.16	261.04	0.11
30	37.301	Max WS	13333.33	-14.26	13.28		13.42	0.000283	2.97	4488.73	238.02	0.12
30	37.30	Max WS	13333.32	-16.74	13.23		13.36	0.000267	2.90	4592.34	239.81	0.12
30	36.302	Max WS	13333.32	-17.10	13.20		13.33	0.000415	2.94	4540.18	243.71	0.12
30	36.301	Max WS	13333.31	-17.10	13.19		13.32	0.000415	2.94	4538.57	243.68	0.12
30	36.30	Max WS	13333.31	-17.10	13.18		13.32	0.000416	2.94	4536.59	243.64	0.12
30	35.30	Max WS	13333.31	-17.58	13.16		13.29	0.000257	2.83	4719.32	251.58	0.11
30	34.301	Max WS	13333.29	-15.03	13.10		13.24	0.000270	2.92	4560.68	238.78	0.12
30	34.30	Max WS	13333.08	-13.40	12.65		12.80	0.000326	3.09	4315.62	241.86	0.13
30	33.30	Max WS	13332.34	-14.57	11.69		11.86	0.000382	3.38	3948.48	215.37	0.14
30	32.30	Max WS	13331.23	-16.60	10.49		10.71	0.000500	3.69	3608.21	210.20	0.16
30	31.30	Max WS	13329.85	-20.45	9.21		9.41	0.000463	3.66	3646.07	201.18	0.15
30	30.30	Max WS	13328.94	-17.40	8.47	-5.45	8.67	0.000500	3.59	3716.17	228.63	0.16

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                     U.S. Army Corps of Engineers
                    Hydrologic Engineering Center
                          609 Second Street
                          Davis, California

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PROJECT DATA
Project Title: SJ Reach 30 with Bifurcation
Project File : SJReach30withBi.prj
Run Date and Time: 4/13/2010 12:54:40 PM

Project in English units

PLAN DATA

Plan Title: Alternative 1 and 2
Plan File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.p05

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           Geometry Title: Alternative 1 and 2
           Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.g03

           Flow Title    :
           Flow File     :
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Plan Description:
Alternative 1 and 2 Geometry with 100 Year Hydrograph

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Plan Summary Information:
Number of:  Cross Sections =   58    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
26	78	Max WS	48277.00	-13.77	18.21		18.85	0.000299	6.46	7757.88	361.92	0.23
26	77	Max WS	48276.71	-9.30	17.21		17.76	0.000293	6.00	8336.33	441.70	0.23
26	76	Max WS	48276.53	-22.76	16.63		17.29	0.000294	6.60	7733.20	388.60	0.23
26	75	Max WS	48276.32	-8.24	16.44		16.88	0.000238	5.36	9403.69	517.81	0.20
31	63.31	Max WS	38103.54	-7.20	16.44		17.67	0.000424	9.05	4535.57	290.42	0.35
31	62.31	Max WS	38103.44	-9.10	16.25		17.24	0.000352	8.08	4949.66	301.15	0.32
31	61.31	Max WS	38103.35	-9.34	15.18		16.74	0.000540	10.14	3948.70	231.70	0.40
31	60.31	Max WS	38103.27	-9.87	14.21		16.01	0.000685	10.86	3626.90	216.71	0.44
31	59.31	Max WS	38103.19	-15.24	13.35		15.07	0.000567	10.61	3747.72	208.94	0.41
31	58.31	Max WS	38103.10	-6.90	13.00	4.35	14.29	0.000504	9.20	4279.68	260.26	0.38
30	74.30	Max WS	10172.79	-25.70	16.44		16.47	0.000046	1.26	8078.07	399.61	0.05
30	73.30	Max WS	10172.66	-3.00	16.32		16.37	0.000162	1.85	5512.21	403.20	0.09
30	72.30	Max WS	10172.55	-8.13	16.27		16.30	0.000116	1.71	6968.22	655.04	0.08
30	71.30	Max WS	10172.41	-5.30	16.16		16.23	0.000148	2.05	5119.11	416.92	0.09
30	70.30	Max WS	10172.13	-15.81	16.05		16.08	0.000082	1.61	6725.58	476.95	0.07
30	69.30	Max WS	10171.88	-7.58	16.00		16.03	0.000081	1.56	8403.83	908.49	0.06
30	68.30	Max WS	10171.42	-13.93	15.95		15.97	0.000056	1.40	9700.44	1021.66	0.05
30	67.30	Max WS	10170.42	-10.24	15.86		15.88	0.000072	1.43	9832.00	1325.32	0.06
30	66.30	Max WS	10169.74	-12.13	15.61		15.70	0.000196	2.46	4126.86	216.93	0.10
30	65.30	Max WS	10169.60	-15.39	15.46		15.54	0.000195	2.38	4276.00	239.01	0.10
30	64.30	Max WS	10163.69	-6.27	15.29		15.36	0.000172	2.16	4698.35	279.03	0.09
30	63.30	Max WS	10163.65	-16.14	14.98		15.06	0.000177	2.34	4350.45	231.08	0.09
30	62.30	Max WS	10163.57	-8.52	14.91		14.95	0.000090	1.64	7492.22	773.94	0.07
30	61.30	Max WS	10163.54	-9.67	14.83		14.90	0.000176	2.20	4691.19	335.87	0.09
30	60.30	Max WS	10163.38	-12.20	14.44		14.52	0.000179	2.23	4552.34	266.18	0.10
30	59.30	Max WS	10163.25	-6.87	14.21		14.28	0.000173	2.15	4726.21	285.83	0.09
30	58.30	Max WS	10163.17	-9.16	14.12		14.18	0.000177	1.98	5141.46	362.25	0.09
30	57.30	Max WS	10163.12	-9.58	14.05		14.12	0.000176	2.16	4707.32	286.68	0.09
30	56.30	Max WS	10163.06	-8.87	13.96		14.04	0.000171	2.19	4638.92	267.69	0.09
30	55.30	Max WS	10162.85	-8.00	13.87		13.92	0.000108	1.78	6792.71	723.36	0.07
30	54.30	Max WS	10162.73	-16.48	13.79		13.86	0.000161	2.11	5137.40	450.10	0.09
30	53.30	Max WS	10162.58	-6.77	13.71		13.77	0.000146	2.01	5657.19	483.18	0.09
30	52.30	Max WS	10162.45	-13.58	13.58		13.66	0.000191	2.32	4383.92	252.86	0.10
30	51.30	Max WS	10157.21	-14.52	13.03		13.13	0.000217	2.54	4126.25	280.17	0.10
30	50.30	Max WS	10157.21	-14.20	13.00		13.04	0.000117	1.81	6669.63	710.76	0.08
30	49.30	Max WS	10157.20	-14.57	12.97		12.99	0.000091	1.45	9068.82	1146.23	0.07
30	48.30	Max WS	10157.18	-11.09	12.93		12.95	0.000055	1.25	11223.53	1417.38	0.05
30	47.30	Max WS	10157.16	-17.87	12.92		12.93	0.000032	1.01	13632.03	1423.70	0.04
30	46.30	Max WS	10157.13	-9.00	12.88		12.90	0.000076	1.37	9923.17	1309.27	0.06
30	45.30	Max WS	10157.12	-15.34	12.83		12.87	0.000109	1.59	7322.99	829.60	0.07
30	44.30	Max WS	10157.09	-13.45	12.65		12.73	0.000180	2.19	4639.82	281.40	0.10
30	43.30	Max WS	10157.06	-15.10	12.30		12.39	0.000217	2.41	4213.77	253.84	0.10
30	41.30	Max WS	10157.03	-13.85	12.04		12.15	0.000255	2.69	3782.71	215.26	0.11
30	40.30	Max WS	10156.97	-9.71	11.71		11.79	0.000223	2.34	4334.70	279.27	0.10
30	39.30	Max WS	10156.92	-18.13	11.42		11.53	0.000248	2.66	3816.91	215.49	0.11
30	38.30	Max WS	10156.79	-10.67	10.81		10.90	0.000225	2.45	4140.06	248.76	0.11
30	37.301	Max WS	10156.67	-14.26	10.25		10.37	0.000267	2.68	3789.15	225.86	0.12
30	37.30	Max WS	10156.65	-16.74	10.21		10.31	0.000253	2.61	3886.01	228.73	0.11
30	36.302	Max WS	10156.65	-17.10	10.18		10.29	0.000381	2.66	3825.30	229.87	0.11
30	36.301	Max WS	10156.65	-17.10	10.17		10.28	0.000382	2.66	3823.92	229.84	0.11
30	36.30	Max WS	10156.64	-17.10	10.16		10.27	0.000382	2.66	3822.20	229.80	0.11
30	35.30	Max WS	10156.64	-17.58	10.15		10.25	0.000241	2.55	3982.55	236.77	0.11
30	34.301	Max WS	10156.63	-15.03	10.09		10.20	0.000252	2.63	3861.14	225.75	0.11
30	34.30	Max WS	10156.53	-13.40	9.66		9.78	0.000313	2.81	3614.90	227.07	0.12
30	33.30	Max WS	10156.35	-14.57	8.76		8.90	0.000357	3.04	3335.91	203.01	0.13
30	32.30	Max WS	10156.17	-16.60	7.62		7.80	0.000482	3.36	3022.00	197.99	0.15
30	31.30	Max WS	10155.98	-20.45	6.41		6.58	0.000427	3.28	3098.63	190.46	0.14
30	30.30	Max WS	10155.86	-17.40	5.69	-6.60	5.86	0.000501	3.28	3094.87	218.76	0.15

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                               Davis, California

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Project File : SJReach30withBi.prj
Run Date and Time: 4/13/2010 4:43:22 PM

Project in English units



PLAN DATA

Plan Title: Alternative 1 and 2 200 year
Plan File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.p08

           Geometry Title: Alternative 1 and 2
           Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.g03

           Flow Title    :
           Flow File     :

Plan Description:
Alternative 1 and 2 Geometry with 200 Year Hydrograph


Plan Summary Information:
Number of:  Cross Sections =   58    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
26	78	Max WS	63866.00	-13.77	21.62		22.46	0.000333	7.44	9017.53	377.08	0.25
26	77	Max WS	63846.13	-9.30	20.55		21.26	0.000314	6.82	9860.23	467.57	0.24
26	76	Max WS	63836.73	-22.76	19.87		20.75	0.000336	7.64	9026.37	409.16	0.25
26	75	Max WS	63827.19	-8.24	19.73		20.29	0.000253	6.09	11144.54	543.84	0.21
31	63.31	Max WS	50035.77	-7.20	19.73		21.20	0.000425	10.00	5517.42	308.38	0.36
31	62.31	Max WS	50031.25	-9.10	19.56		20.77	0.000352	8.95	5984.72	323.69	0.33
31	61.31	Max WS	50026.70	-9.34	18.34		20.28	0.000559	11.36	4703.52	246.10	0.41
31	60.31	Max WS	50022.98	-9.87	17.29		19.53	0.000700	12.15	4308.02	226.04	0.46
31	59.31	Max WS	50018.51	-15.24	16.32		18.52	0.000618	12.08	4382.70	218.90	0.43
31	58.31	Max WS	50014.02	-6.90	16.11	6.33	17.70	0.000507	10.24	5105.86	271.12	0.39
30	74.30	Max WS	13791.42	-25.70	19.73		19.76	0.000054	1.46	9423.79	420.30	0.05
30	73.30	Max WS	13785.63	-3.00	19.60		19.66	0.000162	1.99	6935.22	454.06	0.09
30	72.30	Max WS	13781.63	-8.13	19.56		19.60	0.000093	1.74	9157.73	674.91	0.07
30	71.30	Max WS	13776.83	-5.30	19.45		19.53	0.000142	2.25	6523.72	437.52	0.09
30	70.30	Max WS	13768.49	-15.81	19.34		19.38	0.000093	1.75	8469.45	557.72	0.07
30	69.30	Max WS	13761.73	-7.58	19.30		19.33	0.000063	1.51	11447.87	935.75	0.06
30	68.30	Max WS	13748.97	-13.93	19.26		19.29	0.000044	1.37	13118.58	1042.20	0.05
30	67.30	Max WS	13723.60	-10.24	19.20		19.22	0.000046	1.29	14298.92	1347.26	0.05
30	66.30	Max WS	13706.91	-12.13	18.93		19.05	0.000222	2.82	4868.33	229.43	0.11
30	65.30	Max WS	13703.88	-15.39	18.76		18.88	0.000216	2.69	5092.64	254.75	0.11
30	64.30	Max WS	13699.63	-6.27	18.58		18.67	0.000183	2.43	5646.16	295.96	0.10
30	63.30	Max WS	13692.26	-16.14	18.23		18.33	0.000214	2.66	5145.93	259.78	0.11
30	62.30	Max WS	13677.26	-8.52	18.18		18.21	0.000073	1.65	10080.35	809.59	0.06
30	61.30	Max WS	13670.22	-9.67	18.08		18.17	0.000171	2.44	5819.67	357.77	0.10
30	60.30	Max WS	13658.41	-12.20	17.67		17.77	0.000194	2.51	5439.24	282.29	0.10
30	59.30	Max WS	13651.88	-6.87	17.43		17.52	0.000183	2.41	5672.15	301.92	0.10
30	58.30	Max WS	13648.51	-9.16	17.35		17.42	0.000172	2.15	6344.17	383.78	0.09
30	57.30	Max WS	13646.42	-9.58	17.27		17.36	0.000187	2.41	5658.35	304.63	0.10
30	56.30	Max WS	13643.91	-8.87	17.17		17.27	0.000184	2.47	5517.72	280.14	0.10
30	55.30	Max WS	13635.83	-8.00	17.10		17.14	0.000088	1.79	9175.81	751.37	0.07
30	54.30	Max WS	13631.05	-16.48	17.02		17.10	0.000146	2.26	6623.88	470.33	0.09
30	53.30	Max WS	13625.77	-6.77	16.95		17.01	0.000128	2.12	7268.50	510.63	0.08
30	52.30	Max WS	13621.28	-13.58	16.80		16.91	0.000207	2.61	5222.95	267.32	0.10
30	51.30	Max WS	13607.55	-14.52	16.23		16.35	0.000217	2.82	5051.49	297.00	0.11
30	50.30	Max WS	13602.67	-14.20	16.23		16.27	0.000093	1.82	8990.20	725.94	0.07
30	49.30	Max WS	13594.17	-14.57	16.21		16.23	0.000060	1.31	12830.76	1173.56	0.06
30	48.30	Max WS	13580.07	-11.09	16.19		16.21	0.000037	1.14	15922.64	1468.47	0.04
30	47.30	Max WS	13565.77	-17.87	16.18		16.19	0.000024	0.97	18357.00	1474.53	0.04
30	46.30	Max WS	13550.22	-9.00	16.15		16.17	0.000048	1.22	14287.68	1355.27	0.05
30	45.30	Max WS	13542.57	-15.34	16.11		16.15	0.000085	1.54	10135.72	884.09	0.07
30	44.30	Max WS	13531.39	-13.45	15.93		16.02	0.000189	2.42	5596.53	302.92	0.10
30	43.30	Max WS	13522.07	-15.10	15.56		15.67	0.000229	2.67	5069.62	271.90	0.11
30	41.30	Max WS	13469.69	-13.85	15.27		15.41	0.000276	2.99	4503.46	231.10	0.12
30	40.30	Max WS	13469.37	-9.71	14.93		15.03	0.000222	2.56	5259.38	294.20	0.11
30	39.30	Max WS	13468.97	-18.13	14.62		14.76	0.000270	2.97	4529.49	229.44	0.12
30	38.30	Max WS	13467.54	-10.67	13.97		14.09	0.000235	2.72	4948.48	261.49	0.11
30	37.301	Max WS	13465.91	-14.26	13.39		13.53	0.000283	2.98	4515.69	238.59	0.12
30	37.30	Max WS	13465.74	-16.74	13.34		13.47	0.000268	2.92	4619.46	240.33	0.12
30	36.302	Max WS	13465.67	-17.10	13.31		13.44	0.000416	2.95	4567.71	244.23	0.12
30	36.301	Max WS	13465.66	-17.10	13.30		13.44	0.000417	2.95	4566.10	244.20	0.12
30	36.30	Max WS	13465.64	-17.10	13.29		13.43	0.000417	2.95	4564.11	244.16	0.12
30	35.30	Max WS	13465.57	-17.58	13.28		13.40	0.000258	2.84	4747.73	252.14	0.12
30	34.301	Max WS	13465.40	-15.03	13.22		13.35	0.000271	2.94	4587.58	239.26	0.12
30	34.30	Max WS	13464.07	-13.40	12.76		12.91	0.000327	3.10	4342.60	242.41	0.13
30	33.30	Max WS	13461.47	-14.57	11.80		11.97	0.000383	3.39	3971.94	215.86	0.14
30	32.30	Max WS	13458.72	-16.60	10.60		10.81	0.000501	3.71	3630.54	210.65	0.16
30	31.30	Max WS	13455.76	-20.45	9.31		9.52	0.000464	3.67	3666.89	201.58	0.15
30	30.30	Max WS	13453.92	-17.40	8.57	-5.41	8.77	0.000500	3.60	3739.70	228.98	0.16

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                               Davis, California

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PROJECT DATA
Project Title: SJ Reach 30 with Bifurcation
Project File : SJReach30withBi.prj
Run Date and Time: 4/13/2010 1:08:29 PM

Project in English units



PLAN DATA

Plan Title: Alternative 2
Plan File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.p04

           Geometry Title: Alternative 2
           Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.g04

           Flow Title    :
           Flow File     :

Plan Description:
Alternative 2 Levee Geometry with 100 Year Hydrograph


Plan Summary Information:
Number of:  Cross Sections =   58    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
26	78	Max WS	48277.00	-13.77	18.24		18.87	0.000298	6.45	7766.53	362.03	0.23
26	77	Max WS	48276.80	-9.30	17.24		17.79	0.000292	5.99	8348.94	442.17	0.23
26	76	Max WS	48276.66	-22.76	16.66		17.32	0.000293	6.59	7745.15	388.79	0.23
26	75	Max WS	48276.50	-8.24	16.48		16.92	0.000236	5.35	9420.30	518.03	0.20
31	63.31	Max WS	38213.35	-7.20	16.48		17.71	0.000425	9.06	4544.88	290.59	0.35
31	62.31	Max WS	38213.27	-9.10	16.28		17.27	0.000352	8.09	4959.28	301.35	0.32
31	61.31	Max WS	38213.20	-9.34	15.21		16.77	0.000540	10.15	3955.66	231.84	0.40
31	60.31	Max WS	38213.14	-9.87	14.24		16.05	0.000686	10.87	3633.15	216.80	0.44
31	59.31	Max WS	38213.08	-15.24	13.38		15.10	0.000568	10.63	3753.43	209.03	0.41
31	58.31	Max WS	38213.01	-6.90	13.03	4.36	14.33	0.000505	9.22	4287.15	260.36	0.38
30	74.30	Max WS	10063.16	-25.70	16.48		16.50	0.000045	1.24	8090.88	399.82	0.05
30	73.30	Max WS	10063.06	-3.00	16.35		16.40	0.000158	1.82	5526.51	403.96	0.09
30	72.30	Max WS	10062.98	-8.13	16.30		16.34	0.000112	1.68	6992.45	655.26	0.07
30	71.30	Max WS	10062.86	-5.30	16.20		16.26	0.000144	2.02	5135.79	417.15	0.09
30	70.30	Max WS	10062.63	-15.81	16.09		16.13	0.000080	1.59	6746.35	478.71	0.06
30	69.30	Max WS	10062.52	-7.58	15.97		16.05	0.000167	2.19	4589.49	260.59	0.09
30	68.30	Max WS	10062.41	-13.93	15.86		15.92	0.000126	2.06	4960.19	308.33	0.08
30	67.30	Max WS	10061.77	-10.24	15.75		15.77	0.000073	1.44	9681.06	1324.57	0.06
30	66.30	Max WS	10061.14	-12.13	15.49		15.58	0.000195	2.45	4102.18	216.50	0.10
30	65.30	Max WS	10061.02	-15.39	15.34		15.43	0.000194	2.37	4248.88	238.47	0.10
30	64.30	Max WS	10055.05	-6.27	15.17		15.24	0.000171	2.15	4666.66	278.43	0.09
30	63.30	Max WS	10055.03	-16.14	14.86		14.95	0.000176	2.33	4324.49	230.35	0.09
30	62.30	Max WS	10054.97	-8.52	14.80		14.84	0.000091	1.64	7405.07	770.04	0.07
30	61.30	Max WS	10054.95	-9.67	14.72		14.79	0.000176	2.19	4653.48	335.11	0.09
30	60.30	Max WS	10054.81	-12.20	14.33		14.40	0.000179	2.22	4522.65	265.62	0.09
30	59.30	Max WS	10054.70	-6.87	14.10		14.17	0.000173	2.14	4694.42	285.28	0.09
30	58.30	Max WS	10054.63	-9.16	14.01		14.07	0.000177	1.97	5101.10	361.51	0.09
30	57.30	Max WS	10054.59	-9.58	13.94		14.01	0.000176	2.15	4675.43	286.06	0.09
30	56.30	Max WS	10054.54	-8.87	13.85		13.93	0.000170	2.18	4609.21	267.26	0.09
30	55.30	Max WS	10054.34	-8.00	13.76		13.80	0.000109	1.78	6711.70	722.34	0.07
30	54.30	Max WS	10054.23	-16.48	13.68		13.75	0.000161	2.11	5087.01	449.40	0.09
30	53.30	Max WS	10054.10	-6.77	13.60		13.66	0.000147	2.01	5602.89	482.20	0.09
30	52.30	Max WS	10053.98	-13.58	13.47		13.55	0.000191	2.31	4355.62	252.35	0.10
30	51.30	Max WS	10053.57	-14.52	12.92		13.01	0.000218	2.53	4095.06	279.58	0.10
30	50.30	Max WS	10053.40	-14.20	12.88		12.93	0.000118	1.82	6589.76	710.23	0.08
30	49.30	Max WS	10053.10	-14.57	12.86		12.88	0.000093	1.45	8939.26	1145.28	0.07
30	48.30	Max WS	10052.60	-11.09	12.82		12.84	0.000058	1.20	11062.18	1415.60	0.05
30	47.30	Max WS	10052.08	-17.87	12.80		12.81	0.000033	1.02	13467.41	1421.98	0.04
30	46.30	Max WS	10051.52	-9.00	12.76		12.78	0.000078	1.38	9770.65	1307.63	0.06
30	45.30	Max WS	10048.75	-15.34	12.71		12.75	0.000110	1.60	7226.07	827.72	0.07
30	44.30	Max WS	10048.75	-13.45	12.53		12.61	0.000180	2.18	4607.02	280.64	0.09
30	43.30	Max WS	10048.73	-15.10	12.19		12.28	0.000217	2.40	4184.37	253.17	0.10
30	41.30	Max WS	10048.71	-13.85	11.92		12.03	0.000254	2.67	3757.96	214.70	0.11
30	40.30	Max WS	10048.67	-9.71	11.59		11.68	0.000223	2.34	4302.63	278.74	0.10
30	39.30	Max WS	10048.63	-18.13	11.30		11.41	0.000248	2.65	3792.35	214.99	0.11
30	38.30	Max WS	10048.53	-10.67	10.69		10.79	0.000225	2.44	4112.04	248.31	0.11
30	37.301	Max WS	10048.42	-14.26	10.14		10.25	0.000267	2.67	3763.98	225.47	0.12
30	37.30	Max WS	10048.41	-16.74	10.10		10.20	0.000252	2.60	3860.54	228.38	0.11
30	36.302	Max WS	10048.41	-17.10	10.07		10.17	0.000380	2.64	3799.73	229.36	0.11
30	36.301	Max WS	10048.41	-17.10	10.06		10.17	0.000380	2.65	3798.35	229.33	0.11
30	36.30	Max WS	10048.41	-17.10	10.05		10.16	0.000381	2.65	3796.65	229.30	0.11
30	35.30	Max WS	10048.40	-17.58	10.04		10.14	0.000241	2.54	3956.22	236.22	0.11
30	34.301	Max WS	10048.39	-15.03	9.98		10.09	0.000252	2.62	3836.08	225.27	0.11
30	34.30	Max WS	10048.31	-13.40	9.55		9.67	0.000313	2.80	3589.90	226.53	0.12
30	33.30	Max WS	10048.15	-14.57	8.65		8.79	0.000356	3.03	3314.00	202.60	0.13
30	32.30	Max WS	10047.99	-16.60	7.52		7.69	0.000481	3.35	3001.12	197.54	0.15
30	31.30	Max WS	10047.82	-20.45	6.31		6.47	0.000426	3.26	3079.11	190.07	0.14
30	30.30	Max WS	10047.71	-17.40	5.59	-6.64	5.75	0.000501	3.27	3072.62	218.37	0.15

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                      HEC-RAS Version 4.1.0 Jan 2010
                       U.S. Army Corps of Engineers
                      Hydrologic Engineering Center
                            609 Second Street
                            Davis, California

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PROJECT DATA
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Project File : SJReach30withBi.prj
Run Date and Time: 4/13/2010 4:42:25 PM

Project in English units



PLAN DATA

Plan Title: Alternative 2 200 year
Plan File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.p07

           Geometry Title: Alternative 2
           Geometry File : C:\Documents and Settings\default\My Documents\Copy of SJ model for 2010 report by KB 2\SJReach30withBi.g04

           Flow Title    :
           Flow File     :

Plan Description:
Alternative 2 Levee Geometry with 200 Year Hydrograph

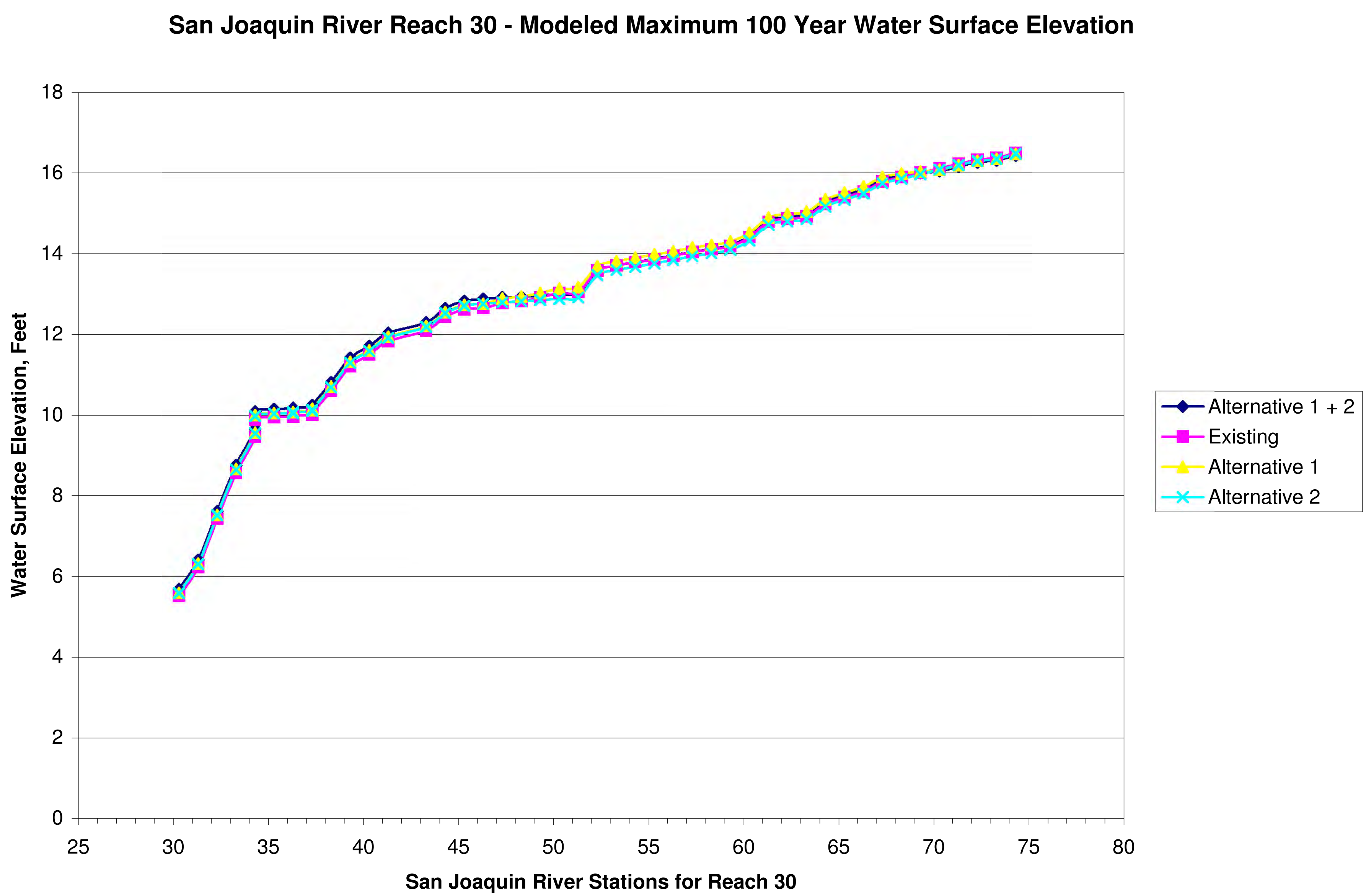

Plan Summary Information:
Number of:  Cross Sections =   58    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

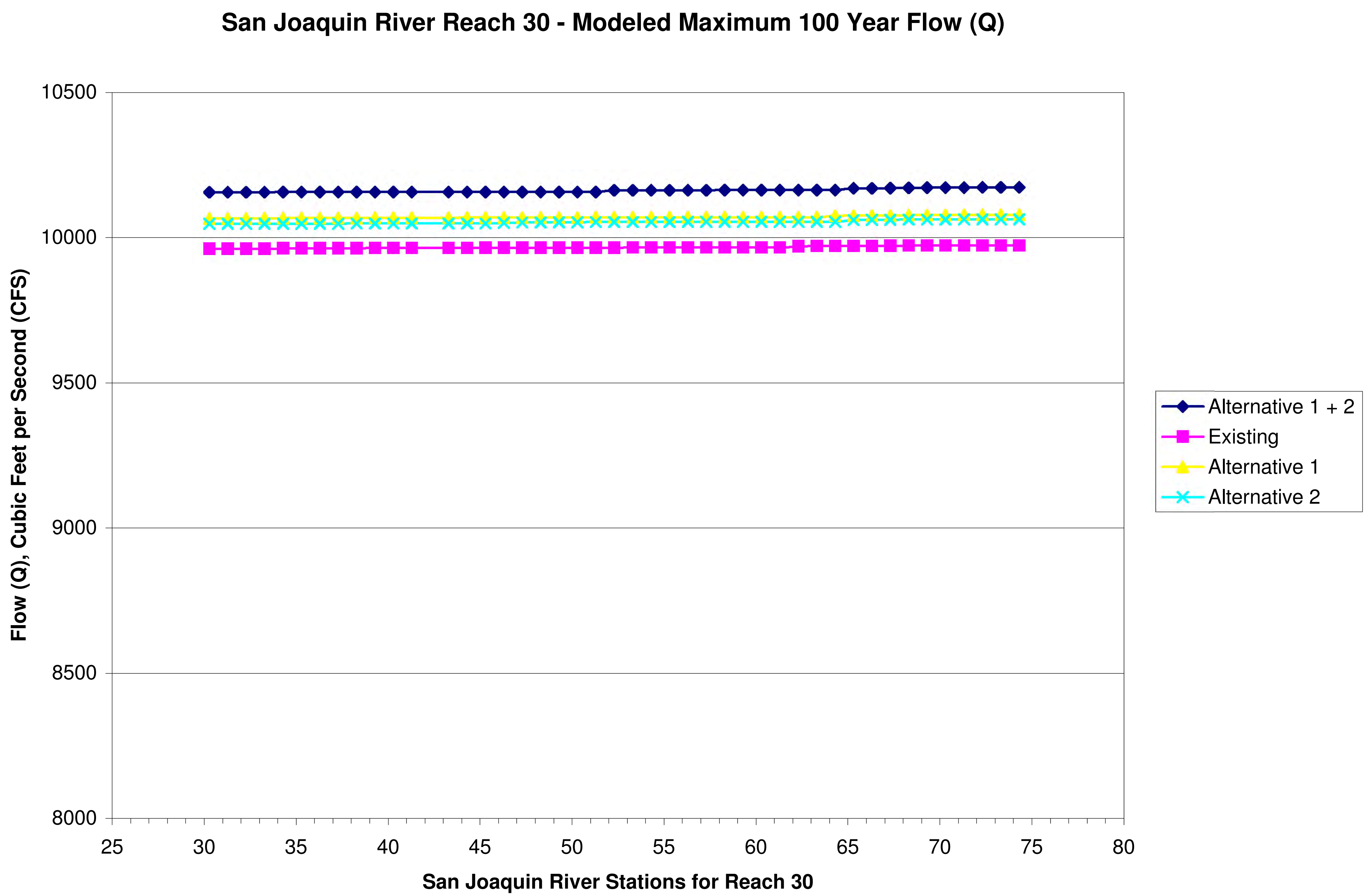
Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow


Profile Output Table - Standard Table 1
```

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
26	78	Max WS	63866.00	-13.77	21.66		22.50	0.000331	7.43	9031.51	377.24	0.25
26	77	Max WS	63846.57	-9.30	20.60		21.30	0.000312	6.81	9880.38	467.88	0.24
26	76	Max WS	63837.41	-22.76	19.92		20.79	0.000334	7.62	9045.56	409.46	0.25
26	75	Max WS	63828.11	-8.24	19.78		20.33	0.000252	6.07	11170.99	544.30	0.21
31	63.31	Max WS	50217.01	-7.20	19.78		21.25	0.000425	10.01	5532.42	308.66	0.36
31	62.31	Max WS	50212.61	-9.10	19.61		20.82	0.000352	8.97	6000.49	324.04	0.33
31	61.31	Max WS	50208.18	-9.34	18.39		20.33	0.000559	11.38	4715.02	246.31	0.41
31	60.31	Max WS	50204.56	-9.87	17.33		19.58	0.000700	12.16	4318.43	226.18	0.46
31	59.31	Max WS	50200.21	-15.24	16.36		18.57	0.000619	12.10	4392.67	219.06	0.43
31	58.31	Max WS	50195.84	-6.90	16.16	6.35	17.75	0.000507	10.26	5118.74	271.30	0.39
30	74.30	Max WS	13611.10	-25.70	19.78		19.81	0.000052	1.44	9444.23	420.61	0.05
30	73.30	Max WS	13605.48	-3.00	19.65		19.71	0.000157	1.95	6959.34	454.48	0.09
30	72.30	Max WS	13601.59	-8.13	19.61		19.65	0.000089	1.71	9194.64	675.24	0.07
30	71.30	Max WS	13596.94	-5.30	19.51		19.58	0.000137	2.21	6549.25	437.91	0.09
30	70.30	Max WS	13588.89	-15.81	19.40		19.44	0.000089	1.72	8504.28	558.66	0.07
30	69.30	Max WS	13585.20	-7.58	19.26		19.35	0.000183	2.48	5470.21	274.95	0.10
30	68.30	Max WS	13581.44	-13.93	19.14		19.22	0.000134	2.35	6000.99	326.28	0.09
30	67.30	Max WS	13563.81	-10.24	19.06		19.08	0.000047	1.30	14103.60	1346.31	0.05
30	66.30	Max WS	13547.42	-12.13	18.78		18.91	0.000221	2.80	4835.24	228.88	0.11
30	65.30	Max WS	13544.45	-15.39	18.62		18.73	0.000215	2.68	5056.03	254.06	0.11
30	64.30	Max WS	13540.27	-6.27	18.44		18.53	0.000183	2.42	5603.77	295.22	0.10
30	63.30	Max WS	13533.03	-16.14	18.08		18.19	0.000213	2.65	5109.30	258.47	0.10
30	62.30	Max WS	13518.27	-8.52	18.04		18.07	0.000073	1.65	9965.13	808.13	0.06
30	61.30	Max WS	13511.35	-9.67	17.94		18.03	0.000171	2.43	5768.95	356.82	0.10
30	60.30	Max WS	13499.73	-12.20	17.53		17.63	0.000193	2.50	5399.43	281.59	0.10
30	59.30	Max WS	13493.29	-6.87	17.29		17.38	0.000183	2.40	5629.74	301.22	0.10
30	58.30	Max WS	13490.00	-9.16	17.21		17.28	0.000172	2.14	6290.17	382.84	0.09
30	57.30	Max WS	13487.96	-9.58	17.13		17.22	0.000187	2.40	5615.57	303.85	0.10
30	56.30	Max WS	13485.49	-8.87	17.03		17.13	0.000184	2.46	5478.45	279.60	0.10
30	55.30	Max WS	13477.52	-8.00	16.96		17.00	0.000089	1.79	9069.76	750.18	0.07
30	54.30	Max WS	13472.83	-16.48	16.88		16.96	0.000147	2.25	6557.52	469.45	0.09
30	53.30	Max WS	13467.65	-6.77	16.81		16.87	0.000128	2.12	7196.22	509.46	0.08
30	52.30	Max WS	13463.23	-13.58	16.66		16.77	0.000207	2.60	5185.29	266.69	0.10
30	51.30	Max WS	13449.68	-14.52	16.09		16.21	0.000217	2.81	5009.75	296.26	0.11
30	50.30	Max WS	13444.85	-14.20	16.08		16.13	0.000094	1.82	8887.42	725.28	0.07
30	49.30	Max WS	13436.47	-14.57	16.07		16.09	0.000061	1.31	12664.10	1172.37	0.06
30	48.30	Max WS	13422.54	-11.09	16.05		16.06	0.000038	1.09	15713.63	1466.23	0.04
30	47.30	Max WS	13408.31	-17.87	16.04		16.05	0.000024	0.97	18145.89	1472.19	0.04
30	46.30	Max WS	13392.94	-9.00	16.01		16.02	0.000049	1.23	14093.10	1353.25	0.05
30	45.30	Max WS	13385.38	-15.34	15.97		16.00	0.000086	1.54	10008.64	881.60	0.07
30	44.30	Max WS	13374.32	-13.45	15.78		15.87	0.000189	2.41	5553.14	301.97	0.10
30	43.30	Max WS	13365.14	-15.10	15.42		15.52	0.000228	2.66	5030.86	271.14	0.11
30	41.30	Max WS	13311.68	-13.85	15.12		15.26	0.000275	2.98	4470.43	230.40	0.12
30	40.30	Max WS	13311.51	-9.71	14.79		14.89	0.000222	2.55	5217.36	293.54	0.11
30	39.30	Max WS	13311.23	-18.13	14.48		14.61	0.000269	2.96	4496.93	228.82	0.12
30	38.30	Max WS	13310.04	-10.67	13.83		13.95	0.000235	2.71	4911.70	260.92	0.11
30	37.301	Max WS	13308.60	-14.26	13.25		13.39	0.000283	2.97	4482.46	237.89	0.12
30	37.30	Max WS	13308.46	-16.74	13.20		13.33	0.000267	2.90	4586.02	239.69	0.12
30	36.302	Max WS	13308.39	-17.10	13.17		13.30	0.000415	2.94	4533.75	243.59	0.12
30	36.301	Max WS	13308.38	-17.10	13.16		13.30	0.000415	2.94	4532.15	243.56	0.12
30	36.30	Max WS	13308.37	-17.10	13.16		13.29	0.000416	2.94	4530.17	243.52	0.12
30	35.30	Max WS	13308.30	-17.58	13.14		13.26	0.000257	2.82	4712.69	251.45	0.11
30	34.301	Max WS	13308.15	-15.03	13.08		13.21	0.000270	2.92	4554.39	238.66	0.12
30	34.30	Max WS	13306.94	-13.40	12.62		12.77	0.000327	3.09	4309.22	241.73	0.13
30	33.30	Max WS	13304.55	-14.57	11.66		11.84	0.000382	3.37	3942.79	215.25	0.14
30	32.30	Max WS	13302.00	-16.60	10.47		10.68	0.000500	3.69	3602.68	210.09	0.16
30	31.30	Max WS	13299.22	-20.45	9.18		9.39	0.000462	3.65	3640.84	201.08	0.15
30	30.30	Max WS	13297.49	-17.40	8.44	-5.46	8.64	0.000500	3.58	3710.26	228.54	0.16


San Joaquin River Reach 30 - Modeled Maximum 100 Year Water Surface Elevation
Water Surface Elevation, Feet
San Joaquin River Stations for Reach 30
Alternative 1 + 2
Existing
Alternative 1
Alternative 2
0
2
4
6
8
10
12
14
16
18
25
30
35
40
45
50
55
60
65
70
75
80


San Joaquin River Reach 30 - Modeled Maximum 100 Year Flow (Q)
Flow (Q), Cubic Feet per Second (CFS)
10500
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9500
9000
8500
8000
25
30
35
40
45
50
55
60
65
70
75
80
San Joaquin River Stations for Reach 30
Alternative 1 + 2
Existing
Alternative 1
Alternative 2

D.2 February 2014 Hydraulic Analysis of Reach IVc Levee Setback for Applicant's Preferred Alternative

MBK ENGINEERS

Water Resources • Flood Control • Water Rights

TECHNICAL MEMORANDUM

DATE: February 20, 2014

SUBJECT: Deterministic Hydraulic Impact Analysis for the Reclamation District 17 Early Implementation Program Levee Setback Project

Prepared by: Michael Archer, P.E.

Reviewed by: Rajat Saha, Ph.D., P.E.

Reclamation District 17 (RD 17) is evaluating a potential levee setback project (Project) through the State Early Implementation Program (EIP). The Project is located on the right bank[1] of the San Joaquin River about ¾ of a mile downstream of Old River, as shown in Figure 1. The affected levee is located between Levee Miles 9.1 and 9.6[2], Comprehensive Study[3] river miles 52.1 to 52.6, or U.S. Geologic Survey river miles 52.4 to 52.9. The proposed setback levee would be approximately 920 feet long and would replace about 2,100 feet of existing Federal Project levee, as shown in Figure 2.

An initial Project configuration that assumed the complete removal of the existing levee was analyzed previously as documented in the MBK Engineers (MBK) technical memorandum "Reconnaissance Level Hydraulic Impact Analysis for the Reclamation District 17 Early Implementation Program Levee Setback Project," dated January 2, 2013. Subsequently, the

[1] The river side is with reference to an observer looking downstream.
[2] RD 17 Unit 2 - Mossdale - San Joaquin River Bank USACE Levee Miles.
[3] Sacramento and San Joaquin River Basins Comprehensive Study, U.S. Army Corps of Engineers, 2002.

Project configuration was modified to leave the existing levee in place with a single breach at the downstream end to allow for hydraulic connectivity between the river and the offset area, as shown in Figure 3. The breach would have a bottom width of 150 feet and top width of 410 feet. Fill would be placed and graded in the offset area to facilitate drainage.

MBK has performed a deterministic hydraulic impact analysis of the revised Project configuration. This analysis, similar to the January 2013 analysis, was performed with the HEC-RAS hydraulic simulation model of the lower San Joaquin River that was used for the Section 408 hydraulic impact analysis for the River Islands at Lathrop project located about 1 mile upstream.

Figure 1. Location Map

Figure 2. Proposed Setback Levee Site Map

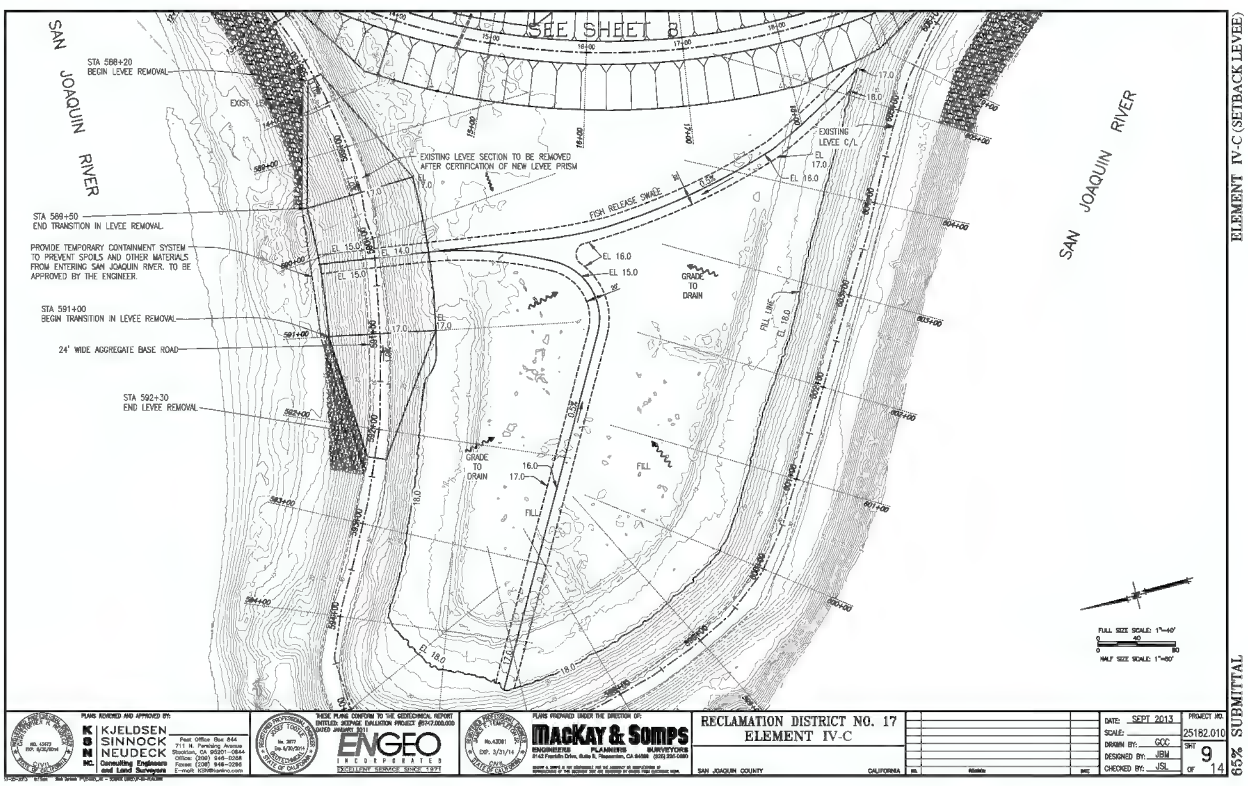

Figure 3. Remnant Levee Breach and Offset Area Grading Plan

With the remnant levee in place, there are no changes to any river cross sections. The offset area was represented in the hydraulic model with a Storage Area[4] that is connected to the river with a weir representing the breach in the remnant levee. The breach cross section is shown in Figure 4.

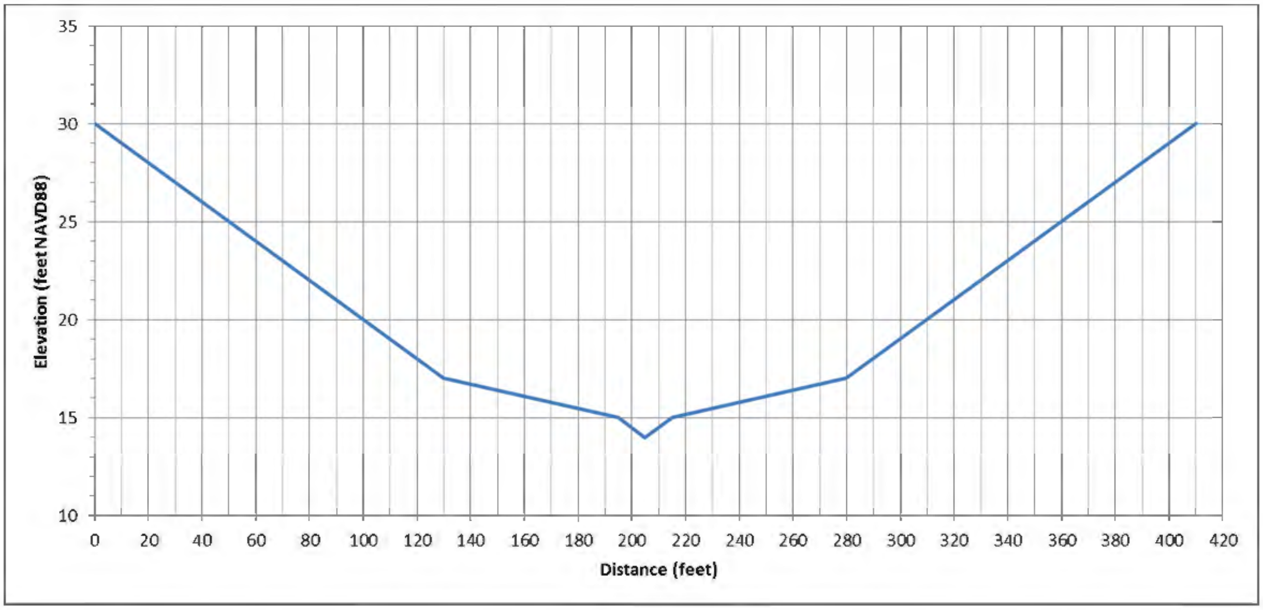

Figure 4. Cross Section of Remnant Levee Breach Opening

Existing (without levee setback) and With Project (with levee setback) conditions were simulated for all seven synthetic flood events for which hydrologic data is available: 1/2 annual exceedance probability (AEP), 1/10 AEP, 1/25 AEP, 1/50 AEP, 1/100 AEP, 1/200 AEP, and 1/500 AEP. The hydrologic input for the hydraulic model was derived from studies performed by the U.S. Army Corps of Engineers (USACE) as part of the Sacramento and San Joaquin River Basins Comprehensive Study. Levees were assumed to act like weirs and not breach when overtopped.

Results

The analysis shows that the Project has essentially no effect on the maximum water surface elevation, with a computed maximum increase in the water surface elevation of 0.0007 feet. Computed maximum water surface elevations at the Index Points shown in Figure 5 are provided in Table 1. The computed maximum water surface elevations for the 1/50 AEP, 1/100 AEP, and 1/200 AEP flood events for all model cross sections are provided in Appendix A. The water surface elevation data in Table 1 and Appendix A are shown to the nearest hundredth of a foot.

[4] HEC-RAS Storage Areas are lake like regions that are defined with an elevation-volume relationship.

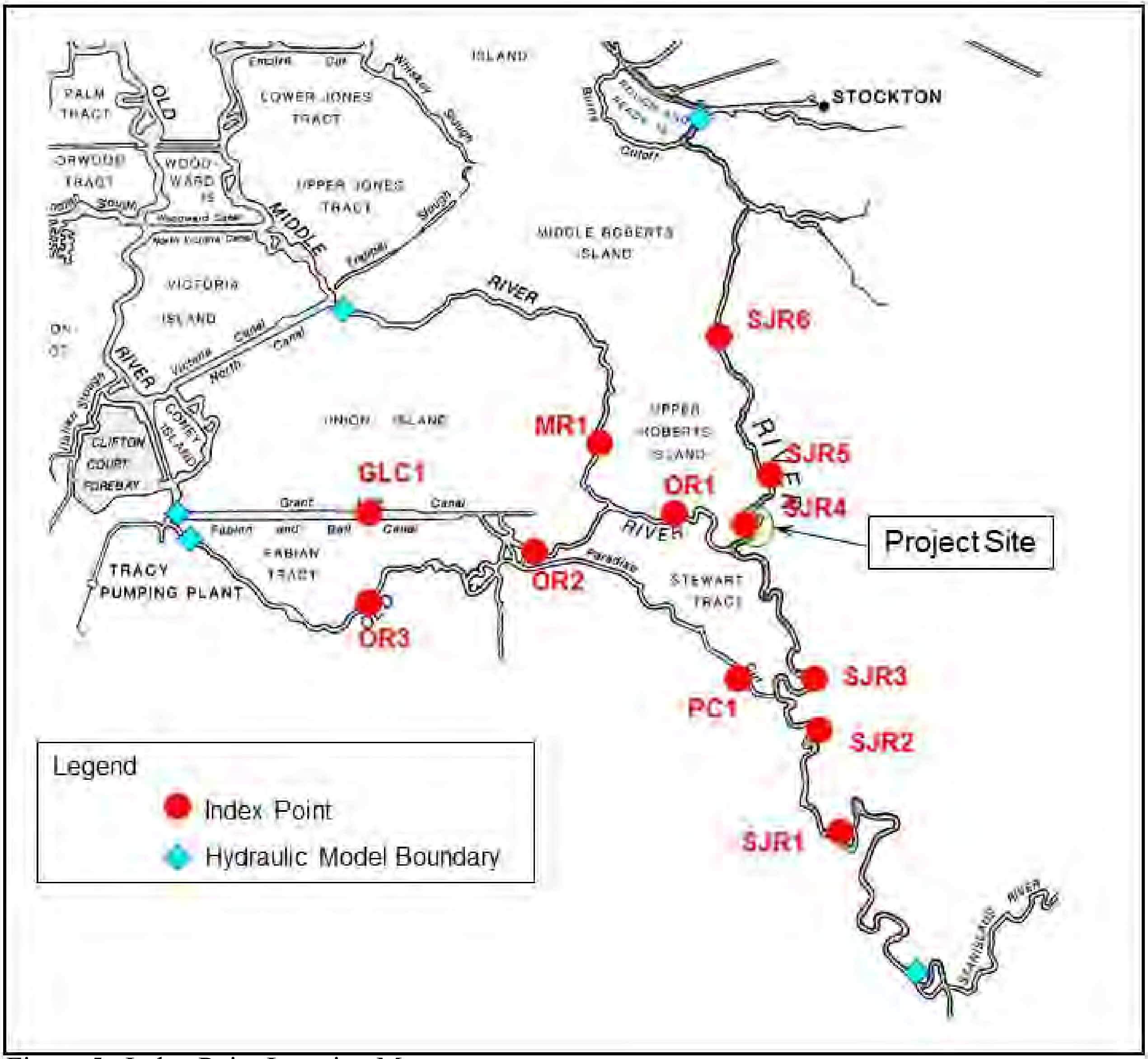

Figure 5. Index Point Location Map

Table 1. Project Impacts on Computed Maximum Water Surface Elevation (WSE)					
Index Point	Model River Station	Flood Event (AEP)	Computed Maximum WSE (ft. NAVD88)[a] Existing	Computed Maximum WSE (ft. NAVD88)[a] With Project	WSE Change due to Project (ft.)
SJR3	57.81	1/2	16.84	16.84	0.00
		1/10	21.78	21.78	0.00
		1/25	23.39	23.39	0.00
		1/50	24.48	24.48	0.00
		1/100	29.62	29.62	0.00
		1/200	32.70	32.70	0.00
		1/500	34.48	34.48	0.00
SJR4 (within the RD17 EIP Project reach)	52.30	1/2	12.85	12.85	0.00
		1/10	16.72	16.72	0.00
		1/25	17.96	17.96	0.00
		1/50	18.74	18.74	0.00
		1/100	22.25	22.25	0.00
		1/200	24.45	24.45	0.00
		1/500	25.17	25.17	0.00
SJR5	50.38	1/2	12.13	12.13	0.00
		1/10	15.67	15.67	0.00
		1/25	16.85	16.85	0.00
		1/50	17.61	17.61	0.00
		1/100	20.97	20.97	0.00
		1/200	23.08	23.08	0.00
		1/500	23.76	23.76	0.00
PC1	267.9	1/2	13.91	13.91	0.00
		1/10	19.34	19.34	0.00
		1/25	20.75	20.75	0.00
		1/50	21.66	21.66	0.00
		1/100	25.76	25.76	0.00
		1/200	28.49	28.49	0.00
		1/500	30.84	30.84	0.00
OR1	142.0	1/2	11.62	11.62	0.00
		1/10	15.15	15.15	0.00
		1/25	16.40	16.40	0.00
		1/50	17.28	17.28	0.00
		1/100	21.44	21.44	0.00
		1/200	23.79	23.79	0.00
		1/500	24.79	24.79	0.00

[a] The vertical datum of the hydraulic model used to compute the water surface elevations is National Geodetic Vertical Datum of 1929 (NGVD29). For presentation in this report all elevation data has been converted to the North American Vertical Datum of 1988 (NAVD88) using a conversion value of +2.53 feet, as developed by Kjeldsen Sinnock Neudeck for Reclamation District 17.

Sensitivity Analysis

Sensitivity analysis is often performed to test the sensitivity of the hydraulic simulation results to user defined parameters that are estimated or may have an acceptable range of values. For this analysis the following sensitivity analyses were performed:

1. Offset area elevation-volume relationship. The elevation-volume relationship was estimated from the Project plan shown in Figure 2. The sensitivity of the model to potential errors in this estimation were evaluated by making simulations with the offset area volume increased by 50% and with the offset area decreased by 50%.
2. Weir type for remnant levee breach. HEC-RAS has four options for weir types for lateral structures: broad crested, ogee, sharp crested, and zero height. For the Project analysis the “zero height” option was used. A sensitivity analysis was performed with the “broad crested” option selected.
3. Weir coefficient for remnant levee breach. For the Project analysis, a weir coefficient of 2.0 was used for the weir representing the remnant levee breach. The HEC-RAS Hydraulic Reference Manual notes a typical weir coefficient range for broad crested weirs of 2.6 to 3.1. It does not provide a typical range for the zero height weir type. To evaluate the sensitivity of this parameter a simulation was performed using a weir coefficient of 3.0 for the remnant levee breach weir.

The sensitivity simulations were made for the 1/50 AEP and 1/200 AEP. For all of the sensitivity simulations the computed maximum water surface elevation in the river channels and in the offset area did not differ from that in the Project analysis.

Erosion and Maintenance

RD 17 is committed to the ongoing protection of the proposed meandering levee and levee breach against the threat of erosion. Both sections of levee will continue to be maintained in full accordance to the RD 17 Operations and Materials Manual and will remain active in the District’s routine rock slope protection repair, vegetation control, and rodent abatement programs.

An evaluation of erosion potential was performed by Kjeldsen Sinnock and Neudeck, Inc., and is documented in a letter memorandum to Adam Riley of USACE, dated February 20, 2014. The letter memorandum also discusses the proposed bank protection measures for the Project.

Appendix A

Computed Maximum Water Surface Elevations

The vertical datum of the hydraulic model used to compute the water surface elevations is National Geodetic Vertical Datum of 1929 (NGVD29). For presentation in this report all elevation data has been converted to the North American Vertical Datum of 1988 (NAVD88) using a conversion value of +2.53 feet, as developed by Kjeldsen Sinnock Neudeck for Reclamation District 17.

**Table A-1. Computed Maximum Water Surface Elevation (WSE) – San Joaquin River; River Stations in the Project reach (52.5566 through 52.155) are highlighted.
[River Stations denoted with * are HEC-RAS interpolated cross sections]**

Hydraulic Model River Station	1/50 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/50 AEP Maximum WSE (ft NAVD88) With Project	1/50 AEP WSE Change (ft)	1/100 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/100 AEP Maximum WSE (ft NAVD88) With Project	1/100 AEP WSE Change (ft)	1/200 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/200 AEP Maximum WSE (ft NAVD88) With Project	1/200 AEP WSE Change (ft)
69.8	34.11	34.11	0.00	39.92	39.92	0.00	42.99	42.99	0.00
69.79	34.08	34.08	0.00	39.88	39.88	0.00	42.95	42.95	0.00
69.78	34.05	34.05	0.00	39.85	39.85	0.00	42.91	42.91	0.00
69.77	34.02	34.02	0.00	39.82	39.82	0.00	42.87	42.87	0.00
69.62	33.24	33.24	0.00	38.79	38.79	0.00	40.75	40.75	0.00
69.45*	32.92	32.92	0.00	38.47	38.47	0.00	40.27	40.27	0.00
69.28	32.75	32.75	0.00	38.29	38.29	0.00	40.01	40.01	0.00
69.1499*	32.66	32.66	0.00	38.23	38.23	0.00	39.99	39.99	0.00
69.02	32.54	32.54	0.00	38.10	38.10	0.00	39.80	39.80	0.00
68.88*	32.38	32.38	0.00	37.93	37.93	0.00	39.56	39.56	0.00
68.74	32.26	32.26	0.00	37.79	37.79	0.00	39.36	39.36	0.00
68.585*	32.16	32.16	0.00	37.70	37.70	0.00	39.27	39.27	0.00
68.43	32.10	32.10	0.00	37.65	37.65	0.00	39.22	39.22	0.00
68.27	32.04	32.04	0.00	37.62	37.62	0.00	39.16	39.16	0.00
68.13*	31.97	31.97	0.00	37.56	37.56	0.00	39.02	39.02	0.00
67.99	31.90	31.90	0.00	37.50	37.50	0.00	38.92	38.92	0.00
67.78	31.85	31.85	0.00	37.44	37.44	0.00	38.84	38.84	0.00
67.595*	31.79	31.79	0.00	37.40	37.40	0.00	38.78	38.78	0.00
67.41	31.67	31.67	0.00	37.25	37.25	0.00	38.54	38.54	0.00
67.1666*	31.58	31.58	0.00	37.18	37.18	0.00	38.44	38.44	0.00
66.9233*	31.46	31.46	0.00	37.02	37.02	0.00	38.20	38.20	0.00
66.68	31.30	31.30	0.00	36.77	36.77	0.00	37.84	37.84	0.00
66.56	31.12	31.12	0.00	36.53	36.53	0.00	37.51	37.51	0.00
66.38*	30.93	30.93	0.00	36.36	36.36	0.00	37.30	37.30	0.00
66.2	30.78	30.78	0.00	36.11	36.11	0.00	36.94	36.94	0.00
65.98	30.64	30.64	0.00	35.99	35.99	0.00	36.85	36.85	0.00
65.8	30.49	30.49	0.00	35.81	35.81	0.00	36.72	36.72	0.00
65.58	30.42	30.42	0.00	35.78	35.78	0.00	36.71	36.71	0.00
65.4*	30.37	30.37	0.00	35.76	35.76	0.00	36.68	36.68	0.00
65.22	30.32	30.32	0.00	35.71	35.71	0.00	36.62	36.62	0.00
65.0133*	30.24	30.24	0.00	35.64	35.64	0.00	36.55	36.55	0.00
64.8066*	30.12	30.12	0.00	35.51	35.51	0.00	36.40	36.40	0.00
64.6	29.93	29.93	0.00	35.30	35.30	0.00	36.17	36.17	0.00
64.38	29.93	29.93	0.00	35.33	35.33	0.00	36.20	36.20	0.00
64.2	29.72	29.72	0.00	35.15	35.15	0.00	36.02	36.02	0.00
64.0133*	29.70	29.70	0.00	35.13	35.13	0.00	36.00	36.00	0.00
63.8266*	29.60	29.60	0.00	35.08	35.08	0.00	35.99	35.99	0.00
63.64	29.42	29.42	0.00	34.88	34.88	0.00	35.81	35.81	0.00
63.44*	29.28	29.28	0.00	34.81	34.81	0.00	35.70	35.70	0.00
63.24	29.11	29.11	0.00	34.63	34.63	0.00	35.51	35.51	0.00
63.04*	28.92	28.92	0.00	34.42	34.42	0.00	35.30	35.30	0.00
62.84	28.74	28.74	0.00	34.15	34.15	0.00	35.05	35.05	0.00
62.715*	28.59	28.59	0.00	34.02	34.02	0.00	34.96	34.96	0.00
62.59	28.51	28.51	0.00	33.95	33.95	0.00	34.92	34.92	0.00
62.39	28.15	28.15	0.00	33.64	33.64	0.00	34.69	34.69	0.00
62.21*	27.99	27.99	0.00	33.47	33.47	0.00	34.57	34.57	0.00
62.03*	27.87	27.87	0.00	33.33	33.33	0.00	34.45	34.45	0.00
61.85	27.78	27.78	0.00	33.23	33.23	0.00	34.36	34.36	0.00
61.69*	27.66	27.66	0.00	33.11	33.11	0.00	34.24	34.24	0.00
61.53	27.56	27.56	0.00	33.01	33.01	0.00	34.14	34.14	0.00
61.29	27.31	27.31	0.00	32.76	32.76	0.00	33.92	33.92	0.00
61.16*	27.17	27.17	0.00	32.59	32.59	0.00	33.96	33.96	0.00
61.03	26.95	26.95	0.00	32.28	32.28	0.00	33.60	33.60	0.00
60.87	26.82	26.82	0.00	32.12	32.12	0.00	33.48	33.48	0.00
60.65	26.49	26.49	0.00	31.76	31.76	0.00	33.30	33.30	0.00
60.42	26.47	26.47	0.00	31.79	31.79	0.00	33.33	33.33	0.00
60.235*	26.37	26.37	0.00	31.70	31.70	0.00	33.28	33.28	0.00

Table A-1. Computed Maximum Water Surface Elevation (WSE) – San Joaquin River; River Stations in the Project reach (52.5566 through 52.155) are highlighted.
[River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP			1/100 AEP			1/200 AEP		
	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)
	Existing (Without Project)	With Project		Existing (Without Project)	With Project		Existing (Without Project)	With Project	
60.05	26.31	26.31	0.00	31.65	31.65	0.00	33.25	33.25	0.00
59.905*	26.24	26.24	0.00	31.60	31.60	0.00	33.22	33.22	0.00
59.76	26.20	26.20	0.00	31.56	31.56	0.00	33.20	33.20	0.00
59.53*	26.00	26.00	0.00	31.34	31.34	0.00	33.09	33.09	0.00
59.3	25.71	25.71	0.00	30.91	30.91	0.00	32.93	32.93	0.00
59.16*	25.55	25.55	0.00	30.69	30.69	0.00	32.87	32.87	0.00
59.02	25.39	25.39	0.00	30.46	30.46	0.00	32.81	32.81	0.00
58.78	25.14	25.14	0.00	30.18	30.18	0.00	32.76	32.76	0.00
58.56	25.00	25.00	0.00	30.10	30.10	0.00	32.72	32.72	0.00
58.4199*	24.87	24.87	0.00	30.00	30.00	0.00	32.67	32.67	0.00
58.28	24.87	24.87	0.00	29.97	29.97	0.00	32.76	32.76	0.00
58.26	24.86	24.86	0.00	29.96	29.96	0.00	32.76	32.76	0.00
58.035*	24.66	24.66	0.00	29.78	29.78	0.00	32.72	32.72	0.00
57.81	24.48	24.48	0.00	29.62	29.62	0.00	32.70	32.70	0.00
57.65*	24.50	24.50	0.00	29.67	29.67	0.00	32.70	32.70	0.00
57.49	24.40	24.40	0.00	29.56	29.56	0.00	32.63	32.63	0.00
57.33	24.18	24.18	0.00	29.36	29.36	0.00	32.16	32.16	0.00
57.12	23.75	23.75	0.00	28.98	28.98	0.00	31.69	31.69	0.00
57.05	23.63	23.63	0.00	28.88	28.88	0.00	31.61	31.61	0.00
56.9*	23.43	23.43	0.00	28.70	28.70	0.00	31.43	31.43	0.00
56.75	23.19	23.19	0.00	28.35	28.35	0.00	31.03	31.03	0.00
56.682	23.16	23.16	0.00	28.33	28.33	0.00	31.02	31.02	0.00
56.672	23.15	23.15	0.00	28.32	28.32	0.00	31.00	31.00	0.00
56.671	23.10	23.10	0.00	28.25	28.25	0.00	30.89	30.89	0.00
56.661	23.10	23.10	0.00	28.24	28.24	0.00	30.88	30.88	0.00
56.59	23.06	23.06	0.00	28.21	28.21	0.00	30.85	30.85	0.00
56.35	22.95	22.95	0.00	28.13	28.13	0.00	30.78	30.78	0.00
56.228	22.83	22.83	0.00	28.00	28.00	0.00	30.64	30.64	0.00
56.18	22.80	22.80	0.00	27.97	27.97	0.00	30.61	30.61	0.00
56.179	22.69	22.69	0.00	27.84	27.84	0.00	30.47	30.47	0.00
56.168	22.69	22.69	0.00	27.84	27.84	0.00	30.46	30.46	0.00
56.167	22.68	22.68	0.00	27.83	27.83	0.00	30.45	30.45	0.00
56.166	22.49	22.49	0.00	27.60	27.60	0.00	30.19	30.19	0.00
56.156	22.49	22.49	0.00	27.59	27.59	0.00	30.18	30.18	0.00
56.145	22.48	22.48	0.00	27.58	27.58	0.00	30.17	30.17	0.00
56.144	22.42	22.42	0.00	27.51	27.51	0.00	30.10	30.10	0.00
56.134	22.41	22.41	0.00	27.50	27.50	0.00	30.09	30.09	0.00
56.112	22.39	22.39	0.00	27.49	27.49	0.00	30.07	30.07	0.00
56.111	22.35	22.35	0.00	27.43	27.43	0.00	30.01	30.01	0.00
56.091	22.31	22.31	0.00	27.39	27.39	0.00	29.97	29.97	0.00
56.05	22.34	22.34	0.00	27.41	27.41	0.00	29.97	29.97	0.00
55.997	22.31	22.31	0.00	27.37	27.37	0.00	29.93	29.93	0.00
55.985	22.30	22.30	0.00	27.37	27.37	0.00	29.92	29.92	0.00
55.984	22.31	22.31	0.00	27.37	27.37	0.00	29.94	29.94	0.00
55.972	22.30	22.30	0.00	27.37	27.37	0.00	29.93	29.93	0.00
55.92	22.18	22.18	0.00	27.19	27.19	0.00	29.71	29.71	0.00
55.86	22.20	22.20	0.00	27.25	27.25	0.00	29.80	29.80	0.00
55.63*	22.00	22.00	0.00	27.02	27.02	0.00	29.54	29.54	0.00
55.4	21.77	21.77	0.00	26.78	26.78	0.00	29.29	29.29	0.00
55.205*	21.58	21.58	0.00	26.67	26.67	0.00	29.25	29.25	0.00
55.01	21.44	21.44	0.00	26.56	26.56	0.00	29.09	29.09	0.00
54.805*	21.20	21.20	0.00	26.31	26.31	0.00	28.88	28.88	0.00
54.6	20.99	20.99	0.00	25.99	25.99	0.00	28.46	28.46	0.00
54.365*	20.76	20.76	0.00	25.72	25.72	0.00	28.16	28.16	0.00
54.13	20.51	20.51	0.00	25.42	25.42	0.00	27.82	27.82	0.00
54.11	20.49	20.49	0.00	25.39	25.39	0.00	27.79	27.79	0.00
53.89	20.36	20.36	0.00	25.28	25.28	0.00	27.68	27.68	0.00

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[River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP			1/100 AEP			1/200 AEP		
	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)
	Existing (Without Project)	With Project		Existing (Without Project)	With Project		Existing (Without Project)	With Project	
53.735*	20.20	20.20	0.00	25.09	25.09	0.00	27.47	27.47	0.00
53.58	20.05	20.05	0.00	24.90	24.90	0.00	27.25	27.25	0.00
53.435*	19.97	19.97	0.00	24.83	24.83	0.00	27.18	27.18	0.00
53.29	19.92	19.92	0.00	24.79	24.79	0.00	27.15	27.15	0.00
53.24	19.92	19.92	0.00	24.79	24.79	0.00	27.15	27.15	0.00
53.05	19.36	19.36	0.00	23.33	23.33	0.00	25.58	25.58	0.00
52.95	19.06	19.06	0.00	22.62	22.62	0.00	24.84	24.84	0.00
52.83	19.03	19.03	0.00	22.59	22.59	0.00	24.81	24.81	0.00
52.784*	19.01	19.01	0.00	22.57	22.57	0.00	24.80	24.80	0.00
52.738*	18.99	18.99	0.00	22.56	22.56	0.00	24.79	24.79	0.00
52.692*	18.98	18.98	0.00	22.55	22.55	0.00	24.78	24.78	0.00
52.646*	18.97	18.97	0.00	22.54	22.54	0.00	24.77	24.77	0.00
52.6	18.97	18.97	0.00	22.53	22.53	0.00	24.76	24.76	0.00
52.5566*	18.93	18.93	0.00	22.49	22.49	0.00	24.71	24.71	0.00
52.5133*	18.88	18.88	0.00	22.41	22.41	0.00	24.62	24.62	0.00
52.47	18.82	18.82	0.00	22.33	22.33	0.00	24.53	24.53	0.00
52.4133*	18.79	18.79	0.00	22.30	22.30	0.00	24.49	24.49	0.00
52.3566*	18.76	18.76	0.00	22.27	22.27	0.00	24.46	24.46	0.00
52.3	18.74	18.74	0.00	22.25	22.25	0.00	24.45	24.45	0.00
52.2516*	18.74	18.74	0.00	22.28	22.28	0.00	24.48	24.48	0.00
52.2033*	18.74	18.74	0.00	22.29	22.29	0.00	24.51	24.50	0.00
52.155*	18.74	18.74	0.00	22.29	22.29	0.00	24.52	24.52	0.00
52.1066*	18.73	18.73	0.00	22.29	22.29	0.00	24.52	24.52	0.00
52.0583*	18.72	18.72	0.00	22.29	22.29	0.00	24.52	24.52	0.00
52.01	18.71	18.71	0.00	22.29	22.29	0.00	24.52	24.52	0.00
51.9583*	18.68	18.68	0.00	22.27	22.27	0.00	24.50	24.50	0.00
51.9066*	18.65	18.65	0.00	22.23	22.23	0.00	24.47	24.47	0.00
51.855*	18.62	18.62	0.00	22.19	22.19	0.00	24.42	24.42	0.00
51.8033*	18.57	18.57	0.00	22.13	22.13	0.00	24.36	24.35	0.00
51.7516*	18.50	18.50	0.00	22.04	22.03	0.00	24.24	24.24	0.00
51.7	18.42	18.42	0.00	21.90	21.90	0.00	24.08	24.07	0.00
51.55	18.32	18.32	0.00	21.79	21.79	0.00	23.96	23.96	0.00
51.36	18.23	18.23	0.00	21.70	21.70	0.00	23.87	23.87	0.00
51.195*	18.11	18.11	0.00	21.56	21.56	0.00	23.71	23.71	0.00
51.03	17.99	17.99	0.00	21.40	21.40	0.00	23.54	23.54	0.00
50.87	18.01	18.01	0.00	21.48	21.48	0.00	23.65	23.65	0.00
50.81	17.89	17.89	0.00	21.32	21.32	0.00	23.46	23.46	0.00
50.595*	17.75	17.75	0.00	21.14	21.14	0.00	23.27	23.27	0.00
50.38	17.61	17.61	0.00	20.97	20.97	0.00	23.08	23.08	0.00
50.255*	17.54	17.54	0.00	20.89	20.89	0.00	23.00	23.00	0.00
50.13	17.47	17.46	0.00	20.81	20.81	0.00	22.92	22.92	0.00
50.02	17.42	17.42	0.00	20.78	20.78	0.00	22.89	22.89	0.00
49.96	17.36	17.36	0.00	20.69	20.69	0.00	22.79	22.79	0.00
49.86	17.30	17.30	0.00	20.62	20.62	0.00	22.71	22.71	0.00
49.7	17.27	17.27	0.00	20.64	20.64	0.00	22.76	22.76	0.00
49.62	17.18	17.18	0.00	20.52	20.52	0.00	22.63	22.63	0.00
49.51	17.14	17.14	0.00	20.48	20.48	0.00	22.59	22.59	0.00
49.39	17.01	17.01	0.00	20.29	20.29	0.00	22.36	22.36	0.00
49.14*	16.82	16.82	0.00	20.07	20.07	0.00	22.12	22.12	0.00
48.89	16.62	16.62	0.00	19.83	19.83	0.00	21.87	21.87	0.00
48.8	16.66	16.66	0.00	19.93	19.93	0.00	21.99	21.99	0.00
48.73	16.53	16.53	0.00	19.73	19.73	0.00	21.75	21.75	0.00
48.62	16.51	16.51	0.00	19.70	19.70	0.00	21.73	21.73	0.00
48.5	16.52	16.52	0.00	19.75	19.75	0.00	21.80	21.80	0.00
48.37	16.38	16.38	0.00	19.56	19.56	0.00	21.57	21.57	0.00
48.31	16.40	16.40	0.00	19.59	19.59	0.00	21.62	21.62	0.00
48.12	16.26	16.26	0.00	19.41	19.41	0.00	21.42	21.42	0.00

**Table A-1. Computed Maximum Water Surface Elevation (WSE) – San Joaquin River; River Stations in the Project reach (52.5566 through 52.155) are highlighted.
[River Stations denoted with * are HEC-RAS interpolated cross sections]**

Hydraulic Model River Station	1/50 AEP			1/100 AEP			1/200 AEP		
	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)
	Existing (Without Project)	With Project		Existing (Without Project)	With Project		Existing (Without Project)	With Project	
47.96*	16.14	16.14	0.00	19.27	19.27	0.00	21.26	21.26	0.00
47.8	16.02	16.02	0.00	19.12	19.12	0.00	21.09	21.09	0.00
47.61	15.83	15.83	0.00	18.85	18.85	0.00	20.78	20.78	0.00
47.465*	15.76	15.76	0.00	18.78	18.78	0.00	20.72	20.72	0.00
47.32	15.68	15.68	0.00	18.71	18.71	0.00	20.64	20.64	0.00
47.11	15.48	15.48	0.00	18.43	18.43	0.00	20.32	20.31	0.00
46.9433*	15.38	15.38	0.00	18.30	18.30	0.00	20.18	20.18	0.00
46.7766*	15.28	15.28	0.00	18.18	18.18	0.00	20.05	20.05	0.00
46.61	15.18	15.18	0.00	18.06	18.06	0.00	19.92	19.92	0.00
46.405*	15.02	15.02	0.00	17.86	17.86	0.00	19.69	19.69	0.00
46.2	14.87	14.87	0.00	17.66	17.66	0.00	19.46	19.46	0.00
46.16	14.85	14.85	0.00	17.64	17.64	0.00	19.44	19.44	0.00
46.144	14.82	14.82	0.00	17.60	17.60	0.00	19.40	19.40	0.00
46.141	14.82	14.82	0.00	17.60	17.60	0.00	19.40	19.40	0.00
46.137	14.82	14.82	0.00	17.59	17.59	0.00	19.39	19.39	0.00
46.12	14.82	14.82	0.00	17.60	17.60	0.00	19.40	19.40	0.00
46.08	14.79	14.79	0.00	17.55	17.55	0.00	19.34	19.34	0.00
45.945*	14.67	14.67	0.00	17.39	17.39	0.00	19.16	19.16	0.00
45.81	14.55	14.55	0.00	17.25	17.25	0.00	19.00	19.00	0.00
45.6433*	14.40	14.40	0.00	17.05	17.05	0.00	18.77	18.77	0.00
45.4766*	14.25	14.25	0.00	16.85	16.85	0.00	18.54	18.54	0.00
45.31	14.11	14.11	0.00	16.65	16.65	0.00	18.31	18.31	0.00
45.06*	13.87	13.87	0.00	16.34	16.34	0.00	17.95	17.95	0.00
44.81	13.62	13.62	0.00	15.99	15.99	0.00	17.55	17.55	0.00
44.64*	13.47	13.47	0.00	15.78	15.78	0.00	17.30	17.30	0.00
44.47*	13.32	13.32	0.00	15.58	15.58	0.00	17.07	17.07	0.00
44.3	13.19	13.19	0.00	15.39	15.39	0.00	16.84	16.84	0.00
44.16*	13.09	13.09	0.00	15.25	15.25	0.00	16.69	16.69	0.00
44.02	12.99	12.99	0.00	15.12	15.12	0.00	16.54	16.54	0.00
43.885*	12.89	12.89	0.00	14.99	14.99	0.00	16.39	16.39	0.00
43.75	12.81	12.81	0.00	14.88	14.88	0.00	16.26	16.26	0.00
43.68	12.67	12.67	0.00	14.66	14.66	0.00	15.99	15.99	0.00
43.43	12.61	12.61	0.00	14.62	14.61	0.00	15.97	15.97	0.00
43.36	12.44	12.44	0.00	14.36	14.36	0.00	15.65	15.65	0.00
43.26	12.34	12.34	0.00	14.21	14.21	0.00	15.47	15.47	0.00
43.17	12.14	12.14	0.00	13.97	13.97	0.00	15.24	15.24	0.00
43.1	12.12	12.12	0.00	13.89	13.89	0.00	15.09	15.09	0.00
42.86	11.91	11.91	0.00	13.59	13.59	0.00	14.73	14.73	0.00
42.685*	11.79	11.79	0.00	13.41	13.40	0.00	14.52	14.52	0.00
42.51	11.69	11.69	0.00	13.27	13.27	0.00	14.36	14.35	0.00
42.27	11.61	11.61	0.00	13.15	13.15	0.00	14.23	14.23	0.00
42.2	11.53	11.53	0.00	13.02	13.02	0.00	14.06	14.06	0.00
42.16	11.50	11.50	0.00	12.98	12.98	0.00	14.01	14.01	0.00
42.155	11.45	11.45	0.00	12.89	12.89	0.00	13.88	13.88	0.00
42.151	11.44	11.44	0.00	12.88	12.88	0.00	13.88	13.88	0.00
42.15	11.48	11.48	0.00	12.95	12.95	0.00	13.97	13.97	0.00
42.12	11.47	11.47	0.00	12.94	12.94	0.00	13.95	13.95	0.00
41.91	11.34	11.34	0.00	12.74	12.74	0.00	13.70	13.70	0.00
41.705*	11.17	11.17	0.00	12.46	12.46	0.00	13.35	13.35	0.00
41.5	11.02	11.02	0.00	12.22	12.22	0.00	13.05	13.05	0.00
41.43	10.99	10.99	0.00	12.17	12.17	0.00	12.99	12.99	0.00
41.376	10.96	10.96	0.00	12.13	12.13	0.00	12.95	12.95	0.00
41.372	10.96	10.96	0.00	12.13	12.13	0.00	12.95	12.95	0.00
41.371	10.94	10.94	0.00	12.10	12.10	0.00	12.90	12.90	0.00
41.368	10.94	10.94	0.00	12.09	12.09	0.00	12.90	12.90	0.00
41.31	10.90	10.90	0.00	12.03	12.03	0.00	12.81	12.81	0.00
41.1	10.76	10.76	0.00	11.79	11.79	0.00	12.50	12.50	0.00

**Table A-1. Computed Maximum Water Surface Elevation (WSE) – San Joaquin River; River Stations in the Project reach (52.5566 through 52.155) are highlighted.
[River Stations denoted with * are HEC-RAS interpolated cross sections]**

Hydraulic Model River Station	1/50 AEP			1/100 AEP			1/200 AEP		
	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)
	Existing (Without Project)	With Project		Existing (Without Project)	With Project		Existing (Without Project)	With Project	
40.865*	10.60	10.60	0.00	11.53	11.53	0.00	12.18	12.18	0.00
40.63	10.47	10.47	0.00	11.30	11.30	0.00	11.87	11.87	0.00
40.54	10.36	10.36	0.00	11.12	11.12	0.00	11.63	11.63	0.00
40.4	10.29	10.29	0.00	11.00	11.00	0.00	11.46	11.46	0.00
40.3	10.15	10.15	0.00	10.74	10.74	0.00	11.11	11.11	0.00
40.1	10.01	10.01	0.00	10.48	10.48	0.00	10.75	10.75	0.00
40.05	10.06	10.06	0.00	10.58	10.58	0.00	10.89	10.89	0.00
40.042	10.06	10.06	0.00	10.57	10.57	0.00	10.87	10.87	0.00
40.041	9.99	9.99	0.00	10.44	10.44	0.00	10.69	10.69	0.00
40.04	9.99	9.99	0.00	10.44	10.44	0.00	10.68	10.68	0.00
39.98	10.00	10.00	0.00	10.47	10.47	0.00	10.72	10.72	0.00
39.95	9.93	9.93	0.00	10.33	10.33	0.00	10.53	10.53	0.00
39.93	9.93	9.93	0.00	10.33	10.33	0.00	10.54	10.54	0.00
39.929	9.93	9.93	0.00	10.33	10.33	0.00	10.53	10.53	0.00
39.926	9.93	9.93	0.00	10.33	10.33	0.00	10.53	10.53	0.00
39.92	9.93	9.93	0.00	10.33	10.33	0.00	10.53	10.53	0.00
39.89	9.92	9.92	0.00	10.32	10.32	0.00	10.52	10.52	0.00
39.81	9.93	9.93	0.00	10.33	10.33	0.00	10.53	10.53	0.00
39.68	9.93	9.93	0.00	10.33	10.33	0.00	10.53	10.53	0.00

**Table A-2. Computed Maximum Water Surface Elevation (WSE) – Paradise Cut
[River Stations denoted with * are HEC-RAS interpolated cross sections]**

Hydraulic Model River Station	1/50 AEP			1/100 AEP			1/200 AEP		
	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)
	Existing (Without Project)	With Project		Existing (Without Project)	With Project		Existing (Without Project)	With Project	
307	23.38	23.38	0.00	27.76	27.76	0.00	30.18	30.18	0.00
306.4	23.18	23.18	0.00	27.39	27.39	0.00	29.74	29.74	0.00
303.9	22.99	22.99	0.00	27.20	27.20	0.00	29.59	29.59	0.00
299.8	22.84	22.84	0.00	27.12	27.12	0.00	29.54	29.54	0.00
295.8	22.68	22.68	0.00	27.02	27.02	0.00	29.47	29.47	0.00
291.9	22.63	22.63	0.00	26.99	26.99	0.00	29.45	29.45	0.00
286.8	22.55	22.55	0.00	26.93	26.93	0.00	29.41	29.41	0.00
282.2	22.42	22.42	0.00	26.83	26.83	0.00	29.35	29.35	0.00
278.2	22.30	22.30	0.00	26.70	26.70	0.00	29.26	29.26	0.00
276.6	22.26	22.26	0.00	26.61	26.61	0.00	29.20	29.20	0.00
276.4	22.25	22.25	0.00	26.43	26.43	0.00	28.91	28.91	0.00
275.4	22.16	22.16	0.00	26.31	26.31	0.00	28.81	28.81	0.00
274	22.05	22.05	0.00	26.18	26.18	0.00	28.75	28.75	0.00
272.3	21.93	21.93	0.00	26.06	26.06	0.00	28.66	28.66	0.00
267.9	21.66	21.66	0.00	25.76	25.76	0.00	28.49	28.49	0.00
263.6	21.31	21.31	0.00	25.31	25.31	0.00	28.20	28.20	0.00
259.7	21.03	21.03	0.00	24.95	24.95	0.00	27.94	27.94	0.00
255.4	20.69	20.69	0.00	24.50	24.50	0.00	27.51	27.51	0.00
251.1	20.26	20.26	0.00	23.89	23.89	0.00	26.76	26.76	0.00
246.7	19.58	19.58	0.00	23.00	23.00	0.00	25.75	25.75	0.00
245.6	19.39	19.39	0.00	22.77	22.77	0.00	25.52	25.52	0.00
245.2	19.08	19.08	0.00	22.23	22.23	0.00	24.94	24.94	0.00
242.2	18.79	18.79	0.00	21.86	21.86	0.00	24.67	24.67	0.00
241.6	18.81	18.81	0.00	21.87	21.87	0.00	24.67	24.67	0.00
241.1	18.76	18.76	0.00	21.80	21.80	0.00	24.62	24.62	0.00
240.2	18.68	18.68	0.00	21.65	21.65	0.00	24.50	24.50	0.00

Table A-2. Computed Maximum Water Surface Elevation (WSE) – Paradise Cut
[River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP Maximum WSE (ft NAVD88)			1/100 AEP Maximum WSE (ft NAVD88)			1/200 AEP Maximum WSE (ft NAVD88)		
	Existing (Without Project)	With Project	WSE Change (ft)	Existing (Without Project)	With Project	WSE Change (ft)	Existing (Without Project)	With Project	WSE Change (ft)
239.7	18.63	18.63	0.00	21.55	21.55	0.00	24.41	24.41	0.00
239.3	18.60	18.60	0.00	21.49	21.48	0.00	24.28	24.28	0.00
238.2	18.58	18.58	0.00	21.50	21.50	0.00	24.34	24.34	0.00
235.4	18.61	18.61	0.00	21.58	21.58	0.00	24.42	24.42	0.00
232.3	18.53	18.53	0.00	21.45	21.45	0.00	24.29	24.29	0.00
230.3	18.44	18.44	0.00	21.30	21.30	0.00	24.15	24.15	0.00
226.8	18.37	18.37	0.00	21.20	21.20	0.00	24.08	24.08	0.00
223.4	18.30	18.30	0.00	21.12	21.12	0.00	24.03	24.03	0.00
220	18.23	18.23	0.00	21.04	21.04	0.00	23.97	23.97	0.00
215.7	18.12	18.12	0.00	20.88	20.88	0.00	23.85	23.85	0.00
212.1	18.04	18.04	0.00	20.78	20.78	0.00	23.79	23.79	0.00
209.6	17.96	17.96	0.00	20.66	20.66	0.00	23.69	23.69	0.00
209.4	17.98	17.98	0.00	20.69	20.69	0.00	23.63	23.63	0.00
206.8	17.98	17.98	0.00	20.71	20.71	0.00	23.66	23.66	0.00
203.8	17.88	17.88	0.00	20.61	20.61	0.00	23.59	23.59	0.00
200.1	17.77	17.77	0.00	20.53	20.53	0.00	23.55	23.55	0.00
195.7	17.58	17.58	0.00	20.40	20.40	0.00	23.49	23.49	0.00
191	17.46	17.46	0.00	20.30	20.30	0.00	23.43	23.43	0.00
186.3	17.33	17.33	0.00	20.14	20.14	0.00	23.31	23.31	0.00
183.7	17.28	17.28	0.00	20.08	20.08	0.00	23.28	23.28	0.00
180.8	17.20	17.20	0.00	20.01	20.01	0.00	23.24	23.24	0.00
177.3	17.12	17.12	0.00	19.95	19.95	0.00	23.22	23.22	0.00
173.7	17.02	17.02	0.00	19.89	19.89	0.00	23.20	23.20	0.00
169.1	16.92	16.92	0.00	19.83	19.83	0.00	23.18	23.18	0.00
164.9	16.84	16.84	0.00	19.78	19.78	0.00	23.16	23.16	0.00
160.5	16.78	16.78	0.00	19.75	19.75	0.00	23.14	23.14	0.00
155.6	16.72	16.72	0.00	19.71	19.71	0.00	23.13	23.13	0.00
151	16.65	16.65	0.00	19.66	19.66	0.00	23.10	23.10	0.00
146.3	16.56	16.56	0.00	19.59	19.59	0.00	23.06	23.06	0.00
142.9	16.47	16.47	0.00	19.50	19.50	0.00	23.01	23.01	0.00
138.5	16.28	16.28	0.00	19.28	19.28	0.00	22.87	22.87	0.00
135.3	16.22	16.22	0.00	19.24	19.24	0.00	22.85	22.86	0.00
130.7	16.13	16.13	0.00	19.19	19.19	0.00	22.85	22.85	0.00
126.5	16.06	16.06	0.00	19.17	19.17	0.00	22.86	22.86	0.00
121.6	15.98	15.98	0.00	19.14	19.14	0.00	22.85	22.85	0.00
115.7	15.93	15.93	0.00	19.13	19.13	0.00	22.85	22.85	0.00
111.3	15.89	15.89	0.00	19.11	19.11	0.00	22.84	22.84	0.00
106	15.84	15.84	0.00	19.08	19.08	0.00	22.83	22.83	0.00
101.5	15.80	15.80	0.00	19.05	19.05	0.00	22.82	22.82	0.00
97.1	15.76	15.76	0.00	19.02	19.02	0.00	22.81	22.81	0.00
93	15.74	15.74	0.00	19.01	19.01	0.00	22.80	22.80	0.00
88.6	15.71	15.71	0.00	18.96	18.96	0.00	22.77	22.77	0.00
84.6	15.65	15.65	0.00	18.91	18.91	0.00	22.74	22.74	0.00
80.4	15.59	15.59	0.00	18.85	18.85	0.00	22.71	22.71	0.00
76.4	15.55	15.55	0.00	18.79	18.79	0.00	22.69	22.69	0.00
72.6	15.51	15.51	0.00	18.74	18.74	0.00	22.66	22.66	0.00
71.7	15.44	15.44	0.00	18.67	18.67	0.00	22.63	22.63	0.00
71.6	15.43	15.43	0.00	18.67	18.67	0.00	22.63	22.63	0.00
71.3	15.37	15.37	0.00	18.56	18.56	0.00	22.55	22.55	0.00
71.2	15.37	15.37	0.00	18.55	18.55	0.00	22.55	22.55	0.00
69.8	15.39	15.39	0.00	18.58	18.58	0.00	22.57	22.57	0.00
67	15.37	15.37	0.00	18.56	18.56	0.00	22.55	22.55	0.00
63.5	15.28	15.28	0.00	18.45	18.45	0.00	22.51	22.51	0.00
59.7	15.26	15.26	0.00	18.43	18.43	0.00	22.49	22.49	0.00
55.1	15.21	15.21	0.00	18.39	18.39	0.00	22.45	22.45	0.00
50.9	15.17	15.17	0.00	18.35	18.35	0.00	22.42	22.42	0.00
47.2	15.14	15.14	0.00	18.31	18.31	0.00	22.37	22.37	0.00
43.5	15.10	15.10	0.00	18.26	18.26	0.00	22.30	22.30	0.00

Table A-2. Computed Maximum Water Surface Elevation (WSE) – Paradise Cut [River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP			1/100 AEP			1/200 AEP		
	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)
	Existing (Without Project)	With Project		Existing (Without Project)	With Project		Existing (Without Project)	With Project	
39.4	15.05	15.05	0.00	18.20	18.20	0.00	22.22	22.22	0.00
33.7	14.99	14.99	0.00	18.12	18.12	0.00	22.04	22.04	0.00
29.7	14.95	14.95	0.00	18.07	18.07	0.00	21.94	21.94	0.00
25.3	14.92	14.92	0.00	18.04	18.04	0.00	21.81	21.81	0.00
21.3	14.89	14.89	0.00	17.99	17.99	0.00	21.67	21.67	0.00
17.6	14.85	14.85	0.00	17.94	17.94	0.00	21.56	21.56	0.00
13	14.80	14.80	0.00	17.88	17.88	0.00	21.45	21.45	0.00
8.8	14.76	14.76	0.00	17.83	17.83	0.00	21.35	21.35	0.00
4.8	14.74	14.74	0.00	17.81	17.81	0.00	21.33	21.33	0.00
0.4	14.73	14.73	0.00	17.81	17.81	0.00	21.37	21.37	0.00

Table A-3. Computed Maximum Water Surface Elevation (WSE) – Old River [River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP			1/100 AEP			1/200 AEP		
	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)
	Existing (Without Project)	With Project		Existing (Without Project)	With Project		Existing (Without Project)	With Project	
301.4	19.92	19.92	0.00	24.79	24.79	0.00	27.15	27.15	0.00
298.3	19.86	19.86	0.00	24.70	24.70	0.00	27.05	27.05	0.00
294.3	19.85	19.85	0.00	24.69	24.69	0.00	27.03	27.03	0.00
290.8	19.78	19.78	0.00	24.61	24.61	0.00	26.95	26.95	0.00
287	19.76	19.76	0.00	24.61	24.61	0.00	26.96	26.96	0.00
283.5	19.68	19.68	0.00	24.50	24.50	0.00	26.83	26.83	0.00
276.3	19.35	19.35	0.00	24.05	24.05	0.00	26.29	26.29	0.00
272.5	19.42	19.42	0.00	24.15	24.15	0.00	26.42	26.42	0.00
268.5	19.34	19.34	0.00	24.05	24.05	0.00	26.30	26.30	0.00
264.3	19.20	19.20	0.00	23.86	23.86	0.00	26.07	26.07	0.00
260.8	19.13	19.13	0.00	23.76	23.76	0.00	25.95	25.95	0.00
256.5	19.06	19.06	0.00	23.68	23.68	0.00	25.86	25.86	0.00
252	19.04	19.04	0.00	23.68	23.68	0.00	25.88	25.88	0.00
247.3	18.82	18.82	0.00	23.37	23.37	0.00	25.55	25.55	0.00
242.3	18.70	18.70	0.00	23.21	23.21	0.00	25.37	25.37	0.00
237.8	18.61	18.61	0.00	23.11	23.11	0.00	25.28	25.28	0.00
233.8	18.56	18.56	0.00	23.06	23.06	0.00	25.24	25.24	0.00
229.3	18.49	18.49	0.00	23.01	23.01	0.00	25.20	25.20	0.00
221.2	18.54	18.54	0.00	23.11	23.11	0.00	25.33	25.33	0.00
215.3	18.29	18.29	0.00	22.75	22.75	0.00	24.94	24.94	0.00
211	18.19	18.19	0.00	22.63	22.63	0.00	24.81	24.81	0.00
207.3	18.13	18.13	0.00	22.56	22.56	0.00	24.74	24.74	0.00
203.7	18.31	18.31	0.00	22.84	22.84	0.00	25.05	25.05	0.00
201.2	18.18	18.18	0.00	22.63	22.63	0.00	24.82	24.82	0.00
196.9	18.08	18.08	0.00	22.50	22.50	0.00	24.69	24.69	0.00
192.8	18.02	18.02	0.00	22.42	22.42	0.00	24.60	24.60	0.00
188.8	17.96	17.96	0.00	22.35	22.35	0.00	24.53	24.53	0.00
184.5	17.93	17.93	0.00	22.33	22.33	0.00	24.53	24.53	0.00
179	18.05	18.04	0.00	22.51	22.51	0.00	24.72	24.72	0.00
173	17.82	17.82	0.00	22.17	22.17	0.00	24.35	24.35	0.00
169	17.67	17.67	0.00	21.95	21.95	0.00	24.11	24.11	0.00
165.3	17.62	17.62	0.00	21.88	21.88	0.00	24.05	24.05	0.00
161.3	17.58	17.58	0.00	21.83	21.83	0.00	23.99	23.99	0.00
157.8	17.54	17.54	0.00	21.79	21.79	0.00	23.96	23.96	0.00
154	17.46	17.46	0.00	21.66	21.66	0.00	23.81	23.81	0.00
150	17.43	17.43	0.00	21.64	21.64	0.00	23.81	23.81	0.00
146	17.42	17.42	0.00	21.66	21.66	0.00	23.91	23.91	0.00

Table A-3. Computed Maximum Water Surface Elevation (WSE) – Old River
[River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/50 AEP Maximum WSE (ft NAVD88) With Project	1/50 AEP WSE Change (ft)	1/100 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/100 AEP Maximum WSE (ft NAVD88) With Project	1/100 AEP WSE Change (ft)	1/200 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/200 AEP Maximum WSE (ft NAVD88) With Project	1/200 AEP WSE Change (ft)
142	17.28	17.28	0.00	21.44	21.44	0.00	23.79	23.79	0.00
138.3	17.17	17.17	0.00	21.30	21.30	0.00	23.69	23.69	0.00
134.5	17.10	17.10	0.00	21.21	21.21	0.00	23.63	23.63	0.00
131	17.11	17.11	0.00	21.23	21.23	0.00	23.64	23.64	0.00
125.5	17.00	17.00	0.00	21.06	21.06	0.00	23.49	23.50	0.00
121.3	16.93	16.93	0.00	20.98	20.98	0.00	23.44	23.44	0.00
117.3	16.89	16.89	0.00	20.93	20.93	0.00	23.41	23.41	0.00
113.8	16.80	16.80	0.00	20.79	20.79	0.00	23.28	23.28	0.00
110.3	16.68	16.68	0.00	20.60	20.60	0.00	23.13	23.13	0.00
107.8	16.64	16.64	0.00	20.53	20.53	0.00	23.07	23.07	0.00
103	16.64	16.64	0.00	20.58	20.58	0.00	23.13	23.13	0.00
97.8	16.50	16.50	0.00	20.37	20.37	0.00	22.96	22.96	0.00
93.5	16.40	16.40	0.00	20.20	20.20	0.00	22.82	22.82	0.00
90	16.32	16.32	0.00	20.10	20.10	0.00	22.75	22.75	0.00
86.5	16.32	16.32	0.00	20.10	20.10	0.00	22.76	22.76	0.00
84.5	16.32	16.32	0.00	20.10	20.10	0.00	22.76	22.76	0.00
81.3	16.21	16.21	0.00	19.95	19.95	0.00	22.65	22.65	0.00
77.8	16.17	16.17	0.00	19.89	19.89	0.00	22.63	22.63	0.00
73	16.01	16.01	0.00	19.68	19.68	0.00	22.49	22.49	0.00
71.5	16.19	16.19	0.00	19.96	19.96	0.00	22.69	22.69	0.00
66.8	16.06	16.06	0.00	19.77	19.77	0.00	22.56	22.56	0.00
60.5	15.83	15.83	0.00	19.42	19.42	0.00	22.32	22.33	0.00
57.3	15.93	15.93	0.00	19.60	19.60	0.00	22.46	22.46	0.00
55	15.82	15.82	0.00	19.46	19.46	0.00	22.37	22.37	0.00
50.5	15.74	15.74	0.00	19.35	19.35	0.00	22.31	22.31	0.00
47.5	15.56	15.56	0.00	19.08	19.08	0.00	22.13	22.13	0.00
43	15.44	15.44	0.00	18.91	18.91	0.00	22.03	22.03	0.00
40	15.44	15.44	0.00	18.92	18.92	0.00	22.04	22.04	0.00
37.3	15.44	15.44	0.00	18.93	18.93	0.00	22.06	22.06	0.00
34.8	15.52	15.52	0.00	19.06	19.06	0.00	22.14	22.14	0.00
29.5	15.28	15.28	0.00	18.65	18.65	0.00	21.87	21.87	0.00
28.3	15.23	15.23	0.00	18.60	18.60	0.00	21.84	21.85	0.00
25.5	15.32	15.32	0.00	18.75	18.75	0.00	21.94	21.94	0.00
20.8	15.15	15.15	0.00	18.48	18.48	0.00	21.76	21.76	0.00
16.5	15.02	15.02	0.00	18.27	18.27	0.00	21.64	21.64	0.00
12.5	14.96	14.96	0.00	18.18	18.18	0.00	21.58	21.58	0.00
8.5	14.82	14.82	0.00	17.95	17.95	0.00	21.44	21.44	0.00
4	14.83	14.83	0.00	17.97	17.97	0.00	21.46	21.46	0.00
0.3	14.73	14.73	0.00	17.81	17.81	0.00	21.37	21.37	0.00
242.73	14.73	14.73	0.00	17.81	17.81	0.00	21.37	21.37	0.00
238.75	14.69	14.69	0.00	17.79	17.79	0.00	21.36	21.36	0.00
235.07	14.64	14.64	0.00	17.75	17.75	0.00	21.33	21.33	0.00
231.42	14.59	14.59	0.00	17.70	17.70	0.00	21.28	21.28	0.00
227.28	14.53	14.53	0.00	17.61	17.61	0.00	21.16	21.16	0.00
223.72	14.43	14.43	0.00	17.46	17.46	0.00	20.96	20.96	0.00
219.73	14.35	14.35	0.00	17.37	17.37	0.00	20.85	20.85	0.00
215.61	14.24	14.24	0.00	17.23	17.23	0.00	20.71	20.71	0.00
211.83	14.15	14.15	0.00	17.14	17.14	0.00	20.63	20.63	0.00
207.63	14.07	14.07	0.00	17.09	17.09	0.00	20.60	20.60	0.00
203.6	13.96	13.96	0.00	17.00	17.00	0.00	20.54	20.54	0.00
199.54	13.86	13.86	0.00	16.92	16.92	0.00	20.49	20.49	0.00
195.54	13.74	13.74	0.00	16.83	16.83	0.00	20.41	20.41	0.00
191.61	13.65	13.65	0.00	16.76	16.76	0.00	20.36	20.36	0.00
187.52	13.59	13.59	0.00	16.72	16.72	0.00	20.33	20.33	0.00
183.73	13.51	13.51	0.00	16.66	16.66	0.00	20.29	20.29	0.00
179.81	13.42	13.42	0.00	16.60	16.60	0.00	20.25	20.25	0.00
175.68	13.32	13.32	0.00	16.54	16.54	0.00	20.20	20.20	0.00
172.06	13.26	13.26	0.00	16.49	16.49	0.00	20.17	20.17	0.00

Table A-3. Computed Maximum Water Surface Elevation (WSE) – Old River
[River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/50 AEP Maximum WSE (ft NAVD88) With Project	1/50 AEP WSE Change (ft)	1/100 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/100 AEP Maximum WSE (ft NAVD88) With Project	1/100 AEP WSE Change (ft)	1/200 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/200 AEP Maximum WSE (ft NAVD88) With Project	1/200 AEP WSE Change (ft)
143.42	13.26	13.26	0.00	16.49	16.49	0.00	20.17	20.17	0.00
139.38	13.19	13.19	0.00	16.43	16.43	0.00	20.17	20.17	0.00
135.41	13.17	13.17	0.00	16.42	16.42	0.00	20.17	20.17	0.00
131.725*	13.14	13.14	0.00	16.40	16.40	0.00	20.17	20.17	0.00
128.04	13.08	13.08	0.00	16.35	16.35	0.00	20.14	20.14	0.00
125.69	13.04	13.04	0.00	16.34	16.34	0.00	20.14	20.14	0.00
123.3	12.99	12.99	0.00	16.33	16.33	0.00	20.13	20.13	0.00
117.03	12.93	12.93	0.00	16.31	16.31	0.00	20.12	20.12	0.00
112.07*	12.91	12.91	0.00	16.30	16.30	0.00	20.12	20.12	0.00
107.11	12.88	12.88	0.00	16.28	16.28	0.00	20.11	20.11	0.00
102.755*	12.86	12.86	0.00	16.28	16.28	0.00	20.10	20.11	0.00
98.4	12.85	12.85	0.00	16.27	16.27	0.00	20.10	20.10	0.00
92.68	12.83	12.83	0.00	16.26	16.26	0.00	20.09	20.09	0.00
88.67*	12.81	12.81	0.00	16.25	16.25	0.00	20.09	20.09	0.00
84.66	12.79	12.79	0.00	16.24	16.24	0.00	20.08	20.08	0.00
79.44*	12.77	12.77	0.00	16.23	16.23	0.00	20.07	20.07	0.00
74.22*	12.76	12.76	0.00	16.22	16.22	0.00	20.06	20.06	0.00
69	12.70	12.70	0.00	16.16	16.16	0.00	20.02	20.02	0.00
64.175*	12.67	12.67	0.00	16.11	16.11	0.00	19.96	19.96	0.00
59.35	12.64	12.64	0.00	16.08	16.08	0.00	19.91	19.91	0.00
55.97	12.54	12.54	0.00	15.95	15.95	0.00	19.76	19.76	0.00
50.96	12.54	12.54	0.00	15.94	15.94	0.00	19.76	19.76	0.00
46.62	12.54	12.54	0.00	15.95	15.95	0.00	19.78	19.78	0.00
40.97	12.40	12.40	0.00	15.68	15.68	0.00	19.36	19.36	0.00
37.28	12.38	12.38	0.00	15.71	15.71	0.00	19.46	19.46	0.00
33.36	12.26	12.26	0.00	15.50	15.50	0.00	19.19	19.19	0.00
29.23	12.22	12.22	0.00	15.46	15.46	0.00	19.13	19.13	0.00
26.38	12.27	12.27	0.00	15.57	15.57	0.00	19.32	19.33	0.00
22.5	12.27	12.27	0.00	15.57	15.57	0.00	19.33	19.33	0.00
18.16	12.24	12.24	0.00	15.55	15.55	0.00	19.32	19.32	0.00
14.59	12.17	12.17	0.00	15.41	15.41	0.00	19.12	19.12	0.00
10	12.11	12.11	0.00	15.31	15.31	0.00	18.95	18.95	0.00
3.4375*	12.06	12.06	0.00	15.23	15.23	0.00	18.85	18.85	0.00
-3.125*	12.01	12.01	0.00	15.15	15.15	0.00	18.75	18.75	0.00
-9.6875*	11.96	11.96	0.00	15.08	15.08	0.00	18.66	18.66	0.00
-16.25*	11.92	11.92	0.00	15.01	15.01	0.00	18.57	18.57	0.00
-22.812*	11.88	11.88	0.00	14.94	14.94	0.00	18.49	18.49	0.00
-29.375*	11.84	11.84	0.00	14.88	14.88	0.00	18.42	18.42	0.00
-35.937*	11.80	11.80	0.00	14.83	14.83	0.00	18.35	18.35	0.00
-42.5	11.77	11.77	0.00	14.77	14.77	0.00	18.28	18.28	0.00
-47.633*	11.73	11.73	0.00	14.70	14.70	0.00	18.17	18.17	0.00
-52.766*	11.68	11.68	0.00	14.61	14.61	0.00	18.05	18.05	0.00
-57.9	11.62	11.62	0.00	14.51	14.51	0.00	17.89	17.89	0.00
-64.75*	11.58	11.58	0.00	14.44	14.44	0.00	17.81	17.81	0.00
-71.6	11.54	11.54	0.00	14.40	14.40	0.00	17.76	17.76	0.00
-77.766*	11.49	11.49	0.00	14.30	14.30	0.00	17.63	17.63	0.00
-83.933*	11.43	11.43	0.00	14.20	14.20	0.00	17.48	17.48	0.00
-90.1	11.37	11.37	0.00	14.09	14.09	0.00	17.32	17.32	0.00
-95.3*	11.33	11.33	0.00	14.01	14.01	0.00	17.20	17.20	0.00
-100.5	11.29	11.29	0.00	13.94	13.94	0.00	17.08	17.08	0.00
-106.83*	11.27	11.27	0.00	13.89	13.89	0.00	17.03	17.03	0.00
-113.16*	11.24	11.24	0.00	13.85	13.85	0.00	16.98	16.98	0.00
-119.5	11.22	11.22	0.00	13.81	13.81	0.00	16.93	16.93	0.00
-126.1*	11.18	11.18	0.00	13.73	13.73	0.00	16.81	16.81	0.00
-132.7	11.14	11.14	0.00	13.65	13.65	0.00	16.68	16.68	0.00
-139.02*	11.09	11.09	0.00	13.56	13.56	0.00	16.55	16.55	0.00
-145.35*	11.04	11.04	0.00	13.47	13.47	0.00	16.41	16.41	0.00
-151.67*	10.99	10.99	0.00	13.37	13.37	0.00	16.26	16.26	0.00

Table A-3. Computed Maximum Water Surface Elevation (WSE) – Old River
[River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP			1/100 AEP			1/200 AEP		
	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)
	Existing (Without Project)	With Project		Existing (Without Project)	With Project		Existing (Without Project)	With Project	
-158	10.93	10.93	0.00	13.26	13.26	0.00	16.12	16.12	0.00
-164.75*	10.88	10.88	0.00	13.17	13.17	0.00	15.99	15.99	0.00
-171.5*	10.85	10.85	0.00	13.10	13.10	0.00	15.87	15.87	0.00
-178.25*	10.81	10.81	0.00	13.03	13.03	0.00	15.77	15.77	0.00
-185	10.78	10.78	0.00	12.96	12.96	0.00	15.67	15.67	0.00
-191.4*	10.73	10.73	0.00	12.87	12.87	0.00	15.52	15.52	0.00
-197.8*	10.67	10.67	0.00	12.74	12.74	0.00	15.36	15.36	0.00
-204.2*	10.59	10.59	0.00	12.61	12.61	0.00	15.26	15.26	0.00
-210.6	10.52	10.52	0.00	12.55	12.55	0.00	15.21	15.21	0.00
-216.3*	10.44	10.44	0.00	12.38	12.38	0.00	15.01	15.01	0.00
-222.*	10.39	10.39	0.00	12.27	12.27	0.00	14.84	14.84	0.00
-227.7*	10.36	10.36	0.00	12.21	12.21	0.00	14.73	14.73	0.00
-233.4*	10.33	10.33	0.00	12.16	12.16	0.00	14.66	14.66	0.00
-239.1	10.31	10.31	0.00	12.12	12.12	0.00	14.60	14.60	0.00
-245.5*	10.28	10.28	0.00	12.05	12.05	0.00	14.49	14.49	0.00
-251.9*	10.24	10.24	0.00	11.97	11.97	0.00	14.36	14.36	0.00
-258.3*	10.20	10.20	0.00	11.88	11.88	0.00	14.21	14.21	0.00
-264.7*	10.16	10.16	0.00	11.78	11.78	0.00	14.03	14.03	0.00
-271.1	10.11	10.11	0.00	11.65	11.65	0.00	13.81	13.81	0.00
-277.35*	10.08	10.08	0.00	11.59	11.59	0.00	13.72	13.72	0.00
-283.6*	10.05	10.05	0.00	11.54	11.54	0.00	13.64	13.64	0.00
-289.85*	10.03	10.03	0.00	11.49	11.49	0.00	13.56	13.56	0.00
-296.1	10.01	10.01	0.00	11.44	11.44	0.00	13.48	13.48	0.00
-302.94*	9.97	9.97	0.00	11.35	11.35	0.00	13.33	13.33	0.00
-309.78*	9.93	9.93	0.00	11.25	11.25	0.00	13.15	13.15	0.00
-316.62*	9.89	9.89	0.00	11.14	11.14	0.00	12.93	12.93	0.00
-323.46*	9.84	9.84	0.00	11.00	11.00	0.00	12.66	12.66	0.00
-330.3	9.78	9.78	0.00	10.83	10.83	0.00	12.30	12.30	0.00
-337.2*	9.72	9.72	0.00	10.67	10.67	0.00	11.97	11.97	0.00
-344.1*	9.66	9.66	0.00	10.50	10.50	0.00	11.61	11.61	0.00
-351	9.60	9.60	0.00	10.32	10.32	0.00	11.22	11.22	0.00
-356.95*	9.56	9.56	0.00	10.21	10.21	0.00	10.97	10.97	0.00
-362.9*	9.51	9.51	0.00	10.08	10.08	0.00	10.67	10.67	0.00
-368.85*	9.47	9.47	0.00	9.96	9.96	0.00	10.35	10.35	0.00
-374.8	9.43	9.43	0.00	9.83	9.83	0.00	10.03	10.03	0.00

Table A-4. Computed Maximum Water Surface Elevation (WSE) – Middle River
[River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP			1/100 AEP			1/200 AEP		
	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)
	Existing (Without Project)	With Project		Existing (Without Project)	With Project		Existing (Without Project)	With Project	
28.318	16.32	16.32	0.00	20.10	20.10	0.00	22.76	22.76	0.00
28.2445*	16.23	16.23	0.00	19.99	19.99	0.00	22.61	22.61	0.00
28.171	16.15	16.15	0.00	19.91	19.91	0.00	22.50	22.50	0.00
28.081	16.11	16.11	0.00	19.88	19.88	0.00	22.48	22.48	0.00
27.983*	16.02	16.02	0.00	19.78	19.78	0.00	22.34	22.34	0.00
27.885*	15.93	15.93	0.00	19.68	19.68	0.00	22.21	22.21	0.00
27.787	15.85	15.85	0.00	19.59	19.59	0.00	22.10	22.10	0.00
27.6805*	15.72	15.72	0.00	19.43	19.43	0.00	21.90	21.90	0.00
27.574	15.63	15.63	0.00	19.31	19.31	0.00	21.70	21.70	0.00
27.4955*	15.53	15.53	0.00	19.18	19.18	0.00	21.53	21.53	0.00
27.417	15.45	15.45	0.00	19.11	19.11	0.00	21.44	21.44	0.00
27.3445*	15.37	15.37	0.00	19.01	19.01	0.00	21.28	21.28	0.00

Table A-4. Computed Maximum Water Surface Elevation (WSE) – Middle River
[River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP			1/100 AEP			1/200 AEP		
	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)	Maximum WSE (ft NAVD88)		WSE Change (ft)
	Existing (Without Project)	With Project		Existing (Without Project)	With Project		Existing (Without Project)	With Project	
27.272	15.31	15.31	0.00	18.91	18.91	0.00	21.14	21.14	0.00
27.1485*	15.18	15.18	0.00	18.74	18.74	0.00	20.88	20.88	0.00
27.025	15.05	15.05	0.00	18.59	18.59	0.00	20.65	20.65	0.00
26.9485*	14.98	14.98	0.00	18.49	18.49	0.00	20.48	20.48	0.00
26.872	14.94	14.94	0.00	18.44	18.44	0.00	20.41	20.41	0.00
26.866	14.94	14.94	0.00	18.44	18.44	0.00	20.41	20.41	0.00
26.865	14.96	14.96	0.00	18.47	18.47	0.00	20.46	20.46	0.00
26.861	14.95	14.95	0.00	18.47	18.47	0.00	20.46	20.46	0.00
26.792*	14.90	14.90	0.00	18.38	18.38	0.00	20.31	20.31	0.00
26.723	14.82	14.82	0.00	18.28	18.28	0.00	20.14	20.14	0.00
26.609*	14.72	14.72	0.00	18.13	18.13	0.00	19.91	19.91	0.00
26.495	14.62	14.62	0.00	17.99	17.99	0.00	19.68	19.68	0.00
26.3725*	14.50	14.50	0.00	17.82	17.82	0.00	19.39	19.39	0.00
26.251	14.38	14.38	0.00	17.66	17.66	0.00	19.27	19.27	0.00
26.1255*	14.26	14.26	0.00	17.49	17.49	0.00	19.11	19.11	0.00
26	14.16	14.16	0.00	17.35	17.35	0.00	18.95	18.95	0.00
25.876	14.08	14.08	0.00	17.26	17.26	0.00	18.86	18.86	0.00
25.778*	14.00	14.00	0.00	17.15	17.15	0.00	18.73	18.73	0.00
25.68	13.94	13.94	0.00	17.06	17.06	0.00	18.61	18.61	0.00
25.59*	13.87	13.87	0.00	16.95	16.95	0.00	18.48	18.48	0.00
25.5	13.78	13.78	0.00	16.83	16.83	0.00	18.33	18.33	0.00
25.39*	13.68	13.68	0.00	16.70	16.70	0.00	18.18	18.18	0.00
25.28*	13.60	13.60	0.00	16.59	16.59	0.00	18.05	18.05	0.00
25.17	13.54	13.54	0.00	16.50	16.50	0.00	17.95	17.95	0.00
25.063	13.43	13.43	0.00	16.32	16.32	0.00	17.71	17.71	0.00
24.969	13.34	13.34	0.00	16.22	16.22	0.00	17.60	17.60	0.00
24.908	13.32	13.32	0.00	16.18	16.18	0.00	17.55	17.55	0.00
24.8135*	13.21	13.21	0.00	16.03	16.03	0.00	17.37	17.37	0.00
24.719	13.14	13.14	0.00	15.92	15.92	0.00	17.23	17.23	0.00
24.642*	13.08	13.08	0.00	15.83	15.83	0.00	17.12	17.12	0.00
24.565	13.02	13.02	0.00	15.74	15.74	0.00	17.00	17.00	0.00
24.49*	12.96	12.96	0.00	15.65	15.65	0.00	16.89	16.89	0.00
24.415	12.91	12.91	0.00	15.57	15.57	0.00	16.80	16.80	0.00
24.333	12.86	12.86	0.00	15.49	15.49	0.00	16.68	16.68	0.00
24.246	12.80	12.80	0.00	15.40	15.40	0.00	16.57	16.57	0.00
24.123*	12.70	12.70	0.00	15.23	15.23	0.00	16.35	16.35	0.00
24	12.60	12.60	0.00	15.07	15.07	0.00	16.15	16.15	0.00
23.9073*	12.52	12.52	0.00	14.94	14.94	0.00	15.97	15.97	0.00
23.8146*	12.43	12.43	0.00	14.80	14.80	0.00	15.78	15.78	0.00
23.722	12.34	12.34	0.00	14.66	14.66	0.00	15.61	15.61	0.00
23.625*	12.25	12.25	0.00	14.51	14.51	0.00	15.41	15.41	0.00
23.528	12.17	12.17	0.00	14.37	14.37	0.00	15.21	15.21	0.00
23.46*	12.12	12.12	0.00	14.28	14.28	0.00	15.08	15.08	0.00
23.392	12.08	12.08	0.00	14.21	14.21	0.00	14.99	14.99	0.00
23.27	11.97	11.97	0.00	14.02	14.02	0.00	14.72	14.72	0.00
23.202	11.91	11.91	0.00	13.93	13.93	0.00	14.59	14.59	0.00
23.199	11.91	11.91	0.00	13.93	13.93	0.00	14.59	14.59	0.00
23.198	11.89	11.89	0.00	13.89	13.89	0.00	14.53	14.53	0.00
23.195	11.89	11.89	0.00	13.89	13.89	0.00	14.53	14.53	0.00
23.096	11.84	11.84	0.00	13.80	13.80	0.00	14.40	14.40	0.00
23.0085*	11.79	11.79	0.00	13.71	13.71	0.00	14.27	14.27	0.00
22.922	11.74	11.74	0.00	13.66	13.66	0.00	14.23	14.23	0.00
22.824*	11.69	11.69	0.00	13.59	13.59	0.00	14.18	14.18	0.00
22.726	11.64	11.64	0.00	13.51	13.51	0.00	14.09	14.09	0.00
22.644	11.62	11.62	0.00	13.49	13.49	0.00	14.08	14.08	0.00
22.586	11.56	11.56	0.00	13.39	13.39	0.00	13.96	13.96	0.00
22.514*	11.51	11.51	0.00	13.32	13.32	0.00	13.87	13.87	0.00
22.442	11.48	11.48	0.00	13.27	13.27	0.00	13.81	13.81	0.00

Table A-4. Computed Maximum Water Surface Elevation (WSE) – Middle River
[River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/50 AEP Maximum WSE (ft NAVD88) With Project	1/50 AEP WSE Change (ft)	1/100 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/100 AEP Maximum WSE (ft NAVD88) With Project	1/100 AEP WSE Change (ft)	1/200 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/200 AEP Maximum WSE (ft NAVD88) With Project	1/200 AEP WSE Change (ft)
22.351	11.42	11.42	0.00	13.19	13.19	0.00	13.73	13.73	0.00
22.264	11.36	11.36	0.00	13.08	13.08	0.00	13.60	13.60	0.00
22.1606*	11.30	11.30	0.00	12.98	12.98	0.00	13.48	13.48	0.00
22.0573*	11.23	11.23	0.00	12.87	12.87	0.00	13.36	13.36	0.00
21.954	11.17	11.17	0.00	12.77	12.77	0.00	13.23	13.23	0.00
21.8875*	11.11	11.11	0.00	12.67	12.67	0.00	13.11	13.11	0.00
21.821	11.09	11.09	0.00	12.63	12.63	0.00	13.07	13.07	0.00
21.723	11.04	11.04	0.00	12.57	12.57	0.00	13.01	13.01	0.00
21.661	11.00	11.00	0.00	12.50	12.50	0.00	12.92	12.92	0.00
21.581*	10.96	10.96	0.00	12.43	12.43	0.00	12.84	12.84	0.00
21.501	10.92	10.92	0.00	12.37	12.37	0.00	12.77	12.77	0.00
21.429*	10.88	10.88	0.00	12.31	12.31	0.00	12.70	12.70	0.00
21.357	10.85	10.85	0.00	12.26	12.26	0.00	12.63	12.63	0.00
21.2835*	10.81	10.81	0.00	12.19	12.19	0.00	12.55	12.55	0.00
21.21	10.78	10.78	0.00	12.13	12.13	0.00	12.47	12.47	0.00
21.132*	10.74	10.74	0.00	12.06	12.06	0.00	12.39	12.39	0.00
21.054	10.70	10.70	0.00	11.99	11.99	0.00	12.31	12.31	0.00
20.9595*	10.65	10.65	0.00	11.91	11.91	0.00	12.21	12.21	0.00
20.866	10.62	10.62	0.00	11.86	11.86	0.00	12.17	12.17	0.00
20.787*	10.58	10.58	0.00	11.82	11.82	0.00	12.13	12.13	0.00
20.708	10.55	10.55	0.00	11.77	11.77	0.00	12.08	12.08	0.00
20.6325*	10.50	10.50	0.00	11.69	11.69	0.00	12.00	12.00	0.00
20.557	10.45	10.45	0.00	11.61	11.61	0.00	11.92	11.92	0.00
20.429*	10.37	10.37	0.00	11.49	11.49	0.00	11.79	11.79	0.00
20.301	10.27	10.27	0.00	11.33	11.33	0.00	11.62	11.62	0.00
20.2013*	10.23	10.23	0.00	11.26	11.26	0.00	11.55	11.55	0.00
20.1016*	10.18	10.18	0.00	11.18	11.18	0.00	11.47	11.47	0.00
20.002	10.14	10.14	0.00	11.11	11.11	0.00	11.40	11.40	0.00
19.8765*	10.09	10.09	0.00	11.03	11.03	0.00	11.31	11.31	0.00
19.751	10.04	10.04	0.00	10.95	10.95	0.00	11.22	11.22	0.00
19.624	9.99	9.99	0.00	10.87	10.87	0.00	11.14	11.14	0.00
19.563	9.98	9.98	0.00	10.85	10.85	0.00	11.12	11.12	0.00
19.494	9.96	9.96	0.00	10.81	10.81	0.00	11.07	11.07	0.00
19.3875*	9.92	9.92	0.00	10.75	10.75	0.00	11.01	11.01	0.00
19.281	9.88	9.88	0.00	10.67	10.67	0.00	10.93	10.93	0.00
19.218	9.89	9.89	0.00	10.68	10.68	0.00	10.94	10.94	0.00
19.144	9.86	9.86	0.00	10.63	10.63	0.00	10.89	10.89	0.00
19.0345*	9.83	9.83	0.00	10.58	10.58	0.00	10.83	10.83	0.00
18.925	9.80	9.80	0.00	10.53	10.53	0.00	10.78	10.78	0.00
18.8016*	9.77	9.77	0.00	10.48	10.48	0.00	10.72	10.72	0.00
18.6783*	9.75	9.75	0.00	10.44	10.44	0.00	10.68	10.68	0.00
18.555	9.73	9.73	0.00	10.40	10.40	0.00	10.63	10.63	0.00
18.4613*	9.71	9.71	0.00	10.36	10.36	0.00	10.60	10.60	0.00
18.3676*	9.69	9.69	0.00	10.33	10.33	0.00	10.56	10.56	0.00
18.274	9.67	9.67	0.00	10.29	10.29	0.00	10.53	10.53	0.00
18.202*	9.63	9.63	0.00	10.22	10.22	0.00	10.45	10.45	0.00
18.13	9.59	9.59	0.00	10.15	10.15	0.00	10.38	10.38	0.00
18.124	9.59	9.59	0.00	10.15	10.15	0.00	10.37	10.37	0.00
18.123	9.59	9.59	0.00	10.14	10.14	0.00	10.36	10.36	0.00
18.117	9.59	9.59	0.00	10.14	10.14	0.00	10.36	10.36	0.00
18.021	9.58	9.58	0.00	10.13	10.13	0.00	10.35	10.35	0.00
17.917*	9.57	9.57	0.00	10.11	10.11	0.00	10.33	10.33	0.00
17.813	9.56	9.56	0.00	10.09	10.09	0.00	10.31	10.31	0.00
17.7155*	9.55	9.55	0.00	10.07	10.07	0.00	10.29	10.29	0.00
17.618	9.55	9.55	0.00	10.06	10.06	0.00	10.28	10.28	0.00
17.55*	9.54	9.54	0.00	10.05	10.05	0.00	10.27	10.27	0.00
17.482	9.53	9.53	0.00	10.04	10.04	0.00	10.25	10.25	0.00
17.361	9.52	9.52	0.00	10.02	10.02	0.00	10.24	10.24	0.00

Table A-4. Computed Maximum Water Surface Elevation (WSE) – Middle River [River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/50 AEP Maximum WSE (ft NAVD88) With Project	1/50 AEP WSE Change (ft)	1/100 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/100 AEP Maximum WSE (ft NAVD88) With Project	1/100 AEP WSE Change (ft)	1/200 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/200 AEP Maximum WSE (ft NAVD88) With Project	1/200 AEP WSE Change (ft)
17.258*	9.51	9.51	0.00	10.00	10.00	0.00	10.21	10.21	0.00
17.155	9.50	9.50	0.00	9.97	9.97	0.00	10.18	10.18	0.00
17.0625*	9.49	9.49	0.00	9.96	9.96	0.00	10.17	10.17	0.00
16.97	9.49	9.49	0.00	9.95	9.95	0.00	10.16	10.16	0.00
16.883	9.48	9.48	0.00	9.93	9.93	0.00	10.14	10.14	0.00
16.819	9.48	9.48	0.00	9.93	9.93	0.00	10.13	10.13	0.00
16.7296*	9.47	9.47	0.00	9.91	9.91	0.00	10.12	10.12	0.00
16.6403*	9.47	9.47	0.00	9.90	9.90	0.00	10.11	10.11	0.00
16.551	9.46	9.46	0.00	9.89	9.89	0.00	10.09	10.09	0.00
16.4585*	9.45	9.45	0.00	9.88	9.88	0.00	10.08	10.08	0.00
16.366	9.45	9.45	0.00	9.86	9.86	0.00	10.06	10.06	0.00
16.269	9.44	9.44	0.00	9.85	9.85	0.00	10.05	10.05	0.00
16.183	9.44	9.44	0.00	9.84	9.84	0.00	10.04	10.04	0.00
16.096	9.43	9.43	0.00	9.83	9.83	0.00	10.03	10.03	0.00
15.988	9.43	9.43	0.00	9.83	9.83	0.00	10.03	10.03	0.00
15.923	9.43	9.43	0.00	9.83	9.83	0.00	10.03	10.03	0.00

Table A-5. Computed Maximum Water Surface Elevation (WSE) – Grant Line Canal [River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/50 AEP Maximum WSE (ft NAVD88) With Project	1/50 AEP WSE Change (ft)	1/100 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/100 AEP Maximum WSE (ft NAVD88) With Project	1/100 AEP WSE Change (ft)	1/200 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/200 AEP Maximum WSE (ft NAVD88) With Project	1/200 AEP WSE Change (ft)
167.79	13.26	13.26	0.00	16.49	16.49	0.00	20.17	20.17	0.00
163.75	13.23	13.23	0.00	16.45	16.45	0.00	20.12	20.12	0.00
159.7	13.19	13.19	0.00	16.40	16.40	0.00	20.05	20.05	0.00
154.3	13.13	13.13	0.00	16.32	16.32	0.00	19.95	19.95	0.00
150.28	13.16	13.16	0.00	16.37	16.37	0.00	20.03	20.03	0.00
146.81	13.04	13.04	0.00	16.23	16.23	0.00	19.89	19.89	0.00
143.46	12.96	12.96	0.00	16.16	16.16	0.00	19.83	19.83	0.00
139.54	12.90	12.90	0.00	16.12	16.12	0.00	19.80	19.80	0.00
135.37	12.90	12.90	0.00	16.11	16.11	0.00	19.78	19.78	0.00
131.34	12.85	12.85	0.00	16.05	16.05	0.00	19.73	19.73	0.00
127.42	12.84	12.84	0.00	16.04	16.04	0.00	19.73	19.73	0.00
123.18	12.82	12.82	0.00	16.03	16.03	0.00	19.72	19.72	0.00
119.13	12.77	12.77	0.00	15.99	15.99	0.00	19.69	19.69	0.00
116.03	12.62	12.62	0.00	15.74	15.74	0.00	19.37	19.37	0.00
110.72*	12.59	12.59	0.00	15.71	15.71	0.00	19.33	19.33	0.00
105.41	12.55	12.55	0.00	15.62	15.62	0.00	19.17	19.17	0.00
100	12.43	12.43	0.00	15.39	15.39	0.00	18.82	18.82	0.00
93.3333*	12.34	12.34	0.00	15.25	15.25	0.00	18.60	18.60	0.00
86.6666*	12.26	12.26	0.00	15.11	15.11	0.00	18.42	18.42	0.00
80	12.18	12.18	0.00	14.98	14.98	0.00	18.23	18.23	0.00
74.1666*	12.13	12.13	0.00	14.89	14.89	0.00	18.10	18.10	0.00
68.3333*	12.09	12.09	0.00	14.81	14.81	0.00	17.98	17.98	0.00
62.5	12.05	12.05	0.00	14.74	14.74	0.00	17.87	17.87	0.00
56.6666*	12.01	12.01	0.00	14.68	14.68	0.00	17.79	17.79	0.00
50.8333*	11.99	11.99	0.00	14.64	14.64	0.00	17.74	17.74	0.00
45	11.95	11.95	0.00	14.59	14.59	0.00	17.69	17.69	0.00
41.3*	11.92	11.92	0.00	14.55	14.55	0.00	17.64	17.64	0.00
37.6	11.87	11.87	0.00	14.48	14.48	0.00	17.55	17.55	0.00
32.9333*	11.82	11.82	0.00	14.39	14.39	0.00	17.44	17.44	0.00
28.2666*	11.77	11.77	0.00	14.30	14.30	0.00	17.31	17.31	0.00
23.6	11.73	11.73	0.00	14.22	14.22	0.00	17.18	17.18	0.00

Table A-5. Computed Maximum Water Surface Elevation (WSE) – Grant Line Canal
[River Stations denoted with * are HEC-RAS interpolated cross sections]

Hydraulic Model River Station	1/50 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/50 AEP Maximum WSE (ft NAVD88) With Project	1/50 AEP WSE Change (ft)	1/100 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/100 AEP Maximum WSE (ft NAVD88) With Project	1/100 AEP WSE Change (ft)	1/200 AEP Maximum WSE (ft NAVD88) Existing (Without Project)	1/200 AEP Maximum WSE (ft NAVD88) With Project	1/200 AEP WSE Change (ft)
17.8333*	11.69	11.69	0.00	14.18	14.18	0.00	17.13	17.13	0.00
12.0666*	11.65	11.65	0.00	14.11	14.11	0.00	17.04	17.04	0.00
6.3	11.58	11.58	0.00	13.99	13.99	0.00	16.87	16.87	0.00
.45*	11.55	11.55	0.00	13.95	13.95	0.00	16.82	16.82	0.00
-5.4	11.48	11.48	0.00	13.84	13.84	0.00	16.67	16.67	0.00
-10.5*	11.44	11.44	0.00	13.77	13.77	0.00	16.57	16.57	0.00
-15.6*	11.39	11.39	0.00	13.70	13.70	0.00	16.47	16.47	0.00
-20.7	11.36	11.36	0.00	13.64	13.64	0.00	16.39	16.39	0.00
-26.3*	11.31	11.31	0.00	13.56	13.56	0.00	16.28	16.28	0.00
-31.9*	11.27	11.27	0.00	13.48	13.48	0.00	16.18	16.18	0.00
-37.5	11.22	11.22	0.00	13.40	13.40	0.00	16.07	16.07	0.00
-43.7*	11.17	11.17	0.00	13.32	13.32	0.00	15.95	15.95	0.00
-49.9*	11.12	11.12	0.00	13.23	13.23	0.00	15.83	15.83	0.00
-56.1	11.07	11.07	0.00	13.14	13.14	0.00	15.70	15.70	0.00
-62.433*	11.03	11.03	0.00	13.07	13.07	0.00	15.61	15.61	0.00
-68.766*	10.97	10.97	0.00	12.97	12.97	0.00	15.45	15.45	0.00
-75.1	10.88	10.88	0.00	12.81	12.81	0.00	15.20	15.20	0.00
-81.899*	10.82	10.82	0.00	12.71	12.71	0.00	15.06	15.06	0.00
-88.7	10.77	10.77	0.00	12.62	12.62	0.00	14.93	14.93	0.00
-94.466*	10.74	10.74	0.00	12.56	12.56	0.00	14.84	14.84	0.00
-100.23*	10.70	10.70	0.00	12.49	12.49	0.00	14.74	14.74	0.00
-106	10.66	10.66	0.00	12.42	12.42	0.00	14.63	14.63	0.00
-110.93*	10.62	10.62	0.00	12.35	12.35	0.00	14.52	14.52	0.00
-115.86*	10.58	10.58	0.00	12.27	12.27	0.00	14.41	14.41	0.00
-120.8	10.55	10.55	0.00	12.20	12.20	0.00	14.31	14.31	0.00
-126.*	10.50	10.50	0.00	12.12	12.12	0.00	14.18	14.18	0.00
-131.2*	10.46	10.46	0.00	12.04	12.04	0.00	14.05	14.05	0.00
-136.4	10.41	10.41	0.00	11.95	11.95	0.00	13.92	13.92	0.00
-141.87*	10.35	10.35	0.00	11.84	11.84	0.00	13.75	13.75	0.00
-147.35*	10.29	10.29	0.00	11.72	11.72	0.00	13.57	13.57	0.00
-152.82*	10.23	10.23	0.00	11.60	11.60	0.00	13.37	13.37	0.00
-158.3	10.16	10.16	0.00	11.46	11.46	0.00	13.15	13.15	0.00
-163.57*	10.10	10.10	0.00	11.35	11.35	0.00	12.97	12.97	0.00
-168.85*	10.06	10.06	0.00	11.26	11.26	0.00	12.81	12.81	0.00
-174.12*	10.01	10.01	0.00	11.17	11.17	0.00	12.67	12.67	0.00
-179.4	9.98	9.98	0.00	11.09	11.09	0.00	12.54	12.54	0.00
-185.5*	9.95	9.95	0.00	11.03	11.03	0.00	12.42	12.42	0.00
-191.6*	9.90	9.90	0.00	10.92	10.92	0.00	12.23	12.23	0.00
-197.7	9.80	9.80	0.00	10.72	10.72	0.00	11.86	11.86	0.00
-204.6*	9.75	9.75	0.00	10.61	10.61	0.00	11.66	11.66	0.00
-211.5*	9.70	9.70	0.00	10.50	10.50	0.00	11.45	11.45	0.00
-218.4*	9.65	9.65	0.00	10.38	10.38	0.00	11.21	11.21	0.00
-225.3*	9.59	9.59	0.00	10.23	10.23	0.00	10.92	10.92	0.00
-232.2*	9.52	9.52	0.00	10.05	10.05	0.00	10.54	10.54	0.00
-239.1	9.43	9.43	0.00	9.83	9.83	0.00	10.03	10.03	0.00

Appendix E. Preliminary Jurisdictional Determinations

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

April 7, 2014

Regulatory Division SPK-2009-01466

Reclamation District No. 17
c/o Dante Nomellini
Nomelini, Grilli and McDaniel
P.O. Box 1461
Stockton, California 95201-1461

Dear Mr. Nomellini:

We are responding to your consultant's request for a preliminary jurisdictional determination (JD), in accordance with our Regulatory Guidance Letter (RGL) 08-02, for the Reclamation District No. 17 100-Year Levee Seepage Project. The approximately 246-acre site is located in Section 12, Township 2 South, Range 6 East, Latitude 37.80175°, Longitude -121.31366°, San Joaquin County, California.

Based on available information, we concur with the estimate of potential waters of the United States, as depicted on AECOM's April 4, 2014 Supplemental Delineation Figures 1-3 (attached). The approximately 0.151-acre of drainage ditches (DD10, DD2, and DD9) and the San Joaquin River present within the modified survey area may be jurisdictional waters of the United States. These waters may be regulated under Section 404 of the Clean Water Act.

A copy of our RGL 08-02 Preliminary Jurisdictional Determination Form for this site is enclosed. Please sign and return a copy of the completed form to this office. Once we receive a copy of the form with your signature we can accept and process a Pre-Construction Notification or permit application for your proposed project.

You should not start any work in any potentially jurisdictional waters of the United States unless you have Department of the Army permit authorization, or if you intend to request an approved JD for this site. In certain circumstances, as described in RGL 08-02, an approved JD may later be necessary.

This preliminary determination has been conducted to identify the potential limits of wetlands and other water bodies which may be subject to Corps of Engineers' jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

We appreciate your feedback. At your earliest convenience, please tell us how we are doing by completing the customer survey on our website under *Customer Service Survey*.

Please refer to identification number SPK-2009-01466 in any correspondence concerning this project. If you have any questions, please contact me at 1325 J Street, Room 1350 Sacramento, California 95814, via email *Kathleen.A.Dadey@usace.army.mil*, or by telephone at 916-557-7253. For more information regarding our program, please visit our website at *www.spk.usace.army.mil/regulatory.html*.

Sincerely,

Kathleen Dadey, PhD
Chief, California South Branch

Enclosures

Copy Furnished without enclosures

Mr Eric Htain, AECOM, 2022 J Street, Suite 400, Sacramento, California 95811
Mr Jason Brush, U.S. Environmental Protection Agency, Region IX, Wetlands Regulatory Office (WTR-8), 75 Hawthorne Street, San Francisco, California 94105-3901
Mr Barry O'Regan, KSN Inc.,1355 Halyard Drive, Suite 180, West Sacramento CA 95691

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

October 21, 2010

Regulatory Division SPK-2009-01466

Dante Nomellini,
Reclamation District No. 17
235 E. Weber Ave
Stockton, California 95202-2706

Dear Mr. Nomellini:

We are responding to your September 16, 2010 request for a revised preliminary jurisdictional determination (JD), in accordance with our Regulatory Guidance Letter (RGL) 08-02, for the RD17 100-Year Levee Seepage Project area. The approximately 368-acre survey area is located in Section 12, Township 2 South, Range 6 East, Latitude 37.80175°, Longitude -121.31366°, San Joaquin County, California.

Based on available information, **we concur with the estimate of potential waters of the United States, as depicted on the Wetland Delineation Figures 1 - 9 drawing prepared by AECOM**. The approximately 7.788- acres of wetlands and other water bodies present within the survey area may be jurisdictional waters of the United States. These waters may be regulated under Section 404 of the Clean Water Act.

A copy of our RGL 08-02 Preliminary Jurisdictional Determination Form for this site is enclosed. Please sign and return a copy of the completed form to this office. Once we receive a copy of the form with your signature we can accept and process a Pre-Construction Notification or permit application for your proposed project.

You should not start any work in potentially jurisdictional waters of the United States unless you have Department of the Army permit authorization. You may request an approved JD for this site at any time prior to starting work within waters. In certain circumstances, as described in RGL 08-02, an approved JD may later be necessary.

You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This preliminary determination has been conducted to identify the potential limits of wetlands and other water bodies which may be subject to Corps of Engineers' jurisdiction for the particular site identified in this request. A Notification of Appeal Process and Request for Appeal (RFA) form is enclosed to notify you of your options with this determination. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in

USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

We appreciate your feedback. At your earliest convenience, please tell us how we are doing by completing the customer survey on our website under *Customer Service Survey*.

Please refer to identification number SPK-2009-01466 in any correspondence concerning this project. If you have any questions, please contact Krystel Bell at 1325 J Street, Room 1480 Sacramento, California 95814-2292, via email *Krystel.L.Bell@usace.army.mil*, or by telephone at 916-557-7745. For more information regarding our program, please visit our website at *www.spk.usace.army.mil/regulatory.html*.

Sincerely,

Original Signed

Kathleen Dadey, PhD
Chief, California Delta Branch

Enclosures

Copy Furnished

Mr. Jason Brush, Wetland Section Chief (WTR-8), United States Environmental Protection Agency, 75 Hawthorne Street, San Francisco, California 94105
Mr. Brian Hansen, Bay-Delta Fish and Wildlife Office, U.S. Fish and Wildlife Service, 650 Capitol Mall Sacramento, California 95814
Mr. Dan Radulescu, Stormwater and Water Quality Certification Unit, Central Valley Regional Water Quality Control Board, 11020 Sun Center Drive #200 Rancho Cordova, California 95670-6114

Copy Furnished without enclosures

Ms. Lisa Mangione, Senior Biologist/Regulatory Specialist, AECOM, 2022 J Street, Sacramento, California 95811

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

April 9, 2010

Regulatory Division SPK-2009-01466

Dante Nomellini
RD 17
235 E. Weber Ave
Stockton, California 95202-2706

Dear Mr. Nomellini:

We are responding to your January 22, 2010 request for a preliminary jurisdictional determination (JD), in accordance with our Regulatory Guidance Letter (RGL) 08-02, for Reach 1b of the RD17 100-Year Levee Seepage Project site. The approximately 1.767-acre December survey area is located in Section 12, Township 2 S, Range 6 E, Latitude 37.80175°, Longitude -121.31366°, San Joaquin County, California.

Based on available information, **we concur with the estimate of potential waters of the United States, as depicted on the Exhibit 1, Revised Wetland Delineation Features Map for Reach 1b (dated January 21, 2010) drawing prepared by AECOM.** The approximately 1.064 acres of freshwater marsh present within Reach 1b may be jurisdictional waters of the United States. These waters may be regulated under Section 404 of the Clean Water Act.

A copy of our RGL 08-02 Preliminary Jurisdictional Determination Form for this site is enclosed. Please sign and return a copy of the completed form to this office. Once we receive a copy of the form with your signature we can accept and process a Pre-Construction Notification or permit application for your proposed project.

You should not start any work in potentially jurisdictional waters of the United States unless you have Department of the Army permit authorization. You may request an approved JD for this site at any time prior to starting work within waters. In certain circumstances, as described in RGL 08-02, an approved JD may later be necessary.

You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This preliminary determination has been conducted to identify the potential limits of wetlands and other water bodies which may be subject to Corps of Engineers' jurisdiction for the particular site identified in this request. A Notification of Appeal Process and Request for Appeal (RFA) form is enclosed to notify you of your options with this determination. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

We appreciate your feedback. At your earliest convenience, please tell us how we are doing by completing the customer survey on our website under *Customer Service Survey.*

Please refer to identification number SPK-2009-01466 in any correspondence concerning this project. If you have any questions, please contact Krystel Bell at 1325 J Street, Room 1480 Sacramento, California 95814-2292, via email *Krystel.L.Bell@usace.army.mil*, or by telephone at (916) 557-7745. For more information regarding our program, please visit our website at *www.spk.usace.army.mil/regulatory.html.*

Sincerely,

ORIGINAL SIGNED

Kathleen Dadey, PhD
Chief, California Delta Branch

Enclosure(s)

Copy furnished without enclosure(s):

Mr. Jason Brush, Wetland Section Chief (WTR-8), United States Environmental Protection Agency, 75 Hawthorne Street, San Francisco, California 94105

Ms. Lisa Mangione, Senior Biologist/Regulatory Specialist, AECOM, 2022 J Street, Sacramento, California 95811

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

November 10, 2009

Regulatory Division SPK-2009-01466

Dante Nomellini,
Reclamation District No. 17
235 E. Weber Ave
Stockton, California 95202-2706

Dear Mr. Nomellini:

We are responding to your request for a preliminary jurisdictional determination (JD), in accordance with our Regulatory Guidance Letter (RGL) 08-02, for the Reclamation District No. 17 100-Year Levee Seepage Project site. The approximately 246-acre site is located in Section 12, Township 2 South, Range 6 East, Latitude 37.80175°, Longitude -121.31366°, San Joaquin County, California.

Based on available information, we concur with the estimate of potential waters of the United States, as depicted on EDAW, Inc.'s November 3, 2009 Wetland Delineation Maps 1-9. The approximately 4.847-acres of wetlands and other water bodies present within the survey area may be jurisdictional waters of the United States. These waters may be regulated under Section 404 of the Clean Water Act.

A copy of our RGL 08-02 Preliminary Jurisdictional Determination Form for this site is enclosed. Please sign and return a copy of the completed form to this office. Once we receive a copy of the form with your signature we can accept and process a Pre-Construction Notification or permit application for your proposed project.

You should not start any work in any potentially jurisdictional waters of the United States unless you have Department of the Army permit authorization, or if you intend to request an approved JD for this site. In certain circumstances, as described in RGL 08-02, an approved JD may later be necessary.

This preliminary determination has been conducted to identify the potential limits of wetlands and other water bodies which may be subject to Corps of Engineers' jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

We appreciate your feedback. At your earliest convenience, please tell us how we are doing by completing the customer survey on our website under *Customer Service Survey.*

Please refer to identification number SPK-2009-01466 in any correspondence concerning this project. If you have any questions, please contact Krystel Bell at 1325 J Street, Room 1480 Sacramento, California 95814-2292, via email *Krystel.L.Bell@usace.army.mil,* or by telephone at 916-557-7745. For more information regarding our program, please visit our website at *www.spk.usace.army.mil/regulatory.html.*

Sincerely,

ORIGINAL SIGNED

Kathleen Dadey, PhD
Chief, California Delta Branch

Enclosures

Copy Furnished without enclosures

Ms. Sarah Bennett, EDAW, Inc., 2022 J Street, Sacramento, California 95811
Ms. Elizabeth Goldmann, U.S. Environmental Protection Agency, Region IX, Wetlands Regulatory Office (WTR-8), 75 Hawthorne Street, San Francisco, California 94105-3901

Appendix F. Native American Correspondence and SHPO Consultation

Avina, Mike

From: Avina, Mike
Sent: Thursday, April 08, 2010 11:37 AM
To: 'Debbie Pilas-Treadway'
Subject: RD 17 Sacred Lands File Search and Contact List Request
Attachments: RD17-TRS.pdf

Dear Ms. Treadway:

Reclamation District 17 is planning construction of improvements to the flood control system of the San Joaquin River within San Joaquin County California. These improvements are depicted on the draft map that is enclosed. The improvements do not fall within lands divided into Township, Range, and Section—the lands are simply indicated as "wetlands" land grants. We would like to check the Sacred Lands File if possible, for resources located on or near the project footprint (depicted as a purple line on the enclosed figure). Please also send us the most recent Native American contact list for San Joaquin County, California. If you need additional information please let me know—we would like to send out contact letters well in advance of the EIR and permitting process if possible.

Mike Avina, Esq.
Environmental Planner
Design + Planning
D +1 916.266.4939 M +1 916.761.2768
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STATE OF CALIFORNIA Arnold Schwarzenegger, Governor

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-6251
Fax (916) 657-5390
Web Site www.nahc.ca.gov
e-mail: ds_nahc@pacbell.net

May 24, 2010

Mike Avina, Esq.
AECOM
2022 J Street
Sacramento, CA 95811

Sent by Fax: 916-414-5850
Number of Pages: 2

Re: Flood Control System of the San Joaquin River, San Joaquin County

Dear Mr. Alvina:

A record search of the sacred land file has failed to indicate the presence of Native American cultural resources in the immediate project area. The absence of specific site information in the sacred lands file does not indicate the absence of cultural resources in any project area. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Enclosed is a list of Native Americans individuals/organizations who may have knowledge of cultural resources in the project area. The Commission makes no recommendation or preference of a single individual, or group over another. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated, if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe or group. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from any of these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at (916) 653-4038.

Sincerely,

Karen Lee

For Debbie Pilas-Treadway
Environmental Specialist III

Native American Contacts
San Joaquin County
May 20, 2010

Katherine Erolinda Perez PO Box 717 Linden , CA 95236 (209) 887-3415	Ohlone/Costanoan Northern Valley Yokuts Bay Miwok
Southern Sierra Miwuk Nation Jay Johnson, Spiritual Leader 5235 Allred Road Mariposa , CA 95338 209-966-6038	Miwok Pauite Northern Valley Yokut
Southern Sierra Miwuk Nation Anthony Brochini, Chairperson P.O. Box 1200 Mariposa , CA 95338 tony_brochini@nps.gov 209-379-1120 209-628-0085 cell	Miwok Pauite Northern Valley Yokut
Southern Sierra Miwuk Nation Les James, Spiritual Leader PO Box 1200 Mariposa , CA 95338 209-966-3690	Miwok Pauite Northern Valley Yokut

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed Flood Control System of the San Joaquin River, San Joaquin County

California Historical Resources Information System

CONFIDENTIAL RECORDS SEARCH REQUEST FORM

Date: 5-25-10 Access Agreement Number: ____________

TO: NWIC Information Center

Name: Brian Ludwig

Affiliation: AECOM

Address: 2022 L Street Suite 400

City: Sacramento State: CA Zip: 95811

Email: brian.ludwig@aecom.com

Phone: 916-414-5886 Cell Phone: ____________ Fax: 916-414-3600

Project Name / Reference: EIR for the Hollister Urban Area Water Master Plan

Project Street Address: Hollister CA

Project Description: Water and waste water treatment facility improvements, groundwater managments and treatment projects and water managment actions.

County: San Benito

USGS 7.5' Quad: Panchecho Peak, Gilroy Hot Springs, Three Sisters, San Felipe

Township/Range/Section or UTMs: Tres Pinos, and Hollister

PRIORITY RESPONSE (Additional Fee): ○ yes / ◉ no

EMERGENCY RESPONSE (Additional Fee): ○ yes / ◉ no

TOTAL FEE NOT TO EXCEED: $ -

Special Instructions: project # 10110066.01

California Historical Resources Information System

CONFIDENTIAL RECORDS SEARCH REQUEST FORM (continued)

Include the following information (check as necessary) for the records search area shown on the attached map. Any selection left unmarked will be considered a "0" or a "no. "

Map of Resource Locations:	within search area	[x] yes	[ ] no
wi	thin 1/8 mi radius	[x] yes	[ ] no
Resource Database Printout:	within search area	[x] yes	[ ] no
wi	thin 1/8 mi radius	[x] yes	[ ] no
Copy of Resource Records:	within search area	[x] yes	[ ] no
wi	thin 1/8 mi radius	[x] yes	[ ] no
Map of Report Locations:	within search area	[x] yes	[ ] no
wi	thin 1/8 mi radius	[x] yes	[ ] no
Report Database Printout:	within search area	[x] yes	[ ] no
wi	thin 1/8 mi radius	[x] yes	[ ] no
Copy of Entire Report:	within search area	[ ] yes	[x] no
wi	thin _____ mi radius	[ ] yes	[x] no
Copy of Title Page Only:	within search area	[x] yes	[ ] no
wi	thin 1/8 mi radius	[x] yes	[ ] no

		REVIEW		PROVIDE DOCUMENTATION	
OHP Historic Properties Directory*:	within search area	[x] yes	[ ] no	[ ] yes	[ ] no
wi	thin 1/8 mi radius	[ ] yes	[x] no	[ ] yes	[ ] no
OHP Archaeological	within search area	[x] yes	[ ] no	[ ] yes	[ ] no
Determinations of Eligibility:	within 1/8 mi radius	[x] yes	[ ] no	[ ] yes	[ ] no
California Inventory of	within search area	[x] yes	[ ] no	[ ] yes	[ ] no
Historical Resources (1976): w	ithin 1/8 mi radius	[x] yes	[ ] no	[ ] yes	[ ] no

*Includes, but not limited to, information regarding National Register of Historic Places, California Register of Historical Resources, California State Historical Landmarks, California State Points of Historical Interest, and historic building surveys.

Listed below are sources of additional information that may be available at the Information Center. Indicate if a review and documentation of any of the following types of information is requested.

Caltrans Bridge Survey	[x] yes	[ ] no
Ethnographic Information	[ ] yes	[x] no
Historical Literature	[x] yes	[ ] no
Historical Maps	[x] yes	[ ] no
Local Inventories	[x] yes	[ ] no
Plat Maps	[x] yes	[ ] no
Shipwreck Inventory	[ ] yes	[x] no
Soil Survey Maps	[ ] yes	[x] no

AECOM

AECOM
2020 L Street, Suite 400
Sacramento, CA 95811
www.aecom.com

916.414.5800 tel
916.414.5850 fax

May 28, 2010

Southern Sierra Miwuk Nation
Les James, Spiritual Leader
PO Box 1200
Mariposa, CA 95338

Subject: Phase 3 of the Reclamation District 17 100-Year Levee Seepage Area Project

Dear Mr. James:

Reclamation District 17 is currently studying the environmental impact of proposed levee improvements along the San Joaquin River east levee, the northerly bank of Walthall Slough, and the Dryland levee extending easterly from Walthall Slough to Aiport Way, within rural San Joaquin County. The approximate footprint of these proposed improvements is depicted on the enclosed maps. The project occurs south of the city of Stockton and west of the city of Manteca.

We respectfully request your assistance in identifying any cultural resources within or near the project footprint as depicted on the enclosed maps. The identification of cultural resources in advance of construction is critical to protecting such resources to the extent feasible. The location of many of these resources may be sensitive and confidential. We will not publicly disclose the location of such resources, but simply wish to identify as many resources in advance of construction as possible.

Sincerely,

Mike Aviña, Esq.
Environmental Planner

AECOM
AECOM
2020 L Street, Suite 400
Sacramento, CA 95811
www.aecom.com
916.414.5800 tel
916.414.5850 fax

May 28, 2010

Katherine Erolinda Perez
PO Box 717
Linden, CA 95236

Subject: Phase 3 of the Reclamation District 17 100-Year Levee Seepage Area Project

Dear Ms. Perez:

Reclamation District 17 is currently studying the environmental impact of proposed levee improvements along the San Joaquin River east levee, the northerly bank of Walthall Slough, and the Dryland levee extending easterly from Walthall Slough to Aiport Way, within rural San Joaquin County. The approximate footprint of these proposed improvements is depicted on the enclosed maps. The project occurs south of the city of Stockton and west of the city of Manteca.

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Sincerely,

Mike Aviña

Mike Aviña, Esq.
Environmental Planner

AECOM
AECOM
2020 L Street, Suite 400
Sacramento, CA 95811
www.aecom.com
916.414.5800 tel
916.414.5850 fax

May 28, 2010

Southern Sierra Miwuk Nation
Anthony Brochini, Chairperson
PO Box 1200
Mariposa, CA 95338

Subject: Phase 3 of the Reclamation District 17 100-Year Levee Seepage Area Project

Dear Mr. Brochini:

Reclamation District 17 is currently studying the environmental impact of proposed levee improvements along the San Joaquin River east levee, the northerly bank of Walthall Slough, and the Dryland levee extending easterly from Walthall Slough to Aiport Way, within rural San Joaquin County. The approximate footprint of these proposed improvements is depicted on the enclosed maps. The project occurs south of the city of Stockton and west of the city of Manteca.

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Sincerely,

Mike Aviña, Esq.
Environmental Planner

AECOM

AECOM
2020 L Street, Suite 400
Sacramento, CA 95811
www.aecom.com

916.414.5800 tel
916.414.5850 fax

May 28, 2010

Southern Sierra Miwuk Nation
Jay Johnson, Spiritual Leader
5235 Allred Road
Mariposa, CA 95338

Subject: Phase 3 of the Reclamation District 17 100-Year Levee Seepage Area Project

Dear Mr. Johnson:

Reclamation District 17 is currently studying the environmental impact of proposed levee improvements along the San Joaquin River east levee, the northerly bank of Walthall Slough, and the Dryland levee extending easterly from Walthall Slough to Aiport Way, within rural San Joaquin County. The approximate footprint of these proposed improvements is depicted on the enclosed maps. The project occurs south of the city of Stockton and west of the city of Manteca.

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Sincerely,

Mike Aviña

Mike Aviña, Esq.
Environmental Planner

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

Environmental Resources Branch

MAR 3 0 2011

Mr. Milford Wayne Donaldson, FAIA
State Historic Preservation Officer
Office of Historic Preservation
Department of Parks and Recreation
1725 23rd Street, Suite 100
Sacramento, CA 95816

Dear Mr. Donaldson:

This letter initiates consultation with your office for the proposed Reclamation District 17 Phase 3 100-Year Levee Seepage Project as required under Section 106 of the National Historic Preservation Act. Reclamation District 17 (RD 17) is considering a series of levee improvements as part of the Phase 3 100-Year Levee Seepage Project, as described in the enclosed report entitled, Cultural Resources Inventory and Evaluation Report, Phase 3 RD 17 100-Year Levee Seepage Area Project (prepared by AECOM, February 2011). Proposed levee improvements would occur along various sections of the RD 17 levee system starting near the southern boundary of the city of Stockton, through the city of Lathrop, and to the southern boundary of the city of Manteca, all within greater San Joaquin County, California. RD 17 has initiated this effort in cooperation with the California Department of Water Resources, the California Central Valley Flood Protection Board, and the U.S. Army Corps Engineers (USACE) with the aim of reducing flood risk during the projected 100-year flood event.

The RD 17 Phase 3 Project requires authorization from USACE pursuant to Section 408 of the Rivers and Harbors Act of 1899 (33 U.S. Code [USC] 408) for alteration of federal project levees; and Section 404 of the Clean Water Act (33 USC 1344) for the placement of fill in jurisdictional waters of the United States. These actions are undertakings that require compliance with Section 106 of the National Historic Preservation Act (16 USC 470f). The enclosed report describes the results of a cultural resource inventory report that identifies cultural resources within the area of potential effect (APE), evaluates those resources for listing in the National Register of Historic Places (NRHP), and makes a finding of effect, as required in the Section 106 regulations (36 CFR Part 800).

The proposed APE is depicted on page 5 (Exhibit 2) of the enclosed inventory report. The APE depicts the maximum footprint where ground-disturbing construction would occur, and thus the area in which the project could directly or indirectly affect historic properties, in accordance with 36 CFR Part 800.4 (1)(a). Two resources were identified within the APE: the Silviera Ranch Complex (P-39-004602) and the modern Reclamation District West Levee itself that forms the western boundary of the basin protected by RD 17. The Silviera Ranch Complex site (P-39-004602) was previously determined ineligible for listing in the NRHP by your office in 2007 in reference to a report entitled, *Historic Resources Evaluation for the Bradshaw's Crossing Bridge Project Near Lathrop San Joaquin County, Texas*, prepared by V. Beard (Tom Origer & Associates, 2007).

We request your concurrence with the definition of the Area of Potential Effect (APE) as depicted on page 5 (Exhibit 2) of the enclosed inventory report. We also request your concurrence with the determination that the modern Reclamation District West Levee for RD 17 is not eligible for inclusion to the NRHP under 36 CFR 60.4. Therefore, we request your concurrence with the determination that no historic properties considered eligible for the NRHP will be affected within the defined APE in accordance with 36 CFR Part 800.4(d)(1). If you have any questions or need any additional information, please contact Mr. Bryan Guevin at 916-557-7378, or by email at bryan.guevin@usace.army.mil.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

Copies Furnished:

Mr. Dante Nomelini, Reclamation District 17, P.O. Box 1461, Stockton, California 95201
Mr. Michael Avina, AECOM, 2020 L Street, Sacramento, California 95811 (without Enclosure)

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
1725 23rd Street, Suite 100
SACRAMENTO, CA 95816-7100
(916) 445-7000 Fax: (916) 445-7053
calshpo@parks.ca.gov
www.ohp.parks.ca.gov

April 6, 2011

In Reply Refer To: COE110404A

Alicia E. Kirchner
Chief, Planning Division
Department of the Army
U.S. Army Engineer District
Sacramento Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Re: Reclamation District 17 Phase 3 100-Year Levee Seepage Project, San Joaquin County, California.

Dear Ms. Kirchner:

Thank you for submitting to my office your letter and supporting documentation regarding the project noted above. The U.S. Army Engineer District, Sacramento Corps of Engineers is seeking my comments on the effects that the Reclamation District 17 Phase 3 100-Year Levee Seepage Project will have on historic properties, pursuant to 36 CFR Part 800 (as amended 8-05-04) regulations implementing Section 106 of the National Historic Preservation Act (NHPA). Reclamation District 17 (RD 17) is requesting authorization from the COE to construct this project pursuant to Section 408 (33 U.S. Code [USC] 408) regarding the alteration of federal project levees, and Section 404 of the Clean Water Act (33 USC 1344) regarding the placement of fill material in waters of the United States. The COE has identified this action as an undertaking subject to review under Section 106 of the NHPA.

The undertaking will consist of the construction of levee improvements along sections of levees owned by RD 17 extending from the City of Stockton, through the City of Lathrop, to the southern boundary of the City of Manteca. The majority of these levee repair sites are along the east bank of the San Joaquin River. The Area of Potential Effects (APE) for this undertaking includes all proposed construction sites and all other ground-disturbing locations (e.g.: staging areas) designated for Phase 3 of the project as documented on exhibit 2 of the report cited below. In addition to your letter of March 30, 2011, you have submitted the following document in support of your efforts to identify historic properties in the APE:

- *Cultural Resources Inventory and Evaluation Report Phase 3 RD 17 100-Year Levee Seepage Area Project* (AECOM: February 2011).

Identification efforts by the COE have determined that there are three cultural resources (and several isolates that are not historic properties under National Register of Historic Places guidelines) located within the project APE. These are the Silviera Ranch

Complex (P-39-004602), the Reclamation 17 West Levee that forms the western boundary of RD 17, and a segment of the South Pacific Railroad that includes a vertical lift railroad drawbridge (Bradshaw's Crossing Bridge) across the San Joaquin River. The Silviera Ranch has previously been determined ineligible for the National Register of Historic Places by Section 106 consensus (SHPO file USCG060605A, SHPO letter of January 26, 2007). The Bradshaw's Crossing Bridge and the segment of Southern Pacific Railroad is a portion of CA-SJO-250H, although the original bridge was replaced in 1895 and again in 1942 by the current structure. This is a component of State Historic Landmark #780, First Transcontinental Railroad and is listed on the California Register of Historic Resources.

The COE, in consultation with the SHPO, has proposed to treat both the Southern Pacific Railroad (including the Bradshaw's Crossing Bridge) and the RD 17 West Levee as eligible for the NRHP under criterion A for the purposes of this undertaking. Under this strategy the COE has determined that the undertaking as proposed will have no adverse effect, either direct or visual, to CA-SJO-250H and that the proposed levee repairs and improvement are standard types of repair and maintenance/upgrade activities that will not adversely affect any of the qualities that would impart NRHP eligibility to the RD 17 West Levee. The COE thus proposes that a finding of No Adverse Effect is appropriate in accordance with 36 CFR Part 800.5(b).

After reviewing your letter and supporting documentation, and considering the additional information from a phone contact and emails (April 6, 2011) between Bryan Guevin of your staff and William Soule of my staff, I have no objection to your finding of No Adverse Effect for this undertaking. Be advised that under certain circumstances, such as unanticipated discovery or a change in project description, the COE may have additional future responsibilities for this undertaking under 36 CFR Part 800. Thank you for seeking my comments and for considering historic properties in planning your project. If you require further information, please contact William Soule, Associate State Archeologist at phone 916-445-7022 or email wsoule@parks.ca.gov.

Sincerely,

Susan K Stratton for

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
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April 6, 2011

In Reply Refer To: COE110404A

Alicia E. Kirchner
Chief, Planning Division
Department of the Army
U.S. Army Engineer District
Sacramento Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Re: Reclamation District 17 Phase 3 100-Year Levee Seepage Project, San Joaquin County, California.

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The undertaking will consist of the construction of levee improvements along sections of levees owned by RD 17 extending from the City of Stockton, through the City of Lathrop, to the southern boundary of the City of Manteca. The majority of these levee repair sites are along the east bank of the San Joaquin River. The Area of Potential Effects (APE) for this undertaking includes all proposed construction sites and all other ground-disturbing locations (e.g.: staging areas) designated for Phase 3 of the project as documented on exhibit 2 of the report cited below. In addition to your letter of March 30, 2011, you have submitted the following document in support of your efforts to identify historic properties in the APE:

• *Cultural Resources Inventory and Evaluation Report Phase 3 RD 17 100-Year Levee Seepage Area Project* (AECOM: February 2011).

Identification efforts by the COE have determined that there are three cultural resources (and several isolates that are not historic properties under National Register of Historic Places guidelines) located within the project APE. These are the Silviera Ranch

Complex (P-39-004602), the Reclamation 17 West Levee that forms the western boundary of RD 17, and a segment of the South Pacific Railroad that includes a vertical lift railroad drawbridge (Bradshaw's Crossing Bridge) across the San Joaquin River. The Silviera Ranch has previously been determined ineligible for the National Register of Historic Places by Section 106 consensus (SHPO file USCG060605A, SHPO letter of January 26, 2007). The Bradshaw's Crossing Bridge and the segment of Southern Pacific Railroad is a portion of CA-SJO-250H, although the original bridge was replaced in 1895 and again in 1942 by the current structure. This is a component of State Historic Landmark #780, First Transcontinental Railroad and is listed on the California Register of Historic Resources.

The COE, in consultation with the SHPO, has proposed to treat both the Southern Pacific Railroad (including the Bradshaw's Crossing Bridge) and the RD 17 West Levee as eligible for the NRHP under criterion A for the purposes of this undertaking. Under this strategy the COE has determined that the undertaking as proposed will have no adverse effect, either direct or visual, to CA-SJO-250H and that the proposed levee repairs and improvement are standard types of repair and maintenance/upgrade activities that will not adversely affect any of the qualities that would impart NRHP eligibility to the RD 17 West Levee. The COE thus proposes that a finding of No Adverse Effect is appropriate in accordance with 36 CFR Part 800.5(b).

After reviewing your letter and supporting documentation, and considering the additional information from a phone contact and emails (April 6, 2011) between Bryan Guevin of your staff and William Soule of my staff, I have no objection to your finding of No Adverse Effect for this undertaking. Be advised that under certain circumstances, such as unanticipated discovery or a change in project description, the COE may have additional future responsibilities for this undertaking under 36 CFR Part 800. Thank you for seeking my comments and for considering historic properties in planning your project. If you require further information, please contact William Soule, Associate State Archeologist at phone 916-445-7022 or email wsoule@parks.ca.gov.

Sincerely,

Susan K Stratton for

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 16 2011

Anthony Brochini, Chairperson
Southern Sierra Miwuk Nation
P.O. Box 1200
Mariposa, California 95338

Dear Mr. Brochini:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Reclamation District (RD) 17 Phase 3 100-Year Levee Seepage Project, in San Joaquin County, California. The project requires authorization from the U.S. Army Corps of Engineers (Corps) pursuant Section 408 of the Rivers and Harbors Act of 1899 (33 U.S. Code [USC] 408) for alteration of Federal project levees; and Section 404 of the Clean Water Act (33 USC 1344) for the placement of fill in jurisdictional waters of the United States. These actions are undertakings that require compliance with Section 106 of the National Historic Preservation Act (16 USC 470f).

The RD Phase 3 100-Year Levee Seepage Project involves a series of levee improvements that would occur along various sections of the RD 17 levee system starting near the southern boundary of the City of Stockton, through the City of Lathrop, and to the southern boundary of the City of Manteca, all within greater San Joaquin County, California. RD 17 has initiated this effort with the Corps in cooperation with the California Department of Water Resources, the California Central Valley Flood Protection Board with the aim of reducing flood risk during the projected 100-year flood event. To date, the Corps is scheduled to publish the project Environmental Impact Statement (EIS) in the Federal Register in late May or early June 2011. In addition, a public meeting presentation for the project EIS is scheduled for June 21, 2011, at the Lathrop City Hall.

An initial records search and cultural resources survey has been conducted for the proposed project (AECOM report entitled, *Cultural Resources Inventory and Evaluation Report Phase 3 RD 17 100-Year Levee Seepage Area Project*, dated February 2011). The cited report describes the results of a cultural resource inventory that identifies cultural resources within the Area of Potential Effect, evaluates those resources for listing in the National Register of Historic Places, and makes a finding of effect, as required in the Section 106 regulations (36 CFR Part 800). The project area is depicted on the enclosed map exhibit.

We are sensitive towards the protection of all cultural resources sites, including traditional cultural properties and sacred sites, and as such, make every effort to avoid affecting them. Please let us know if you have additional knowledge of locations of archaeological sites, or areas of traditional cultural value or concern within the described project area.

Correspondence may be sent to Mr. Bryan Guevin, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. You may also contact Mr. Guevin directly at (916) 557-7378 or by email at: bryan.guevin@usace.army.mil. We look forward to hearing from you.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 16 2011

Rhonda Morningstar Pope, Chairperson
Buena Vista Rancheria
P.O. Box 162283
Sacramento, CA 95816

Dear Ms. Pope:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Reclamation District (RD) 17 Phase 3 100-Year Levee Seepage Project, in San Joaquin County, California. The project requires authorization from the U.S. Army Corps of Engineers (Corps) pursuant Section 408 of the Rivers and Harbors Act of 1899 (33 U.S. Code [USC] 408) for alteration of Federal project levees; and Section 404 of the Clean Water Act (33 USC 1344) for the placement of fill in jurisdictional waters of the United States. These actions are undertakings that require compliance with Section 106 of the National Historic Preservation Act (16 USC 470f).

The RD Phase 3 100-Year Levee Seepage Project involves a series of levee improvements that would occur along various sections of the RD 17 levee system starting near the southern boundary of the City of Stockton, through the City of Lathrop, and to the southern boundary of the City of Manteca, all within greater San Joaquin County, California. RD 17 has initiated this effort with the Corps in cooperation with the California Department of Water Resources, the California Central Valley Flood Protection Board with the aim of reducing flood risk during the projected 100-year flood event. To date, the Corps is scheduled to publish the project Environmental Impact Statement (EIS) in the Federal Register in late May or early June 2011. In addition, a public meeting presentation for the project EIS is scheduled for June 21, 2011, at the Lathrop City Hall.

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Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 16 2011

Mary Daniels-Tarango, Chairperson
Wilton Rancheria
7916 Farnell Way
Sacramento, California 95823

Dear Ms. Daniels-Tarango:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Reclamation District (RD) 17 Phase 3 100-Year Levee Seepage Project, in San Joaquin County, California. The project requires authorization from the U.S. Army Corps of Engineers (Corps) pursuant Section 408 of the Rivers and Harbors Act of 1899 (33 U.S. Code [USC] 408) for alteration of Federal project levees; and Section 404 of the Clean Water Act (33 USC 1344) for the placement of fill in jurisdictional waters of the United States. These actions are undertakings that require compliance with Section 106 of the National Historic Preservation Act (16 USC 470f).

The RD Phase 3 100-Year Levee Seepage Project involves a series of levee improvements that would occur along various sections of the RD 17 levee system starting near the southern boundary of the City of Stockton, through the City of Lathrop, and to the southern boundary of the City of Manteca, all within greater San Joaquin County, California. RD 17 has initiated this effort with the Corps in cooperation with the California Department of Water Resources, the California Central Valley Flood Protection Board with the aim of reducing flood risk during the projected 100-year flood event. To date, the Corps is scheduled to publish the project Environmental Impact Statement (EIS) in the Federal Register in late May or early June 2011. In addition, a public meeting presentation for the project EIS is scheduled for June 21, 2011, at the Lathrop City Hall.

An initial records search and cultural resources survey has been conducted for the proposed project (AECOM report entitled, *Cultural Resources Inventory and Evaluation Report Phase 3 RD 17 100-Year Levee Seepage Area Project*, dated February 2011). The cited report describes the results of a cultural resource inventory that identifies cultural resources within the Area of Potential Effect, evaluates those resources for listing in the National Register of Historic Places, and makes a finding of effect, as required in the Section 106 regulations (36 CFR Part 800). The project area is depicted on the enclosed map exhibit.

We are sensitive towards the protection of all cultural resources sites, including traditional cultural properties and sacred sites, and as such, make every effort to avoid affecting them. Please let us know if you have additional knowledge of locations of archaeological sites, or areas of traditional cultural value or concern within the described project area.

Correspondence may be sent to Mr. Bryan Guevin, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. You may also contact Mr. Guevin directly at (916) 557-7378 or by email at: bryan.guevin@usace.army.mil. We look forward to hearing from you.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 16 2011

Chairperson
Ione Band of Miwok Indians
P.O. Box 699
Plymouth, California 95669

Dear Chairperson:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Reclamation District (RD) 17 Phase 3 100-Year Levee Seepage Project, in San Joaquin County, California. The project requires authorization from the U.S. Army Corps of Engineers (Corps) pursuant Section 408 of the Rivers and Harbors Act of 1899 (33 U.S. Code [USC] 408) for alteration of Federal project levees; and Section 404 of the Clean Water Act (33 USC 1344) for the placement of fill in jurisdictional waters of the United States. These actions are undertakings that require compliance with Section 106 of the National Historic Preservation Act (16 USC 470f).

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Correspondence may be sent to Mr. Bryan Guevin, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. You may also contact Mr. Guevin directly at (916) 557-7378 or by email at: bryan.guevin@usace.army.mil. We look forward to hearing from you.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 16 2011

Debra Grimes, Cultural Preservation Specialist
California Valley Miwok Tribe
P.O. Box 1015
West Point, California 95255

Dear Ms. Grimes:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Reclamation District (RD) 17 Phase 3 100-Year Levee Seepage Project, in San Joaquin County, California. The project requires authorization from the U.S. Army Corps of Engineers (Corps) pursuant Section 408 of the Rivers and Harbors Act of 1899 (33 U.S. Code [USC] 408) for alteration of Federal project levees; and Section 404 of the Clean Water Act (33 USC 1344) for the placement of fill in jurisdictional waters of the United States. These actions are undertakings that require compliance with Section 106 of the National Historic Preservation Act (16 USC 470f).

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Sincerely,

Alicia E. Kirchner

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 16 2011

Silvia Burley, Chairperson
California Valley Miwok Tribe
10601 N. Escondido Place
Stockton, California 95212

Dear Ms. Burley:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Reclamation District (RD) 17 Phase 3 100-Year Levee Seepage Project, in San Joaquin County, California. The project requires authorization from the U.S. Army Corps of Engineers (Corps) pursuant Section 408 of the Rivers and Harbors Act of 1899 (33 U.S. Code [USC] 408) for alteration of Federal project levees; and Section 404 of the Clean Water Act (33 USC 1344) for the placement of fill in jurisdictional waters of the United States. These actions are undertakings that require compliance with Section 106 of the National Historic Preservation Act (16 USC 470f).

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Correspondence may be sent to Mr. Bryan Guevin, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. You may also contact Mr. Guevin directly at (916) 557-7378 or by email at: bryan.guevin@usace.army.mil. We look forward to hearing from you.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 16 2011

Katherine Erolinda Perez
North Valley Yokuts Tribes
P.O. Box 717
Linden, California 95236

Dear Ms. Perez:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Reclamation District (RD) 17 Phase 3 100-Year Levee Seepage Project, in San Joaquin County, California. The project requires authorization from the U.S. Army Corps of Engineers (Corps) pursuant Section 408 of the Rivers and Harbors Act of 1899 (33 U.S. Code [USC] 408) for alteration of Federal project levees; and Section 404 of the Clean Water Act (33 USC 1344) for the placement of fill in jurisdictional waters of the United States. These actions are undertakings that require compliance with Section 106 of the National Historic Preservation Act (16 USC 470f).

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We are sensitive towards the protection of all cultural resources sites, including traditional cultural properties and sacred sites, and as such, make every effort to avoid affecting them. Please let us know if you have additional knowledge of locations of archaeological sites, or areas of traditional cultural value or concern within the described project area.

Correspondence may be sent to Mr. Bryan Guevin, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. You may also contact Mr. Guevin directly at (916) 557-7378 or by email at: bryan.guevin@usace.army.mil. We look forward to hearing from you.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

or areas of traditional cultural value or concern within the described project area. Correspondence may be sent to Mr. Bryan Guevin, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. You may also contact Mr. Guevin directly at (916) 557-7378 or by email at bryan.guevin@usace.army.mil. We look forward to hearing from you.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

CESPK-PD
CESPK-PD-R
CESPK-PD-RA (Suazo)
CESPK-PD-RC (Guevin)
CESPK-PM-C (Turner)

BLG 5/12/11
GUEVIN/mhm
CESPD-PD-RC

RINK 5/12
CESPK-PD-RC

TURNER
CESPK-PM-C

OSBORN
CESPK-PD-R

CLARK
CESPK-PD

KIRCHNER
CESPK-PD
5-13-11

AECOM
2020 L Street, Suite 400
Sacramento, CA 95811
www.aecom.com

916.414.5800 tel
916.414.5850 fax

May 28, 2014

Anthony Brochini
Chairperson Southern Sierra Miwuk Nation
P.O. Box 1200
Mariposa, CA 95338

Subject: Update to the Phase 3 RD 17 100-Year Levee Seepage Project

Dear Mr. Brochini:

This letter is to update you regarding the Phase 3 RD 17 100-Year Levee Seepage Project. Since you were last contacted the project footprint has changed. In many areas the footprint has shrunk. In some areas the footprint has been enlarged, mostly south of Louise Avenue in Lathrop, California. In most instances the project expanding into existing seepage berm areas or into paved residential areas. One haul road, Madruga Road, has been added to the project and extends through the southern end of CA-SJO-3. Madruga Road is an improved, graveled farm road currently in use. The project design does not call for any improvement or modification of the road. The current project APE is attached to this report. The expanded areas have been surveyed and no artifacts were identified.

If you have any questions or concerns regarding the updated APE please contact me via email (jesse.martinez@aecom.com) or at my direct office number (916-414-5894).

Sincerely,

Jesse Martinez, M.A., RPA
Archaeologist

Enclosure

cc: Topographic Map of Project Area of Potential Effect

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Yvonne Miller, Chairperson
Ione Band of Miwok Indians
9252 Bush Street
Plymouth, California 95699

Dear Chairperson Miller

We are writing to reopen consultation concerning the Reclamation District 17 (RD 17) Phase 3 100-year Levee Seepage Project (project), San Joaquin County, California. RD 17, in cooperation with the California Department of Water Resources and the Central Valley Flood Protection Board, requires authorization from the Corps pursuant to Section 408 of the Rivers and Harbors Act of 1899 for alteration of federal project levees and Section 404 of the Clean Water Act for the placement of fill in jurisdictional waters of the United States. In our last communication concerning this project in 2011, we requested any information concerning cultural sites or concerns your tribe had about the project. At this time we are notifying you of changes to the proposed project, as discussed below, and requesting any additional information concerning cultural resources or concerns you may have.

RD-17 has identified three additional areas that were not considered as part of the area of potential effects (APE) that need to be taken under consideration as part of this project. The Corps has determined that the APE now includes those areas, as seen in the enclosed maps.

Additional studies, including a record search and intensive pedestrian survey, were undertaken by RD-17 to identify any cultural resources within the additional areas. Only one previously recorded site, CA-SJO-3, is within the expanded APE and no new cultural resources were located during survey. No evidence of CA-SJO-3 was seen in during the surveys. According to previous excavations, CA-SJO-3 is a deeply buried habitation site with abundant artifacts and human burials. Non-cultural fill above the site is approximately 3 meters. The site was previously determined eligible for listing in the National Register of Historic Places in 2003. Construction activities within the boundaries of the site are limited to the use of an existing raised improved road. This road will not be altered in any way.

The Corps has determined that due to the amount of fill over the site and because project work within the boundaries of CA-SJO-3 are limited to use of an existing road, the project will continue to have no adverse effect to historic properties.

We are sensitive toward the protection of traditional cultural properties and sacred sites, and make every effort to avoid them. If you have comments on the APE, our efforts to identify historic properties, or our finding of *no adverse effect to historic properties* for the proposed project, we request that you contact us. Please let us know if you have knowledge of locations of archaeological sites or areas of traditional cultural value or concern in or near the Project APE. We ask that you provide your response within 30 days of receipt of this letter. Comments or questions may be sent to Ms. Nikki Polson, CESPK-PD-RC, U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814; email at nikki.polson@usace.army.mil; or telephone at (916) 557-6977.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

cc: (w/enclosures)
Mr. Anthony Burris, Chairman, Cultural Heritage Committee, Ione Band of Miwok Indians, P.O. Box699, Plymouth, California 95669

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

FEB 17 2015

Ms. Carol Roland-Nawi
State Historic Preservation Officer
Office of Historic Preservation
1725 23rd Street, Suite 100
Sacramento, CA 95816

Dear Ms. Roland-Nawi:

We are writing to reopen consultation concerning the Reclamation District 17 (RD 17) Phase 3 100-year Levee Seepage Project (project), San Joaquin County, California (COE110404A). RD 17, in cooperation with the California Department of Water Resources and the Central Valley Flood Protection Board, requires authorization from the Corps pursuant to Section 408 of the Rivers and Harbors Act of 1899 for alteration of federal project levees and Section 404 of the Clean Water Act for the placement of fill in jurisdictional waters of the United States. In our last communication concerning this project in 2011, we requested and your office concurred with our finding of no adverse effect to historic properties (Enclosure 1). At this time we are asking that you concur with an expanded area of potential effects (APE) and finding of no adverse effect to historic properties, as discussed below.

RD-17 has identified three additional areas that were not considered as part of the APE that need to be taken under consideration as part of this project. The Corps has determined that the APE now includes those areas seen in the enclosed report, "Addendum Cultural Resources Inventory Report: Phase 3 RD 17 100-Year Levee Seepage Area Project," (Enclosure 2, Appendix A).

Additional studies, including a record search, Native American consultation, and intensive pedestrian survey, were undertaken by RD-17 to identify any cultural resources within the project area. Only one previously recorded site, CA-SJO-3, is within the expanded APE and no new cultural resources were located during survey. No evidence of CA-SJO-3 was seen in during the surveys. According to previous excavations, CA-SJO-3 is a deeply buried habitation site with abundant artifacts and human burials. Non-cultural fill above the site is approximately 3 meters. The site was previously determined eligible for listing in the National Register of Historic Places in 2003. Construction activities within the boundaries of the site are limited to the use of an existing raised improved road. This road will not be altered in any way.

The Corps has determined that due to the amount of fill over the site and because project work within the boundaries of CA-SJO-3 are limited to use of an existing road, the project will continue to have no adverse effect to historic properties.

At this time, the Corps is requesting your concurrence with our determination of the expanded APE as depicted in Enclosure 2. Additionally, the Corps is requesting your concurrence with our finding of no adverse effect to historic properties. We ask that you provide your response within 30 days of receipt of this letter. Comments or questions may be sent to Ms. Nikki Polson, CESPK-PD-RC, U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814; email at nikki.polson@usace.army.mil; or telephone at (916) 557-6977.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

FEB 27 2015

Ms. Katherine Erolinda Perez, Chairperson
Nototomne / Northern Valley Yokuts
P.O. Box 717
Linden, California 95236

Dear Chairperson Perez:

We are writing to reopen consultation concerning the Reclamation District 17 (RD 17) Phase 3 100-year Levee Seepage Project (project), San Joaquin County, California. RD 17, in cooperation with the California Department of Water Resources and the Central Valley Flood Protection Board, requires authorization from the Corps pursuant to Section 408 of the Rivers and Harbors Act of 1899 for alteration of federal project levees and Section 404 of the Clean Water Act for the placement of fill in jurisdictional waters of the United States. In our last communication concerning this project in 2011, we requested any information concerning cultural sites or concerns your tribe had about the project. At this time we are notifying you of changes to the proposed project, as discussed below, and requesting any additional information concerning cultural resources or concerns you may have.

RD-17 has identified three additional areas that were not considered as part of the area of potential effects (APE) that need to be taken under consideration as part of this project. The Corps has determined that the APE now includes those areas, as seen in the enclosed maps.

Additional studies, including a record search and intensive pedestrian survey, were undertaken by RD-17 to identify any cultural resources within the additional areas. Only one previously recorded site, CA-SJO-3, is within the expanded APE and no new cultural resources were located during survey. No evidence of CA-SJO-3 was seen in during the surveys. According to previous excavations, CA-SJO-3 is a deeply buried habitation site with abundant artifacts and human burials. Non-cultural fill above the site is approximately 3 meters. The site was previously determined eligible for listing in the National Register of Historic Places in 2003. Construction activities within the boundaries of the site are limited to the use of an existing raised improved road. This road will not be altered in any way.

The Corps has determined that due to the amount of fill over the site and because project work within the boundaries of CA-SJO-3 are limited to use of an existing road, the project will continue to have no adverse effect to historic properties.

We are sensitive toward the protection of traditional cultural properties and sacred sites, and make every effort to avoid them. If you have comments on the APE, our efforts to identify historic properties, or our finding of *no adverse effect to historic properties* for the proposed project, we request that you contact us. Please let us know if you have knowledge of locations of archaeological sites or areas of traditional cultural value or concern in or near the Project APE. We ask that you provide your response within 30 days of receipt of this letter. Comments or questions may be sent to Ms. Nikki Polson, CESPK-PD-RC, U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814; email at nikki.polson@usace.army.mil; or telephone at (916) 557-6977.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

FEB 2 7 2015

Ms. Silvia Burley, Chairwoman
California Valley Miwok Tribe
10601 N. Excondido PL
Stockton, California 95212

Dear Chairwoman Burley:

We are writing to reopen consultation concerning the Reclamation District 17 (RD 17) Phase 3 100-year Levee Seepage Project (project), San Joaquin County, California. RD 17, in cooperation with the California Department of Water Resources and the Central Valley Flood Protection Board, requires authorization from the Corps pursuant to Section 408 of the Rivers and Harbors Act of 1899 for alteration of federal project levees and Section 404 of the Clean Water Act for the placement of fill in jurisdictional waters of the United States. In our last communication concerning this project in 2011, we requested any information concerning cultural sites or concerns your tribe had about the project. At this time we are notifying you of changes to the proposed project, as discussed below, and requesting any additional information concerning cultural resources or concerns you may have.

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Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

FEB 27 2015

Mr. Anthony Brochini, Chairperson
Southern Sierra Miwuk Nation
P.O. Box 1200
Mariposa, California 95338

Dear Chairperson Brochini:

We are writing to reopen consultation concerning the Reclamation District 17 (RD 17) Phase 3 100-year Levee Seepage Project (project), San Joaquin County, California. RD 17, in cooperation with the California Department of Water Resources and the Central Valley Flood Protection Board, requires authorization from the Corps pursuant to Section 408 of the Rivers and Harbors Act of 1899 for alteration of federal project levees and Section 404 of the Clean Water Act for the placement of fill in jurisdictional waters of the United States. In our last communication concerning this project in 2011, we requested any information concerning cultural sites or concerns your tribe had about the project. At this time we are notifying you of changes to the proposed project, as discussed below, and requesting any additional information concerning cultural resources or concerns you may have.

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Additional studies, including a record search and intensive pedestrian survey, were undertaken by RD-17 to identify any cultural resources within the additional areas. Only one previously recorded site, CA-SJO-3, is within the expanded APE and no new cultural resources were located during survey. No evidence of CA-SJO-3 was seen in during the surveys. According to previous excavations, CA-SJO-3 is a deeply buried habitation site with abundant artifacts and human burials. Non-cultural fill above the site is approximately 3 meters. The site was previously determined eligible for listing in the National Register of Historic Places in 2003. Construction activities within the boundaries of the site are limited to the use of an existing raised improved road. This road will not be altered in any way.

The Corps has determined that due to the amount of fill over the site and because project work within the boundaries of CA-SJO-3 are limited to use of an existing road, the project will continue to have no adverse effect to historic properties.

We are sensitive toward the protection of traditional cultural properties and sacred sites, and make every effort to avoid them. If you have comments on the APE, our efforts to identify historic properties, or our finding of *no adverse effect to historic properties* for the proposed project, we request that you contact us. Please let us know if you have knowledge of locations of archaeological sites or areas of traditional cultural value or concern in or near the Project APE. We ask that you provide your response within 30 days of receipt of this letter. Comments or questions may be sent to Ms. Nikki Polson, CESPK-PD-RC, U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814; email at nikki.polson@usace.army.mil; or telephone at (916) 557-6977.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

FEB 2 7 2015

Ms. Yvonne Miller, Chairperson
Ione Band of Miwok Indians
9252 Bush Street
Plymouth, California 95699

Dear Chairperson Miller

We are writing to reopen consultation concerning the Reclamation District 17 (RD 17) Phase 3 100-year Levee Seepage Project (project), San Joaquin County, California. RD 17, in cooperation with the California Department of Water Resources and the Central Valley Flood Protection Board, requires authorization from the Corps pursuant to Section 408 of the Rivers and Harbors Act of 1899 for alteration of federal project levees and Section 404 of the Clean Water Act for the placement of fill in jurisdictional waters of the United States. In our last communication concerning this project in 2011, we requested any information concerning cultural sites or concerns your tribe had about the project. At this time we are notifying you of changes to the proposed project, as discussed below, and requesting any additional information concerning cultural resources or concerns you may have.

RD-17 has identified three additional areas that were not considered as part of the area of potential effects (APE) that need to be taken under consideration as part of this project. The Corps has determined that the APE now includes those areas, as seen in the enclosed maps.

Additional studies, including a record search and intensive pedestrian survey, were undertaken by RD-17 to identify any cultural resources within the additional areas. Only one previously recorded site, CA-SJO-3, is within the expanded APE and no new cultural resources were located during survey. No evidence of CA-SJO-3 was seen in during the surveys. According to previous excavations, CA-SJO-3 is a deeply buried habitation site with abundant artifacts and human burials. Non-cultural fill above the site is approximately 3 meters. The site was previously determined eligible for listing in the National Register of Historic Places in 2003. Construction activities within the boundaries of the site are limited to the use of an existing raised improved road. This road will not be altered in any way.

The Corps has determined that due to the amount of fill over the site and because project work within the boundaries of CA-SJO-3 are limited to use of an existing road, the project will continue to have no adverse effect to historic properties.

We are sensitive toward the protection of traditional cultural properties and sacred sites, and make every effort to avoid them. If you have comments on the APE, our efforts to identify historic properties, or our finding of *no adverse effect to historic properties* for the proposed project, we request that you contact us. Please let us know if you have knowledge of locations of archaeological sites or areas of traditional cultural value or concern in or near the Project APE. We ask that you provide your response within 30 days of receipt of this letter. Comments or questions may be sent to Ms. Nikki Polson, CESPK-PD-RC, U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814; email at nikki.polson@usace.army.mil; or telephone at (916) 557-6977.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

cc: (w/enclosures)
Mr. Anthony Burris, Chairman, Cultural Heritage Committee, Ione Band of Miwok Indians, P.O. Box699, Plymouth, California 95669

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

FEB 2 7 2015

Ms. Rhonda Morningstar Pope, Chairwoman
Buena Vista Rancheria of Me-Wuk Indians
1418 20th Street, Suite B
Sacramento, California 95811

Dear Chairwoman Pope:

We are writing to reopen consultation concerning the Reclamation District 17 (RD 17) Phase 3 100-year Levee Seepage Project (project), San Joaquin County, California. RD 17, in cooperation with the California Department of Water Resources and the Central Valley Flood Protection Board, requires authorization from the Corps pursuant to Section 408 of the Rivers and Harbors Act of 1899 for alteration of federal project levees and Section 404 of the Clean Water Act for the placement of fill in jurisdictional waters of the United States. In our last communication concerning this project in 2011, we requested any information concerning cultural sites or concerns your tribe had about the project. At this time we are notifying you of changes to the proposed project, as discussed below, and requesting any additional information concerning cultural resources or concerns you may have.

RD-17 has identified three additional areas that were not considered as part of the area of potential effects (APE) that need to be taken under consideration as part of this project. The Corps has determined that the APE now includes those areas, as seen in the enclosed maps.

Additional studies, including a record search and intensive pedestrian survey, were undertaken by RD-17 to identify any cultural resources within the additional areas. Only one previously recorded site, CA-SJO-3, is within the expanded APE and no new cultural resources were located during survey. No evidence of CA-SJO-3 was seen in during the surveys. According to previous excavations, CA-SJO-3 is a deeply buried habitation site with abundant artifacts and human burials. Non-cultural fill above the site is approximately 3 meters. The site was previously determined eligible for listing in the National Register of Historic Places in 2003. Construction activities within the boundaries of the site are limited to the use of an existing raised improved road. This road will not be altered in any way.

The Corps has determined that due to the amount of fill over the site and because project work within the boundaries of CA-SJO-3 are limited to use of an existing road, the project will continue to have no adverse effect to historic properties.

We are sensitive toward the protection of traditional cultural properties and sacred sites, and make every effort to avoid them. If you have comments on the APE, our efforts to identify historic properties, or our finding of *no adverse effect to historic properties* for the proposed project, we request that you contact us. Please let us know if you have knowledge of locations of archaeological sites or areas of traditional cultural value or concern in or near the Project APE. We ask that you provide your response within 30 days of receipt of this letter. Comments or questions may be sent to Ms. Nikki Polson, CESPK-PD-RC, U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814; email at nikki.polson@usace.army.mil; or telephone at (916) 557-6977.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

cc: (w/enclosures)
Ms. Roselyn Lwenya, Ph.D., Tribal Historic Preservation Officer, Buena Vista Rancheria of Me-Wuk Indians, 1418 20th Street, Suite B, Sacramento, California 95236

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

FEB 2 7 2015

Mr. Andrew Franklin, Chairman
Wilton Rancheria
9300 West Stockton Boulevard, Suite 200
Elk Grove, California 95758

Dear Chairman Franklin:

We are writing to reopen consultation concerning the Reclamation District 17 (RD 17) Phase 3 100-year Levee Seepage Project (project), San Joaquin County, California. RD 17, in cooperation with the California Department of Water Resources and the Central Valley Flood Protection Board, requires authorization from the Corps pursuant to Section 408 of the Rivers and Harbors Act of 1899 for alteration of federal project levees and Section 404 of the Clean Water Act for the placement of fill in jurisdictional waters of the United States. In our last communication concerning this project in 2011, we requested any information concerning cultural sites or concerns your tribe had about the project. At this time we are notifying you of changes to the proposed project, as discussed below, and requesting any additional information concerning cultural resources or concerns you may have.

RD-17 has identified three additional areas that were not considered as part of the area of potential effects (APE) that need to be taken under consideration as part of this project. The Corps has determined that the APE now includes those areas, as seen in the enclosed maps.

Additional studies, including a record search and intensive pedestrian survey, were undertaken by RD-17 to identify any cultural resources within the additional areas. Only one previously recorded site, CA-SJO-3, is within the expanded APE and no new cultural resources were located during survey. No evidence of CA-SJO-3 was seen in during the surveys. According to previous excavations, CA-SJO-3 is a deeply buried habitation site with abundant artifacts and human burials. Non-cultural fill above the site is approximately 3 meters. The site was previously determined eligible for listing in the National Register of Historic Places in 2003. Construction activities within the boundaries of the site are limited to the use of an existing raised improved road. This road will not be altered in any way.

The Corps has determined that due to the amount of fill over the site and because project work within the boundaries of CA-SJO-3 are limited to use of an existing road, the project will continue to have no adverse effect to historic properties.

We are sensitive toward the protection of traditional cultural properties and sacred sites, and make every effort to avoid them. If you have comments on the APE, our efforts to identify historic properties, or our finding of *no adverse effect to historic properties* for the proposed project, we request that you contact us. Please let us know if you have knowledge of locations of archaeological sites or areas of traditional cultural value or concern in or near the Project APE. We ask that you provide your response within 30 days of receipt of this letter. Comments or questions may be sent to Ms. Nikki Polson, CESPK-PD-RC, U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814; email at nikki.polson@usace.army.mil; or telephone at (916) 557-6977.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

cc: (w/enclosures)
Mr. Steve Hutchason, Executive Director, Cultural Rights Protection/Environmental, 9300 West Stockton Boulevard, Suite 200, Elk Grove, California 95758

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
1725 23rd Street, Suite 100
SACRAMENTO, CA 95816-7100
(916) 445-7000 Fax: (916) 445-7053
calshpo@parks.ca.gov
www.ohp.parks.ca.gov

APR 14 2015 OB

April 1, 2015

In reply refer to: COE110404A

Alicia E. Kirchner
Chief, Planning Division
Department of the Army
Corps of Engineers
Sacramento District
1325 J Street,
Sacramento, CA 95814-2922

Re: Section 106 Consultation for the Reclamation District 17 (RD 17) Phase 3 100-year Levee Seepage Project, San Joaquin County, California.

Dear Ms. Kirchner:

Thank you for your letter, received on February 18, 2015, requesting re-initiation of consultation with regard to the proposed Reclamation District 17 (RD17) Phase 3 100-year Levee Seepage Project (Project). The Army Corps of Engineers (COE) is continuing consultation for this undertaking Pursuant to 36 CFR Part 800 (as amended 8-05-04) regulations implementing Section 106 of the National Historic Preservation Act. Along with your consultation letter, you also provided the following document:

- *Addendum Cultural Resources Inventory Report, Phase 3 RD 17 100-Year Levee Seepage Area Project* (AECOM, September 2014).

The COE would modify the Area of Potential Effects (APE) to the proposed undertaking's activities that fall under Section 404 of the Clean Water Act for the placement of fill in jurisdictional waters of the United States and Section 408 of the Rivers and Harbors Act of 1899 for alteration of federal project levees. The COE initiated consultation for the project on April 4, 2011. In a letter, dated April 6, 2011, I concurred with the COE determination of No Adverse Effect for the proposed undertaking. You now inform me that the COE is requesting my concurrence with the expanded APE and their finding of no adverse effects to historic properties.

The modified APE includes an augmentation of the project in three areas (identified in the cultural resources report as project areas IIIa, VIIa.4-Viib, and VIIe) totaling approximately 10.7-acres. In project areas IIIa, VIa.4 through VIb, and VIIe, approximately 25 to 35 meters have been added to the width of the previously defined APE. Project area VIIb has expanded by approximately 0.4 acres and now includes an existing raised dirt road that extends from the west end of Madruga Road for approximately 590 meters to the levee.

The cultural resources identification efforts conducted in association with the previously issued COE permit included a records search, survey, and Native American coordination performed by AECOM (Consultant) in 2010 and 2011. The previously conducted identification efforts identified three potential historic resources within the project's APE, one of which, CA-SJO-250H, the old southern Pacific rail line and vertical-lift drawbridge, had previously been determined eligible for listing on the National Register of Historic Places (NRHP). The COE determined that the other two resources, including P-39-004602 (the Silveria Ranch) and the RD 17 levee itself, were ineligible for listing on the NRHP. In a letter dated April 6, 2011, I concurred with the COE's finding of "No Adverse Effect" for the proposed undertaking.

The Archaeological Survey Report prepared by the consultant in September 2014 indicates that the areas within the expanded APE were subject to a records search, Native American coordination, and field investigation conducted by AECOM between March and June, 2014. The records search, conducted by the consultant on June 3, 2014, identified one previously recorded cultural resource, CA-SJO-3 (a large prehistoric-era habitation site), within the expanded APE. Previous investigations conducted for Caltrans found that deeply buried intact deposits still exist at CA-SJO-3 and recommended the site eligible for listing on the NRHP. In 2003, my office concurred with Caltrans' finding that CA-SJO-3 was eligible for NRHP listing.

The pedestrian survey, conducted on March 4, March 11, and April 23, 2014, did not result in the identification of additional cultural resources within the expanded APE. The Native American Heritage Commission (NAHC) was contacted by the consultant on March 20, 2014 and had not responded by September 2014. Previous consultation with the NAHC associated with the initial project did not result in the identification any known Native American sacred lands or areas of cultural importance within the vicinity of the project area. Native American coordination initiated by the consultant on May 28, 2014 has not resulted in the identification of potential historic properties within the expanded APE.

In assessing potential adverse effects to site CA-SJO-3, the COE has determined that, due to the approximately 3 meters of fill over the site and because the proposed activities within the boundaries of CA-SJO-3 are limited to the use of an existing raised roadway, the project will continue to have no adverse effect to historic properties.

The COE is requesting my review and comment on the adequacy of their historic property identification efforts, determination of National Register of Historic Places (NRHP) eligibility, and finding of effect associated with the proposed undertaking. After reviewing your submission I have the following comments:

- Pursuant to 36 CFR 800.4(a)(1), I have no objections to the revised APE as defined.

- Pursuant to 36 CFR 800.4(b), I find that the COE has made a reasonable and good faith effort to identify historic properties within the area of potential effects.

- Pursuant to 36 CFR 800.3(e) and (f), the COE is responsible for carrying out consultation with Indian tribes, the public, and other interested parties. A federal agency cannot delegate its government-to-government consultation with Indian tribes to applicants or other non-federal entities, including state and local governments, without prior consent from the tribes. It is important to remember that Indian tribes are under no obligation to consult directly with an applicant. Absent a formal agreement or approved protocol previously negotiated between the federal agency and the Indian tribe, an agency must initiate and conduct the consultation process with the Indian tribe.

- Pursuant to 36 CFR 800.4(c)(2), I concur that the prehistoric site CA-SJO-3 is eligible for listing on the NRHP.
- Pursuant to 36 CFR 800.5(c)(1), I concur with your determination of no adverse effects to historic properties for this undertaking.

Thank you for seeking my comments and considering historic properties as part of your project planning. Be advised that under certain circumstances, such as unanticipated discovery or a change in project description, the COE may have additional future responsibilities for this undertaking under 36 CFR Part 800. If you have any questions, please contact Patrick Riordan of my staff at (916) 445-7017 or Patrick.Riordan@parks.ca.gov.

Sincerely,

Carol Roland-Nawi, Ph.D.

Carol Roland-Nawi, PhD
State Historic Preservation Officer

Appendix G. Air Quality Modeling Results

Appendix G: RD 17 Phase III LSAP Air Quality Calculations

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Table 1a: Alternatives 1 and 2 - Reach Ia

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.035	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Seepage Berm															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	35	50%	4.3	42.2	2.0	1.9	8752.1	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	19.6	231.5	7.7	7.1	31770.9	lb/project
Scraper(s)	2	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	52.1	617.0	24.1	22.1	77018.4	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	28.3	297.5	14.6	13.4	21717.8	lb/project
Compactor(s)	2	0.04	0.25	0.01	0.01	34.48	lb/day		75%	2.1	13.2	0.5	0.5	1810.2	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	16.7	221.4	7.1	6.5	22495.2	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.6	8.7	0.2	0.2	2189.9	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	2.3	22.1	0.8	0.7	4475.2	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	34.8	331.9	12.1	11.1	67127.7	lb/project
									Subtotal Emissions (lb/project) =	**160.9**	**1,785.6**	**69.0**	**63.5**	**237,357.3**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.6**	**51.0**	**2.0**	**1.8**	**6,781.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach Ia_Alt 1 and 2					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach Ia Alternatives 1 and 2 (tons/project)	**0.1**	**1.0**	**0.0**	**0.0**	**124.9**
Peak Day from Reach Ia Alternatives 1 and 2 (lb/day)	**4.6**	**52.8**	**2.1**	**1.9**	**6781.6**
Total from Reach Ia Alternatives 1 and 2 (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.076**

Table 1b: Preferred Alternative - Reach Ia

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.035	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Seepage Berm															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	39	50%	4.8	47.0	2.3	2.1	9752.3	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	21.9	258.0	8.6	7.9	35401.9	lb/project
Scraper(s)	2	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	58.1	687.5	26.8	24.7	85820.5	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	31.6	331.5	16.2	14.9	24199.8	lb/project
Compactor(s)	2	0.04	0.25	0.01	0.01	34.48	lb/day		75%	2.3	14.7	0.6	0.6	2017.0	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	18.6	246.7	7.9	7.3	25066.0	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.7	9.7	0.2	0.2	2440.2	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	2.6	24.7	0.9	0.8	4986.6	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	38.8	369.9	13.5	12.4	74799.4	lb/project
									Subtotal Emissions (lb/project) =	**179.3**	**1,989.7**	**76.9**	**70.8**	**264,483.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.6**	**51.0**	**2.0**	**1.8**	**6,781.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach Ia_Preferred Alt	ROG	NOX	PM10	PM2.5	CO2
Total from Reach Ia Preferred Alternative (tons/project)	**0.1**	**1.1**	**0.0**	**0.0**	**137.2**
Peak Day from Reach Ia Preferred Alternative (lb/day)	**4.6**	**52.8**	**2.1**	**1.9**	**6781.6**
Total from Reach Ia Preferred Alternative (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.076**

Table 2: Alternative 1 and 2 - Reach Ib

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Seepage Berm and Chimney Drain															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	8	50%	1.0	9.7	0.5	0.4	2000.5	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	4.5	52.9	1.8	1.6	7261.9	lb/project
Scraper(s)	2	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.9	141.0	5.5	5.1	17604.2	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	6.5	68.0	3.3	3.1	4964.1	lb/project
Compactor(s)	2	0.04	0.25	0.01	0.01	34.48	lb/day		75%	0.5	3.0	0.1	0.1	413.8	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	3.8	50.6	1.6	1.5	5141.8	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.1	2.0	0.0	0.0	500.6	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	0.5	5.1	0.2	0.2	1022.9	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	8.0	75.9	2.8	2.5	15343.5	lb/project
									Subtotal Emissions (lb/project) =	**36.8**	**408.1**	**15.8**	**14.5**	**54,253.1**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.6**	**51.0**	**2.0**	**1.8**	**6,781.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach Ib					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach Ib (tons/project)	**0.0**	**0.4**	**0.0**	**0.0**	**41.8**
Peak Day from Reach Ib (lb/day)	**4.6**	**52.8**	**2.1**	**1.9**	**6781.6**
Total from Reach Ib (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.076**

Table 3: Alternative 1 and 2 - Reach Ie

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Seepage Berm and Chimney Drain															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	44	50%	5.4	53.1	2.6	2.4	11002.6	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	24.7	291.0	9.7	8.9	39940.6	lb/project
Scraper(s)	2	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	65.5	775.6	30.2	27.8	96823.1	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	35.6	374.0	18.3	16.8	27302.3	lb/project
Compactor(s)	2	0.04	0.25	0.01	0.01	34.48	lb/day		75%	2.6	16.6	0.6	0.6	2275.6	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	20.9	278.3	8.9	8.2	28279.6	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.8	11.0	0.2	0.2	2753.0	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	2.9	27.8	1.0	0.9	5625.9	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	43.8	417.3	15.2	14.0	84389.1	lb/project
									Subtotal Emissions (lb/project) =	**202.3**	**2,244.7**	**86.8**	**79.9**	**298,392.0**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.6**	**51.0**	**2.0**	**1.8**	**6,781.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach Ie					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach Ie (tons/project)	**0.1**	**1.3**	**0.0**	**0.0**	**152.6**
Peak Day from Reach Ie (lb/day)	**4.6**	**52.8**	**2.1**	**1.9**	**6781.6**
Total from Reach Ie (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.076**

Table 4a: Alternative 1 - Reach IIab

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Cutoff Wall															
Drill Rig(s)	2	0.28	3.52	0.10	0.09	909.81	lb/day	34	75%	14.15	179.64	5.18	4.76	46400.19	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	19.1	224.9	7.5	6.9	30863.2	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	16.2	215.1	6.9	6.3	21852.5	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.6	8.5	0.2	0.2	2127.3	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	2.3	21.5	0.8	0.7	4347.3	lb/project
Supply Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	16.9	161.2	5.9	5.4	32604.9	lb/project
Pickup Truck(s)	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	33.8	322.5	11.7	10.8	65209.8	lb/project
Generator(s)	2	0.40	3.48	0.20	0.20	623.04	lb/day		75%	20.4	177.4	10.0	10.0	31774.8	lb/project
Slurry Pump(s)	2	0.42	3.53	0.21	0.21	623.04	lb/day		75%	21.6	180.0	10.6	10.6	31774.8	lb/project
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day								lb/project
									Subtotal Emissions (lb/project) =	**144.9**	**1,490.7**	**58.7**	**55.6**	**266,954.7**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.3**	**43.8**	**1.7**	**1.6**	**7,851.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.03	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach IIab_Alt1					
	ROG	NOX	PM10	PM2.5	CO2
Total from Reach IIab Alt 1 (tons/project)	**0.1**	**0.9**	**0.0**	**0.0**	**138.3**
Peak Day from Reach IIab Alt 1 (lb/day)	**4.4**	**52.8**	**2.1**	**1.9**	**7851.6**
Total from Reach IIab Alt 1 (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.561**

Table 4b: Alternative 2 - Reach IIab

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day	5	75%	11.2	132.2	5.2	4.7	16503.9	lb/project
									Subtotal Emissions (lb/project) =	**11.2**	**132.2**	**5.2**	**4.7**	**16503.9**	**lb/project**
									Subtotal Emissions (lb/day) =	**2.2**	**26.4**	**1.0**	**0.9**	**3300.8**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day	5	75%	2.8	33.1	1.1	1.0	4538.7	lb/project
									Subtotal Emissions (lb/project) =	**2.8**	**33.1**	**1.1**	**1.0**	**4538.7**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.6**	**6.6**	**0.2**	**0.2**	**907.7**	**lb/day**
[3] Construction of Setback Levee															
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day	313	50%	181.2	2331.1	87.9	80.8	238001.8	lb/project
									Subtotal Emissions (lb/project) =	**181.2**	**2,331.1**	**87.9**	**80.8**	**238,001.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.6**	**7.4**	**0.3**	**0.3**	**760.4**	**lb/day**
[4] Site Restoration/Demobilization															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	3	25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**0.0**	**0.4**	**0.0**	**0.0**	**93.9**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.0**	**0.1**	**0.0**	**0.0**	**31.3**	**lb/day**
[5] Removal of Existing Levee at Setback Levee Reaches															
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day	22	75%	7.9	104.4	3.3	3.1	10604.9	lb/project
									Subtotal Emissions (lb/project) =	**7.9**	**104.4**	**3.3**	**3.1**	**10604.9**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.7**	**0.2**	**0.1**	**482.0**	**lb/day**
[6] Existing Levee Site Restoration/Demobilization															
Chipper/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day	3	25%	0.7	7.9	0.4	0.4	898.2	lb/project
									Subtotal Emissions (lb/project) =	**0.7**	**7.9**	**0.4**	**0.4**	**898.2**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.2**	**2.6**	**0.1**	**0.1**	**299.4**	**lb/day**

Summary - Reach IIab_Alt2					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach IIab Alt 2 (tons/project)	**0.1**	**1.3**	**0.0**	**0.0**	**122.7**
Peak Day from Reach IIab Alt 2 (lb/day)	**2.2**	**26.4**	**1.0**	**0.9**	**3300.8**
Total from Reach IIab Alt 2 (tons/day)	**0.001**	**0.013**	**0.001**	**0.000**	**1.497**

Table 4c: Preferred Alternative - Reach IIab

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Cutoff Wall															
Drill Rig(s)	2	0.28	3.52	0.10	0.09	909.81	lb/day	35	75%	14.57	184.92	5.33	4.90	47764.90	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	19.6	231.5	7.7	7.1	31770.9	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	16.7	221.4	7.1	6.5	22495.2	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.6	8.7	0.2	0.2	2189.9	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	2.3	22.1	0.8	0.7	4475.2	lb/project
Supply Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	17.4	166.0	6.0	5.6	33563.9	lb/project
Pickup Truck(s)	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	34.8	331.9	12.1	11.1	67127.7	lb/project
Generator(s)	2	0.40	3.48	0.20	0.20	623.04	lb/day		75%	21.0	182.6	10.3	10.3	32709.3	lb/project
Slurry Pump(s)	2	0.42	3.53	0.21	0.21	623.04	lb/day		75%	22.2	185.3	10.9	10.9	32709.3	lb/project
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day								lb/project
									Subtotal Emissions (lb/project) =	**149.2**	**1,534.5**	**60.4**	**57.3**	**274,806.3**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.3**	**43.8**	**1.7**	**1.6**	**7,851.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.03	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach IIab_Preferred Alt	ROG	NOX	PM10	PM2.5	CO2
Total from Reach IIab Preferred Alt (tons/project)	**0.1**	**0.9**	**0.0**	**0.0**	**141.9**
Peak Day from Reach IIab Preferred Alt (lb/day)	**4.4**	**52.8**	**2.1**	**1.9**	**7851.6**
Total from Reach IIab Preferred Alt (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.561**

Table 5: Alternative 1 and 2 - Reach IIIa

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Construction of Chimney Drain															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	109	50%	13.4	131.5	6.4	5.9	27256.5	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	61.2	721.0	23.9	22.0	98943.7	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	88.2	926.4	45.4	41.7	67635.3	lb/project
Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	25.9	344.7	11.0	10.1	35028.2	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	7.2	68.9	2.5	2.3	13937.0	lb/project
Subtotal Emissions (lb/project) =										**195.9**	**2,192.5**	**89.2**	**82.1**	**242,800.7**	**lb/project**
Subtotal Emissions (lb/day) =										**1.8**	**20.1**	**0.8**	**0.8**	**2,227.5**	**lb/day**
[2] Site Restoration/Demobilization															
Hydroseeding Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.49	14.23	0.52	0.48	2876.90	lb/yr
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/yr
Subtotal Emissions (lb/project) =										**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
Subtotal Emissions (lb/day) =										**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach IIIa					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach IIIa (tons/project)	**0.1**	**1.1**	**0.0**	**0.0**	**111.5**
Peak Day from Reach IIIa (lb/day)	**1.8**	**20.1**	**0.8**	**0.8**	**2227.5**
Total from Reach IIIa (tons/day)	**0.001**	**0.010**	**0.000**	**0.000**	**1.010**

Table 6: Alternative 1 and 2 - Reach IIIb

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Seepage Berm and Chimney Drain															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	48	50%	5.9	57.9	2.8	2.6	12002.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	26.9	317.5	10.5	9.7	43571.5	lb/project
Scraper(s)	2	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	71.5	846.2	33.0	30.4	105625.2	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	38.9	408.0	20.0	18.4	29784.4	lb/project
Compactor(s)	2	0.04	0.25	0.01	0.01	34.48	lb/day		75%	2.9	18.1	0.7	0.7	2482.5	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	22.8	303.6	9.7	8.9	30850.5	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.8	12.0	0.2	0.2	3003.3	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	3.2	30.3	1.1	1.0	6137.4	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	47.7	455.2	16.6	15.3	92060.9	lb/project
									Subtotal Emissions (lb/project) =	**220.7**	**2,448.8**	**94.6**	**87.1**	**325,518.5**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.6**	**51.0**	**2.0**	**1.8**	**6,781.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach IIIb					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach IIIb (tons/project)	**0.1**	**1.4**	**0.1**	**0.0**	**164.9**
Peak Day from Reach IIIb (lb/day)	**4.6**	**52.8**	**2.1**	**1.9**	**6781.6**
Total from Reach IIIb (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.076**

Table 7: Alternative 1 and 2 - Reach IVa

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Seepage Berm and Chimney Drain															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	35	50%	4.3	42.2	2.0	1.9	8752.1	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	19.6	231.5	7.7	7.1	31770.9	lb/project
Scraper(s)	2	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	52.1	617.0	24.1	22.1	77018.4	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	28.3	297.5	14.6	13.4	21717.8	lb/project
Compactor(s)	2	0.04	0.25	0.01	0.01	34.48	lb/day		75%	2.1	13.2	0.5	0.5	1810.2	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	16.7	221.4	7.1	6.5	22495.2	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.6	8.7	0.2	0.2	2189.9	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	2.3	22.1	0.8	0.7	4475.2	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	34.8	331.9	12.1	11.1	67127.7	lb/project
									Subtotal Emissions (lb/project) =	**160.9**	**1,785.6**	**69.0**	**63.5**	**237,357.3**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.6**	**51.0**	**2.0**	**1.8**	**6,781.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach IVa					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach IVa (tons/project)	**0.1**	**1.0**	**0.0**	**0.0**	**124.9**
Peak Day from Reach IVa (lb/day)	**4.6**	**52.8**	**2.1**	**1.9**	**6781.6**
Total from Reach IVa (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.076**

Table 8a: Alternative 1 - Reach IVc

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Cutoff Wall															
Drill Rig(s)	2	0.28	3.52	0.10	0.09	909.81	lb/day	33.4	75%	13.90	176.48	5.09	4.68	45585.15	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	18.7	220.9	7.3	6.7	30321.1	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	15.9	211.3	6.8	6.2	21468.6	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.6	8.3	0.2	0.1	2090.0	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	2.2	21.1	0.8	0.7	4271.0	lb/project
Supply Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	16.6	158.4	5.8	5.3	32032.2	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	33.2	316.8	11.5	10.6	64064.3	lb/project
Generator(s)	2	0.40	3.48	0.20	0.20	623.04	lb/day		75%	20.0	174.3	9.8	9.8	31216.7	lb/project
Slurry Pump(s)	2	0.42	3.53	0.21	0.21	623.04	lb/day		75%	21.2	176.8	10.4	10.4	31216.7	lb/project
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	16.6	158.4	5.8	5.3	32032.2	lb/project
									Subtotal Emissions (lb/project) =	**159.0**	**1,622.9**	**63.4**	**60.0**	**294,297.7**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.8**	**48.6**	**1.9**	**1.8**	**8,810.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach IVc_Alt1					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach IVc Alt 1 (tons/project)	**0.1**	**1.0**	**0.0**	**0.0**	**150.7**
Peak Day from Reach IVc Alt 1 (lb/day)	**4.8**	**52.8**	**2.1**	**1.9**	**8810.6**
Total from Reach IVc Alt 1 (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.996**

Table 8b: Alternative 2 - Reach IVc

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day	5	75%	11.2	132.2	5.2	4.7	16503.9	lb/project
									Subtotal Emissions (lb/project) =	**11.2**	**132.2**	**5.2**	**4.7**	**16503.9**	**lb/project**
									Subtotal Emissions (lb/day) =	**2.2**	**26.4**	**1.0**	**0.9**	**3300.8**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day	5	75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**1.4**	**16.5**	**0.5**	**0.5**	**2269.4**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.3**	**3.3**	**0.1**	**0.1**	**453.9**	**lb/day**
[3] Construction of Setback Levee															
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day	103	50%	59.6	767.1	28.9	26.6	78320.1	lb/project
									Subtotal Emissions (lb/project) =	**59.6**	**767.1**	**28.9**	**26.6**	**78,320.1**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.6**	**7.4**	**0.3**	**0.3**	**760.4**	**lb/day**
[4] Setback Levee Site Restoration/Demobilization															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	3	25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**0.0**	**0.4**	**0.0**	**0.0**	**93.9**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.0**	**0.1**	**0.0**	**0.0**	**31.3**	**lb/day**
[5] Removal of Existing Levee at Setback Levee Reaches															
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day	13	75%	4.6	61.7	2.0	1.8	6266.5	lb/project
									Subtotal Emissions (lb/project) =	**4.6**	**61.7**	**2.0**	**1.8**	**6266.5**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.7**	**0.2**	**0.1**	**482.0**	**lb/day**
[6] Existing Levee Site Restoration/Demobilization															
Chipper/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day	3	25%	0.7	7.9	0.4	0.4	898.2	lb/project
									Subtotal Emissions (lb/project) =	**0.7**	**7.9**	**0.4**	**0.4**	**898.2**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.2**	**2.6**	**0.1**	**0.1**	**299.4**	**lb/day**

Summary - Reach IVc_Alt2	ROG	NOX	PM10	PM2.5	CO2
Total from Reach IVc Alt 2 (tons/project)	**0.0**	**0.5**	**0.0**	**0.0**	**47.3**
Peak Day from Reach IVc Alt 2 (lb/day)	**2.2**	**26.4**	**1.0**	**0.9**	**3300.8**
Total from Reach IVc Alt 2 (tons/day)	**0.001**	**0.013**	**0.001**	**0.000**	**1.497**

Table 8c: Preferred Alternative - Reach IVc Setback Levee with Seepage Berm

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day	5	75%	11.2	132.2	5.2	4.7	16503.9	lb/project
									Subtotal Emissions (lb/project) =	**11.2**	**132.2**	**5.2**	**4.7**	**16503.9**	**lb/project**
									Subtotal Emissions (lb/day) =	**2.2**	**26.4**	**1.0**	**0.9**	**3300.8**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day	5	75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**1.4**	**16.5**	**0.5**	**0.5**	**2269.4**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.3**	**3.3**	**0.1**	**0.1**	**453.9**	**lb/day**
[3] Construction of Setback Levee															
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day	212	50%	122.7	1578.9	59.5	54.7	161202.5	lb/project
									Subtotal Emissions (lb/project) =	**122.7**	**1,578.9**	**59.5**	**54.7**	**161,202.5**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.6**	**7.4**	**0.3**	**0.3**	**760.4**	**lb/day**
[4] Setback Levee Site Restoration/Demobilization															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	3	25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**0.0**	**0.4**	**0.0**	**0.0**	**93.9**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.0**	**0.1**	**0.0**	**0.0**	**31.3**	**lb/day**
[5] Removal of Existing Levee at Setback Levee Reaches															
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day	4	75%	1.4	19.0	0.6	0.6	1928.2	lb/project
									Subtotal Emissions (lb/project) =	**1.4**	**19.0**	**0.6**	**0.6**	**1928.2**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.7**	**0.2**	**0.1**	**482.0**	**lb/day**
[6] Existing Levee Site Restoration/Demobilization															
Chipper/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day	3	25%	0.7	7.9	0.4	0.4	898.2	lb/project
									Subtotal Emissions (lb/project) =	**0.7**	**7.9**	**0.4**	**0.4**	**898.2**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.2**	**2.6**	**0.1**	**0.1**	**299.4**	**lb/day**

Summary - Reach IVc_PrefAlt: Setback Levee with Seepage Berm					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach IVc Alt 2 (tons/project)	**0.1**	**0.9**	**0.0**	**0.0**	**82.9**
Peak Day from Reach IVc Alt 2 (lb/day)	**2.2**	**26.4**	**1.0**	**0.9**	**3300.8**
Total from Reach IVc Alt 2 (tons/day)	**0.001**	**0.013**	**0.001**	**0.000**	**1.497**

Table 9a: Alternative 1 - Reach Va and VIa.1

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Cutoff Wall															
Drill Rig(s)	2	0.28	3.52	0.10	0.09	909.81	lb/day	132	75%	54.95	697.41	20.10	18.48	180141.90	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	74.06	873.10	28.99	26.67	119821.75	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	62.8	835.0	26.7	24.6	84838.9	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	2.3	33.0	0.6	0.6	8259.1	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	8.8	83.5	3.0	2.8	16877.8	lb/project
Supply Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	65.6	626.0	22.8	21.0	126583.7	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	131.3	1251.9	45.6	42.0	253167.3	lb/project
Generator(s)	2	0.40	3.48	0.20	0.20	623.04	lb/day		75%	79.0	688.8	38.9	38.9	123360.9	lb/project
Slurry Pump(s)	2	0.42	3.53	0.21	0.21	623.04	lb/day		75%	83.8	698.7	41.0	41.0	123360.9	lb/project
									Subtotal Emissions (lb/project) =	**562.6**	**5,787.3**	**227.7**	**216.0**	**1,036,412.4**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.3**	**43.8**	**1.7**	**1.6**	**7,851.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach Va and VIa.1_Alt 1					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach Va and VIa.1 Alt 1 (tons/project)	**0.3**	**3.0**	**0.1**	**0.1**	**487.3**
Peak Day from Reach Va and VIa.1 Alt 1 (lb/day)	**4.4**	**52.8**	**2.1**	**1.9**	**7851.6**
Total from Reach Va and VIa.1 Alt 1 (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.561**

Table 9b: Alternative 2 - Reach Va and VIa.1

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Seepage Berm with Toe Drain															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	587	50%	71.9	708.1	34.3	31.5	146784.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	329.3	3882.6	128.9	118.6	532843.7	lb/project
Scraper(s)	2	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	874.3	10347.7	403.5	371.2	1291708.0	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	475.3	4989.0	244.3	224.8	364237.8	lb/project
Compactor(s)	2	0.04	0.25	0.01	0.01	34.48	lb/day		75%	35.3	221.3	8.6	8.6	30359.1	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	279.3	3713.1	118.7	109.2	377276.2	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	10.2	146.6	2.8	2.6	36727.9	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	38.9	371.1	13.5	12.4	75055.2	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	583.8	5567.2	202.8	186.7	1125827.5	lb/project
									Subtotal Emissions (lb/project) =	**2,698.4**	**29,946.8**	**1,157.5**	**1,065.7**	**3,980,820.2**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.6**	**51.0**	**2.0**	**1.8**	**6,781.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach Va and VIa.1_Alt 2					
	ROG	NOX	PM10	PM2.5	CO2
Total from Reach Va and VIa.1 Alt 2 (tons/project)	**1.4**	**15.1**	**0.6**	**0.5**	**1822.6**
Peak Day from Reach Va and VIa.1 Alt 2 (lb/day)	**4.6**	**52.8**	**2.1**	**1.9**	**6781.6**
Total from Reach Va and VIa.1 Alt 2 (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.076**

Table 9c: Preferred Alternative - Reach Va and VIa.1

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Cutoff Wall															
Drill Rig(s)	2	0.28	3.52	0.10	0.09	909.81	lb/day	132	75%	54.95	697.41	20.10	18.48	180141.90	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	74.06	873.10	28.99	26.67	119821.75	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	62.8	835.0	26.7	24.6	84838.9	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	2.3	33.0	0.6	0.6	8259.1	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	8.8	83.5	3.0	2.8	16877.8	lb/project
Supply Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	65.6	626.0	22.8	21.0	126583.7	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	131.3	1251.9	45.6	42.0	253167.3	lb/project
Generator(s)	2	0.40	3.48	0.20	0.20	623.04	lb/day		75%	79.0	688.8	38.9	38.9	123360.9	lb/project
Slurry Pump(s)	2	0.42	3.53	0.21	0.21	623.04	lb/day		75%	83.8	698.7	41.0	41.0	123360.9	lb/project
									Subtotal Emissions (lb/project) =	**562.6**	**5,787.3**	**227.7**	**216.0**	**1,036,412.4**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.3**	**43.8**	**1.7**	**1.6**	**7,851.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach Va and VIa.1_PrefAlt	ROG	NOX	PM10	PM2.5	CO2
Total from Reach Va and VIa.1 Alt 1 (tons/project)	**0.3**	**3.0**	**0.1**	**0.1**	**487.3**
Peak Day from Reach Va and VIa.1 Alt 1 (lb/day)	**4.4**	**52.8**	**2.1**	**1.9**	**7851.6**
Total from Reach Va and VIa.1 Alt 1 (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.561**

Table 10a: Alternative 1 and 2 - Reach VIa.4

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Seepage Berm and Chimney Drain															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Scraper(s)	2	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	7.4	88.1	3.4	3.2	11002.6	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	4.0	42.5	2.1	1.9	3102.5	lb/project
Compactor(s)	2	0.04	0.25	0.01	0.01	34.48	lb/day		75%	0.3	1.9	0.1	0.1	258.6	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	2.4	31.6	1.0	0.9	3213.6	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.1	1.2	0.0	0.0	312.8	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	0.3	3.2	0.1	0.1	639.3	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	5.0	47.4	1.7	1.6	9589.7	lb/project
									Subtotal Emissions (lb/project) =	**23.0**	**255.1**	**9.9**	**9.1**	**33,908.2**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.6**	**51.0**	**2.0**	**1.8**	**6,781.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach VIa.4_Alt 1 and 2	ROG	NOX	PM10	PM2.5	CO2
Total from Reach VIa.4 (tons/project)	**0.0**	**0.3**	**0.0**	**0.0**	**32.6**
Peak Day from Reach VIa.4 (lb/day)	**4.6**	**52.8**	**2.1**	**1.9**	**6781.6**
Total from Reach VIa.4 (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.076**

Table 10b: Preferred Alternative - Reach VIa.4

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Seepage Berm and Chimney Drain															
Drill Rig(s)	2	0.28	3.52	0.10	0.09	909.81	lb/day	1	75%	0.4	5.3	0.2	0.1	1364.7	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	0.6	6.6	0.2	0.2	907.7	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	0.5	6.3	0.2	0.2	642.7	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.2	0.0	0.0	62.6	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	0.1	0.6	0.0	0.0	127.9	lb/project
Supply Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	0.5	4.7	0.2	0.2	959.0	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	1.0	9.5	0.3	0.3	1917.9	lb/project
Generator(s)	2	0.40	3.48	0.20	0.20	623.04	lb/day		75%	0.6	5.2	0.3	0.3	934.6	lb/project
Slurry Pump(s)	2	0.42	3.53	0.21	0.21	623.04	lb/day		75%	0.6	5.3	0.3	0.3	934.6	lb/project
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	0.5	4.7	0.2	0.2	959.0	lb/project
									Subtotal Emissions (lb/project) =	**4.8**	**48.6**	**1.9**	**1.8**	**8,810.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.8**	**48.6**	**1.9**	**1.8**	**8,810.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach VIa.4_PrefAlt	ROG	NOX	PM10	PM2.5	CO2
Total from Reach VIa.4 (tons/project)	**0.0**	**0.2**	**0.0**	**0.0**	**21.2**
Peak Day from Reach VIa.4 (lb/day)	**4.8**	**52.8**	**2.1**	**1.9**	**8810.6**
Total from Reach VIa.4 (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.996**

Table 11: Alternative 1 and 2 - Reach VIb

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Construction of Blanket Drain															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	53	50%	6.5	63.9	3.1	2.8	13253.1	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	29.7	350.6	11.6	10.7	48110.2	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	42.9	450.5	22.1	20.3	32886.9	lb/project
Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	12.6	167.6	5.4	4.9	17032.1	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	3.5	33.5	1.2	1.1	6776.7	lb/project
									Subtotal Emissions (lb/project) =	**95.3**	**1,066.1**	**43.4**	**39.9**	**118,059.0**	**lb/project**
									Subtotal Emissions (lb/day) =	**1.8**	**20.1**	**0.8**	**0.8**	**2,227.5**	**lb/day**
[2] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.49	14.23	0.52	0.48	2876.90	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach Vib_Alt 1 and 2					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach VIb (tons/project)	**0.0**	**0.5**	**0.0**	**0.0**	**54.9**
Peak Day from Reach VIb (lb/day)	**1.8**	**20.1**	**0.8**	**0.8**	**2227.5**
Total from Reach VIb (tons/day)	**0.001**	**0.010**	**0.000**	**0.000**	**1.010**

Table 12a: Alternative 1 - Reach VIcde

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Place Fill in Location of Existing Parking Lot															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	61	50%	7.5	73.6	3.6	3.3	15253.6	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	34.2	403.5	13.4	12.3	55372.2	lb/project
Scraper(s)	2	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	90.9	1075.3	41.9	38.6	134232.0	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	49.4	518.5	25.4	23.4	37850.9	lb/project
Compactor(s)	1	0.04	0.25	0.01	0.01	34.48	lb/day		75%	1.8	11.5	0.4	0.4	1577.4	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	29.0	385.9	12.3	11.4	39205.9	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	1.1	15.2	0.3	0.3	3816.7	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	4.0	38.6	1.4	1.3	7799.6	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	60.7	578.5	21.1	19.4	116994.0	lb/project
									Subtotal Emissions (lb/project) =	**278.6**	**3,100.5**	**119.8**	**110.3**	**412,102.3**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.6**	**50.8**	**2.0**	**1.8**	**6,755.8**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach VIcde_Alt 1

	ROG	NOX	PM10	PM2.5	CO2
Total from Reach VIcde Alt 1 (tons/project)	**0.2**	**1.7**	**0.1**	**0.1**	**204.1**
Peak Day from Reach VIcde Alt 1 (lb/day)	**4.6**	**52.8**	**2.1**	**1.9**	**6755.8**
Total from Reach VIcde Alt 1 (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.064**

Table 12b: Alternative 2 - Reach VIcde

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day	5	75%	11.2	132.2	5.2	4.7	16503.9	lb/project
									Subtotal Emissions (lb/project) =	**11.2**	**132.2**	**5.2**	**4.7**	**16503.9**	**lb/project**
									Subtotal Emissions (lb/day) =	**2.2**	**26.4**	**1.0**	**0.9**	**3300.8**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day	5	75%	2.8	33.1	1.1	1.0	4538.7	lb/project
									Subtotal Emissions (lb/project) =	**2.8**	**33.1**	**1.1**	**1.0**	**4538.7**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.6**	**6.6**	**0.2**	**0.2**	**907.7**	**lb/day**
[3] Construction of Setback Levee															
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day	145	50%	83.9	1079.9	40.7	37.4	110256.4	lb/project
									Subtotal Emissions (lb/project) =	**83.9**	**1,079.9**	**40.7**	**37.4**	**110,256.4**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.6**	**7.4**	**0.3**	**0.3**	**760.4**	**lb/day**
[4] Site Restoration/Demobilization															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	3	25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**0.0**	**0.4**	**0.0**	**0.0**	**93.9**	**lb/yr**
									Subtotal Emissions (lb/day) =	**0.0**	**0.1**	**0.0**	**0.0**	**31.3**	**lb/day**
[5] Removal of Existing Levee at Setback Levee Reaches															
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day	11	75%	3.9	52.2	1.7	1.5	5302.4	lb/project
									Subtotal Emissions (lb/project) =	**3.9**	**52.2**	**1.7**	**1.5**	**5302.4**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.7**	**0.2**	**0.1**	**482.0**	**lb/day**
[6] Existing Levee Site Restoration/Demobilization															
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day	3	25%	0.7	7.9	0.4	0.4	898.2	lb/yr
									Subtotal Emissions (lb/project) =	**0.7**	**7.9**	**0.4**	**0.4**	**898.2**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.2**	**2.6**	**0.1**	**0.1**	**299.4**	**lb/day**

Summary - Reach VIcde_Alt 2					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach VIcde Alt 2 (tons/project)	**0.1**	**0.7**	**0.0**	**0.0**	**62.4**
Peak Day from Reach VIcde Alt 2 (lb/day)	**2.2**	**26.4**	**1.0**	**0.9**	**3300.8**
Total from Reach VIcde Alt 2 (tons/day)	**0.001**	**0.013**	**0.001**	**0.000**	**1.497**

Table 12c: Preferred Alternative - Reach VIbcd

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Place Fill in Location of Existing Parking Lot															
Drill Rig(s)	2	0.28	3.52	0.10	0.09	909.81	lb/day	52	75%	21.6	274.7	7.9	7.3	70965.0	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	29.2	343.9	11.4	10.5	47202.5	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	24.7	328.9	10.5	9.7	33421.4	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.9	13.0	0.2	0.2	3253.6	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	3.4	32.9	1.2	1.1	6648.8	lb/project
Supply Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	25.9	246.6	9.0	8.3	49866.3	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	51.7	493.2	18.0	16.5	99732.6	lb/project
Generator(s)	2	0.40	3.48	0.20	0.20	623.04	lb/day		75%	31.1	271.3	15.3	15.3	48596.7	lb/project
Slurry Pump(s)	2	0.42	3.53	0.21	0.21	623.04	lb/day		75%	33.0	275.3	16.2	16.2	48596.7	lb/project
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	25.9	246.6	9.0	8.3	49866.3	lb/project
									Subtotal Emissions (lb/project) =	**247.5**	**2,526.4**	**98.7**	**93.3**	**458,150.0**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.8**	**48.6**	**1.9**	**1.8**	**8,810.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach VIbc_PrefAlt					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach VIbc Alt 1 (tons/project)	**0.1**	**1.4**	**0.1**	**0.1**	**225.0**
Peak Day from Reach VIbc Alt 1 (lb/day)	**4.8**	**52.8**	**2.1**	**1.9**	**8810.6**
Total from Reach VIbc Alt 1 (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.996**

Table 13: Alternative 1 and 2 - Reach VIIb

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Seepage Berm and Blanket Drain															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	23.7	50%	2.9	28.5	1.4	1.3	5918.1	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	13.3	156.5	5.2	4.8	21483.2	lb/project
Scraper(s)	2	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	35.3	417.2	16.3	15.0	52079.1	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	19.2	201.1	9.9	9.1	14685.3	lb/project
Compactor(s)	2	0.04	0.25	0.01	0.01	34.48	lb/day		75%	1.4	8.9	0.3	0.3	1224.0	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	11.3	149.7	4.8	4.4	15211.0	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.4	5.9	0.1	0.1	1480.8	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	1.6	15.0	0.5	0.5	3026.1	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	23.5	224.5	8.2	7.5	45391.1	lb/project
									Subtotal Emissions (lb/project) =	**108.8**	**1,207.4**	**46.7**	**43.0**	**160,498.7**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.6**	**51.0**	**2.0**	**1.8**	**6,781.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach VIIb	ROG	NOX	PM10	PM2.5	CO2
Total from Reach VIIb (tons/project)	**0.1**	**0.8**	**0.0**	**0.0**	**90.0**
Peak Day from Reach VIIb (lb/day)	**4.6**	**52.8**	**2.1**	**1.9**	**6781.6**
Total from Reach VIIb (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.076**

Table 14a: Alternative 1 and 2 - Reach VIIe

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Cutoff Wall (Slurry)															
Drill Rig(s)	2	0.28	3.52	0.10	0.09	909.81	lb/day	35	75%	14.57	184.92	5.33	4.90	47764.90	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	19.64	231.50	7.69	7.07	31770.92	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	16.65	221.39	7.08	6.51	22495.17	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.61	8.74	0.16	0.16	2189.91	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	2.32	22.13	0.81	0.74	4475.18	lb/project
Supply Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	17.41	165.97	6.05	5.57	33563.85	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	34.81	331.94	12.09	11.13	67127.70	lb/project
Generator(s)	2	0.40	3.48	0.20	0.20	623.04	lb/day		75%	20.95	182.63	10.30	10.30	32709.34	lb/project
Slurry Pump(s)	2	0.42	3.53	0.21	0.21	623.04	lb/day		75%	22.22	185.27	10.88	10.88	32709.34	lb/project
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	17.41	331.94	12.09	11.13	67127.70	lb/project
									Subtotal Emissions (lb/project) =	**166.6**	**1,866.4**	**72.5**	**68.4**	**341,934.0**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.8**	**53.3**	**2.1**	**2.0**	**9,769.5**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach VIIe_Alt 1 2					
	ROG	**NOX**	**PM10**	**PM2.5**	**CO2**
Total from Reach VIIe (tons/project)	**0.1**	**1.1**	**0.0**	**0.0**	**172.3**
Peak Day from Reach VIIe (lb/day)	**4.8**	**53.3**	**2.1**	**2.0**	**9769.5**
Total from Reach VIIe (tons/day)	**0.002**	**0.027**	**0.001**	**0.001**	**4.431**

Table 14b: Preferred Alternative Reach VIIe

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Cutoff Wall (Slurry)															
Drill Rig(s)	2	0.28	3.52	0.10	0.09	909.81	lb/day	26	75%	10.82	137.37	3.96	3.64	35482.50	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	14.59	171.97	5.71	5.25	23601.25	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	12.37	164.46	5.26	4.84	16710.70	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.45	6.50	0.12	0.12	1626.79	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	1.72	16.44	0.60	0.55	3324.42	lb/project
Supply Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	12.93	123.29	4.49	4.13	24933.15	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	25.86	246.59	8.98	8.27	49866.29	lb/project
Generator(s)	2	0.40	3.48	0.20	0.20	623.04	lb/day		75%	15.56	135.67	7.65	7.65	24298.37	lb/project
Slurry Pump(s)	2	0.42	3.53	0.21	0.21	623.04	lb/day		75%	16.50	137.63	8.08	8.08	24298.37	lb/project
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	12.93	246.59	8.98	8.27	49866.29	lb/project
									Subtotal Emissions (lb/project) =	**123.7**	**1,386.5**	**53.8**	**50.8**	**254,008.1**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.8**	**53.3**	**2.1**	**2.0**	**9,769.5**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach VIIe_PrefAlt					
	ROG	NOX	PM10	PM2.5	CO2
Total from Reach VIIe (tons/project)	**0.1**	**0.8**	**0.0**	**0.0**	**132.4**
Peak Day from Reach VIIe (lb/day)	**4.8**	**53.3**	**2.1**	**2.0**	**9769.5**
Total from Reach VIIe (tons/day)	**0.002**	**0.027**	**0.001**	**0.001**	**4.431**

Table 15: Alternative 1 and 2 - Reach VIIg

Work Schedule : 2020/2021

Conversion	
2000	lb/ton
2205	lb/metric ton

Activity	Qty	Emission Factor						Usage		Emissions (lb/project)					
		ROG	NOX	PM10	PM2.5	CO2	Units	Days	Utilization Factor	ROG	NOX	PM10	PM2.5	CO2	Units
[1] Site Preparation															
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day	5	25%	0.0	0.6	0.0	0.0	156.4	lb/project
Scraper(s)	3	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	11.2	132.2	5.2	4.7	16503.9	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	2.8	33.1	1.1	1.0	4538.7	lb/project
Crawler Tractor(s)	2	0.58	7.45	0.28	0.26	760.39	lb/day		75%	4.3	55.9	2.1	1.9	5702.9	lb/project
Motor Grader(s)	1	0.48	6.33	0.20	0.19	642.72	lb/day		50%	1.2	15.8	0.5	0.5	1606.8	lb/project
Chippers/Grinder(s)	2	0.49	5.24	0.28	0.25	598.80	lb/day		50%	2.5	26.2	1.4	1.3	2994.0	lb/project
									Subtotal Emissions (lb/project) =	**22.0**	**263.8**	**10.3**	**9.4**	**31502.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.4**	**52.8**	**2.1**	**1.9**	**6300.6**	**lb/day**
[2] Removal of Landside Structures and Other Facilities															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	5	50%	0.6	6.0	0.3	0.3	1250.3	lb/project
Loader(s)	1	0.37	4.41	0.15	0.13	605.16	lb/day		75%	1.4	16.5	0.5	0.5	2269.4	lb/project
									Subtotal Emissions (lb/project) =	**2.0**	**22.6**	**0.8**	**0.8**	**3519.6**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.4**	**4.5**	**0.2**	**0.2**	**703.9**	**lb/day**
[3] Construction of Seepage Berm and Fill															
Excavator(s)	1	0.25	2.41	0.12	0.11	500.12	lb/day	48.125	50%	5.9	58.1	2.8	2.6	12034.1	lb/project
Loader(s)	2	0.37	4.41	0.15	0.13	605.16	lb/day		75%	27.0	318.3	10.6	9.7	43685.0	lb/project
Scraper(s)	2	0.99	11.75	0.46	0.42	1467.02	lb/day		75%	71.7	848.4	33.1	30.4	105900.2	lb/project
Dozer(s)	1	1.08	11.33	0.55	0.51	827.34	lb/day		75%	39.0	409.0	20.0	18.4	29861.9	lb/project
Compactor(s)	2	0.04	0.25	0.01	0.01	34.48	lb/day		75%	2.9	18.1	0.7	0.7	2489.0	lb/project
Grader(s)	2	0.48	6.33	0.20	0.19	642.72	lb/day		50%	22.9	304.4	9.7	9.0	30930.9	lb/project
Water Truck(s)	2	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.8	12.0	0.2	0.2	3011.1	lb/project
Fuel Maintenance Truck	1	0.66	6.32	0.23	0.21	1278.62	lb/day		10%	3.2	30.4	1.1	1.0	6153.4	lb/project
Pickup Truck	2	0.66	6.32	0.23	0.21	1278.62	lb/day		75%	47.9	456.4	16.6	15.3	92300.6	lb/project
									Subtotal Emissions (lb/project) =	**221.2**	**2,455.2**	**94.9**	**87.4**	**326,366.2**	**lb/project**
									Subtotal Emissions (lb/day) =	**4.6**	**51.0**	**2.0**	**1.8**	**6,781.6**	**lb/day**
[4] Site Restoration/Demobilization															
Hydroseeding Truck(s)	1	0.66	6.32	0.23	0.21	1278.62	lb/day	3	75%	1.5	14.2	0.5	0.5	2876.9	lb/project
Water Truck(s)	1	0.03	0.50	0.01	0.01	125.14	lb/day		25%	0.0	0.4	0.0	0.0	93.9	lb/project
									Subtotal Emissions (lb/project) =	**1.5**	**14.6**	**0.5**	**0.5**	**2970.8**	**lb/project**
									Subtotal Emissions (lb/day) =	**0.5**	**4.9**	**0.2**	**0.2**	**990.3**	**lb/day**

Summary - Reach VIIg_Alt 1 2	ROG	NOX	PM10	PM2.5	CO2
Total from Reach VIIg (tons/project)	**0.1**	**1.4**	**0.1**	**0.0**	**165.2**
Peak Day from Reach VIIg (lb/day)	**4.6**	**52.8**	**2.1**	**1.9**	**6781.6**
Total from Reach VIIg (tons/day)	**0.002**	**0.026**	**0.001**	**0.001**	**3.076**

Table 16: Haul Trucks (Alternatives 1, 2, and Preferred Alternative)

Work Schedule : 2020/2021

Conversion	
0.002204623	lb/gram
2000	lb/ton
2205	lb/metric ton

	Emission Factor								Emissions (lb/project)					
	Qty	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit
Alternative 1														
Mobile Source Combustion Exhaust - Haul Trucks														
Haul Truck(s)	252,046	miles	0.53	7.55	0.24	0.17	1892.05	g/mile[1]	292.8	4,197.8	133.1	95.2	1,051,348.1	lb/project
Haul Truck(s)	65,583	total starts[3]	0.00	3.31	0.00	0.00	0.00	g/trip[2]	0.0	479.1	0.0	0.0	0.0	lb/project
Fugitive PM (lb/project) =											448.8	44.9		lb/project
Fugitive PM (ton/project) =											0.22	0.022		ton/project
Total Emissions (ton/project) =									**0.15**	**2.34**	**0.29**	**0.070**	**476.8**	**ton/project**

Fugitive Emissions (PM10)

Haul Truck(s)	252,046	miles
Emission Factor	0.00178049	lbs/VMT
Fugitive PM10 Emissions	448.77	lb/project

Quantities of Fill Required for the Minimum Footprint Alternative (Alternative 1)

Material Type	Cubic Yards (CY)	Average Round-Trip (Haul Distance)	Total 1-Way Trips	Total Roundtrip Miles
Levee Fill Material	47,122	8	2618	20943
Seepage berm fill	342,963	8	19054	152428
Drain rock	83,901	8	6454	51631
Filter material 3/8 inch (Sand)	8,029	8	446	3568
Aggregate base	14,066	8	781	6252
Asphalt concrete	44,571	5	3429	17143
Steel Sheet Piles (Element VIIe only)	182	8	10	81
Total	**540,834**	-	-	-
Dual Bottom Dump Truck Capacity (CY)[4]	18	-	-	-
Avg. Haul Truck Capacity (CY)[5]	13	-	-	-
Project Duration (days)[6]	160	-	-	-
		Total =	**32,791**	**252,046**

Notes:
1. Emission factor represents running exhaust, tire wear, and break wear (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)
3. Accounts for 2 starts per trip.
4. Dual bottom-dump trucks would haul fill, sand, and aggregate base.
5. Haul trucks would haul drain rock and aggregate base.
6. Duration based on 123-day construction season which assumes 80 work days for two years; therefore, duration represents total project activity.

Table 16: Haul Trucks (Alternatives 1, 2, and Preferred Alternative)

Work Schedule : 2020/2021

Conversion	
0.002204623	lb/gram
2000	lb/ton
2205	lb/metric ton

	Emission Factor								Emissions (lb/project)					
	Qty	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit
Alternative 2														
Mobile Source Combustion Exhaust - Haul Trucks														
Haul Truck(s)	402,296	miles	0.53	7.55	0.24	0.17	1892.05	g/mile[1]	467.4	6,700.2	212.5	151.9	1,678,078.0	lb/project
Haul Truck(s)	100,574	total starts[3]	0.00	3.31	0.00	0.00	0.00	g/trip[2]	0.0	734.7	0.0	0.0	0.0	lb/project
Fugitive PM (lb/project) =											716.3	71.6		lb/project
Fugitive PM (ton/project) =											0.36	0.036		ton/project
Total Emissions (ton/project) =									**0.23**	**3.72**	**0.46**	**0.11**	**761.0**	ton/project

Fugitive Emissions (PM10)

Haul Truck(s)	402,296	miles
Emission Factor	**0.00178049**	lbs/VMT
Fugitive PM10 Emissions	716.28	lb/project

Quantities of Fill Required for Maximum Footprint Alternative (Alternative 2)

Material Type	Cubic Yards (CY)	Average Round-Trip (Haul Distance)	Total 1-Way Trips	Total Roundtrip Miles
Seepage berm fill	528,889	8	29383	235062
Drain rock	218,908	8	16839	134713
Filter material 3/8 inch (sand)	61,198	8	3400	27199
Aggregate base	11,793	8	655	5241
Steel Sheet Piles (Element VIIe only)	182	8	10	81
Total	**820,970**	-	-	-
Dual Bottom Dump Truck Capacity (CY)[3]	18	-	-	-
Avg. Haul Truck Capacity (CY)[4]	13	-	-	-
Project Duration (days)[5]	160	-	-	-
		Total =	**50,287**	**402,296**

Notes:
1. Emission factor represents running exhaust, tire wear, and break wear (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)
3. Dual bottom-dump trucks would haul fill, sand, and aggregate base.
4. Haul trucks would haul drain rock and aggregate base.
5. Duration based on 123-day construction season which assumes 80 work days for two years; therefore, duration represents total project activity.

Table 16: Haul Trucks (Alternatives 1, 2, and Preferred Alternative)

Work Schedule : 2020/2021

Conversion	
0.002204623	lb/gram
2000	lb/ton
2205	lb/metric ton

	Emission Factor								Emissions (lb/project)					
	Qty	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit
Preferred Alternative														
Mobile Source Combustion Exhaust - Haul Trucks														
Haul Truck(s)	245,570	miles	0.53	7.55	0.24	0.17	1892.05	g/mile[1]	285.3	4,090.0	129.7	92.7	1,024,337.2	lb/project
Haul Truck(s)	61,393	total starts[3]	0.00	3.31	0.00	0.00	0.00	g/trip[2]	0.0	448.5	0.0	0.0	0.0	lb/project
Fugitive PM (lb/project) =											437.2	43.7		lb/project
Fugitive PM (ton/project) =											0.22	0.022		ton/project
Total Emissions (ton/project) =									**0.14**	**2.27**	**0.28**	**0.07**	**464.6**	ton/project

Fugitive Emissions (PM10)

Haul Truck(s)	245,570	miles
Emission Factor	**0.00178049**	lbs/VMT
Fugitive PM10 Emissions	437.24	lb/project

Quantities of Fill Required for Preferred Alternative				
Material Type	Cubic Yards (CY)	Average Round-Trip (Haul Distance)	Total 1-Way Trips	Total Roundtrip Miles
Seepage berm fill	7,000	8	389	3111
Levee fill	131,000	8	24778	198224
Drain rock	5,500	8	423	3385
Filter material 3/8 inch (sand)	1,500	8	83	667
Aggregate base	8,500	8	1577	12616
Asphalt concrete	0	8	3446	27568
Total	**153,500**	-	-	-
Dual Bottom Dump Truck Capacity (CY)[3]	18	-	-	-
Avg. Haul Truck Capacity (CY)[4]	13	-	-	-
Project Duration (days)[5]	160	-	-	-
		Total =	**30,696**	**245,570**

Notes:
1. Emission factor represents running exhaust, tire wear, and break wear (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)
3. Dual bottom-dump trucks would haul fill, sand, and aggregate base.
4. Haul trucks would haul drain rock and aggregate base.
5. Duration based on 123-day construction season which assumes 80 work days for two years; therefore, duration represents total project activity.

Travel on Paved Roads (Heavy Duty Trucks)
E(lbs/VMT)=(k)(sL)^.91 (W)^1.02-C

Where:	**PM10**	Unit	Source
k= Particle Size Multiplier:	0.0022	lbs/VMT	AP-42 Chapter 13.2.1, Table 13.2.1-1, PM10 emissions
sL= road surface silt loading	0.06	g/m^2	AP-42 Chapter 13.2.1, Table 13.2.1-2
C= exhaust, break, tire wear	0.00047	lbs/VMT	AP-42 Chapter 13.2.1, Background Documentation Pg 2-5
W=Vehicle Weight	2.115	tons	Worker Commute Vehicles
W=Vehicle Weight	10	tons	Average weight of loaded and unloaded truck: assumed empty truck weights 2 tons, 10 CY truck capacity and 1 CY of fill equals 1.6 tons ((2+(10cy truck capacity*1.6 tons+2))/2)
	0.00178	**lbs/VMT**	**Heavy Duty Haul Trucks**
	0.00037	lbs/VMT	Worker Commute Vehicles

Source: EPA 2011. AP-42, Chapter 13.2.4 Miscellaneous Sources, Paved Roads, Equation 1

Table 17: Employee Trips (Alternatives 1, 2 and Preferred Alternative)

Work Schedule : 2020/2021

Conversion	
0.002204623	lb/gram
2000	lb/ton
2205	lb/metric ton

	Emission Factor								Emissions (lb/project)						
	Qty	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit	Days	ROG	NOX	PM10	PM2.5	CO2	Unit
Alternatives 1 and 2, and Preferred Alternative															
Mobile Sources															
Employee Trips	185	Employees	0.001	0.0049	0.0001	0.0001	15.472	lbs/day/employee	246	47.3	225.2	3.6	3.3	704136.5	lb/project
Total Emissions (lb/project) =										**47.3**	**225.2**	**3.6**	**3.3**	**704136.5**	**lb/project**
Total Emissions (ton/project) =										**0.0**	**0.1**	**0.0**	**0.0**	**319.3**	**ton/project**
Total Emissions (lb/day) =										**0.2**	**0.9**	**0.0**	**0.0**	**2862.3**	**lb/day**

Table 18a: Alternative 1 Summary

Reach	ROG	NOx	PM10	PM2.5	CO2
Total Project Emissions (tons)					
Ia	0.09	1.0	0.04	0.04	124.9
Ib	0.03	0.4	0.01	0.01	41.8
Ie	0.11	1.3	0.05	0.05	152.6
IIab	0.09	0.9	0.04	0.03	138.3
IIIa	0.10	1.1	0.04	0.04	111.5
IIIb	0.12	1.4	0.05	0.05	164.9
IVa	0.09	1.0	0.04	0.04	124.9
IVc	0.09	1.0	0.04	0.04	150.7
Va and VIa.1	0.29	3.0	0.12	0.11	487.3
VIa.4	0.02	0.3	0.01	0.01	32.6
VIb	0.05	0.5	0.02	0.02	54.9
VIcde	0.15	1.7	0.07	0.06	204.1
VIIb	0.07	0.8	0.03	0.03	90.0
VIIe - With Shallow Slurry Cutoff Wall	0.10	1.1	0.04	0.04	172.30
VIIg	0.12	1.4	0.05	0.05	165.2
Construction Off-Road Fugitive Dust Emissions (tons)	--	--	2.64	0.26	--
Total Construction Emissions (tons)	1.5	16.8	3.3	0.87	2215.9
Haul Truck Emissions (tons)[1] =	**0.15**	**2.3**	**0.29**	**0.07**	**476.8**
Employee Trips (tons) =	**0.02**	**0.11**	**0.002**	**0.002**	**319.3**
Total Project Emissions with Shallow Slurry Cutoff Wall (tons) =	**1.7**	**19.3**	**3.6**	**0.9**	**3012.0**

[1]: includes on-road fugitive PM

Reach	ROG	NOx	PM10	PM2.5	CO2
Total Project Emissions (tons)					
Ia	0.09	1.0	0.04	0.04	124.9
Ib	0.03	0.35	0.01	0.01	41.8
Ie	0.11	1.3	0.05	0.05	152.6
IIab	0.10	1.3	0.05	0.05	122.7
IIIa	0.10	1.1	0.04	0.04	111.5
IIIb	0.12	1.4	0.1	0.05	164.9
IVa	0.09	1.0	0.04	0.04	124.9
IVc	0.04	0.49	0.02	0.02	47.3
Va and VIa.1	1.4	15.1	0.58	0.54	1822.6
VIa.4	0.02	0.28	0.01	0.01	32.6
VIb	0.05	0.54	0.02	0.02	54.9
VIcde	0.05	0.65	0.02	0.02	62.4
VIIb	0.07	0.75	0.03	0.03	90.0
VIIe - With Shallow Slurry Cutoff Wall	0.10	1.1	0.04	0.04	172.3
VIIg	0.12	1.4	0.05	0.05	165.2
Construction Off-Road Fugitive Dust Emissions (tons)	--	--	2.84	0.28	--
Total Construction Emissions (tons)	2.5	27.8	3.9	1.27	3290.5
Haul Truck Emissions (tons)[1] =	**0.23**	**3.7**	**0.46**	**0.11**	**761.0**
Employee Trips (tons) =	**0.024**	**0.11**	**0.0018**	**0.0017**	**319.3**
Total Project Emissions with Shallow Slurry Cutoff Wall (tons) =	**2.7**	**31.6**	**4.4**	**1.4**	**4370.9**

Table 18c: Preferred Alternative Summary

Reach	ROG	NOx	PM10	PM2.5	CO2
Total Project Emissions (tons)					
Ia	0.10	1.1	0.04	0.04	137.2
IIab	0.09	0.92	0.04	0.03	141.9
IVc	0.07	0.88	0.03	0.03	82.9
Va and VIa.1	0.29	3.0	0.12	0.11	487.3
VIa.4	0.02	0.17	0.01	0.01	21.2
VIbcd	0.14	1.4	0.06	0.05	225.0
VIIe - With Shallow Slurry Cutoff Wall	0.07	0.84	0.03	0.03	132.4
Construction Off-Road Fugitive Dust Emissions (tons)	--	--	2.78	0.28	--
Total Construction Emissions (tons)	0.78	8.42	3.11	0.59	1227.9
Haul Truck Emissions (tons)[1] =	**0.14**	**2.3**	**0.28**	**0.07**	**464.6**
Employee Trips (tons) =	**0.02**	**0.11**	**0.002**	**0.002**	**319.3**
Total Project Emissions with Shallow Slurry Cutoff Wall (tons) =	**0.95**	**10.8**	**3.4**	**0.66**	**2011.8**

Table 19a: Alternative 1 Significance Summary

Total Project Emissions (tons)					
Emissions Source	**ROG**	**NOx**	**PM10**	**PM2.5**	**CO2**
Reach Activity (tons) =	1.5	16.8	3.3	0.9	2,215.9
Haul Truck(s) (tons) =	0.1	2.3	0.29	0.07	476.8
Employee Commuter Trips (tons) =	0.0	0.1	0.0	0.0	319.3
Total Project Emissions (tons) =	**1.7**	**19.3**	**3.6**	**0.9**	**3,012.0**
2020	0.85	9.6	1.80	0.47	1,506.0
2021	0.85	9.6	1.80	0.47	1,506.0
Regional Impact Analysis					
Regional Threshold	10	10	15	-	-
Exceed Regional Significance Threshold?	No	No	No	-	-
Significant with Mitigation Implemented?	No	No	No	-	-
General Conformity Impact Analysis					
General Conformity de minimus Threshold	10	10	100	100	-
Exceed de minimus Threshold?	No	No	No	No	-

Table 19b: Alternative 2 Significance Summary

Total Project Emissions (tons)					
Emissions Source	**ROG**	**NOx**	**PM10**	**PM2.5**	**CO2**
Reach Activity (tons) =	2.5	27.8	3.9	1.3	3,290.5
Haul Truck(s) (tons) =	0.2	3.7	0.5	0.1	761.0
Employee Commuter Trips (tons) =	0.02	0.11	0.00	0.00	319.3
Total Project Emissions (tons) =	**2.7**	**31.6**	**4.4**	**1.4**	**4,370.9**
2020	1.4	15.8	2.2	0.69	2,185.5
2021	1.4	15.8	2.2	0.69	2,185.5
% Reduction	-	20%	45%	45%	-
TOTAL	2.7	25.3	2.41	0.76	4,370.9
2020	1.4	12.7	1.20	0.38	2,185.45
2021	1.4	12.7	1.20	0.38	2,185.5
Regional Impact Analysis					
Regional Threshold	10	10	15	-	-
Exceed Regional Significance Threshold?	No	**Yes**	No	-	-
General Conformity Impact Analysis					
General Conformity de minimus Threshold	10	10	100	100	-
Exceed de minimus Threshold?	No	**Yes**	No	No	-

Table 19c: Alternative 2 Mitigated Significance Summary

Total Project Emissions (tons)					
Emissions Source	**ROG**	**NOx**	**PM10**	**PM2.5**	**CO2**
Reach Activity: Exhaust (tons) =	2.5	27.8	1.1	1.0	3,290.5
Reach Activity: Fugitives (tons) =	-	-	2.8	0.28	-
Haul Truck(s) (tons) =	0.2	3.7	0.5	0.1	761.0
Employee Commuter Trips (tons) =	0.0	0.1	0.0	0.0	319.3
Total Project Emissions (tons) =	**2.7**	**31.6**	**4.4**	**1.4**	**4,370.9**
% Fugitives Reduction[1]	-	-	50%	50%	-
TOTAL	2.7	31.6	3.0	1.2	4,370.9
2020	1.4	15.8	1.5	0.62	2,185.5
2021	1.4	15.8	1.5	0.62	2,185.5
Regional Impact Analysis					
Regional Threshold	10	10	15	-	-
Exceed Regional Significance Threshold?	No	Yes	No	-	-
Significant with Mitigation Implemented?	No	No	No		
General Conformity Impact Analysis					
General Conformity de minimus Threshold	10	10	100	100	-
Exceed de minimus Threshold?	No	Yes	No	No	-
[1]50% reduction of Fugitive Emissions					

Table 19d: Preferred Alternative Significance Summary					
Total Project Emissions (tons)					
Emissions Source	**ROG**	**NOx**	**PM10**	**PM2.5**	**CO2**
Reach Activity (tons) =	0.78	8.4	3.11	0.59	1,228
Haul Truck(s) (tons) =	0.14	2.3	0.28	0.07	464.6
Employee Commuter Trips (tons) =	0.02	0.11	0.002	0.002	319.3
Total Project Emissions (tons) =	**0.95**	**10.8**	**3.40**	**0.66**	**2,011.8**
TOTAL	0.95	10.8	3.40	0.66	2,011.8
2020	0.47	5.4	1.70	0.33	1,005.9
2021	0.47	5.4	1.70	0.33	1,005.9
Regional Impact Analysis					
Regional Threshold	10	10	15	-	-
Exceed Regional Significance Threshold?	No	No	No	-	-
Significant with Mitigation Implemented?	No	No	No	-	-
General Conformity Impact Analysis					
General Conformity de minimus Threshold	10	10	100	100	-
Exceed de minimus Threshold?	No	No	No	No	-

Appendix G - Off-Road Dust Emissions

Quantities of Fill Required for the Minimum Footprint Alternative (Alternative 1)		
Material Type	**Cubic Yards (CY)**	**Days**
Levee Fill Material	47,122	160
Seepage berm fill	342,963	160
Drain rock	83,901	160
Filter material 3/8 inch (Sand)	8,029	160
Aggregate base	14,066	160
Asphalt concrete	44,571	160
Steel Sheet Piles (Element VIIe)	182	160
Total	**540,834**	

Quantities of Fill Required for the Maximum Footprint Alternative (Alternative 2)		
Material Type	**Cubic Yards (CY)**	**Days**
Seepage berm fill	528,889	160
Drain rock	218,908	160
Filter material 3/8 inch (sand)	61,198	160
Aggregate base	11,793	160
Steel Sheet Piles (Element VIIe)	182	160
Asphalt concrete	0	
Total	**820,970**	

Quantities of Fill Required for the Preferred Alternative		
Material Type	**Cubic Yards (CY)**	**Days**
Levee fill	131,000	160
Seepage berm fill	7,000	160
Drain rock	5,500	160
Filter material 3/8 inch (sand)	1,500	160
Aggregate base	8,500	160
Asphalt concrete	0	
Total	**153,500**	

Appendix G - Off-Road Dust Emissions

1. Aggregate Storage Piles

Alternative 1 (Minimum Footprint)

Construction Material	Imported Fill (CY)	Imported Fill (tons)	Aggregate (cy)	Aggregate (tons)	Activity Total (tons)	Material (Tons/day)	PM10 (lbs/day)[1]
Levee Fill Material	47,122	75,395			75,395	471.22	0.32
Seepage berm fill	342,963	548,741			548,741	3,429.63	2.32
Drain rock	83,901	134,242			134,242	839.01	0.57
Filter material 3/8 inch (Sand)	8,029	12,846			12,846	80.29	0.054
Aggregate base			14,066	22,506	22,506	140.66	0.095
Asphalt concrete	44,571	71,314			71,314	445.71	0.30
Steel Sheet Piles (Element VIIe only)							
						TOTAL:	**3.65**

Alternative 2 (Maximum Footprint)

Construction Material	Imported Fill (CY)	Imported Fill (tons)	Aggregate (cy)	Aggregate (tons)	Activity Total (tons)	Material (Tons/day)	PM10 (lbs/day)[1]
Levee Fill Material	0.00	0.00			0	0.00	0.00
Seepage berm fill	528,889	846,222			846,222	5,288.89	3.57
Drain rock	218,908	350,253			350,253	2,189.08	1.48
Filter material 3/8 inch (Sand)	61,198	97,917			97,917	611.98	0.413
Aggregate base			11,793.00	18,869	18,869	117.93	0.080
Asphalt concrete							
Steel Sheet Piles (Element VIIe only)							
						TOTAL:	**5.54**

Preferred Alternative

Construction Material	Imported Fill (CY)	Imported Fill (tons)	Aggregate (lbs)	Aggregate (tons)	Activity Total (tons)	Material (Tons/day)	PM10 (lbs/day)[1]
Levee Fill Material	131,000	209,600			209,600	1,310.00	0.88
Seepage berm fill	7,000	11,200			11,200	70.00	0.05
Drain rock	5,500	8,800			8,800	55.00	0.04
Filter material 3/8 inch (Sand)	1,500	2,400			2,400	15.00	0.010
Aggregate base			8,500.00	13,600	13,600	85.00	0.057
Asphalt concrete							
Steel Sheet Piles (Element VIIe only)							
						TOTAL:	**1.04**

Conversion Rates
2000 lbs/ton
1.6 ton/cy

Aggregate Storage Piles - Emissions Factor Calculation

Emissions result from several distinct processes within the stockpiling cycle: 1. loading in of materials through batch or drop operations,
2. equipment traffic in storage areas, 3. wind erosion of piles, 4. loadout of material through batch or drop operations
E(lb/ton)=(k)(0.0032)(U/5)^1.3/(M/2)^1.4

Where:	**PM10**	Unit	Source
k= Particle Size Multiplier:	0.35	lbs/ton	AP-42 Chapter 13.2.4-3, PM10 emissions
U=mean wind speed	6	mph	CalEEMod for San Joaquin County
M=moisture content (%)	3.400	constant	AP-42 Chapter 13.2.4-3, Table 13.2.4-1, exposed ground
	0.00068	**lbs/ton**	

Source: EPA 2006.AP-42, Chapter 13.2.4 Miscellaneous Sources, Aggregate Storage Piles, Equation 1

2. Construction Activity (grading and earthmoving)

Grading Equipment	Alternative 1			Alternative 2			Preferred Alternative		
	Equipment Hours		Dust Emissions	Equipment Hours		Dust Emissions	Equipment Hours		Dust Emissions
		Daily Hours (avg)	PM10 (lbs/day)		Daily Hours (avg)	PM10 (lbs/day)		Daily Hours (avg)	PM10 (lbs/day)
Bulldozers + Graders	(across all segments)	6.509	4.90	(across all segments)	6.63	4.99	(across all segments)	7.47	5.63
Total			**4.90**			**4.99**			**5.63**

Bulldozing and Grading - Emission Factor Calculation

Equation is applied to graders and dozers to estimate fugitive dust from grading activity
Emissions factors for P10 from bulldozing are scaled from those of PM15

E(lbs/hr)=C(PM15)*s^1.5/M^1.5
Where
E(PM10)=E(PM15)*F(PM10)

			PM15	
Where:			Unit	Source
C=	coeffiecient	1	constant	AP-42 Table 11.9-1, PM15,overburden
M=	material moisture content	7.9	%	AP-42 Table 11.9-3,Overburden
s=	material silt content	6.9	%	AP-42 Table 11.9-3,Overburden
F=	scaling factor	0.75	constant	AP-42 Table 11.9-1, PM10
		1.004	lbs/hr	
			PM10	
		0.753	**lbs/hr**	

3. Total Off-Road Fugitive Dust Emissions (lbs/day)

Construction Activity	PM 10 Fugitive Dust (lbs/day)			PM2.5 Fugitive Dust (lbs/day)[1]		
	Alternative 1	Alternative 2	Preferred Alternative	Alternative 1	Alternative 2	Preferred Alternative
Levee Fill Material	5.22	4.99	6.51	0.52	0.50	0.65
Seepage berm fill	7.22	8.56	5.67	0.72	0.86	0.57
Drain rock	5.47	6.47	5.66	0.55	0.65	0.57
Filter material 3/8 inch (Sand)	4.95	5.41	5.64	0.50	0.54	0.56
Aggregate base	4.99	5.07	5.68	0.50	0.51	0.57
Asphalt concrete	5.20	4.99	5.63	0.52	0.50	0.56
Steel Sheet Piles (Element VIIe only)						
TOTAL:	33.0	35.5	34.8	3.3	3.5	3.5
lb/project (160 days)	5288	5679	5566	529	568	557
ton/project	**2.6**	**2.8**	**2.8**	**0.26**	**0.28**	**0.28**

Appendix G - Emission Factors

Equipment Type	Emission Factors for Year 2020					
	ROG	NOX	PM10	PM2.5	CO2	Unit
Employee Light-Duty Trucks[1]	0.0010	0.0049	0.0001	0.0001	15.472	lb/day/employee
Backhoes	0.2095	2.1051	0.1331	0.12	300.7688	lb/day
Bore/Drill Rigs	0.2775	3.5223	0.1015	0.09	909.8076	lb/day
Compactor	0.0401	0.2513	0.0098	0.01	34.4794	lb/day
Concrete/Industrial Saws	0.4182	3.2986	0.1981	0.20	592.6651	lb/day
Cranes	0.4533	5.3915	0.2222	0.20	558.7901	lb/day
Crawler Tractors	0.5788	7.4477	0.2807	0.26	760.3891	lb/day
Crushing/Proc. Equipment	0.5531	3.7992	0.2409	0.24	664.5307	lb/day
Dozer	1.0795	11.3323	0.5550	0.51	827.3431	lb/day
Excavator	0.2450	2.4126	0.1169	0.11	500.1188	lb/day
Forklifts, Rough Terrain	0.1335	1.7300	0.0724	0.07	333.6808	lb/day
Generator	0.3991	3.4786	0.1962	0.20	623.0351	lb/day
Grader	0.4758	6.3255	0.2022	0.19	642.7192	lb/day
Loaders, Rubber Tired	0.3740	4.4096	0.1464	0.13	605.1604	lb/day
Off-Highway Trucks	0.6630	6.3227	0.2304	0.21	1,278.6229	lb/day
Other Construction Equip.	0.4940	5.2391	0.2765	0.25	598.8046	lb/day
Pavers	0.2627	2.8103	0.1366	0.13	455.2725	lb/day
Paving Equipment	0.2074	2.1414	0.1071	0.10	394.5285	lb/day
Pump	0.4232	3.5290	0.2072	0.21	623.0351	lb/day
Rollers	0.2081	2.0811	0.1327	0.12	254.0667	lb/day
Scraper	0.9930	11.7521	0.4583	0.42	1,467.0164	lb/day
Signal Boards	0.0574	0.3594	0.0140	0.01	49.3136	lb/day
Skid Steer Loaders	0.0799	1.0624	0.0460	0.04	200.1689	lb/day
Surfacing Equipment	0.2949	4.4842	0.1353	0.12	662.9750	lb/day
Tractors	0.2095	2.1051	0.1331	0.12	300.7688	lb/day
Trenchers	0.4197	3.7966	0.2842	0.26	326.8124	lb/day
Water Trucks (exhaust)[1]	0.0349	0.4997	0.0094	0.0090	125.1375	lb/day

[1]Assumptions: Emission factors from the Road Construction Emissions Model (RoadMod), Version 9.0.0 (SMAQMD 2019) for calender year 2020 which assumes equipment operates 8 hrs/day; employee LD truck trips = 20 mile/day round trip (includes Load Factors and Utilization Rates)

Emission Rates for Haul Truck(s)[1]						
	ROG	NOX	PM10	PM2.5	CO2	
Running Exhaust	0.53	7.55	0.14	0.14	1892.05	g/mile
Tire Wear			0.036	0.009		g/mile
Break Wear			0.0617	0.0265		g/mile
Start Emissions Rate		3.314				g/trip

[1]Rates obtained from SMAQMD's RoadMod Version 9.0.0, EMFAC2017 - web 1.0.2, T7 Single Unit Construction Truck, 2020

Appendix H. Noise Modeling Results

Appendix H

Project-Generated Construction Source Noise Prediction Model

RD 17 Phase III - Clearing & Grubbing

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold*	1,174	50.0
	1,860	45.0
	100	76.3
	150	71.7
	200	68.4
	250	65.9
	300	63.8
	350	62.0
	400	60.5
	450	59.1
	500	57.9
	550	56.8
	600	55.8
	2,948	40.0

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Front End Loader	80	0.4
Dozer	85	0.4
Dump Truck	84	0.4

Ground Type	Soft
Source Height	8
Receiver Height	5
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Front End Loader	76.0
Dozer	81.0
Dump Truck	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.3

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2018.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold

Appendix H

Project-Generated Construction Source Noise Prediction Model

RD 17 Phase III - Levee Degrade

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold*	1,218	50.0
	1,931	45.0
	100	76.7
	150	72.1
	200	68.8
	250	66.3
	300	64.2
	350	62.4
	400	60.9
	450	59.5
	500	58.3
	550	57.2
	600	56.2
	3,060	40.0

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Front End Loader	80	0.4
Dozer	85	0.4
Scraper	85	0.4

Ground Type	Soft
Source Height	8
Receiver Height	5
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Front End Loader	76.0
Dozer	81.0
Scraper	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.7

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2018.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold

Appendix H

Project-Generated Construction Source Noise Prediction Model

RD 17 Phase III - Cutoff Wall

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold*	1,351	50.0
	2,141	45.0
	100	77.9
	150	73.2
	200	69.9
	250	67.4
	300	65.3
	350	63.5
	400	62.0
	450	60.7
	500	59.5
	550	58.4
	600	57.4
	3,393	40.0

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Excavator	85	0.4
Dozer	85	0.4
Scraper	85	0.4

Ground Type	Soft
Source Height	8
Receiver Height	5
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Excavator	81.0
Dozer	81.0
Scraper	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
85.8

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2018.

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold

Appendix H

Project-Generated Construction Source Noise Prediction Model

RD 17 Phase III - Seepage Berm

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold*	1,351	50.0
	2,141	45.0
	100	77.9
	150	73.2
	200	69.9
	250	67.4
	300	65.3
	350	63.5
	400	62.0
	450	60.7
	500	59.5
	550	58.4
	600	57.4
	3,393	40.0

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	0.4
Dozer	85	0.4
Scraper	85	0.4

Ground Type	Soft
Source Height	8
Receiver Height	5
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Grader	81.0
Dozer	81.0
Scraper	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
85.8

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2018.

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold

Appendix H

Project-Generated Construction Source Noise Prediction Model

RD 17 Phase III - Setback Levee

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold*	1,351	50.0
	2,141	45.0
	100	77.9
	150	73.2
	200	69.9
	250	67.4
	300	65.3
	350	63.5
	400	62.0
	450	60.7
	500	59.5
	550	58.4
	600	57.4
	3,393	40.0

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	0.4
Dozer	85	0.4
Scraper	85	0.4

Ground Type	Soft
Source Height	8
Receiver Height	5
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Grader	81.0
Dozer	81.0
Scraper	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
85.8

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2018.

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold

Appendix H

Project-Generated Construction Source Noise Prediction Model

RD 17 Phase III - Restoration Demobilization

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold*	972	50.0
	1,540	45.0
	100	74.3
	1290	45.0
	200	66.4
	250	63.8
	300	61.7
	350	60.0
	400	58.4
	450	57.1
	500	55.9
	550	54.8
	600	53.8
	2,441	40.0

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	0.4
Front End Loader	80	0.4

Ground Type	Soft
Source Height	8
Receiver Height	5
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Grader	81.0
Front End Loader	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
82.2

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2018.

$L_{eq}(\text{equip}) = \text{E.L.} + 10*\log(\text{U.F.}) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold

Appendix H

Project-Generated Construction Source Noise Prediction Model

RD 17 Phase III - Pile Driving

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold*	1500	50.0
	2325	45.0
	3600	40.0
	50	88.9
	100	81.0
	200	73.0
	300	68.4
	400	65.1
	500	62.5
	600	60.5
	700	58.7
	800	57.2

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Impact Pile Driver	95	0.2
Front End Loader	80	0.4
Dump Truck	84	0.4
Pickup Truck	55	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Impact Pile Driver	88.0
Front End Loader	76.0
Dump Truck	80.0
Pickup Truck	51.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.9

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2018.

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold (Madera 1995)

Appendix H

Project-Generated Haul Trips Source Noise Prediction Model

RD 17 Phase III

Assumptions:	**ALT 1**	**ALT 2**	**Pref Alt**
Mean SEL Reference Level	84.0	84.0	84.0
Assumed Haul Truck Speed (mph)	35.0	35.0	35.0
Number of Hours for Hauling per Day	8.0	8.0	8.0
Haul Truck Size in Cubic Yards	12.0	12.0	12.0
Number of Trips per Hour-one way	51.3	78.8	48.0
Leq for Haul Trips at 50 feet	66.2	68.0	65.9

Appendix H

Project-Generated Construction Source Vibration Prediction Model

RD 17 Phase III - Threshold Compliance Thresholds

Location	Distance to Nearest Receiver in feet	Predicted Vibration Level (PPV)		Predicted Vibration Level (VdB)		Equipment	Reference Distance	PPV at 25 feet (in/sec)[1]	Approximate Lv (VdB) at 25 feet[2]
		Bulldozer	Trucks	Bulldozer	Trucks				
CA Threshold (0.08 PPV)	**45**	**0.037**	**0.031**			Lg Bulldozer	25	0.089	87
CA Threshold (80VdB)	**45**			**79**	**78**	Trucks	25	0.076	86

Notes:

[1] Where PPV is the peak particle velocity

[2] Where Lv is the RMS velocity expressed in vibration decibels (VdB), assuming a crest factor of 4.

Source: Caltrans 2009, FTA 2018

Appendix I. Environmental Permits Issued to Date for the Phase 3 Repair Project

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

April 6, 2017

Regulatory Division (SPK-2009-01466)

Reclamation District (RD) 17
Attn: Mr. Christopher Neudeck
Kjeldsen-Sinnock & Associates, Inc.
711 North Pershing Avenue
Stockton, California 95203

Dear Mr. Neudeck:

We are responding to your March 21, 2017, request for a Department of the Army permit for the RD17 100-Year Levee Seepage Project. This approximately 4.54-acre project involves activities, including discharges of dredged or fill material, in waters of the United States (WOUS) to construct seepage berms to prevent flooding. The project consist of three separate sites totaling approximately 4.54-acre along the San Joaquin River, Latitude 37.8017°, Longitude -121.3136°, Latitude 37.8653°, Longitude -121.3242°, Latitude 37.8186°, Longitude -121.3142°, San Joaquin County, California.

Based on the information you provided, the proposed activity, resulting in the permanent loss of approximately 0.55 acre of wetlands and 0.15 acre of drainage ditches is authorized by Regional General Permit (RGP) number 8. **Your work must comply with the general terms and conditions listed on the enclosed RGP information sheets and the following special conditions (enclosure 1)**:

Special Conditions

1. You shall notify the Corps of the start and completion dates for each phase of the authorized work within 1 calendar day prior to initiation of construction activities within WOUS and 30 calendar days following completion of construction activities.

2. To mitigate for the loss of 0.70 acre of WOUS (0.55 acre of wetlands and 0.15 acre of drainage ditches), you shall purchase 0.55 credits of Floodplain Mosaic Wetlands and 0.15 credits of Floodplain Riparian habitat at Cosumnes Floodplain Mitigation Bank. Evidence of this purchase shall be provided to the Corps within 30 days of authorized discharge of fill or dredge material in WOUS.

3. The enclosure document titled *Figure 3, 4 and 5, "Effects to Waters of the United States – Elements Ia and Ib, 1e, IIIa, IIIb, and Iva"*, dated May 2014, is incorporated as the permit boundary this authorization (enclosure 2).

4. Additionally, if the proposed activities intends to alter the Lower San Joaquin River and Tributaries Project and will require an authorization under Section 14 of the Rivers and Harbors Act of 1899, as amended, and codified in 33 USC 408 (Section 408) if it is to remain in place beyond the duration of the imminent threat to life or property.

You must sign the enclosed Compliance Certification and return it to this office within 30 days after completion of the authorized work.

This verification is valid for two years from the date of this letter or until the RGP is modified, reissued, or revoked, whichever comes first. Failure to comply with the General Conditions of this RGP, or the project-specific Special Conditions of this authorization, may result in the suspension or revocation of your authorization.

We appreciate your feedback. At your earliest convenience, please tell us how we are doing by completing the customer survey on our website under *Customer Service Survey.*

Please refer to identification number SPK-2009-01466 in any correspondence concerning this project. If you have any questions, please contact Mr. Peck Ha at the above address, by email at *Peck.Ha@usace.army.mil,* or telephone at (916) 557-6617. For more information regarding our program, please visit our website at *www.spk.usace.army.mil/Missions/Regulatory.aspx*.

Sincerely,

Peck Ha
Senior Project Manager
CA Delta Section
CA North Branch
Regulatory Division

Enclosures

cc: (w/o encls)
Ms. Cindy Davis, CEI Consultants, Inc. cdavis.@geiconsultants.com
Mr. Ryan Larson, Chief, Flood Protection and Navigation Section, Ryan.T.Larson2@usace.army.mil
Ms. Elizabeth Lee, CVWQCRB, Elizabeth.Lee@waterboards.ca.gov
Ms. Holley Kline, USFWS, San Joaquin Valley Division, holley_kline@fws.gov

COMPLIANCE CERTIFICATION

Permit File Number: SPK-2009-01466

Regional General Permit Number: 8

Permittee: Reclamation District (RD) 17
Attn: Mr. Christopher Neudeck
Kjeldsen-Sinnock & Associates, Inc.
711 North Pershing Avenue
Stockton, California 95203

County: San Joaquin

Date of Verification: April 6, 2017

Within 30 days after completion of the activity authorized by this permit, sign this certification and return it to the following address:

U.S. Army Corps of Engineers
Sacramento District
DLL-CESPK-RD-Compliance@usace.army.mil

Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with the terms and conditions of the permit your authorization may be suspended, modified, or revoked. If you have any questions about this certification, please contact the U.S. Army Corps of Engineers.

* * * * * * * * * *

I hereby certify that the work authorized by the above-referenced permit, including all the required mitigation, was completed in accordance with the terms and conditions of the permit verification.

________________________ __________
Signature of Permittee Date

Cosumnes Floodplain Mitigation Bank
AGREEMENT FOR SALE OF MITIGATION CREDITS
Permit Number: SPK-2009-01466

This Agreement is entered into this 13th day of April, 2017 by and between WESTERVELT ECOLOGICAL SERVICES, LLC (Bank Owner) and the RECLAMATION DISTRICT 17 (Project Applicant), jointly referred to as the "Parties," as follows:

RECITALS

A. The Bank Owner has developed the Cosumnes Floodplain Mitigation Bank (Bank) located in Sacramento County, California; and

B. The Bank was approved by the U.S. Army Corps of Engineers (USACE), U.S. Environmental Protection Agency (USEPA), National Marine Fisheries Service (NMFS) and California Department of Fish and Wildlife (CDFW) (jointly referred to as "Agencies") on **September 30, 2009**, and is currently in good standing with these agencies; and

C. The Bank has received approval from the Agencies to offer riparian wetlands and seasonal wetlands under the Clean Water Act and riparian forest, Scrub Shrub, and Shaded Riverine Aquatic (SRA) credits through the *Cosumnes Floodplain Mitigation Bank Enabling Instrument* (Bank Agreement); and

D. Project Applicant is seeking to implement an Emergency Flood Response action described on Exhibit "A" attached hereto (Project), which would unavoidably and adversely impact aquatic and riparian habitat and seeks to compensate for the loss of the aquatic and riparian habitat by purchasing Credits from the Bank; and

E. Project Applicant has been authorized by the U.S. Army Corps of Engineers, (Permit Number: SPK-2009-01466), to purchase from the Bank **0.55 Floodplain Mosaic Wetland credits and 0.15 Floodplain Riparian Habitat credits** upon confirmation by the Bank Owner of credit availability/adequate balance of credits remaining for sale; and

F. Project Applicant has been authorized by the Central Valley Regional Water Quality Control Board (Water Quality Certification Number: 5B39CR00238), to purchase from the Bank **0.07 Floodplain Riparian Habitat credits** to mitigate for future impacts related to the Reclamation District Phase 3 Levee Seepage Repair Project which involves discharge of dredged or fill material that would result in loss of an additional approximately 0.07 acres of aquatic habitat; and

G. Project Applicant desires to purchase from Bank and Bank desires to sell to Project Applicant **0.55 Floodplain Mosaic Wetland credits and 0.22 Floodplain Riparian Habitat credits**;

NOW, THEREFORE, THE PARTIES AGREE AS FOLLOWS:

1. Bank hereby sells to Project Applicant and Project Applicant hereby purchases from Bank **0.55 Floodplain Mosaic Wetland credits and 0.22 Floodplain Riparian Habitat credits** for the purchase price of **$98,450.00**. The Bank will then deliver to Project Applicant an executed Bill of Sale in the manner and form as attached hereto and marked Exhibit "B". The purchase price for said credits shall be paid by cashier's check or, at the option of Bank, wire transfer of funds according to written instructions by Bank to Project Applicant.

2. The sale and transfer herein is not intended as a sale or transfer to Project Applicant of a security, license, lease, easement, or possessory or non-possessory interest in real property, nor the granting of any interest of the foregoing.

3. Project Applicant shall have no obligation whatsoever by reason of the purchase of the Credits, to support, pay for, monitor, report on, sustain, continue in perpetuity, or otherwise be obligated or liable for the success or continued expense or maintenance in perpetuity of the credits sold, or the Bank. Pursuant to the Bank Agreement and any amendments thereto, Bank shall monitor and make reports to the appropriate agency or agencies on the status of any Credits sold to Project Applicant. Bank shall be fully and completely responsible for satisfying any and all conditions placed on the Bank or the Credits by all state or federal jurisdictional agencies.

4. The Credits sold and transferred to Project Applicant shall be non-transferable and non-assignable, and shall not be used as compensatory mitigation for any other Project or purpose, except as set forth herein.

5. Project Applicant hereby commits to purchase the Credits and in association therewith shall tender payment for the Credits no later than 30 days from the date of this Agreement.

6. Upon purchase of the credits specified in paragraph E above, the Bank shall submit to the parties listed in the Notices section of the Bank Agreement / Bank Enabling Instrument, copies of the: a) Agreement for Sale of Credits; b) Bill of Sale; c) Payment Receipt; and d) an updated ledger. The updated inventory / ledger must detail: i) Project Applicant; ii) Project Name; iii) Status (sale complete/sale not complete); iv) Credit Sale Date; v) Service File Number; vi) U.S. Army Corps of Engineers File Number (if applicable); vii) Total Number of Credits Authorized to Sell; viii) Total Number of Credits Sold to Date (inclusive); and ix) Balance of all Credits Available. The inventory / ledger should include all sales data from bank opening/establishment to the present.

IN WITNESS WHEREOF, the parties have executed this Agreement the day and year first above written.

BANK:

WESTERVELT ECOLOGICAL SERVICES, LLC
Cosumnes Floodplain Mitigation Bank Owner

By: ______________________ Date: 4/13/17

PROJECT APPLICANT:

RECLAMATION DISTRICT 17

By: ______________________ Date: 4-12-17
Dante Nomellini Sr.

Exhibit "A"

DESCRIPTION OF PROJECT
TO BE
MITIGATED

The Reclamation District 17 Emergency Flood Response action is an approximate 4.54-acre project involving activities previously identified as part of the Reclamation District 17 Phase 3 Levee Seepage Repair Project, and include discharges of dredged or fill material, in waters of the United States (WOUS) to construct seepage berms to prevent flooding. The proposed activity will result in the permanent loss of approximately 0.55 acre of wetland and 0.15 acre of drainage ditches and is authorized by Regional General Permit number 8, Permit File Number SPK-2009-01466. The Reclamation District 17 Phase 3 Levee Seepage Repair Project also would involve discharge of dredged or fill material that would result in loss of an additional approximately 0.07 acres of WOUS in the future to construct seepage berms to prevent flooding.

*****

Exhibit "B"

BILL OF SALE

In consideration of **$98,450.00**, receipt of which is hereby acknowledged, *Westervelt Ecological Services, LLC (Bank Owner)* does hereby bargain, sell and transfer to the *Reclamation District 17* **0.55 Floodplain Mosaic Wetland credits and 0.22 Floodplain Riparian Habitat credits** in the *Cosumnes Floodplain Mitigation Bank* in Sacramento County, California, developed, and approved by the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, California Department of Fish and Wildlife, and National Marine Fisheries Service.

Westervelt Ecological Services, LLC represents and warrants that it has good title to the credits, has good right to sell the same, and that they are free and clear of all claims, liens, or encumbrances.

Westervelt Ecological Services, LLC covenants and agrees with the buyer to warrant and defend the sale of the credits hereinbefore described against all and every person and persons whomsoever lawfully claiming or to claim the same.

DATED: 4/24/2017

Westervelt Ecological Services, LLC
Cosumnes Floodplain Mitigation Bank Owner

By: ______________________

Exhibit "C"

Cosumnes Floodplain Mitigation Bank
PAYMENT RECEIPT

PARTICIPANT INFORMATION

Name: Reclamation District 17

Address: P.O. Box 1461, Stockton, CA 95201

Telephone: 209-465-5883

Contact: Dante Nomellini Sr.

PROJECT INFORMATION

Project Name: Emergency Flood Response Action

Corps Permit Number: SPK-2009-01466

Water Quality Certification Number: 5B39CR00238

Species/Habitat Affected: Aquatic and Riparian habitat

Credits to be Purchased: 0.22 Floodplain Riparian Habitat credits, 0.55 Floodplain Mosaic Wetland credits

Payment Amount: $98,450.00

Project Location: San Joaquin County River

County/Address: San Joaquin County

PAYMENT INFORMATION

Payee: Westervelt Ecological Services, LLC

Payer: Reclamation District 17

Amount: Ninety-Eight Thousand Four Hundred and Fifty Dollars

Method of payment: Cash Check No. 801332 Money Order No.

Received by: ______________________ Date: 4/24/2017
(Signature)

Name: Travis Hemmen Title: Vice President

Central Valley Regional Water Quality Control Board

20 October 2014

Mr. Christopher H. Neudeck
Reclamation District 17
c/o Kjeldsen, Sinnock & Neudeck, Inc.
711 North Pershing Avenue
Stockton, CA 95203

CLEAN WATER ACT §401 TECHNICALLY CONDITIONED WATER QUALITY CERTIFICATION FOR DISCHARGE OF DREDGED AND/OR FILL MATERIALS FOR THE RECLAMATION DISTRICT 17 PHASE 3 100-YEAR LEVEE SEEPAGE AREA PROJECT (WDID#5B39CR00238), MANTECA, SAN JOAQUIN COUNTY

ACTION:

1. ☐ Order for Standard Certification

2. ■ Order for Technically-conditioned Certification

3. ☐ Order for Denial of Certification

WATER QUALITY CERTIFICATION STANDARD CONDITIONS:

1. This certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to §13330 of the California Water Code and §3867 of Title 23 of the California Code of Regulations (23 CCR).

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

3. The validity of any non-denial certification action shall be conditioned upon total payment of the full fee required under 23 CCR §3833, unless otherwise stated in writing by the certifying agency.

4. Certification is valid for the duration of the described project. Reclamation District 17 shall notify the Central Valley Water Board in writing within 7 days of project completion.

ADDITIONAL TECHNICALLY CONDITIONED CERTIFICATION CONDITIONS:

In addition to the four standard conditions, Reclamation District 17 shall satisfy the following:

1. Reclamation District 17 shall notify the Central Valley Water Board in writing 7 days in advance of the start of any in-water activities.

2. Except for activities permitted by the U.S. Army Corps under §404 of the Clean Water Act, soil, silt, or other organic materials shall not be placed where such materials could pass into surface water or surface water drainage courses.

3. All areas disturbed by project activities shall be protected from washout or erosion.

4. Reclamation District 17 shall maintain a copy of this Certification and supporting documentation (Project Information Sheet) at the Project site during construction for review by site personnel and agencies. All personnel (employees, contractors, and subcontractors) performing work on the proposed project shall be adequately informed and trained regarding the conditions of this Certification.

5. An effective combination of erosion and sediment control Best Management Practices (BMPs) must be implemented and adequately working during all phases of construction.

6. All temporarily affected areas will be restored to pre-construction contours and conditions upon completion of construction activities.

7. Reclamation District 17 shall perform surface water sampling: 1) When performing any in-water work; 2) In the event that project activities result in any materials reaching surface waters or; 3) When any activities result in the creation of a visible plume in surface waters. The following monitoring shall be conducted immediately upstream out of the influence of the project and 300 feet downstream of the active work area. Sampling results shall be submitted to this office within two weeks of initiation of sampling and every two weeks thereafter. The sampling frequency may be modified for certain projects with written permission from the Central Valley Water Board.

Parameter	Unit	Type of Sample	Frequency of Sample
Turbidity	NTU	Grab	Every 4 hours during in water work
Settleable Material	ml/l	Grab	Same as above.
Visible construction related pollutants	Observations	Visible Inspections	Continuous throughout the construction period

8. Activities shall not cause turbidity increases in surface water to exceed:

   (a) where natural turbidity is less than 1 Nephelometric Turbidity Units (NTUs), controllable factors shall not cause downstream turbidity to exceed 2 NTU;
   (b) where natural turbidity is between 1 and 5 NTUs, increases shall not exceed 1 NTU;
   (c) where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent;
   (d) where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs;
   (e) where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent.

   Except that these limits will be eased during in-water working periods to allow a turbidity increase of 15 NTU over background turbidity as measured in surface waters 300 feet downstream from the working area. In determining compliance with the above limits, appropriate averaging periods may be applied provided that beneficial uses will be fully protected. Averaging periods may only be assessed by prior permission of the Central Valley Water Board.

9. Activities shall not cause settleable matter to exceed 0.1 ml/l in surface waters as measured in surface waters 300 feet downstream from the project.

10. The discharge of petroleum products or other excavated materials to surface water is prohibited. Activities shall not cause visible oil, grease, or foam in the work area or downstream. Reclamation District 17 shall notify the Central Valley Water Board immediately of any spill of petroleum products or other organic or earthen materials.

11. Reclamation District 17 shall notify the Central Valley Water Board immediately if the above criteria for turbidity, settleable matter, oil/grease, or foam are exceeded.

12. Reclamation District 17 shall comply with all Department of Fish and Wildlife 1600 requirements for the project.

13. Reclamation District 17 must obtain coverage under the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities issued by the State Water Resources Control Board for any project disturbing an area of 1 acre or greater.

14. The Conditions in this water quality certification are based on the information in the attached "Project Information." If the information in the attached Project Information is modified or the project changes, this water quality certification is no longer valid until amended by the Central Valley Water Board.

15. In the event of any violation or threatened violation of the conditions of this Order, the violation or threatened violation shall be subject to any remedies, penalties, process, or sanctions as provided for under State law and section 401 (d) of the federal Clean Water Act. The applicability of any State law authorizing remedies, penalties, process, or sanctions for the violation or threatened violation constitutes a limitation necessary to ensure

compliance into this Order.

a. If Reclamation District 17 or a duly authorized representative of the project fails or refuses to furnish technical or monitoring reports, as required under this Order, or falsifies any information provided in the monitoring reports, the applicant is subject to civil monetary liabilities, for each day of violation, or criminal liability.

b. In response to a suspected violation of any condition of this Order, the Central Valley Water Board may require Reclamation District 17 to furnish, under penalty of perjury, any technical or monitoring reports the Central Valley Water Board deems appropriate, provided that the burden, including cost of the reports, shall be in reasonable relationship to the need for the reports and the benefits to be obtained from the reports.

c. Reclamation District 17 shall allow the staff(s) of the Central Valley Water Board, or an authorized representative(s), upon the presentation of credentials and other documents, as may be required by law, to enter the project premises for inspection, including taking photographs and securing copies of project-related records, for the purpose of assuring compliance with this certification and determining the ecological success of the project.

ADDITIONAL STORM WATER QUALITY CONDITIONS:

Reclamation District 17 shall also satisfy the following additional storm water quality conditions:

1. During the construction phase, Reclamation District 17 must employ strategies to minimize erosion and the introduction of pollutants into storm water runoff. These strategies must include the following:

   (a) the Storm Water Pollution Prevention Plan (SWPPP) must be prepared during the project planning and design phases and before construction;
   (b) an effective combination of erosion and sediment control Best Management Practices (BMPs) must be implemented and adequately working prior to the rainy season and during all phases of construction.

2. Reclamation District 17 must minimize the short and long-term impacts on receiving water quality from the Reclamation District 17 Phase 3 100-Year Levee Seepage Area Project by implementing the following post-construction storm water management practices:

   (a) minimize the amount of impervious surface;
   (b) reduce peak runoff flows;
   (c) provide treatment BMPs to reduce pollutants in runoff;
   (d) ensure existing waters of the State (e.g., wetlands, vernal pools, or creeks) are not used as pollutant source controls and/or treatment controls;
   (e) preserve and, where possible, create or restore areas that provide important water quality benefits, such as riparian corridors, wetlands, and buffer zones;
   (f) limit disturbances of natural water bodies and natural drainage systems caused by development (including development of roads, highways, and bridges);
   (g) use existing drainage master plans or studies to estimate increases in pollutant loads and flows resulting from projected future development and require

incorporation of structural and non-structural BMPs to mitigate the projected pollutant load increases in surface water runoff;

(h) identify and avoid development in areas that are particularly susceptible to erosion and sediment loss, or establish development guidance that protects areas from erosion/ sediment loss;

(i) control post-development peak storm water run-off discharge rates and velocities to prevent or reduce downstream erosion, and to protect stream habitat.

3. Reclamation District 17 must ensure that all development within the project provides verification of maintenance provisions for post-construction structural and treatment control BMPs. Verification shall include one or more of the following, as applicable:

(a) the developer's signed statement accepting responsibility for maintenance until the maintenance responsibility is legally transferred to another party; or

(b) written conditions in the sales or lease agreement that require the recipient to assume responsibility for maintenance; or

(c) written text in project conditions, covenants and restrictions for residential properties assigning maintenance responsibilities to a home owner's association, or other appropriate group, for maintenance of structural and treatment control BMPs; or

(d) any other legally enforceable agreement that assigns responsibility for storm water BMP maintenance.

4. Staff of the Central Valley Water Board has prepared total maximum daily load (TMDL) allocations that, once approved, would limit methylmercury in storm water discharges to the Sacramento-San Joaquin Delta. The Central Valley Water Board has scheduled these proposed allocations to be considered for adoption. When the Central Valley Water Board adopts the TMDL and once approved by the Environmental Protection Agency, the discharge of methylmercury may be limited from the proposed project. The purpose of this condition is to provide notice to Reclamation District 17 that methylmercury discharge limitations and monitoring requirements may apply to this project in the future and also to provide notice of the Central Valley Water Board's TMDL process and that elements of the planned construction may be subject to a TMDL allocation.

REGIONAL WATER QUALITY CONTROL BOARD CONTACT PERSON:

George D. Day, P.E.,Redding Branch Office, 364 Knollcrest Drive, Suite 205, Redding, California 96002, (530) 224-4845

WATER QUALITY CERTIFICATION:

I hereby issue an order certifying that any discharge from Reclamation District 17, Reclamation District 17 Phase 3 100-Year Levee Seepage Area Project (WDID# 5B39CR00238) will comply with the applicable provisions of §301 ("Effluent Limitations"), §302 ("Water Quality Related Effluent Limitations"), §303 ("Water Quality Standards and Implementation Plans"), §306 ("National Standards of Performance"), and §307 ("Toxic and Pretreatment Effluent Standards") of the Clean Water Act. This discharge is also regulated under State Water Resources Control Board Water Quality Order No. 2003-0017 DWQ "Statewide General Waste Discharge

Requirements For Dredged Or Fill Discharges That Have Received State Water Quality Certification (General WDRs)."

Except insofar as may be modified by any preceding conditions, all certification actions are contingent on (a) the discharge being limited and all proposed mitigation being completed in strict compliance with Reclamation District 17's project description and the attached Project Information Sheet, and (b) compliance with all applicable requirements of the Water Quality Control Plan *for the Sacramento River and San Joaquin River*, Fourth Edition, revised October 2011 (Basin Plan).

Any person aggrieved by this action may petition the State Water Quality Control Board to review the action in accordance with California Water Code § 13320 and California Code of Regulations, title 23, § 2050 and following. The State Water Quality Control Board must receive the petition by 5:00 p.m., 30 days after the date of this action, except that if the thirtieth day following the date of this action falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Quality Control Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at: http://www.waterboards.ca.gov/public_notices/petitions/water_quality or will be provided upon request.

(for) PAMELA C. CREEDON
Executive Officer

GDD:lmw

Enclosure: Water Quality Order No. 2003-0017 DWQ

cc w/o enclosures:
Mr. Bill Guthrie, U.S. Army Corp of Engineers, Sacramento
Department of Fish and Wildlife, Region 2, Rancho Cordova
U.S. Fish and Wildlife Service, Sacramento
Mr. Bill Jennings, CALSPA, Stockton
Mr. Eric Htain, AECOM, Sacramento

cc w/o enclosures by email:
U.S. EPA, Region 9, San Francisco
Mr. Bill Orme, SWRCB, Certification Unit, Sacramento

R:\RB5\R5RSection\N Central Valley\aCross Section\Clerical\Storm_water\GDay\2014\401 5B39CR00238 Reclamation District 17 Phase 3 100-Year Levee Seepage Area Project, Reclamation District 17.doc

PROJECT INFORMATION

Application Date: 30 July 2014

Application Complete Date: 17 September 2014

Applicant: Reclamation District 17, Attn: Mr. Christopher H. Neudeck

Project Name: Reclamation District 17 Phase 3 100-Year Levee Seepage Area Project

Application Number: WDID No. 5B39CR00238

U.S. Army Corps File Number: SPK-2009-01466

Type of Project: Levee improvements including use of cutoff walls, seepage berms, chimney drains, and engineering techniques to provide 100-year level of flood protection.

Project Location: Township 1/2 South, Range 6 East, MDB&M.
Latitude: 37°52'48" and Longitude: -121°19'54"

County: San Joaquin County

Receiving Water(s) (hydrologic unit): Irrigation and drainage ditches, which are tributary to the San Joaquin River. San Joaquin Valley Floor Hydrologic Unit-Mantica Hydrologic Area No. 535.10

Water Body Type: Wetlands, Streambed

Designated Beneficial Uses: The Water Quality Control Plan *for the Sacramento River and San Joaquin River*, Fourth Edition, revised September 2009, has designated beneficial uses for surface and ground waters within the region. Beneficial uses that could be impacted by the project include: Municipal and Domestic Water Supply (MUN); Agricultural Supply (AGR); Industrial Supply (IND), Hydropower Generation (POW); Groundwater Recharge, Water Contact Recreation (REC-1); Non-Contact Water Recreation (REC-2); Warm Freshwater Habitat (WARM); Cold Freshwater Habitat (COLD); Spawning, Reproduction, and /or Early Development (SPWN); and Wildlife Habitat (WILD).

Project Description (purpose/goal): The Reclamation District (RD) 17 Phase 3 100-Year Levee Seepage Area Project consists of correcting levee geometry where needed to meet USACE design standards; increasing the levee's resistance to under-seepage and/or through-seepage; and providing seepage exit gradients of less than 0.5 at the water surface elevation associated with the 100-year flood event. Levee improvements under consideration include constructing seepage berms designed to address under-seepage, installing chimney drains in existing and new seepage berms designed to address through-seepage, installing shallow cutoff walls designed to address through-seepage, installing deep cutoff walls designed to address both under and through-seepage, and modification of levee slopes and crown widths where needed to achieve levee geometry requirements.

At three locations, RD 17 is also considering constructing setback levees largely because RD 17 desires to obtain funding for the project from DWR's Proposition 1E Early Implementation Project (EIP) program. Proposition 1E—the Disaster Preparedness and Flood Protection Bond

Act of 2006—authorized $4.09 billion in general obligation bonds to rebuild and repair California's most vulnerable structures for reducing flood damage. The EIP program prioritizes projects to more rapidly receive funding from the overall Proposition 1E funding pool. To receive EIP funding the program requires that project proponents at least consider setback levees as an option for repairing/enhancing flood control systems; acknowledging that setback levees can serve the combined purposes of improving flood protection infrastructure, reducing water surface elevations through expansion of the floodway, and providing habitat restoration/enhancement opportunities.

Preliminary Water Quality Concerns: Construction activities may impact surface waters with increased turbidity and settleable matter.

Proposed Mitigation to Address Concerns: Reclamation District 17 will implement Best Management Practices (BMPs) to control sedimentation and erosion. All temporary affected areas will be restored to pre-construction contours and conditions upon completion of construction activities. Reclamation District 17 will conduct turbidity and settleable matter testing during in-water work, stopping work if Basin Plan criteria are exceeded or are observed.

Fill/Excavation Area Project implementation will permanently impact 0.55 acre of jurisdictional wetland and 0.22 acre (2,712 linear feet) of un-vegetated streambed.

Dredge Volume: Not Applicable

U.S. Army Corps of Engineers Permit Number: Individual Permit

Department of Fish and Wildlife Streambed Alteration Agreement: Reclamation District 17 applied for a Streambed Alteration Agreement in July 2014.

Possible Listed Species: Valley elderberry longhorn beetle (VELB)

Status of CEQA Compliance: Reclamation District 17 prepared a Draft Environmental Impact Statement/Environmental Impact Report and was circulated for public comment and review in September 2011. The Reclamation District 17 will adopt the EIR in November 2014 (State Clearinghouse Number 2010042073).

Compensatory Mitigation: Reclamation District 17 will purchase 0.55 acre of floodplain mosaic wetlands and 0.22 acre of floodplain riparian habitat from the Cosumnes Floodplain Mitigation Bank, for the unavoidable impacts to jurisdictional waters.

Application Fee Provided: On 30 July 2014 a certification application fee of $5,718.00 was submitted as required by 23 CCR §3833b(3)(A) and by 23 CCR §2200(e).

State of California – The Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Bay Delta Region
7329 Silverado Trail
Napa, CA 94558
(707) 944-5500
www.wildlife.ca.gov

EDMUND G. BROWN JR., *Governor*
CHARLTON H. BONHAM, *Director*

September 13, 2016

Christopher Neudeck
Reclamation District No. 17
c/o Kjeldsen, Sinnock & Neudeck
711 N. Pershing Avenue
Stockton, CA 95203

Subject: Final Lake or Streambed Alteration Agreement
Notification No. 1600-2014-0424-R3
San Joaquin River; RD 17 Phase 3 Levee Seepage Area Project

Dear Mr. Neudeck:

Enclosed is the final Streambed Alteration Agreement (Agreement) for the RD 17 Phase 3 Levee Seepage Area Project (Project). Before the California Department of Fish and Wildlife (Department) may issue an Agreement, it must comply with the California Environmental Quality Act (CEQA). In this case, the Department, acting as a responsible agency, filed a Notice of Determination (NOD) within five working days of signing the Agreement. The NOD was based on information contained in the Mitigated Negative Declaration prepared by the lead agency.

Under CEQA, the filing of an NOD triggers a 30-day statute of limitations period during which an interested party may challenge the filing agency's approval of the Project. You may begin the Project before the statute of limitations expires if you have obtained all necessary local, state, and federal permits or other authorizations. However, if you elect to do so, it will be at your own risk.

If you have any questions regarding this matter, please contact Melissa Farinha, Senior Environmental Scientist (Supervisory) at (707) 944-5579 or Melissa.Farinha@wildlife.ca.gov.

Sincerely,

Randi Adair

for James Starr
Environmental Program Manager
Bay Delta Region

cc: Eric Htain; eric.htain@aecom.com
Lieutenant Vielhauer

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

STREAMBED ALTERATION AGREEMENT
NOTIFICATION NO. 1600-2014-0424-R3
San Joaquin River

RECLAMATION DISTRICT NO. 17
RD 17 PHASE 3 LEVEE SEEPAGE AREA PROJECT

This Streambed Alteration Agreement (Agreement) is entered into between the California Department of Fish and Wildlife (CDFW) and Reclamation District No. 17 (Permittee) as represented by Christopher Neudeck.

RECITALS

WHEREAS, pursuant to Fish and Game Code (FGC) section 1602, Permittee notified CDFW on December 3, 2014 that Permittee intends to complete the project described herein.

WHEREAS, pursuant to FGC section 1603, CDFW has determined that the project could substantially adversely affect existing fish or wildlife resources and has included measures in the Agreement necessary to protect those resources.

WHEREAS, Permittee has reviewed the Agreement and accepts its terms and conditions, including the measures to protect fish and wildlife resources.

NOW THEREFORE, Permittee agrees to complete the project in accordance with the Agreement

PROJECT LOCATION

The Reclamation District No. 17 (RD 17) Phase 3 Levee Seepage Area Project, Element IVc (Project), is located at the San Joaquin River, in San Joaquin County, State of California; Latitude 37.815230, Longitude -121.318225. The Project area is located along two sections of the RD 17 levee system on the San Joaquin River, west of I-5 in the City of Lathrop and is identified in the attached exhibits as Element IVc (see Exhibits A and B).

PROJECT DESCRIPTION

The Project is limited to the following actions (See Exhibit B):

Degrade existing levee waterside slope. A 410 linear foot section of the waterside slope of the existing levee along the San Joaquin River will be excavated to a point no lower than the mean high water mark. The degraded levee will allow high water to enter a new landside setback levee swale area between the existing levee and a new setback levee. The swale will be constructed to reduce the potential for fish stranding or entrapment in the setback area when river flows overtop the existing degraded levee, which will then allow drainage upon receding of the high water.

The existing levee will be fully restored at the tie-in points to the new setback levee where fill benching is required. The excavated levee material will be placed on top of the new setback levee.

Placement of rock slope protection along the San Joaquin River bank. Rock slope protection (riprap) will be placed on the waterside of the existing levee in three locations to reduce bank erosion during high flow periods, including two areas where the river would overtop the existing levee, which is to be degraded, during high flows, and another portion of the levee needing repair.

Approximately 1.136 acre of 18-inch quarry stone will be used for rock slope protection. Any disturbed existing riprap will be supplemented to ensure a uniform layer across the connection points with the new setback levee. The footprint of the degraded levee would be hydroseeded with native annual grasses.

Construction equipment to be used for the Project include dump trucks, scrapers, excavators, graders, trenchers, and bulldozers. Landside staging areas and existing access roads will be used for the Project.

PROJECT IMPACTS

Existing fish or wildlife resources the project could substantially adversely affect include: Spring-run Chinook Salmon (*Oncorhynchus tshawytscha*), Winter-run Chinook Salmon (*O. tshawytscha*), and Pacific pond turtle (*Clemmys marmorata*).

The adverse effects the project could have on the fish or wildlife resources identified above include: loss of bank stability, siltation and turbidity due to bank erosion during construction or riprap entering the water, and disturbance to nesting birds and other wildlife from construction activity.

As designed, the Project activities will occur above the mean high water line. The rock slope protection and degraded levee area will result in the permanent removal of 0.89

acre of ruderal and annual grassland. No riparian vegetation or trees on the waterside of the levee will be removed.

MEASURES TO PROTECT FISH AND WILDLIFE RESOURCES

1. Administrative Measures

Permittee shall meet each administrative requirement described below.

1.1 Documentation at Project Site. Permittee shall make the Agreement, any extensions and amendments to the Agreement, and all related notification materials and California Environmental Quality Act (CEQA) documents, readily available at the project site at all times and shall be presented to CDFW personnel, or personnel from another state, federal, or local agency upon request.

1.2 Providing Agreement to Persons at Project Site. Permittee shall provide copies of the Agreement and any extensions and amendments to the Agreement to all persons who will be working on the project at the project site on behalf of Permittee, including but not limited to contractors, subcontractors, inspectors, and monitors.

1.3 Notification of Conflicting Provisions. Permittee shall notify CDFW if Permittee determines or learns that a provision in the Agreement might conflict with a provision imposed on the project by another local, state, or federal agency. In that event, CDFW shall contact Permittee to resolve any conflict.

1.4 Project Site Entry. Permittee agrees that CDFW personnel may enter the project site at any time to verify compliance with the Agreement.

1.5 Notify CDFW of Project Modifications. All work shall be done according to the Notification and supporting materials received by CDFW, unless otherwise noted in this Agreement. The Permittee shall notify CDFW of any modifications made to the plans submitted to CDFW. Modifications to the project description may require an Amendment to this Agreement, and the Permittee shall not implement the proposed changes until CDFW has responded to the submitted changes.

1.6 Designated Biologist. At least 30 days before initiating project activities, Permittee shall obtain the CDFW's written approval for a Designated Biologist and all other biologists monitoring project activities (see Reporting Measure 3.3). The Designated Biologist or other approved biologist will be on site during ground disturbance activities.

2. Avoidance and Minimization Measures

To avoid or minimize adverse impacts to fish and wildlife resources identified above, Permittee shall implement each measure listed below.

2.1 Work Period. All project work shall be limited to the period between August 1 and November 30. Permittee shall conduct waterside levee construction activities as described in the Project Notification, above the mean high water mark.

2.2 Education Program. Permittee shall conduct a worker environmental awareness training for all persons employed or otherwise working on the Project site prior to performing any work at the project site. The program shall consist of a presentation made by the Designated Biologist that includes a discussion of the biology of the species and habitats identified in this Agreement. The Biologist shall also include as part of the education program information about the distribution and habitat needs of any special status species that may be present, legal protections for those species, penalties for violations and project-specific protective measures included in this Agreement. Interpretation shall be provided for non-English speaking workers. Upon completion of the education program, employees shall sign a form stating they attended the program and understand all protection measures. These forms shall be filed at the worksite and be available to CDFW upon request. The Permittee shall be responsible for ensuring compliance with all measures required by this Agreement.

2.3 Pacific Pond Turtle Pre-Construction Surveys and Avoidance. The Designated biologist shall conduct a pre-construction survey for the Pacific pond turtle prior to project activities. All survey results shall be sent to CDFW at the contact information below (see Reporting Measure 3.4). If a Pacific pond turtle is observed in the project area, it should be left alone to move out of the area on its own or may be relocated by an approved biologist to a suitable aquatic habitat at least 50 feet downstream of the construction area.

2.4 Removal of Riparian Vegetation and Trees. Disturbance or removal of riparian vegetation and trees is prohibited. Should riparian vegetation removal or tree trimming or removal be required CDFW must be notified at the contact information below prior to removal/trimming. CDFW at that time may require additional measures to protect wildlife and mitigation measures for affected wildlife or habitat.

2.5 Equipment, Hazardous Materials, Storage and Staging Areas. Permittee shall locate staging and storage areas for equipment, materials, fuels, lubricants, and solvents outside the waterway and adjacent banks. Stationary equipment such as motors, pumps, generators, compressors and welders, located within or adjacent to the channel shall be positioned over drip-pans. Vehicles must be moved away from the channel prior to refueling and lubrication. Permittee shall not stockpile or store construction material where it could be washed into the waterway or where it would cover aquatic or riparian vegetation.

2.6 Spill Prevention. The Permittee shall implement standard best management practices (BMPs) related to spill prevention and spill response measures in and around the project area.

2.7 Erosion Control Best Management Practices. Construction best management practices (BMPs) shall be implemented for the project activities. All exposed/disturbed areas within the project site shall be stabilized to the greatest extent possible. At no time shall silt, earthen fill material, or riprap be allowed to enter the river.

2.8 Trash Abatement. The Permittee shall not dump any litter or debris within the stream zone. All debris and waste shall be picked up daily and properly disposed of at an appropriate site. All construction debris and associated materials shall be removed from the work site upon project completion.

3. Reporting Measures

Permittee shall meet each reporting requirement described below.

3.1 Notification of Work Initiation/Completion. The Permittee shall notify CDFW in writing or by email at the CDFW contact information below at least 48 hours prior to the initiation, and following completion, of work.

3.2 Photo Documentation. Prior to project construction activities and upon completion of project construction activities the Permittee shall photograph the project site. Labeled copies of the photographs shall be sent to CDFW within 30 days of completion of the project. Photographs shall be submitted via email or post mail to the CDFW contact information below.

3.3 Biologist Approval. At least 30 days prior to initiation of work or pre-construction biological surveys, the Permittee shall submit to CDFW at the contact information below for written approval the resumes of the Designated Biologist and all other biologists working on the project.

3.4 Biological Pre-Construction Survey Results. The results of biological surveys shall be submitted to CDFW at the contact information below within 5 days of each survey and prior to commencement of work.

3.5 Special Status Species Documentation. If any species covered by this Agreement are observed, the Permittee shall immediately contact CDFW. Permittee shall also submit California Natural Diversity Data Base (CNDDB) forms to the CNDDB for all survey data within 15 working days of the sightings, and provide CDFW with copies of the CNDDB forms and survey maps. See http://www.dfg.ca.gov/biogeodata/cnddb for additional information.

3.6 Notification of Spill. In the event of a spill into the waters of the State, the Permittee shall immediately notify the California Emergency Management Agency at 1-800-852-7550 and immediately initiate the clean-up activities. CDFW shall be notified by the Permittee at the contact information below and consulted regarding clean-up procedures. Project operations shall not resume until the situation is remedied.

CONTACT INFORMATION

Any communication that Permittee or CDFW submits to the other shall be in writing and any communication or documentation shall be delivered to the address below by U.S. mail, fax, or email, or to such other address as Permittee or CDFW specifies by written notice to the other.

To Permittee:

Christopher Neudeck
Reclamation District No. 17
c/o Kjeldsen, Sinnock & Neudeck
711 N. Pershing Avenue
Stockton, CA 95203
Fax (209) 946-0296
Office (209) 946-0268
Email cneudeck@ksninc.com

To CDFW:

California Department of Fish and Wildlife
Bay Delta Region
7329 Silverado Trail
Napa, California 94558
Attn: Lake and Streambed Alteration Program – Ms. Crystal Spurr, Senior Environmental Scientist (Supervisory)
Notification #1600-2014-0424-R3
Fax (707) 944-5553
Office (209) 234-3442
Email crystal.spurr@wildlife.ca.gov

LIABILITY

Permittee shall be solely liable for any violations of the Agreement, whether committed by Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents or contractors and subcontractors, to complete the project or any activity related to it that the Agreement authorizes.

This Agreement does not constitute CDFW's endorsement of, or require Permittee to proceed with the project. The decision to proceed with the project is Permittee's alone.

SUSPENSION AND REVOCATION

CDFW may suspend or revoke in its entirety the Agreement if it determines that Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, is not in compliance with the Agreement.

Before CDFW suspends or revokes the Agreement, it shall provide Permittee written notice by certified or registered mail that it intends to suspend or revoke. The notice shall state the reason(s) for the proposed suspension or revocation, provide Permittee an opportunity to correct any deficiency before CDFW suspends or revokes the Agreement, and include instructions to Permittee, if necessary, including but not limited to a directive to immediately cease the specific activity or activities that caused CDFW to issue the notice.

ENFORCEMENT

Nothing in the Agreement precludes CDFW from pursuing an enforcement action against Permittee instead of, or in addition to, suspending or revoking the Agreement.

Nothing in the Agreement limits or otherwise affects CDFW's enforcement authority or that of its enforcement personnel.

OTHER LEGAL OBLIGATIONS

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from obtaining any other permits or authorizations that might be required under other federal, state, or local laws or regulations before beginning the project or an activity related to it.

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from complying with other applicable statutes in the FGC including, but not limited to, FGC sections 2050 et seq. (threatened and endangered species), 3503 (bird nests and eggs), 3503.5 (birds of prey), 5650 (water pollution), 5652 (refuse disposal into water), 5901 (fish passage), 5937 (sufficient water for fish), and 5948 (obstruction of stream).

Nothing in the Agreement authorizes Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, to trespass.

AMENDMENT

CDFW may amend the Agreement at any time during its term if CDFW determines the amendment is necessary to protect an existing fish or wildlife resource.

Permittee may amend the Agreement at any time during its term, provided the amendment is mutually agreed to in writing by CDFW and Permittee. To request an amendment, Permittee shall submit to CDFW a completed CDFW "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the corresponding amendment fee identified in CDFW's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

TRANSFER AND ASSIGNMENT

This Agreement may not be transferred or assigned to another entity, and any purported transfer or assignment of the Agreement to another entity shall not be valid or effective, unless the transfer or assignment is requested by Permittee in writing, as specified below, and thereafter CDFW approves the transfer or assignment in writing.

The transfer or assignment of the Agreement to another entity shall constitute a minor amendment, and therefore to request a transfer or assignment, Permittee shall submit to CDFW a completed CDFW "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the minor amendment fee identified in CDFW's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

EXTENSIONS

In accordance with FGC section 1605(b), Permittee may request one extension of the Agreement, provided the request is made prior to the expiration of the Agreement's term. To request an extension, Permittee shall submit to CDFW a completed CDFW "Request to Extend Lake or Streambed Alteration" form and include with the completed form payment of the extension fee identified in CDFW's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5). CDFW shall process the extension request in accordance with FGC 1605(b) through (e).

If Permittee fails to submit a request to extend the Agreement prior to its expiration, Permittee must submit a new notification and notification fee before beginning or continuing the project the Agreement covers (Fish & G. Code, § 1605, subd. (f)). .

EFFECTIVE DATE

The Agreement becomes effective on the date of CDFW's signature, which shall be: 1) after Permittee's signature; 2) after CDFW complies with all applicable requirements under the California Environmental Quality Act (CEQA); and 3) after payment of the applicable FGC section 711.4 filing fee listed at http://www.wildlife.ca.gov/habcon/ceqa/ceqa_changes.html.

TERM

This Agreement shall expire on **December 31, 2019**, unless it is terminated or extended before then. All provisions in the Agreement shall remain in force throughout its term. Permittee shall remain responsible for implementing any provisions specified herein to protect fish and wildlife resources after the Agreement expires or is terminated, as FGC section 1605(a)(2) requires.

EXHIBITS

The documents listed below are included as exhibits to the Agreement and incorporated herein by reference.

EXHIBIT A – Project Location (Element IVc)
EXHIBIT B – Project (Element IVc) Features

AUTHORITY

If the person signing the Agreement (signatory) is doing so as a representative of Permittee, the signatory hereby acknowledges that he or she is doing so on Permittee's behalf and represents and warrants that he or she has the authority to legally bind Permittee to the provisions herein.

AUTHORIZATION

This Agreement authorizes only the project described herein. If Permittee begins or completes a project different from the project the Agreement authorizes, Permittee may be subject to civil or criminal prosecution for failing to notify CDFW in accordance with FGC section 1602.

CONCURRENCE

The undersigned accepts and agrees to comply with all provisions contained herein.

FOR RECLAMATION DISTRICT NO. 17

Christopher N. Neudeck   5/15/15

Christopher Neudeck   Date

FOR DEPARTMENT OF FISH AND WILDLIFE

Randi Adair   9/13/16

for James Starr   Date
Environmental Program Manager

Prepared by: Crystal Spurr
Senior Environmental Scientist (Supervisory)

Date Sent: May 11, 2015

EXHIBIT A – PROJECT LOCATION (Element IVc)

Source: RD 17, 2014

EXHIBIT B – Project (Element 5b) Features

Source: AECOM 2009, 2010, 2014

FOR DEPARTMENT USE ONLY				
Date Received	*Amount Received*	*Amount Due*	*Date Complete*	*Notification No.*
12/3/14	$ 1351.50	$		1600-2014-0424-3

VT#1579 · Reclamation District 17

Elsholz Lt-Vielhauer

STATE OF CALIFORNIA
DEPARTMENT OF FISH AND WILDLIFE

NOTIFICATION OF LAKE OR STREAMBED ALTERATION

Fish & Wildlife
DEC 03 2014
Napa

Complete EACH field, unless otherwise indicated, following the enclosed instructions and submit ALL required enclosures. Attach additional pages, if necessary.

1. APPLICANT PROPOSING PROJECT

Name	Christopher Neudeck		
Business/Agency	Reclamation District No. 17 (RD 17) c/o Kjeldsen, Sinnock & Neudeck		
Street Address	711 N. Pershing Avenue		
City, State, Zip	Stockton, CA 95203		
Telephone	209-946-0268	Fax	209-946-0296
Email	cneudeck@ksninc.com		

2. CONTACT PERSON (*Complete only if different from applicant*)

Name	Eric Htain, AECOM		
Street Address	2020 L Street, Suite 400		
City, State, Zip	Sacramento, CA 95811		
Telephone	916-414-5800	Fax	916-414-5850
Email	eric.htain@aecom.com		

3. PROPERTY OWNER (*Complete only if different from applicant*)

Name	See Attachment A for a list of owners of properties that adjoin the project area and their addresses.		
Street Address			
City, State, Zip			
Telephone		Fax	
Email			

4. PROJECT NAME AND AGREEMENT TERM

A. Project Name	RD 17 Phase 3 Levee Seepage Area Project
B. Agreement Term Requested	☑ Regular (*5 years or less*) ☐ Long-term (*greater than 5 years*)

C. Project Term		D. Seasonal Work Period		E. Number of Work Days
Beginning (*year*)	Ending (*year*)	Start Date (*month/day*)	End Date (*month/day*)	
2015	2017	May	November	552

NOTIFICATION OF LAKE OR STREAMBED ALTERATION

5. AGREEMENT TYPE

Check the applicable box. If box B, C, D, or E is checked, complete the specified attachment.		
A.	☑ Standard *(Most construction projects, excluding the categories listed below)*	
B.	☐ Gravel/Sand/Rock Extraction (*Attachment A*)	*Mine I.D. Number:* ____
C.	☐ Timber Harvesting (*Attachment B*)	THP *Number:* ____
D.	☐ Water Diversion/Extraction/Impoundment (*Attachment C*)	*SWRCB Number:* ____
E.	☐ Routine Maintenance (*Attachment D*)	
F.	☐ CDFW Fisheries Restoration Grant Program (FRGP)	*FRGP Contract Number* ____
G.	☐ Master	
H.	☐ Master Timber Harvesting	

6. FEES

Please see the current fee schedule to determine the appropriate notification fee. Itemize each project's estimated cost and corresponding fee. ***Note: The Department may not process this notification until the correct fee has been received.***

	A. Project	B. Project Cost	C. Project Fee
1	Placement of rock slope protection on San Joaquin river bank (Element IVc)	$125,000	$1,351.50
2			
3			
4			
5			
		D. Base Fee *(if applicable)*	
		E. TOTAL FEE ENCLOSED	$1,351.50

7. PRIOR NOTIFICATION OR ORDER

A. Has a notification previously been submitted to, or a Lake or Streambed Alteration Agreement previously been issued by, the Department for the project described in this notification?

☐ Yes (*Provide the information below*) ☑ No

Applicant: ____ Notification Number: ____ Date: ____

B. Is this notification being submitted in response to an order, notice, or other directive ("order") by a court or administrative agency (including the Department)?

☑ No ☐ Yes (*Enclose a copy of the order, notice, or other directive. If the directive is not in writing, identify the person who directed the applicant to submit this notification and the agency he or she represents, and describe the circumstances relating to the order.*)

☐ *Continued on additional page(s)*

8. PROJECT LOCATION

A. Address or description of project location.
(*Include a map that marks the location of the project with a reference to the nearest city or town, and provide driving directions from a major road or highway*)

The project location is not associated with a street address. The proposed project area is located along various sections of the RD 17 levee system in San Joaquin County, starting near the southern boundary of the City of Stockton, through the City of Lathrop, and to the western boundary of the City of Manteca. This includes portions of the San Joaquin River east levee and portions of the levee along the north bank of Walthall Slough. See Attachment A, Exhibits 1 and 2 for maps of RD 17 and the project elements.

From Sacramento, take Interstate 5 south past Stockton to the West Mathews Road exit. Travel west on West Mathews Road. Veer left onto Howard Road. The northernmost project elements are located where Howard Road crosses the San Joaquin River east levee. All other reaches are south of this location, along the San Joaquin River and Walthall Sough.

☐ *Continued on additional page(s)*

B. River, stream, or lake affected by the project. San Joaquin River

C. What water body is the river, stream, or lake tributary to? San Joaquin River

D. Is the river or stream segment affected by the project listed in the state or federal Wild and Scenic Rivers Acts? ☐ Yes ☑ No ☐ Unknown

E. County San Joaquin

F. USGS 7.5 Minute Quad Map Name	G. Township	H. Range	I. Section	J. ¼ Section
Lathrop	1S and 2S	6E	NA	NA

☐ *Continued on additional page(s)*

K. Meridian (*check one*) ☐ Humboldt ☑ Mt. Diablo ☐ San Bernardino

L. Assessor's Parcel Number(s)

Available upon request.

☐ *Continued on additional page(s)*

M. Coordinates (*If available, provide at least latitude/longitude or UTM coordinates and check appropriate boxes*)

Latitude/Longitude	*Latitude:* 37.880271	*Longitude:* -121.33173	
	☐ Degrees/Minutes/Seconds	☑ Decimal Degrees	☐ Decimal Minutes
UTM	*Easting:*	*Northing:*	☐ Zone 10 ☐ Zone 11
Datum used for Latitude/Longitude or UTM		☐ NAD 27	☑ NAD 83 or WGS 84

9. PROJECT CATEGORY AND WORK TYPE *(Check each box that applies)*

PROJECT CATEGORY	NEW CONSTRUCTION	REPLACE EXISTING STRUCTURE	REPAIR/MAINTAIN EXISTING STRUCTURE
Bank stabilization – bioengineering/recontouring	☐	☐	☐
Bank stabilization – rip-rap/retaining wall/gabion	☑	☐	☐
Boat dock/pier	☐	☐	☐
Boat ramp	☐	☐	☐
Bridge	☐	☐	☐
Channel clearing/vegetation management	☐	☐	☐
Culvert	☐	☐	☐
Debris basin	☐	☐	☐
Dam	☐	☐	☐
Diversion structure – weir or pump intake	☐	☐	☐
Filling of wetland, river, stream, or lake	☐	☐	☐
Geotechnical survey	☐	☐	☐
Habitat enhancement – revegetation/mitigation	☐	☐	☐
Levee	☑	☐	☑
Low water crossing	☐	☐	☐
Road/trail	☐	☐	☐
Sediment removal – pond, stream, or marina	☐	☐	☐
Storm drain outfall structure	☐	☐	☐
Temporary stream crossing	☐	☐	☐
Utility crossing : Horizontal Directional Drilling	☐	☐	☐
Jack/bore	☐	☐	☐
Open trench	☐	☐	☐
Other *(specify)*:	☐	☐	☐

10. PROJECT DESCRIPTION

A. Describe the project in detail. Photographs of the project location and immediate surrounding area should be included.
- Include any structures (e.g., rip-rap, culverts, or channel clearing) that will be placed, built, or completed in or near the stream, river, or lake.
- Specify the type and volume of materials that will be used.
- If water will be diverted or drafted, specify the purpose or use.

Enclose diagrams, drawings, plans, and/or maps that provide all of the following: site specific construction details; the dimensions of each structure and/or extent of each activity in the bed, channel, bank or floodplain; an overview of the entire project area (i.e., "bird's-eye view") showing the location of each structure and/or activity, significant area features, and where the equipment/machinery will enter and exit the project area.

The proposed project is a levee flood risk reduction project involving use of cutoff walls, seepage berms, chimney drains, and engineering techniques to address existing levee flood risks. See Attachment A, Notification Continuation, for a more detailed project description.

☑ *Continued on additional page(s)*

B. Specify the equipment and machinery that will be used to complete the project.

Specific equipment to be used for the project will be determined by the construction contractor. Types of equipment anticipated to be used include: dump trucks for delivery/hauling, excavator, dozer, grader, loader, trencher, roller, heavy duty water tank truck, and pickup trucks.

☐ *Continued on additional page(s)*

C. Will water be present during the proposed work period (specified in box 4.D) in the stream, river, or lake (specified in box 8.B).	☑ Yes ☐ No (*Skip to box 11*)
D. Will the proposed project require work in the wetted portion of the channel?	☐ Yes (*Enclose a plan to divert water around work site*) ☑ No

NOTIFICATION OF LAKE OR STREAMBED ALTERATION

11. PROJECT IMPACTS

A. Describe impacts to the bed, channel, and bank of the river, stream, or lake, and the associated riparian habitat. Specify the dimensions of the modifications in length (linear feet) and area (square feet or acres) and the type and volume of material (cubic yards) that will be moved, displaced, or otherwise disturbed, if applicable.

See Attachment A, Notification Continuation, for a complete description of project activities and impacts.

☑ *Continued on additional page(s)*

B. Will the project affect any vegetation? ☑ Yes (*Complete the tables below*) ☐ No

Vegetation Type	Temporary Impact	Permanent Impact
Annual grassland (on waterside slope of levee)	Linear feet: 0 Total area: 0	Linear feet: 850 Total area: 0.89 acre
	Linear feet: Total area:	Linear feet: Total area:

Tree Species	Number of Trees to be Removed	Trunk Diameter (range)

☐ *Continued on additional page(s)*

C. Are any special status animal or plant species, or habitat that could support such species, known to be present on or near the project site?

☑ Yes *(List each species and/or describe the habitat below)* ☐ No ☐ Unknown

See Attachment A, Notification Continuation, for more information on special-status species with potential to occur in the project area.

☑ *Continued on additional page(s)*

D. Identify the source(s) of information that supports a "yes" or "no" answer above in Box 11.C.

Draft EIS/EIR prepared for the project (see CD provided as Attachment B).

☑ *Continued on additional page(s)*

E. Has a biological study been completed for the project site?

☑ Yes (*Enclose the biological study*) ☐ No

Note: A biological assessment or study may be required to evaluate potential project impacts on biological resources.

F. Has a hydrological study been completed for the project or project site?

☐ Yes (*Enclose the hydrological study*) ☑ No

Note: A hydrological study or other information on site hydraulics (e.g., flows, channel characteristics, and/or flood recurrence intervals) may be required to evaluate potential project impacts on hydrology.

12. MEASURES TO PROTECT FISH, WILDIFE, AND PLANT RESOURCES

A. Describe the techniques that will be used to prevent sediment from entering watercourses during and after construction.

See Attachment A, Notification Continuation, for a description of measures to ensure control of erosion and sedimentation resulting from the project.

☑ *Continued on additional page(s)*

B. Describe project avoidance and/or minimization measures to protect fish, wildlife, and plant resources.

See the Draft EIS/EIR and Biological Assessment (see CD provided as Attachment B) for discussion of measures to protect fish, wildlife, and plant resources.

☑ *Continued on additional page(s)*

C. Describe any project mitigation and/or compensation measures to protect fish, wildlife, and plant resources.

The Draft EIS/EIR (see CD provided as Attachment B) prepared for the project includes a number of mitigation measures to avoid, minimize, and compensate for potential impacts on special-status fish, wildlife and plant resources .

Because impacts on areas of CDFW jurisdiction would be limited to 0.89 acres of grassland on the waterside slope of the San Joaquin River east levee and no loss of CDFW jurisdictional riparian vegetation or other important fish or wildlife habitat would occur, no compensatory mitigation for this impact is proposed.

☑ *Continued on additional page(s)*

13. PERMITS

List any local, state, and federal permits required for the project and check the corresponding box(es). Enclose a copy of each permit that has been issued.

A. See Table 3 in Attachment A for a complete list of permits applied for. ☑ Applied ☐ Issued

B. ______ ☑ Applied ☐ Issued

C. ______ ☑ Applied ☐ Issued

D. Unknown whether ☐ local, ☐ state, or ☐ federal permit is needed for the project. (*Check each box that applies*)

☑ *Continued on additional page(s)*

14. ENVIRONMENTAL REVIEW

A. Has a draft or final document been prepared for the project pursuant to the California Environmental Quality Act (CEQA), National Environmental Protection Act (NEPA), California Endangered Species Act (CESA) and/or federal Endangered Species Act (ESA)?

☑ Yes *(Check the box for each CEQA, NEPA, CESA, and ESA document that has been prepared and enclose a copy of each)*

☐ No *(Check the box for each CEQA, NEPA, CESA, and ESA document listed below that will be or is being prepared)*

☐ Notice of Exemption	☐ Mitigated Negative Declaration	☑ NEPA document (*type*): DEIS
☐ Initial Study	☑ Environmental Impact Report	☐ CESA document (*type*):
☐ Negative Declaration	☐ Notice of Determination *(Enclose)*	☑ ESA document (*type*): Biological Assessment
☐ THP/ NTMP	☐ Mitigation, Monitoring, Reporting Plan	

B. State Clearinghouse Number (*if applicable*)	2010042073
C. Has a CEQA lead agency been determined?	☑ Yes (*Complete boxes D, E, and F*) ☐ No (*Skip to box 14.G*)
D. CEQA Lead Agency	RD 17
E. Contact Person	Christopher Neudeck
F. Telephone Number	209-946-0268

G. If the project described in this notification is part of a larger project or plan, briefly describe that larger project or plan.

RD 17 is currently undertaking a program of levee improvements at various locations along the San Joaquin River east levees. The overall purpose of the RD 17 Phase 3 Levee Seepage Area Project (the RD 17 LSAP) is to increase the levee system's resistance to underseepage and through seepage. The RD 17 LSAP consists of three phases. RD 17 has completed the Phase 1 and Phase 2 projects. The project described in this notification, Phase 3 of the RD 17 LSAP, is the last of the three project phases.

☐ *Continued on additional page(s)*

H. Has an environmental filing fee (Fish and Game Code section 711.4) been paid?

☐ Yes (*Enclose proof of payment*) ☑ No (*Briefly explain below the reason a filing fee has not been paid*)

A filing fee has not yet been paid because the Final EIR is still in preparation. Certification of the Final EIR is anticipated for January or February 2015. A copy of the proof of payment of the fee will be sent to CDFW upon certification and payment of the filing fee.

Note: If a filing fee is required, the Department may not finalize a Lake or Streambed Alteration Agreement until the filing fee is paid.

15. SITE INSPECTION

Check one box only.

☐ In the event the Department determines that a site inspection is necessary, I hereby authorize a Department representative to enter the property where the project described in this notification will take place at any reasonable time, and hereby certify that I am authorized to grant the Department such entry.

☑ I request the Department to first contact (*insert name*) Christopher Neudeck at (*insert telephone number*) 209-946-0268 to schedule a date and time to enter the property where the project described in this notification will take place. I understand that this may delay the Department's determination as to whether a Lake or Streambed Alteration Agreement is required and/or the Department's issuance of a draft agreement pursuant to this notification.

16. DIGITAL FORMAT

Is any of the information included as part of the notification available in digital format (i.e., CD, DVD, etc.)?

☑ Yes (Please enclose the information via digital media with the completed notification form)

☐ No

17. SIGNATURE

I hereby certify that to the best of my knowledge the information in this notification is true and correct and that I am authorized to sign this notification as, or on behalf of, the applicant. I understand that if any information in this notification is found to be untrue or incorrect, the Department may suspend processing this notification or suspend or revoke any draft or final Lake or Streambed Alteration Agreement issued pursuant to this notification. I understand also that if any information in this notification is found to be untrue or incorrect and the project described in this notification has already begun, I and/or the applicant may be subject to civil or criminal prosecution. I understand that this notification applies only to the project(s) described herein and that I and/or the applicant may be subject to civil or criminal prosecution for undertaking any project not described herein unless the Department has been separately notified of that project in accordance with Fish and Game Code section 1602 or 1611.

Christopher H. Neudeck — 11/20/17

Signature of Applicant or Applicant's Authorized Representative — Date

Christopher Neudeck

Print Name

BOX 3: PROPERTY OWNER

Table 1 provides a list of owners of properties that adjoin the project area and their addresses.

Table 1
Property Owners Adjoining the Reclamation District 17 Phase 3 Levee Seepage Area Project

Property Owner	Address
Calcagno Family	4533 Mosher Drive, Stockton CA 95212
Rodgers Family	7569 South Roberts Road, Stockton, CA 95206
Luckey Family	1481 Manila Road Lathrop, CA 95330
Silveira Family	499 Embarcadero, Oakland, CA 94606
Queirolo Family	18880 Queirolo Road, Lathrop, CA 95330
Queirolo Family	18424 Queirolo Road, Lathrop, CA 95330
Machado Family	24916 S. Manteca Road, Manteca, CA 95336
Pegi Barker	1112 N. Main Street, Manteca, CA 95336-3208
Giacomo Longo	21111 S. Airport Way, Manteca, CA 95337-8805
Edward Fonseca	P.O. Box 4010, Manteca, CA 95337-0001
Jose Pena	21161 S. Airport Way, Manteca, CA 95337-8805
San Joaquin County	44 N. San Joaquin Street, Stockton, CA 95202
City of Lathrop	390 Towne Center Drive, Lathrop, CA 95330
Richland Planned Communities, Inc.	4100 Newport Place, Suite 800, Newport Beach, CA 92660
Reclamation District 17	P.O. Box 1461, Stockton, CA 95201
Califia, LLC	2999 Oak Road #400, Walnut Creek, CA 94597
UPRR	1400 Douglas Street, Omaha, NE 68179
HCW Lathrop Investors, LLC	4100 Newport Place, Suite 800, Newport Beach, CA 92660
Beck Properties, Inc.	3114 W Hammer Lane, Stockton, CA 95209
Baird Lands, Inc.	1851 Argonne Drive, Walnut Creek, CA 94598
Rosi Cerri Foundation	P.O. Box 1607, Stockton, CA 95201-1607
Terra Ranch, LLC	5151 Almondwood Road, Manteca, CA 95337-8868
TCN Properties, LP	PO Box 317 Lathrop, CA 95330
Oakwood LT Ventures II, LLC	5000 Executive Parkway #530, San Ramon, CA 94583
Oakwood Lake Water District, c/o Doug Coty, Esq. Bold, Polisner, Maddow, Nelson & Judson	500 Ygnacio Valley Road, Suite 325, Walnut Creek, CA 94596
George Perry & Sons	P.O. Box 2588, Manteca, CA 95336

BOX 10: PROJECT DESCRIPTION

RD 17 is responsible for levee operation and maintenance along the east side of the San Joaquin River, the south side of French Camp Slough, the north side of Walthall Slough, and a dryland levee in an area ranging from the City of Stockton south to the City of Manteca (Exhibit 1, at end of this attachment). RD 17 is currently undertaking a program of levee improvements at various locations along the San Joaquin River east levee. The overall purpose of the RD 17 Levee Seepage Area Project (the RD 17 LSAP) is to increase the levee system's resistance to underseepage and through seepage. The RD 17 LSAP consists of three phases (Phases 1-3). RD 17 has completed the Phase 1 and Phase 2 Projects, and the currently proposed Phase 3 of the RD 17 LSAP (the Phase 3 Project) is the last of the three project phases.

The Phase 3 Project would address under seepage and/or through seepage concerns and repair and/or remediate levee geometry to USACE design standards along approximately 5.2 miles of the RD 17 levee system, including portions of the San Joaquin River east levee and portions of the levee along the northerly bank of Walthall Slough (Exhibit 2). Flood risk reduction improvements along the dryland levee portion of the RD 17 LSAP area are not planned as part of the Phase 3 Project; therefore RD 17 is not seeking authorization for this area at this time.

Levee Improvement Components

Levee improvements would consist primarily of in-place repair/remediation, but would also include a single setback levee at Element IVc. The Phase 3 Project's landside levee improvements include a combination of constructing seepage berms, installing chimney drains and cutoff walls, raising the landside grade, and constructing a setback levee with seepage berm and an underlying cutoff wall along 19 elements of the RD 17 levee system. These levee improvement components, as well as additional project components, such as levee geometry corrections and stormwater management, are summarized in Table 2 and described in more detail below.

Table 2
Summary of Major Activities Proposed for each Element of the Reclamation District 17 Phase 3 Levee Seepage Area Project

Element	Type of Remediation	Proposed Activities
Ia	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width, and install a 590-foot-long seepage berm (minimum 65 feet wide) with chimney drain to meet required exit gradients.
Ib	under seepage and through seepage	Fill existing depression to 300 feet from toe of existing levee; place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width; and install a 125-foot-long seepage berm (minimum 60 feet wide) with chimney drain on top of fill to meet required exit gradients.
Ie, IIIb, IVa, and VIIb	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and construct seepage berms with lengths of 655 feet (Ie), 720 feet (IIIb), 525 feet (IVa), and 385 feet (VIIb), and chimney drains to meet required exit gradients. Minimum seepage berm widths would vary (65–105 feet) depending on the element. For Element Ie, construct v-ditch from seepage berm to existing swale.
IIa and IIb	under seepage and through seepage	Install cutoff wall with a length of 2,550 feet to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.
IVc	under seepage and through seepage	Construct 1,240-foot-long setback levee with seepage berm and cutoff wall to meet required exit gradients. Seepage berm would be a minimum of 65 feet wide. Install riprap on waterside of existing levee where it would intersect setback levee. After setback levee is completed, remove 400 linear feet of the existing levee on downstream side of oxbow. Construct fish release swale in setback area to drain to river through downstream opening in remnant levee.

Table 2 Summary of Major Activities Proposed for each Element of the Reclamation District 17 Phase 3 Levee Seepage Area Project		
Element	**Type of Remediation**	**Proposed Activities**
Va and VIa.1	under seepage and through seepage	Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and install cutoff walls with a length of 9,520 feet to meet required exit gradients. Depth of cutoff walls would vary from 60–85 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls.
IIIa	through seepage	Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths and install chimney drain in existing 4,680-feet-long seepage berm to meet required exit gradients.
VIa.4	under seepage and through seepage	Install cutoff wall with length of 70 feet to meet required exit gradients. Depth of cutoff wall would vary from 90–100 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.
VIb, VIc, VId, and VIe	under seepage and through seepage	Install cutoff wall with length of 3,720 feet (VIbcde) to meet required exit gradients. Depth of cutoff wall would vary from 70–80 feet. Cutoff wall in levee prism would involve DSM construction, as well as, degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown.
VIIe	under seepage and through seepage	Install DSM cutoff wall with a length of 1,900 feet to meet required exit gradients. Depth of cutoff wall would vary from 60–120 feet. Deep slurry mixing method would be used. Plaee levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Project.
VIIg	under seepage and througb seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width, and construct seepage berm with chimney drain with length 395 feet to meet required exit gradients. Minimum seepage berm width would be 65 feet.
Source: Data provided by Kjeldsen, Sinnock & Neudeck, Inc. in 2014		

SEEPAGE BERMS

Reducing the risk of levee failure caused by both under seepage and through seepage may be addressed by constructing a drained seepage berm. A drained berm collects and conveys seepage, thereby reducing the flood risk associated with a high-water event. A drained seepage berm is built on the landside, adjacent to a levee, and consists of layers of sand filter material, drain rock, geosynthetic filter fabric, and a seepage berm soil fill.

The drained seepage berm reduces flood risk during sustained high-river-stage events by collecting seepage that otherwise would flow onto the landside ground surface at and beyond the landside toe of the levee slope, and then by conveying the seepage away from the levee. The layer of sand filter material placed on the natural ground surface serves to reduce the transmission of fine-grained soils into the drain rock, thereby maintaining the drain rock's ability to be a conductive soil unit that conveys collected seepage. Similarly, the filter fabric that separates the drain rock from the seepage berm fill soil prevents finer soils from migrating into the drain rock unit. The weight of the berm acts as ballast, reducing the potential for detrimental boils and piping.

The design width and height of a seepage berm are dependent on the relative permeability of the underlying soil layers and the amount of pressure head pushing water under the levee and through the near-surface soils during sustained high-river-stage events. The higher the water pressure head acting on the near-surface soils on the landside of the levee prism, the wider and/or deeper the seepage berm must be to reduce flood risk.

For the Phase 3 Project, drained seepage berm widths of 65–125 feet would be adequate to meet the design criteria in most cases. However, these types of berms may extend up to 300–400 feet inland of the landside toe of the levee. Seepage berms are typically constructed using select materials excavated from borrow sites or obtained from commercial sources. In the case of the Phase 3 Project, soil material would be purchased from commercial sources. A compacted-surface patrol road would be constructed near the outside edge of the seepage berm (see "Additional Project Components" below).

In urban areas, some seepage berms would also include a toe drain system (Element VIIg) or a V-ditch (Element Ie) to safely collect and discharge the seepage water into an urban storm drainage system. A toe drain pipe is a below-grade, perforated pipe surrounded by a layer of drain rock. The toe drain pipe is a mechanism to safely collect and convey seepage water away from the levee and seepage berm. If the toe drain pipe were unable to convey the seepage water, it would exit the seepage berm through the drain rock at the face of the berm similar to a nonurban berm.

Chimney Drains

Chimney drains are drainage systems that collect seepage waters that are flowing through the aboveground portion of the levee structure. These drains are used to collect and convey through seepage. A chimney drain consists of a 1- to 3-foot-thick layer of sand and drain rock. Filter fabric is placed between the soil and rock layer to avoid migration of the soil into the rock, which could clog the rock layer and reduce its ability to carry seepage flows. The chimney drain is placed directly on the landside slope of the levee and tied into an existing or new seepage berm at the landside base of the levee; the height of the proposed chimney drains would vary from 5 to 20 feet above the elevation of the landside levee toe. The chimney drain conveys the through seepage flows to a seepage berm, which is located at the landside base of the levee.

Installing a chimney drain in an existing seepage berm would involve adding the through seepage material on top of the existing seepage berm, and tying this material into the existing seepage berm material by excavating off the seepage berm fill material and physically tying the two drainage rock layers together. Where the remediation involves construction of a new seepage berm with a chimney drain, the chimney drain would be installed during construction of the new seepage berm.

Cutoff Walls

In selected locations of the Phase 3 Project, cutoff walls are being considered for placement within the levee prism (parallel to the river). Cutoff walls use specialized earthen materials (often bentonite clay, which has low permeability). Cutoff walls would be constructed vertically through the levee prism, extending into or through deeper foundational soils that have low-permeability soil (a layer through which seepage does not flow readily). Cutoff walls would thus significantly reduce the potential for under and through seepage flow during high-river-stage events. Two methods for installing cutoff walls would be used along portions of the RD 17 levees: the open-cut method and the deep slurry mixing method.

The open-cut method is used to install shallow cutoff walls to a maximum depth of approximately 80 feet. This method involves excavating material in an open trench (the trench is filled with a bentonite slurry to maintain the side slopes of the excavation) and then replacing it with the select materials, typically a bentonite or cement-bentonite slurry. In this case, the top one-third to one-half of the levee height is "degraded," meaning that it is excavated to ensure that any weakness in the narrow upper portion of the levee would not fail during construction.

For the deep slurry mixing method, specialized equipment is used to excavate deep into the subsurface, allowing the cutoff walls to reach depths of up to 120 feet. The deep slurry mixing method involves mixing a soil-cement-bentonite mixture and replacing material as it is excavated during construction of the cutoff wall, thereby reducing the risk of failure during construction. This method does not require levee crown degradation.

Cutoff walls would be extended approximately 300 feet beyond the element boundary to provide the required overlap when seepage berms have been or are being installed along the landside of adjacent levee elements. Levee slopes where cutoff walls would be installed would also be modified as needed to achieve the required 3:1 slope.

Setback Levee with Seepage Berm and Underlying Cutoff Wall

A setback levee is a levee constructed some distance behind an existing levee. The setback is tied into the existing levee at the upstream and downstream ends of the setback area. All or a portion of the existing levee between these two points is then typically removed to allow high-water events to inundate the newly expanded floodway. Soil from the old levee may be used as a source of fill for other flood protection improvement projects, depending on the quality and quantity of material generated from demolition of the old levee. In some cases, it may be necessary to continue maintaining the existing levee after a setback levee is constructed (e.g., to protect existing development in the setback area) and to use the newly constructed levee as a backup levee.

In the Phase 3 Project area, soil materials below a setback levee are anticipated to have properties similar to those of materials below the existing levees. Therefore, a setback levee would have no seepage-related benefit in the RD 17 area relative to other seepage control methods, and like the existing levees, a setback levee would require either a cutoff wall or seepage berm to sufficiently reduce the potential negative impacts of under seepage flows. Nonetheless, implementing a setback levee could provide some additional capacity in the river for floodwaters, and would also have the potential to provide environmental habitat in the area between the new and old levee locations. In the Phase 3 Project area, any newly expanded floodway created by a proposed setback levee would be designed to drain surface water after a high-water event to prevent fish stranding. A setback levee with a seepage berm and an underlying cutoff wall is proposed for construction in Element IVc.

Raised Landside Grade

Directly adjacent to the landside toe of the levee in Element Ib, there is an approximately 5-foot-deep depression that was used as a borrow site to facilitate construction of the Howard Road Bridge. RD 17 will place fill within this depression to raise the landside grade.

Additional Project Components

The following additional activities would occur as part of the Phase 3 Project:

- **Levee geometry corrections:** Many Phase 3 Project elements do not currently meet requirements for levee geometry (i.e., slopes, crown width). To correct levee geometry, levee fill material would be placed along the landside of existing levee slopes where needed to provide the minimum 3:1 slope and a minimum 20-foot-wide levee crown.

- **O&M access and utility corridors:** A 20-foot-wide permanent O&M access corridor would be established adjacent to the landside toe of seepage berms and levees (if not already present for levees). Any relocated power poles and other utility infrastructure would be located outside this easement.

- **Temporary construction easements:** Where needed, a 20-foot-wide temporary construction easement and construction turnaround area (up to 80 feet in diameter) would be included adjacent to the inland side of the permanent O&M access corridor, to provide access to the site during construction. These features would be removed and the sites returned to preproject conditions at the end of construction.

- **Stormwater management:** Drainage swales would be constructed around the outside of levee improvements, where needed, and other stormwater best management practices (BMPs) would be implemented to manage stormwater runoff during and after construction.

- **Right-of-way acquisition:** Lands within the Phase 3 Project footprint would be acquired as needed to accommodate levee improvements (e.g., seepage berms, setback levees) and establish the minimum 20-foot-wide O&M access corridor at the landside toes of all the improved levees, to prevent encroachment into the levee or seepage berm improvements. Privately owned lands would be acquired in fee but may be taken as easements if needed. Where the RD 17 project footprint would overlie land owned and managed by other agencies (i.e., the City of Lathrop, San Joaquin County, Union Pacific Railroad [UPRR]), either the land would have to be acquired in fee or easements would have to be obtained and secured. Real property acquisition and any relocation services (if needed—no relocations are anticipated) would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 USC 4601 et seq.) and implementing regulation, Title 49 of CFR Part 24, and California Government Code Section 7267 et seq.

- **Haul roads:** An estimated 700,000 cubic yards of imported material (i.e., soil, aggregate, and concrete) would be required to construct these levee improvements. These materials would be hauled to the work sites from commercial sources up to 11 miles away. Personnel, equipment, and imported materials would be transported to the Phase 3 Project area using various surface roads that connect with Interstate 5 or State Route 120. The primary corridors where construction activity would take place would include public roadways, on and within 300 feet of the levees; existing unpaved roads used for access to work areas; and levee patrol roads atop the levee crown.

- **Landside vegetation removal:** Landside vegetation within the footprint of the proposed levee improvements, including maintenance roadway corridors and temporary access easements, would be cleared to prepare for levee improvement work under the Phase 3 Project. These areas would be hydroseeded with a seed mix compliant with USACE levee vegetation criteria after construction activities are completed, and temporary construction easements would be returned to pre-project conditions. The proposed action would not involve performing any work on the waterside of the levee; therefore, no waterside vegetation would be removed.

- **Encroachment management:** Several features are within the Phase 3 Project footprint: power poles, overhead and underground utilities, and a variety of agriculture-related items (e.g., irrigation and drainage infrastructure, fences). Utility infrastructure (power poles) would be relocated as needed to accommodate the levee improvements, and any pipelines or other underground utility crossings would be replaced as needed. Other encroachments in the Phase 3 Project area would be removed or relocated as required to meet the criteria of USACE, the CVFPB, and FEMA.

BOX 11: PROJECT IMPACTS

CDFW JURISDICTION WITHIN THE PROJECT AREA

AECOM wetland ecologists conducted wetland delineations within the RD 17 Phase 3 Project area on November 3, 2009, December 21, 2009, July 1, 2010, and again on February 13, 2014. The multiple delineations were required due to revisions and changes in the footprint of the project to ensure the project design meets current USACE standards. The USACE issued Preliminary Jurisdictional Determinations for the project on November 10, 2009, April 9, 2010, October 21, 2010, and again on April 7, 2014.

The Wetland Delineation Report and observations made during associated field surveys were used to determine CDFW jurisdiction. The only portion of the project site determined to be under CDFW jurisdiction is the San Joaquin River.

Additional aquatic features and vegetation that are present on the land side of the San Joaquin River east levee were determined not to qualify for CDFW jurisdiction, including a small area of freshwater marsh in Element Ib, several short ditch segments in Elements Ie, IVa, and Va–VIa.1, and a few scattered isolated trees and small clumps of trees in upland areas between the levee and adjacent agricultural fields and developed areas. The freshwater marsh is a small piece of a larger marsh (located outside the project area) between West Howard Road and an agricultural field to the south that is only connected to the San Joaquin River via pumping to and from irrigation and drainage ditches. The ditches in the project area function primarily as drainage ditches for the adjacent agricultural fields and are supplied with water from the San Joaquin River via runoff from irrigation of the adjacent agricultural fields. These isolated areas of wetland and upland vegetation on the land side of the levee provide small isolated patches of marginal quality wildlife habitat, but they are not associated with a riparian zone of the San Joaquin River or other feature under CDFW jurisdiction.

EFFECTS ON CDFW JURISDICTION

Exhibits 3 through 16 depict the project area associated with each element of the proposed project. Because CDFW jurisdiction within the project area is limited to the San Joaquin River, the only portion of the proposed project that would affect habitat under CDFW jurisdiction is in Element IVc (Exhibit 8). A setback levee is proposed at this bend in the river, rather than improving the existing levee. The setback levee would span the San Joaquin River east levee sections upstream and downstream of the river bend, along the eastern boundary of the project area. Most of the existing levee would remain, except for a 400-foot-long portion due west of the downstream end of the setback levee, which would be degraded. Degrading this portion of the levee would facilitate drainage of a swale that would be constructed in the area within the river bend, between the existing levee and the new setback levee (which would be considered the setback area). The swale would be constructed to reduce the potential for fish stranding or entrapment in the setback area when river flows overtop the levee and inundate the setback area. In addition, riprap would be placed along the waterside slope of the existing levee in three locations to reduce bank erosion during high flow periods, including the area where the river would likely overtop the existing levee in high flows and on each side of levee segment that would be degraded.

Degrading the levee segment and placing riprap would affect approximately 0.25 acre and 0.64 acre, respectively, on the waterside of the San Joaquin River east levee (Table 2). These effects would be permanent but are not anticipated to require removal of any riparian vegetation. The upstream area where riprap would be placed does not support any woody vegetation. The downstream area where the levee segment would be degraded and riprap would be placed is adjacent to a small patch of riparian vegetation on a bench above the ordinary high water mark. However, project activities would occur on the maintained levee slope above the bench, which does not support any woody vegetation. Therefore, although impact to these areas would be permanent, they would not result in loss of important habitat for fish or wildlife.

Table 3
Acreages of CDFW Jurisdiction that would be Permanently Affected by the Reclamation District 17 Phase 3 Levee Seepage Area Project

Proposed Levee Improvement	Habitat Type	Action	Acreage	Linear Feet
setback levee	annual grassland on maintained levee slope	Cut – levee degradation	0.25	400
		Fill – riprap placement	0.64	700
TOTAL PERMANENT EFFECTS TO CDFW JURISDICTION			**0.89**	**850[1]**

Note: [1] Levee degradation and riprap placement overlap for 250 linear feet.
Source: CAD from McKay and Somps Civil Engineers, Inc., adapted by AECOM 2014

EFFECTS ON SPECIAL STATUS SPECIES

Potential for the proposed project to affect special-status species was evaluated in the Draft Environmental Impact Statement/Environmental Impact Report (DEIS/DEIR) that was prepared and circulated for public comment and review in September 2011 (SCH # 2010042073). The public comment period has closed and RD 17 is in the process of completing the Final EIR for the project. It is anticipated that RD 17 will adopt the EIR in November 2014. In addition, a Biological Assessment has been completed to facilitate consultation under Section 7 of the Endangered Species Act between USACE Construction Operations (ConOps) Division and the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). USACE ConOps Division will initiate consultation with the USFWS for federally listed terrestrial and freshwater fish species that may be affected, and with the NMFS for federally listed anadromous fish species and essential fish habitat that may be affected by the proposed project. A copy of the public DEIS/DEIR and the Biological Assessment are included on the CD provided as Attachment C.

The DEIS/DEIR concludes that implementation of the proposed project could result in adverse effects to a number of special-status fish, plant, and terrestrial wildlife species. Federally and/or state-listed species that are known to occur or have the potential to occur in the Phase 3 Project area include: Delta button-celery (*Eryngium racemosum*), Mason's lilaeopsis (*Lilaeopsis masonii*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), Swainson's hawk (*Buteo swainsoni*), riparian brush rabbit (*Sylvilagus bachmani riparius*), delta smelt (*Hypomesus transpacificus*), longfin smelt *(Spirinchus thaleichthy)*,Central Valley steelhead distinct population segment (DPS) (*Oncorhyncus mykiss*), Sacramento River winter-run Chinook salmon ESU (*O. tshawytscha*), Central Valley spring-run Chinook salmon ESU (*O. tshawytscha*), and Southern DPS of North American green sturgeon (*Acipenser medirostris*). Central Valley fall-/late-fall-run Chinook salmon evolutionary significant unit (ESU) (*O. tshawytscha*) is not federally or state-listed but Essential Fish Habitat for this species occurs in the Phase 3 Project Area. Other federally and state-listed species such as vernal pool fairy shrimp (*Branchinecta lynchii*), vernal pool tadpole shrimp (*Lepidurus packardi*), California tiger salamander (*Ambystoma californiense*), giant garter snake (*Thamnophis gigas*), and California red-legged frog (*Rana draytonii*) are not likely to occur in the Phase 3 Project Area as no suitable habitat is present in the action area. Mitigation measures designed to avoid and reduce potential impacts on these species, and to compensate for unavoidable impacts, are identified in the DEIS/DEIR and would be implemented by RD17.

BOX 12: MEASURES TO PROTECT FISH, WILDLIFE, AND PLANT RESOURCES

Project designs have been iterative between the initial conceptual design and the 65% design stage currently available. The designs have been refined over time to include more specific information, but also to utilize smaller footprints and less disturbing engineering techniques, resulting in avoidance of adverse effects in some areas. In addition, the DEIR/DEIS analyzes project alternatives, including a maximum footprint alternative, which would have greater effects than the preferred alternative (proposed project). One major design change that reduces effects is the method for installation of the cutoff walls. Rather than conduct a traditional 1/3-levee degrade of the upper waterside and landside slopes of the levee to facilitate installation of the deep cutoff wall, RD 17 is proposing to degrade the levee through the crown road and within the middle portion of the levee prism, without any degrade of the waterside crown limit or waterside slope. This results in no disturbance of the waterside bank of the San Joaquin River to accommodate cutoff wall construction.

A number of BMPs would be implemented to minimize indirect impacts to the San Joaquin River, meet "maximum extent practicable" and "best conventional technology/best available technology" requirements, and to address compliance with water quality standards. A monitoring program shall be implemented during and after construction to ensure that the Phase 3 Project complies with all applicable standards and that the BMPs are effective. The project proponent will file a notice of intent with the Central Valley Regional Water Quality Control Board (RWQCB) to discharge stormwater associated with construction activity, and final design and construction specifications will require the implementation of standard erosion, siltation, and good housekeeping BMPs. In addition, construction contractors will be required to prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) and comply with the conditions of the National Pollutant Discharge Elimination System general stormwater permit for construction activity (Order No. 2009-0009-DWQ). The SWPPP would describe the construction activities to be conducted, BMPs that would be implemented to prevent discharges of contaminated stormwater into waterways, and inspection and monitoring activities that shall be conducted.

The SWPPP shall include the following:

- pollution prevention measures (erosion and sediment control measures and measures to control nonstormwater discharges and hazardous spills);
- demonstration of compliance with all applicable Central Valley RWQCB standards and other applicable water quality standards;
- demonstration of compliance with regional and local standards for erosion and sediment control;
- identification of responsible parties;
- checklists that document when maintenance inspections occurred, the results of the inspection, required corrective measures, and when corrective measures were implemented;
- detailed construction timelines; and
- a BMP monitoring and maintenance schedule.

BMPs shall include requirements to:

- conduct all work according to site-specific construction plans that identify areas for clearing, grading, and revegetation so that ground disturbance is minimized;

- install silt fences near riparian areas or existing drainages to control erosion and trap sediment and reseed cleared areas with native vegetation;
- stabilize disturbed soils before the onset of the winter rainfall season;
- stabilize and protect soil stockpiles from exposure to rain and potential erosion;
- conduct maintenance on a regular basis to confirm proper installation and function of BMPs, and during storm events conduct maintenance daily ; and
- immediately repair and replace BMPs that have failed (within 48 hours of the storm event) with sufficient devices and materials (e.g., silt fence, coir rolls, erosion blankets) provided throughout project construction to enable immediate corrective action for failed BMPs.

The SWPPP also shall specify appropriate hazardous materials handling, storage, and spill response practices to reduce the possibility of adverse impacts from use or accidental spills or releases of contaminants. Specific measures applicable to the Phase 3 Project include, but are not limited to, the following:

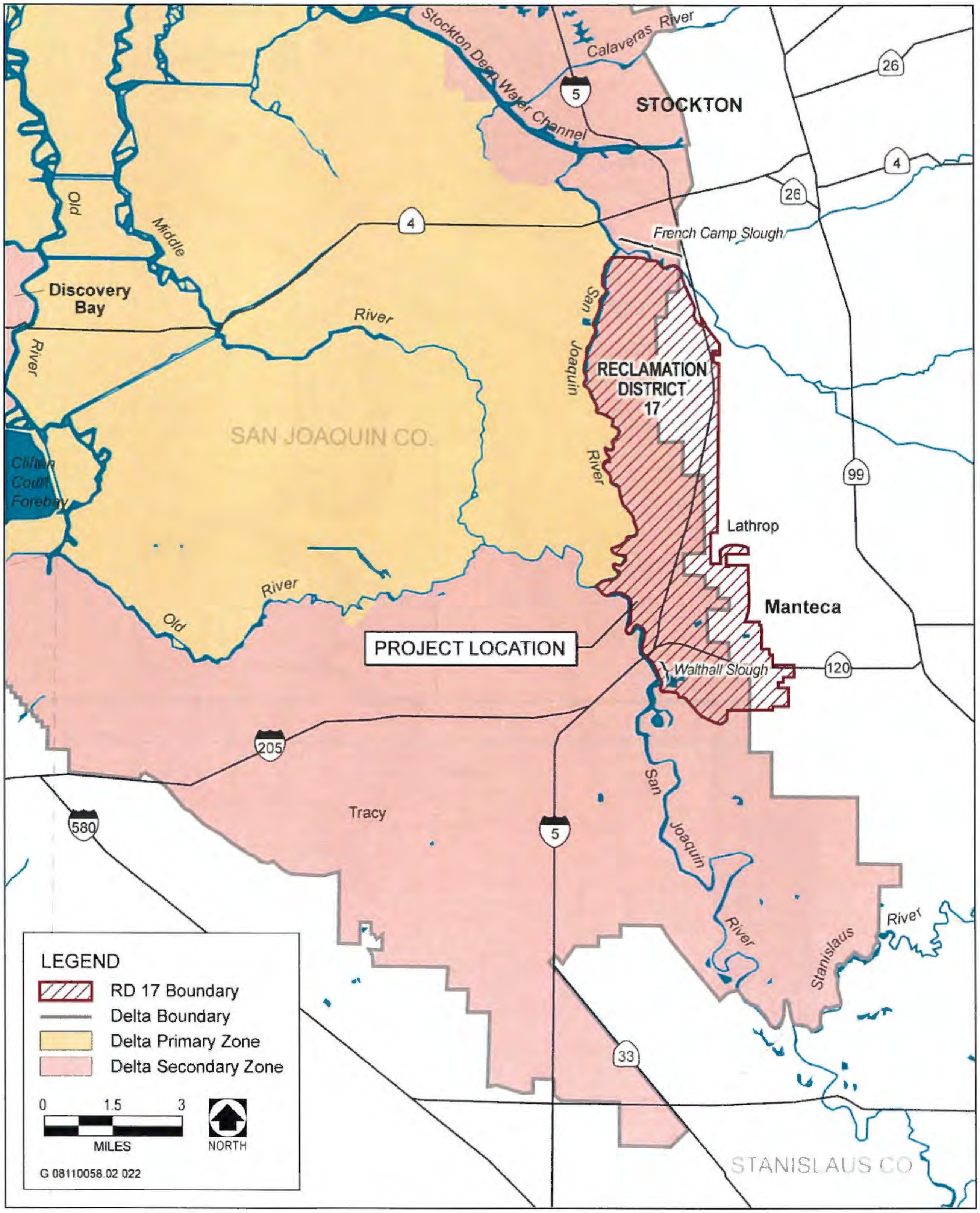
- develop and implement strict on-site handling rules to keep potentially contaminating construction and maintenance materials out of drainages and other waterways;
- conduct all refueling and servicing of equipment with absorbent material or drip pans underneath to contain spilled fuel, oil, and other fluids; and collect any fluid drained from machinery during servicing in leak-proof containers and deliver to an appropriate disposal or recycling facility;
- maintain controlled construction staging and fueling areas at least 100 feet away from channels or wetlands to minimize accidental spills and runoff of contaminants in stormwater;
- prevent substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses;
- maintain spill cleanup equipment in proper working condition. Clean up all spills immediately according to the spill prevention and response plan;
- develop a slurry spill contingency plan to respond to a potential for bentonite slurry spill and prevent slurry from entering watercourses; and
- immediately notify the California Department of Fish and Game and the Central Valley RWQCB of any spills and cleanup procedures.

BOX 13: PERMITS

Table 4 provides a complete list of additional state and federal permits and authorizations applicable to the proposed project and for which RD 17 has applied or will apply.

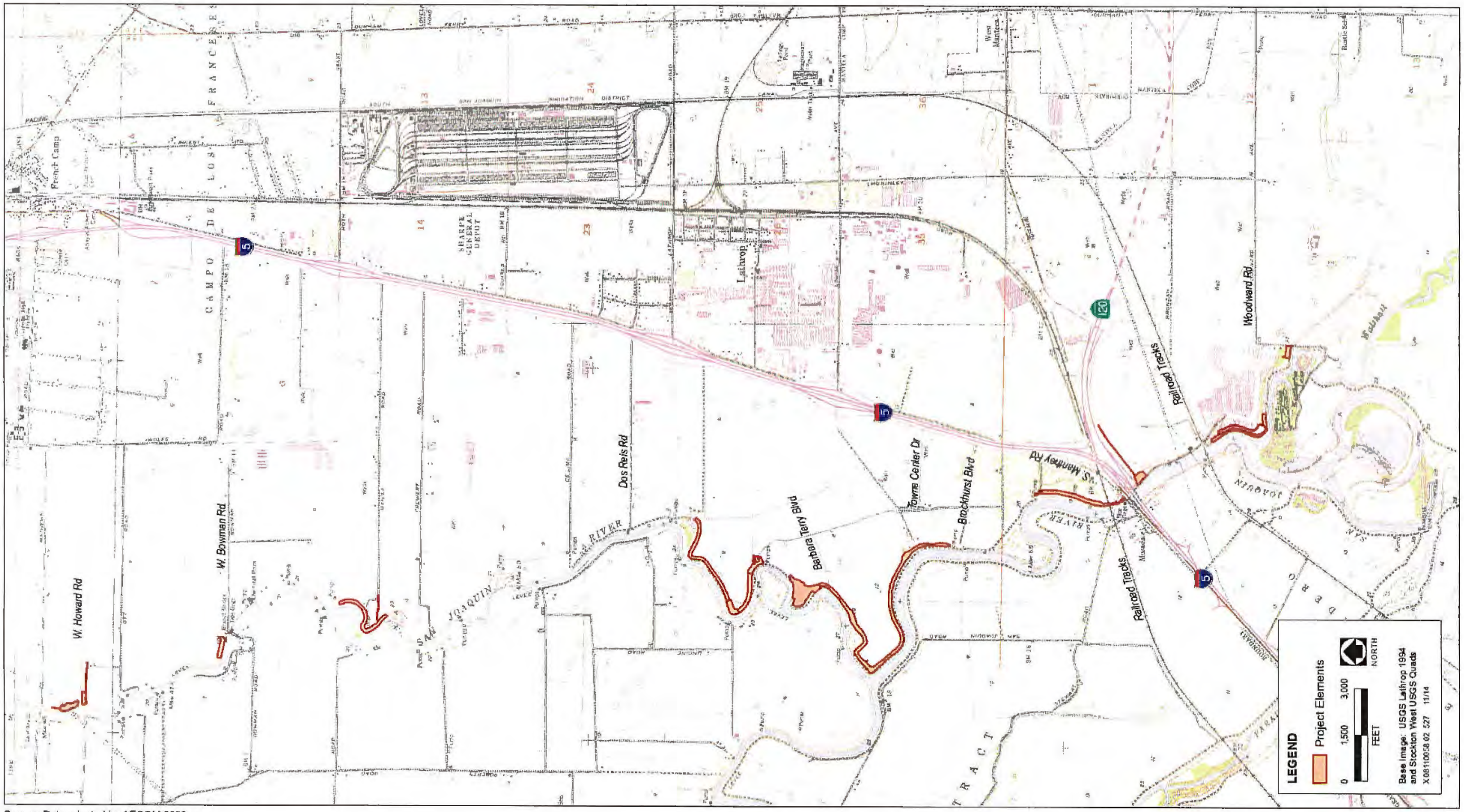
Table
Other Authorizations Applicable to the
Reclamation District 17 Phase 3 Levee Seepage Area Project

Agency	Permit/Authorization	Date Applied/Initiated
Central Valley Flood Protection Board	Encroachment Permit	
U.S. Army Corps of Engineers	Clean Water Act, Section 404 Permit	May 2014
U.S. Fish and Wildlife Service	Endangered Species Act, Section 7 consultation/biological opinion	
State Historic Preservation Officer	National Historic Preservation Act, Section 106 consultation and SHPO concurrence	
Regional Water Quality Control Board	Clean Water Act, Section 401 Certification	July 2014
	Clean Water Act, Section 402 NPDES Permit	



Source: Data adapted by AECOM 2009

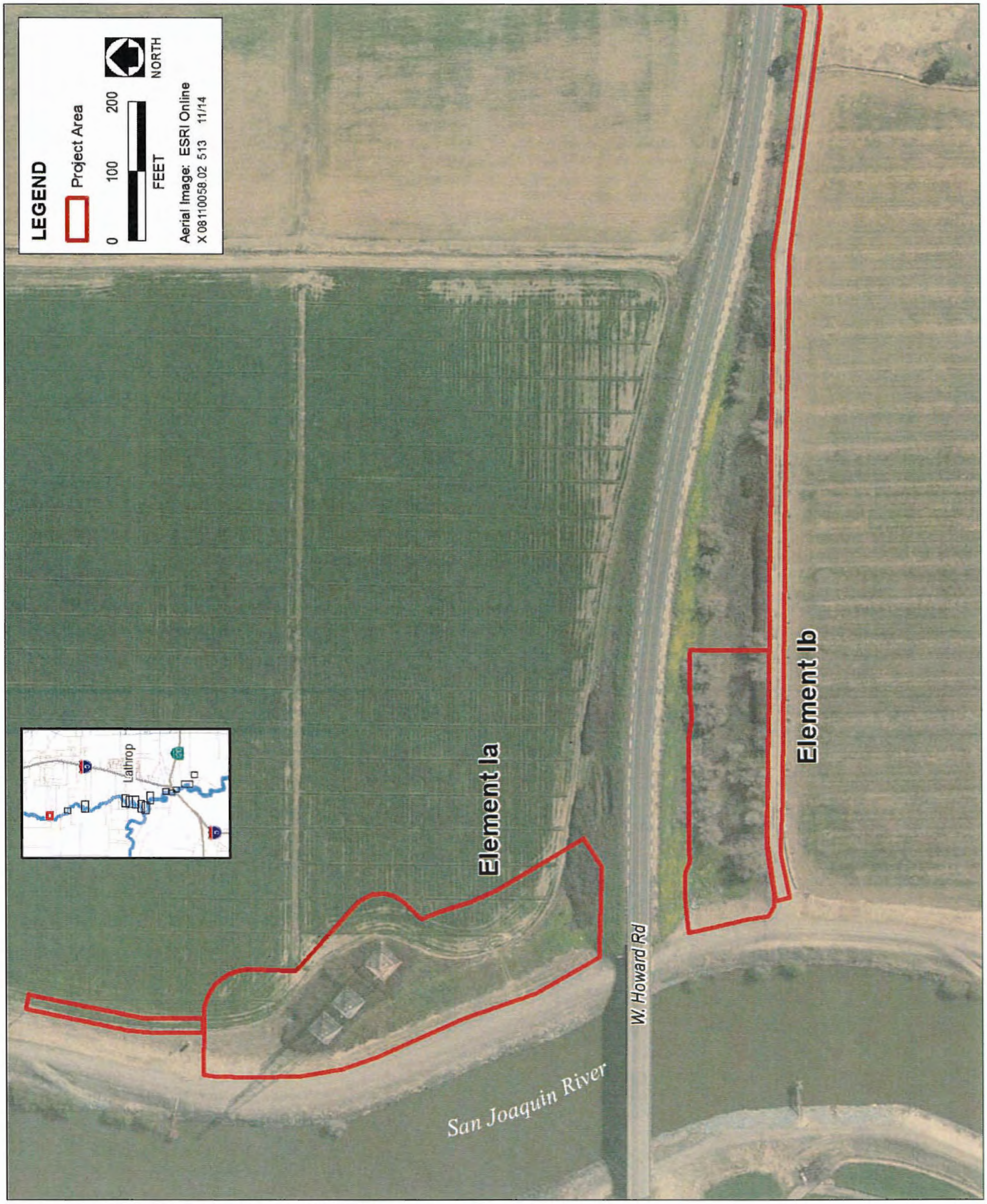
Exhibit 1 **Reclamation District 17 Vicinity Map**



Source: Data adapted by AECOM 2009

Exhibit 2

Project Site Map

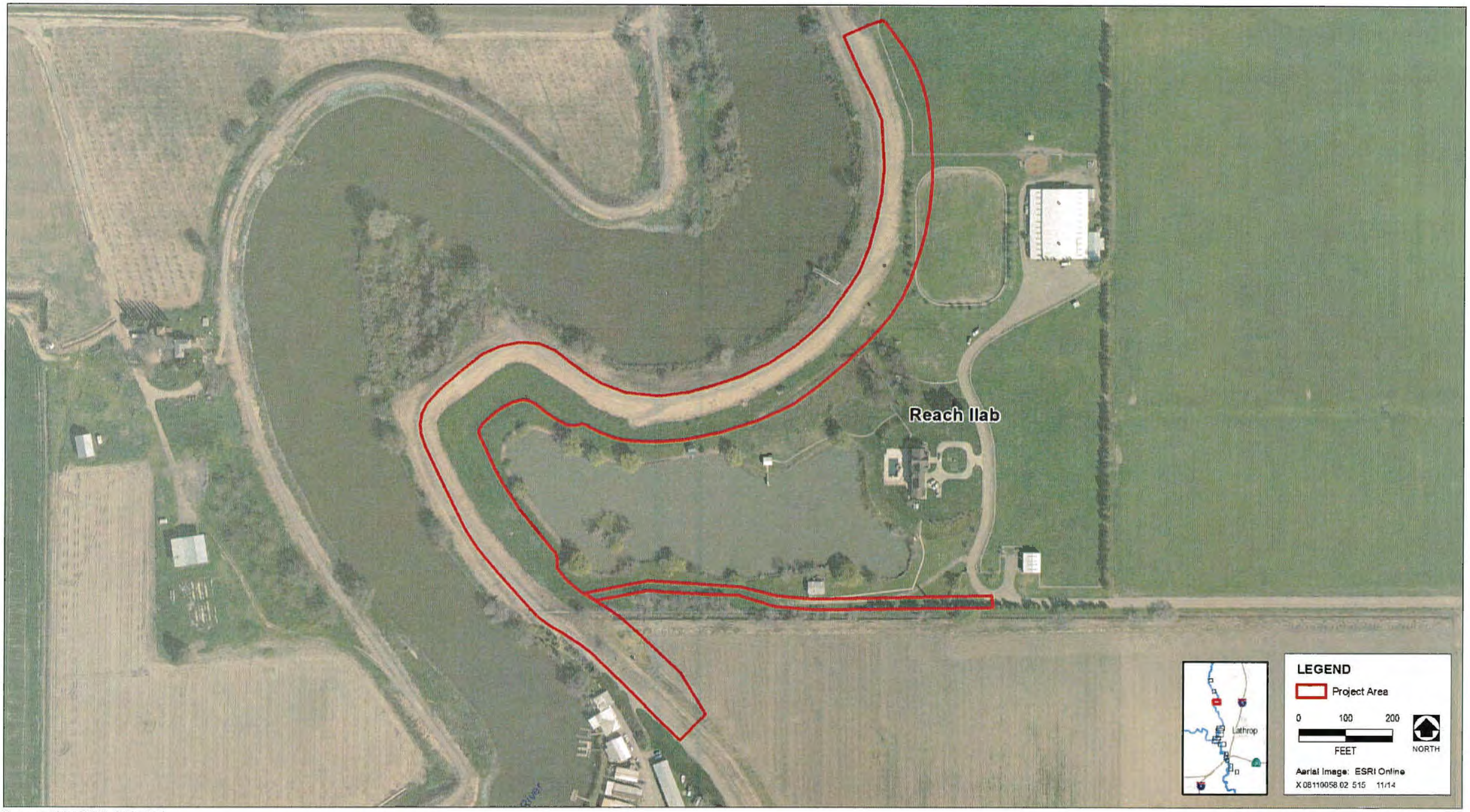


Source: Engeo 2008, EDAW 2008, AECOM 2009, 2010

Exhibit 3 **Effects to CDFW Jurisdiction – RD 17 LSAP Elements Ia and Ib**

Source: AECOM 2014

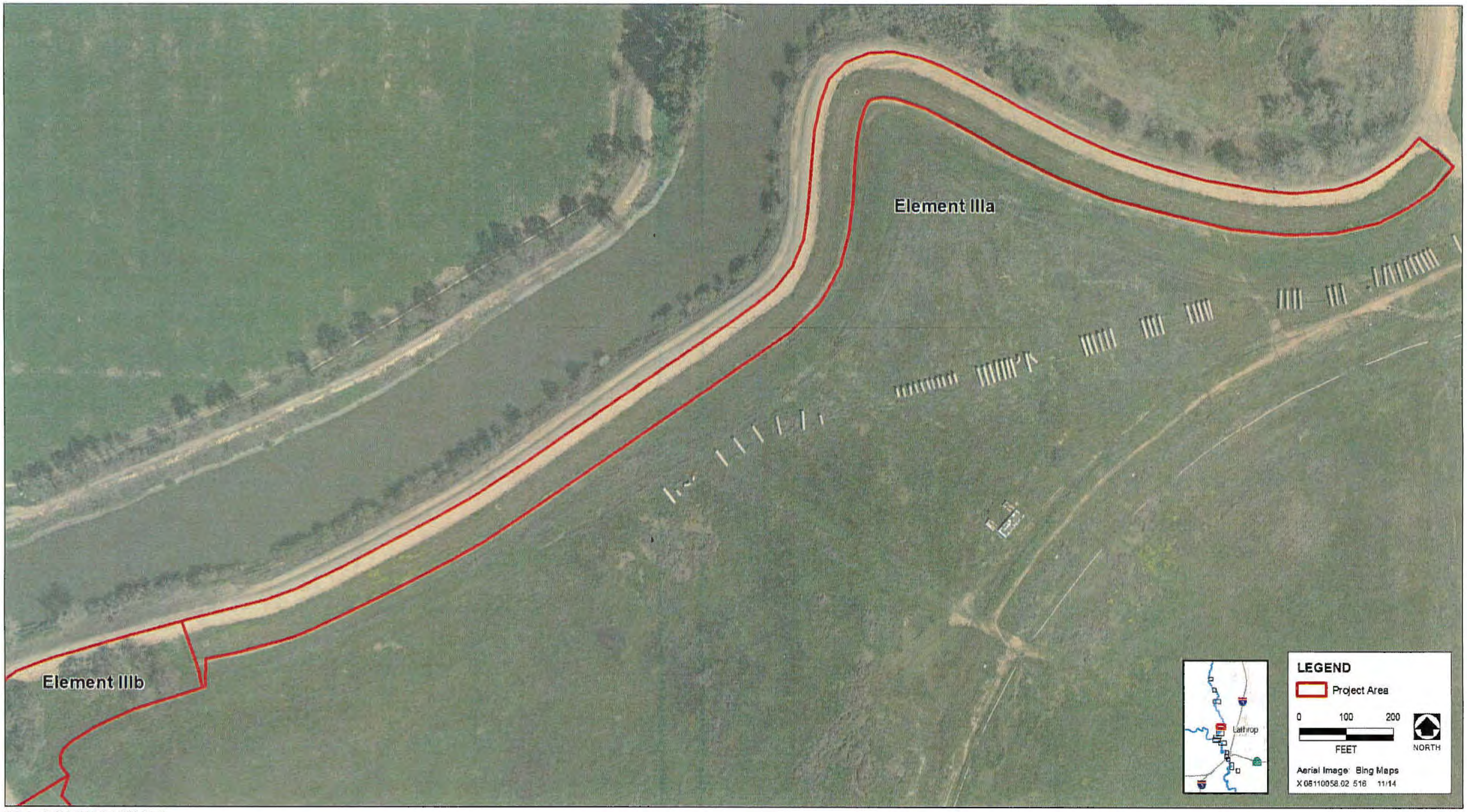
Exhibit 4 **Effects to CDFW Jurisdiction – RD 17 LSAP Element 1e**



Source: AECOM 2009, 2010, 2014

Exhibit 5

Effects to CDFW Jurisdiction – RD 17 LSAP Elements IIa and IIb



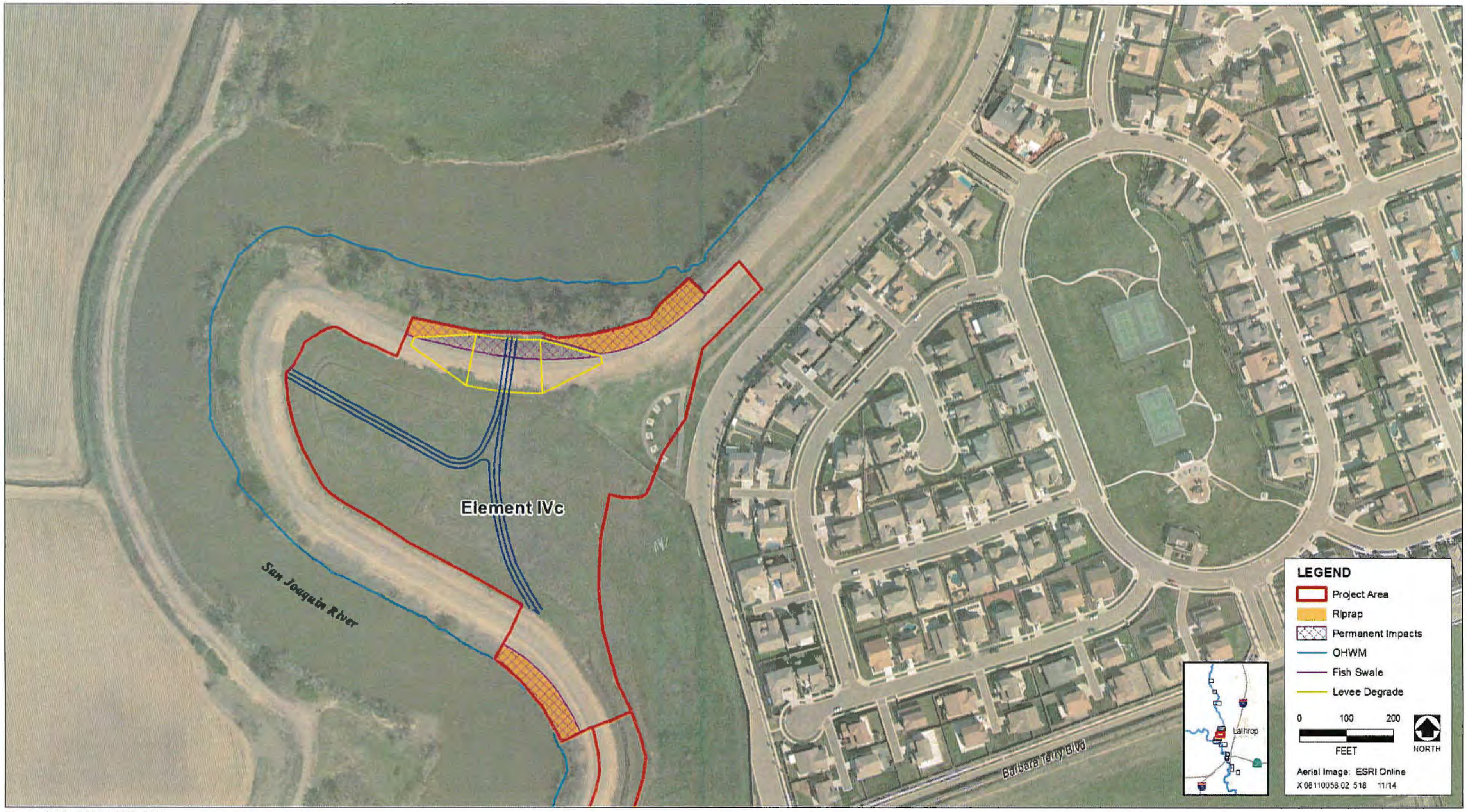
Source: AECOM 2009, 2010, 2014

Exhibit 6

Effects to CDFW Jurisdiction – RD 17 LSAP Elements IIIa and IIIb

Source: AECOM 2009, 2010, 2014

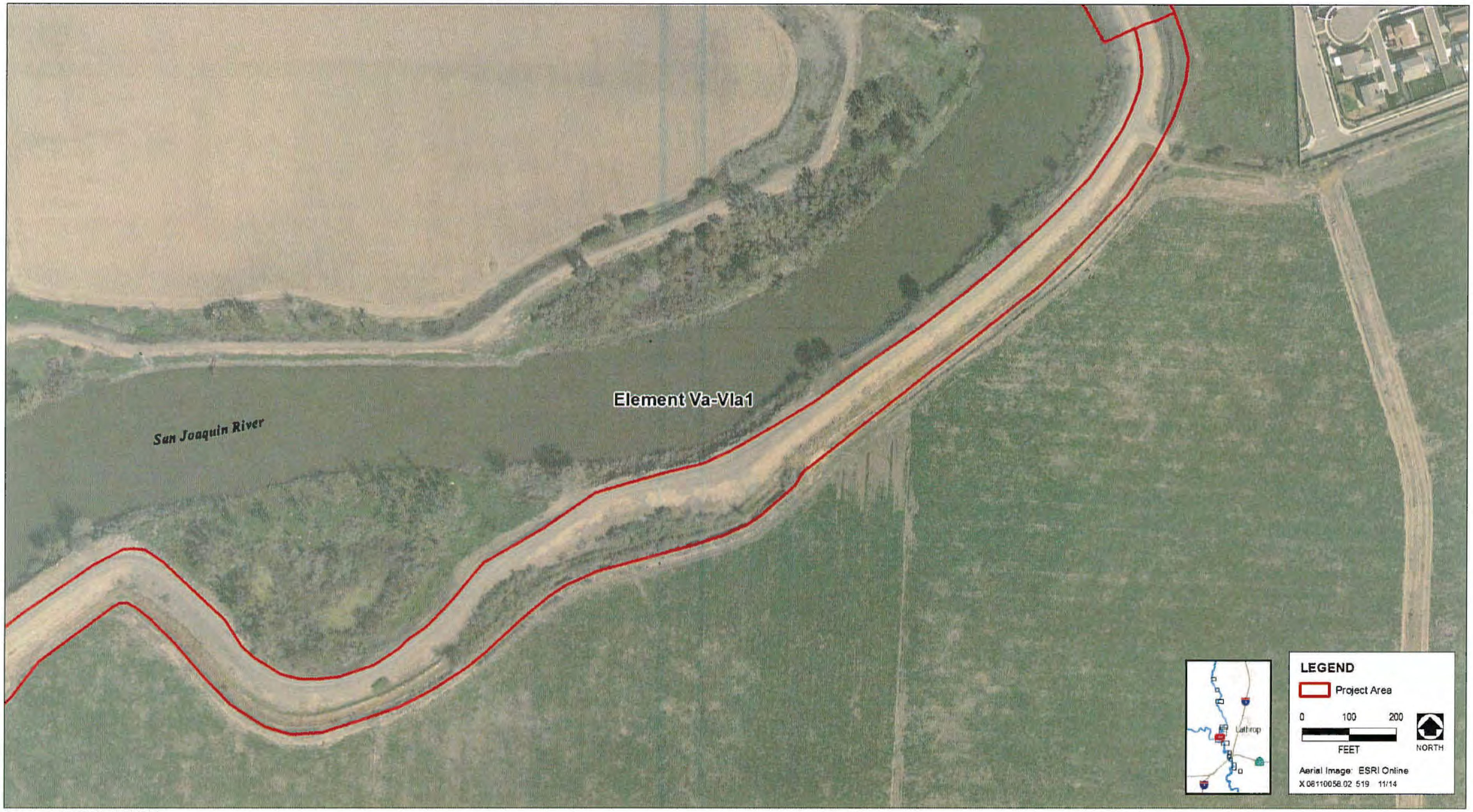
Exhibit 7 **Effects to CDFW Jurisdiction – RD 17 LSAP Elements IIIa, IIIb, and IVa**



Source: AECOM 2009, 2010, 2014

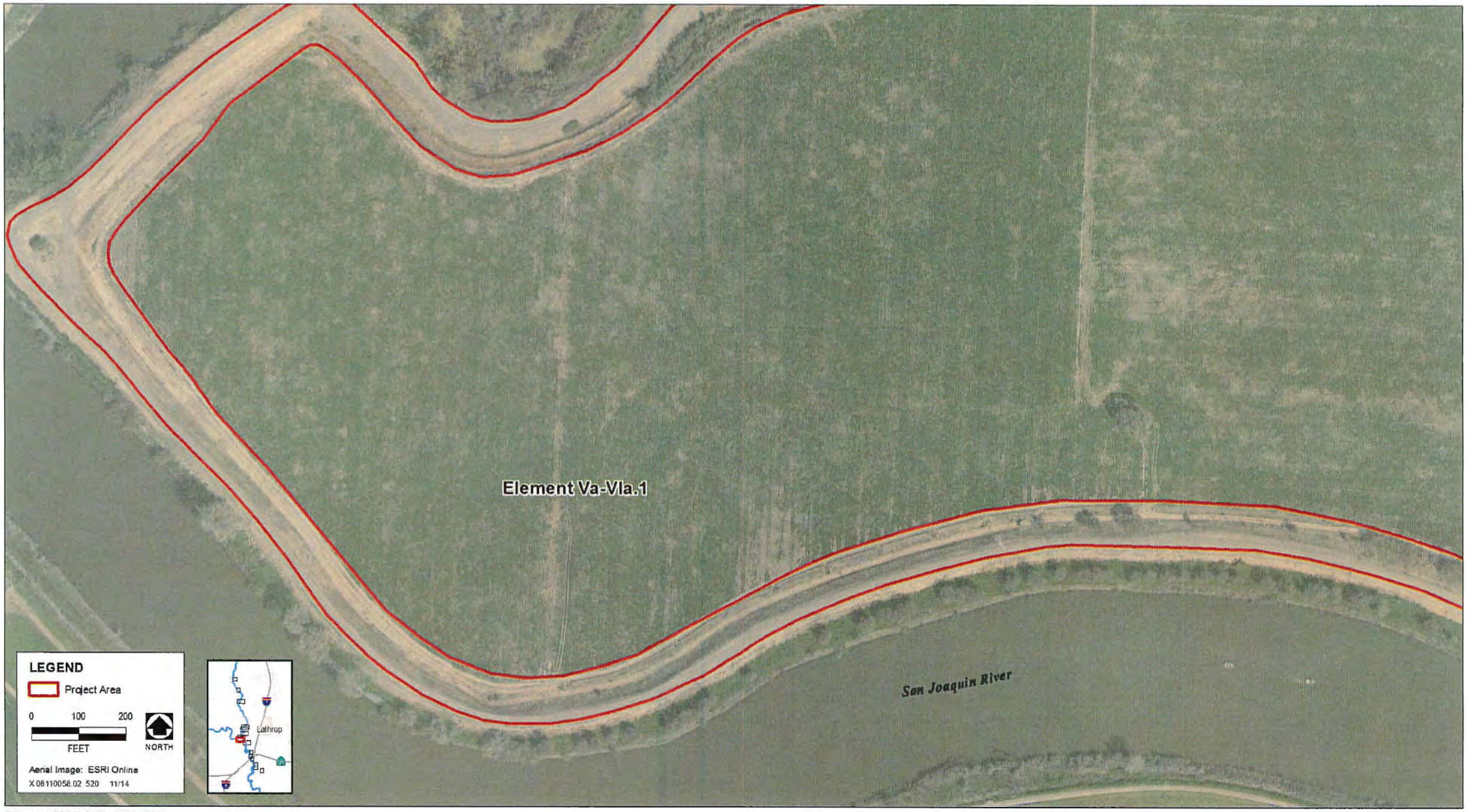
Exhibit 8

Effects to CDFW Jurisdiction – RD 17 LSAP Element IVc



Source: AECOM 2009, 2010, 2014

Exhibit 9 **Effects to CDFW Jurisdiction – RD 17 LSAP Elements Va and VIa.1**



Source: AECOM 2009, 2010, 2014

Exhibit 10

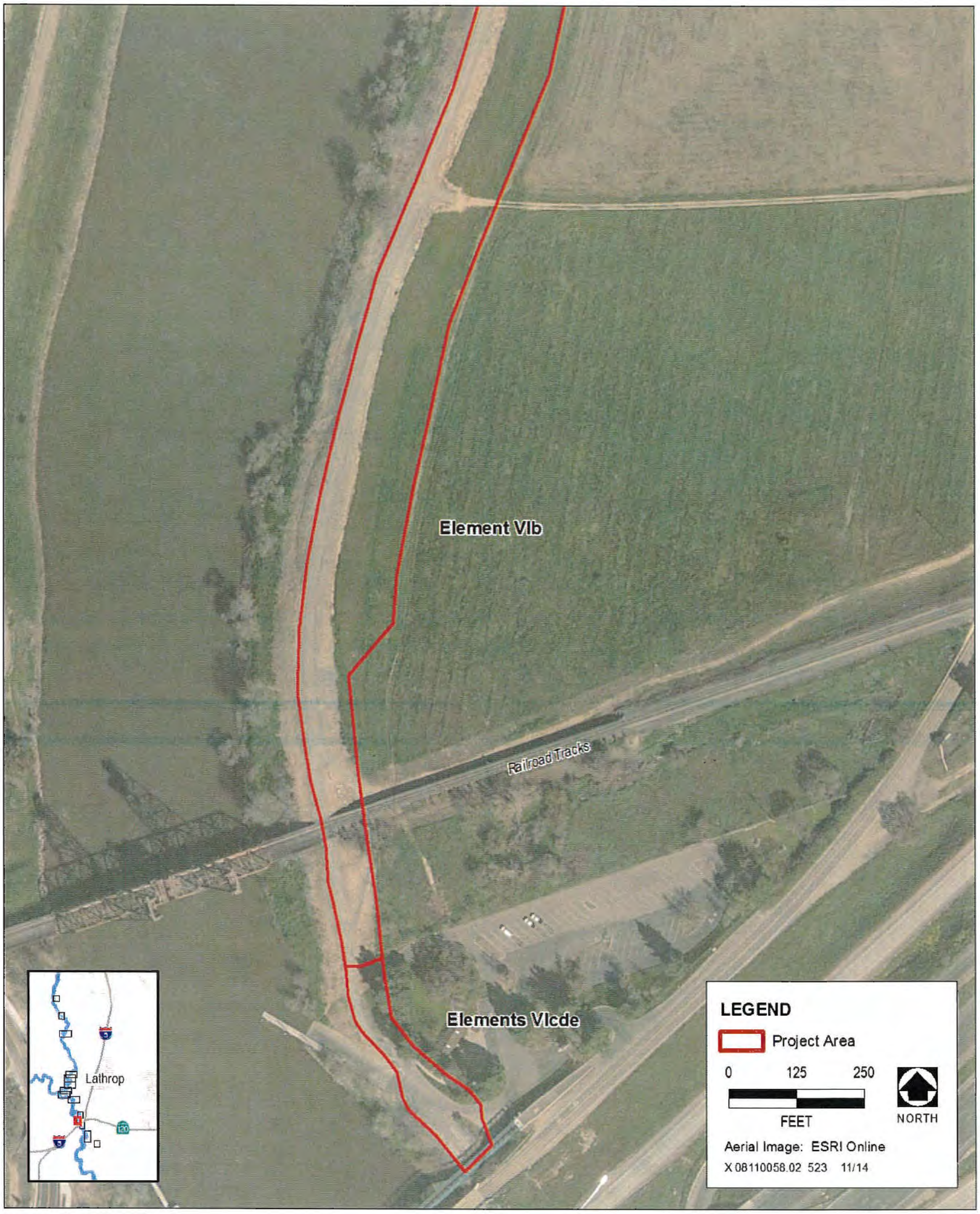
Effects to CDFW Jurisdiction – RD 17 LSAP Elements Va and VIa.1

Source: AECOM 2009, 2010, 2014

Exhibit 11 **Effects to CDFW Jurisdiction – RD 17 LSAP Elements Va and VIa.1**

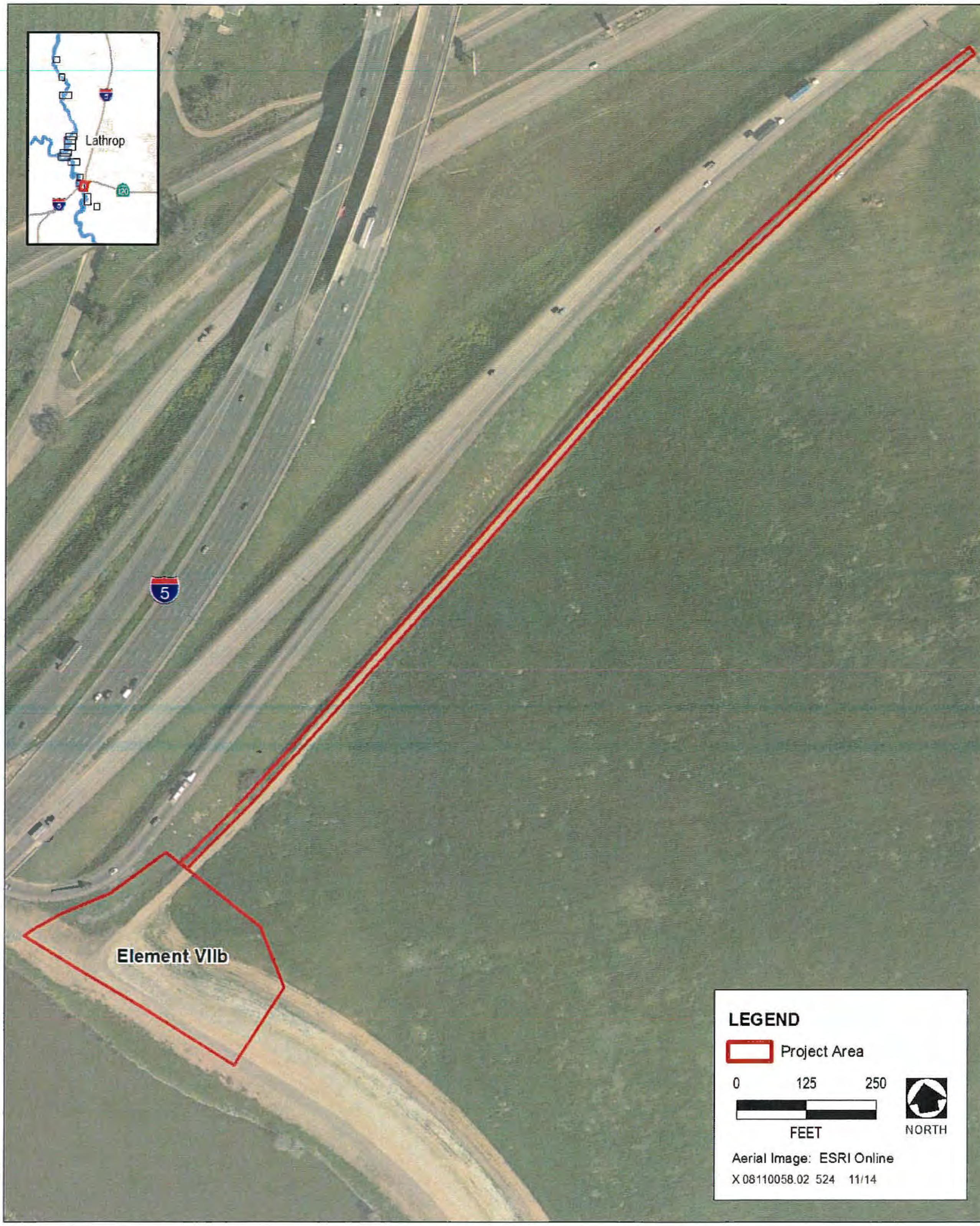
Source: AECOM 2014

Exhibit 12 **Effects to CDFW Jurisdiction – RD 17 LSAP Elements VIa.4 and VIb**



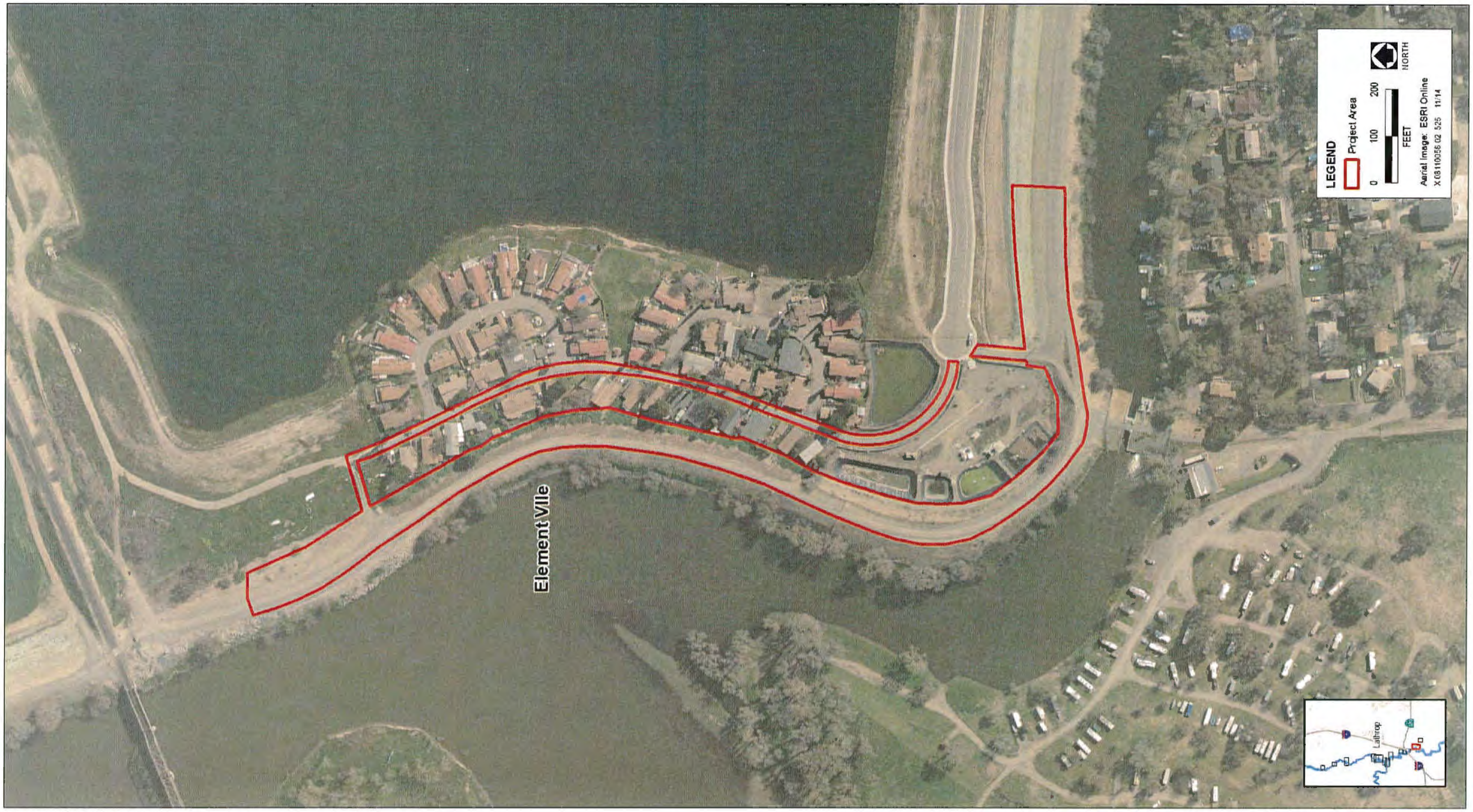
Source: AECOM 2014

Exhibit 13 **Effects to CDFW Jurisdiction – RD 17 LSAP Elements VIb and VIcde**



Source: AECOM 2014

Exhibit 14 **Effects to CDFW Jurisdiction – RD 17 LSAP Element VIIb**



Source: AECOM 2009, 2010, 2014

Exhibit 15

Effects to Waters of the United States – RD 17 LSAP Element VIIe

Source: AECOM 2014

Exhibit 16 **Effects to CDFW Jurisdiction – RD 17 LSAP Element VIIg**

To:
Office of Planning and Research
For U.S. Mail:
P.O. Box 3044
Sacramento, CA 95812-3044

Street Address:
1400 Tenth Street
Sacramento, CA 95814

From:
Department of Fish and Wildlife
Bay Delta Region
7329 Silverado Trail
Napa, CA 94588
Contact: Robert Stanley
Phone: (707) 944-5573

Lead Agency
Reclamation District No. 17
PO Box 1461
Stockton, CA 95201
Contact: Dante John Nomellini Sr.
Phone: (209) 465-5883

SUBJECT: ***Filing of Notice of Determination pursuant to Public Resources Code section 21108***

State Clearinghouse Number: 2010042073

Project Title: Phase 3 RD 17 Levee Seepage Area Project (Lake or Streambed Alteration Agreement No. 1600-2014-0424-R3)

Project Location (include county): The Project is located along two sections of the Reclamation District No. 17 levee system on the San Joaquin River, west of I-5 in the City of Lathrop in San Joaquin County, State of California; Latitude 37.815230, Longitude -121.318225.

Project Description: The California Department of Fish and Wildlife (CDFW) has executed a Lake or Streambed Alteration Agreement, No.1600-2014-0424-R3, pursuant to section 1602 of the Fish and Game Code to Reclamation District No. 17, as represented by Christopher Neudeck.

The Project is limited to the following activities: One 410 linear foot section of the waterside slope of the existing levee along the San Joaquin River will be excavated to a point no lower than the mean high water mark. The degraded levee will allow high water to enter a new landside setback levee swale area between the existing levee and a new setback levee. The swale will be constructed to reduce the potential for fish stranding or entrapment in the setback area when river flows overtop the existing degraded levee, which will then allow drainage upon receding of the high water. Rock slope protection (riprap) will be placed on the waterside of the existing levee in three locations to reduce bank erosion during high flow periods, including two areas where the river would overtop the existing levee, which is to be degraded, during high flows, and another portion of the levee needing repair.

This is to advise that CDFW, acting as Responsible Agency approved the above described project on September 13, 2016 and has made the following determinations regarding the project pursuant to California Code of Regulations section 15096, subdivision (i):

1. The project will not have a significant effect on the environment.
2. An ☒ Environmental Impact Report / ☐ mitigated negative declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures ☒ were / ☐ were not made a condition of CDFW's approval of the project.
4. A mitigation reporting or monitoring plan ☒ was / ☐ was not adopted by CDFW for this project.
5. A statement of overriding considerations was not adopted by CDFW for this project.
6. Findings were not made by CDFW pursuant to California Code of Regulations section 15091.

   The ☒ environmental impact report / ☐ mitigated negative declaration prepared for the project is available to the general public at the office location listed above for the Lead Agency. CDFW's record of project approval as Responsible Agency is available at CDFW's regional office.

Signature Randi Adair *Date: September 13, 2016*

for James Starr, Environmental Program Manager

Date Received for filing at OPR: ____________________

California Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Bay Delta Region
2825 Cordelia Road, Suite 100
Fairfield, CA 94534
(707) 428-2002
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

RECEIVED
JUL 29 2019
By CHW

July 25, 2019

Christopher Neudeck
Reclamation District 17 c/o KSN
711 North Pershing Avenue
Stockton, CA 95203

Dear Mr. Neudeck:

Conditioned Extension of Lake or Streambed Alteration Agreement, Notification No. 1600-2014-0424-R3, San Joaquin River; RD 17 Phase 3 Levee Seepage Area Project

The California Department of Fish and Wildlife (CDFW) received your request to extend Streambed Alteration Agreement 1600-2014-0424-R3 (Agreement) and extension fee, for the above referenced agreement.

CDFW hereby agrees to extend the Agreement expiration from December 31, 2019, to December 31, 2024, with addition of the following conditions:

2.9 Riparian Brush Rabbit Avoidance. To avoid impacts to Riparian brush rabbit (RBR) from project activities, the Permittee shall implement the following measures:

2.9.1 At least 15 days prior to the Initiation of Work the Permittee shall submit to CDFW for written approval plans for an exclusion fencing system that shall be installed along the waterside boundary of the project site(s) and potential RBR habitat, and access routes as appropriate. The plan shall include a map indicating location of exclusion fencing in relation to the project site(s), location of special-status wildlife habitat features, dimension specifications, and a description of fencing materials. In addition, the following criteria for the exclusion fencing system shall be met:

- The exclusion fencing shall consist of material appropriate for exclusion of special-status species that have the potential to occur on-site (excluding avian species).
- The exclusion fencing shall either measure at least 36 inches tall above the ground or be of an appropriate height for exclusion of special-status species that have the potential to occur on-site (excluding avian species).
- The bottom of the exclusion fencing shall be buried, staked, or weighed down so as to not allow wildlife to pass through gaps or holes.
- The exclusion fencing shall be taut between the supporting stakes and shall have the supporting stakes oriented on the inside edge of the project site(s).
- The exclusion fencing shall feature one-way escape doors or an appropriate design for preventing special-status species and other wildlife from being trapped within the project site(s).
- Fencing system entry/exit points for vehicular and pedestrian traffic shall be constructed so wildlife cannot access the project site(s) during non-work hours.

- The Designated Biologist shall inspect the project site(s) prior to installation of the exclusion fencing. The exclusion fencing system shall remain in place until all construction activities have been completed. All components of the exclusion fencing will be removed for storage or disposal off-site immediately upon completion of construction activities. All vegetation slated for removal in the exclusion fencing buffer area shall be inspected by the Designated Biologist prior to the initiation of removal. Exclusion fencing shall be inspected daily by the Designated Biologist or other CDFW-approved biologist and repaired as necessary.

2.9.2 Permittee shall terminate all project activities at 1 (one) hour before sunset and shall not resume until 1 (one) hour after sunrise unless otherwise approved in writing by CDFW. Permittee shall use sunrise and sunset times established by the U.S. Naval Observatory Astronomical Applications Department for the geographic area (https://www.esrl.noaa.gov/gmd/grad/solcalc/sunrise.html).

2.9.3 Prior to the initiation of project activities, the Designated Biologist shall survey for terrestrial wildlife species. Surveys shall entail walking the entire boundary of the exclusion fence and motorized vehicle pathways as well as walking linear transects inside the fenced areas. Transects shall be spaced approximately 30 feet or less apart. Once initial grading has been completed or the exclusion fencing system has been installed then a CDFW-approved biologist may conduct the daily clearance surveys. If wildlife is found within the project site(s) the Designated Biologist or CDFW-approved biologist shall halt work and, if needed, assist the wildlife in vacating the project site(s). If special-status species are discovered within the project site(s) or directly outside the exclusion fencing, findings shall be reported to CDFW no later than four (4) hours from the time the species are observed and work within that vicinity shall be placed on hold until consultation with CDFW has been initiated. CDFW reserves the right to provide additional measures to this Agreement in the event special-status species are discovered.

2.9.4 If a rabbit species of any kind is observed within the project site(s), then all project activities shall halt, and work shall not continue until the rabbit species is identified by the Designated Biologist. If RBR is discovered at any time within the project site(s), then all project activities shall halt and CDFW shall be notified immediately, and work shall not resume until Permittee can demonstrate compliance with CESA to CDFW's satisfaction. CDFW reserves the right to provide additional RBR protection measures to this Agreement. If take of RBR is expected to occur as a result of project activities, then an Incidental Take permit is recommended.

4. Compensatory Measures

To compensate for adverse impacts to fish and wildlife resources identified above that cannot be avoided, Permittee shall implement each measure listed below.

4.1 Habitat Impacts and Mitigation. To compensate for project-related impacts to 3.31 acres of riparian habitat, Permittee shall create and restore a minimum of 9.9 acres of riparian habitat. At least 3.31 acres of the created or restored habitat shall be on site and designed to facilitate use as an RBR movement corridor.

4.2 Riparian Restoration Plan. To ensure a successful habitat creation and or restoration effort, planting shall be conducted as specified in a CDFW-approved Riparian Restoration Plan (Plan) that incorporates the Mitigation and Monitoring Plan for Levee Setback Area dated June 2016 in Appendix E of the Project's Final Biological Assessment. The Plan shall be submitted to CDFW for review and written approval 30 days prior to initiation of the project activities. The Plan shall include the following criteria:

- A description and amounts of plant species, planting ratios, and spacing, name(s) of supplying nurseries, a description, map, and reference pictures of restoration site. Replacement trees shall consist of 15-gallon saplings, 1-inch caliper sized nursery stock, or comparable nursery stock, and shrubs shall consist of 5-gallon sized nursery stock, or comparable nursery stock. Plants shall be native species adapted to the lighting, soil, and hydrological conditions at the restoration site. Hydroseed mixes shall comprise of native seed or sterile non-native seed mixes. Mitigation trees shall be identifiable through unique numbering on the map.
- A monitoring and maintenance plan that outlines adaptive management strategies to achieve the following success criteria:
  - All plantings and trees shall have a minimum of 80% survival at the end of five years.
  - Vegetation cover shall consist of no invasive plant species rated as "high" by the Cal-IPC at the end of five years.
  - If the survival and/or cover requirements are not meeting these goals, Permittee is responsible for replacement planting, additional watering, weeding, invasive exotic eradication, or any other practice, to achieve these requirements over subsequent years until the success criteria is reached. Replacement plants shall be monitored with the same survival and growth requirements as during the initial monitoring period.
  - Monitoring shall be conducted annually for a period of five years to determine whether the success criteria have been met. If the survival and/or cover requirements are not projected to meet these goals, based on annual monitoring, Permittee is responsible for replacement planting, additional watering, weeding, invasive exotic eradication, or any other practice(s) that would to achieve these requirements.
- An implementation schedule that outlines timing of planting, monitoring schedule, and estimated success criteria benchmarks.

4.3 Annual Monitoring and Mitigation Compliance Reports. Monitoring of the restoration plantings shall be reported annually for a period of five years to determine whether success criteria have been met. No later than February 15 of each year in which monitoring is required the Permittee shall electronically submit an annual report to CDFW that includes the following items: Agreement Number; a summarized description of monitoring efforts and whether compliance for mitigation has been met; recommendations to achieve compliance of mitigation that has not been met; and photo documentation of site conditions.

All other conditions in the Agreement remain in effect unless otherwise noted herein.

Copies of the original Agreement and this letter must be readily available at project worksites and must be presented when requested by a CDFW representative or other agency with inspection authority.

If you have any questions regarding this letter, please contact Jeanette Griffin, Environmental Scientist at (209) 234-3447 or Jeanette.Griffin@wildlife.ca.gov.

Sincerely,

Melissa Farinha

Melissa Farinha
Senior Environmental Scientist (Supervisory)
Bay Delta Region

cc: GEI Consultants, Inc.
Nicholas Tomera
ntomera@gmail.com.

California Department of Fish and Wildlife
Lieutenant Vielhauer

FOR DEPARTMENT USE ONLY				
Date Received	Amount Received	Approved?	Date Approved	Expiration Date
4-17-2019	$ 597.00	☑ Yes ☐ No	7-25-19	12-31-2024
Assigned to: Gardner		Lt. Viehauen		

REQUEST TO EXTEND LAKE OR STREAMBED ALTERATION AGREEMENT

Complete EACH field, unless otherwise indicated, and submit ALL required enclosures, attachments, and fee to the CDFW regional or field office that serves the area where the project will occur. Attach additional pages to notification, if necessary.

1. APPLICANT REQUESTING EXTENSION

If the applicant is a business, agency, or utility, please include the name of the applicant's representative, who should be an employee of the applicant.

Name	Christopher Neudeck
Business/Agency	Reclamation District 17 c/o KSN
Mailing Address	711 North Pershing Avenue
City, State, Zip	Stockton, CA 95203
Phone Number	(209) 946-0268
Email	cneudeck@ksninc.com

Fish & Wildlife
APR 17 2019

2. CONTACT PERSON (*Complete only if different from applicant.*)

Name	Nicholas Tomera
Business/Agency	GEI Consultants, Inc.
Mailing Address	2868 Prospect Park Drive, Suite 400
City, State, Zip	Rancho Cordova, CA 95670
Phone Number	(916) 214-1308
Email	ntomera@gmail.com

While an applicant is legally responsible for complying with Fish and Game Code section 1602 et seq., an applicant may designate and authorize an agent (e.g., lawyer, consultant, or other individual) to act as a Designated Representative. The Designated Representative is authorized to sign the notification and any agreement on behalf of the Applicant.

Do you authorize the Contact Person above to represent you as your Authorized Designated Representative?

☑ Yes, I authorize. ☐ No, I do not authorize.

3. EXTENSION FEE

Refer to the current fee schedule to determine the appropriate fee.

☑ Extension Fee Included

Note: CDFW is not required to determine whether an extension is complete or otherwise process the extension until CDFW has received the correct fee.

4. PROJECT INFORMATION

Project Name (as identified in the Final Agreement)	RD 17 Phase 3 Levee Seepage Area Project
Agreement Number	1600-2014-0424-R3
Original Expiration Date	December 31, 2019
New Expiration Date Requested	December 31, 2024

A. Describe the following:
- The work that has been completed;
- The work that needs to be completed; and
- The amount of time needed to complete the work.

RD 17 began work in May 2014 under an emergency response action. The work was primarily limited to construction of seepage berms at Elements Ia, Ib, Ie, IIIb, IVa, Va-VIa.1, IVcde, and VIIb. RD 17 would install chimney drains, cutoff walls, and setback levee at Element IVc. See Table 2 in the Biological Assessment (GEI 2019) for work that has been completed and work that needs to be completed. RD 17 needs approximately 42 months to complete the work (which includes construction only).

☑ Continued on additional page(s)

B. Explain the reason(s) for the extension request

RD 17 could not begin work until authorized by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act and Section 14 of the Rivers and Harbors Act (i.e., 33 USC 408). Section 404 would be authorized under RGP 8 (May 2014) and NWP 13 (anticipated to be spring 2019). Section 408 would be authorized under a Categorical Permission (anticipated to be spring 2019) and Individual Permission (anticipated to be Spring 2020).

☐ Continued on additional page(s)

5. SIGNATURE

I hereby certify that to the best of my knowledge the information in this extension request ("request") is true and correct and that I am authorized to sign this request as, or on behalf of, the applicant. I understand that if any information in this request is found to be untrue or incorrect, CDFW may suspend processing this request or suspend or revoke any draft or final Lake or Streambed Alteration Agreement issued pursuant to this request. I understand also that if any information in this request is found to be untrue or incorrect, I and/or the applicant may be subject to civil or criminal prosecution.

Christopher H. Neudeck
Signature of Applicant or Applicant's Authorized Representative

Date 4/2/19

CHRISTOPHER H. NEUDECK
Print Name

Note: If approved, a copy of this form must be available at the work site with the original agreement.

Appendix J. Endangered Species Act Section 7 Consultation Administrative Record

1. Letter from AECOM to USFWS and NMFS Requesting Technical Assistance. May 14, 2010. Includes two attachments (2009 preliminary wetland delineation and 2010 updated wetland delineation).
2. Letter from NMFS to AECOM, responding to technical assistance request. June 11, 2010.
3. Letter from USACE to USFWS, requesting initiation of formal consultation. March 27, 2015. Includes one attachment (February 2015 Biological Assessment).
4. Letter from NMFS to USACE, requesting additional information. July 7, 2015.
5. Letter from USFWS to USACE, requesting additional information. October 2, 2015.
6. Conceptual Mitigation and Monitoring Plan for levee setback area. June 2016.
7. Letter to NMFS, responding to request for additional information. October 7, 2016.
8. Letter to USFWS, responding to request for additional information. October 7, 2016.
9. February 2017 Biological Assessment.
10. Letter from USACE to USFWS, requesting initiation of formal consultation. March 3, 2017.
11. September 2017 Biological Assessment.
12. Letter from USFWS to USACE, providing comments on Conceptual MMP. February 27, 2018.
13. Letter from NMFS to USACE, providing comments on Conceptual MMP. March 14, 2018.
14. Letter to USFWS, responding to comments on Conceptual MMP. April 30, 2018.
15. Letter to NMFS, responding to comments on Conceptual MMP. April 30, 2018.
16. May 2018 Biological Assessment (Final).
17. Letter from USACE to USFWS, requesting initiation of formal consultation. August 21, 2018.
18. Letter from USACE to NMFS, requesting initiation of formal consultation. August 21, 2018.
19. NMFS Biological Opinion. February 21, 2019.
20. USFWS Biological Opinion. April 16, 2019.

1. **Letter from AECOM to USFWS and NMFS Requesting Technical Assistance. May 14, 2010. Includes two attachments (2009 preliminary wetland delineation and 2010 updated wetland delineation).**

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Memorandum

To	Doug Weinrich – USFWS Howard Brown – NMFS	Page	1
CC	Sarah Ross, Claire Marie Turner, Krystel Bell – USACE Sean Bechta, Lisa Mangione – AECOM		
Subject	Request for Technical Assistance: Reclamation District 17 100-Year Levee Seepage Area Project		
From	Kelly Fitzgerald-Holland – AECOM		
Date	May 14, 2010		

This memorandum is a request for technical assistance with Phase 3 of Reclamation District No. 17's (RD 17's) 100-Year Levee Seepage Area Project (LSAP) (proposed project, LSAP Phase 3). This project involves flood risk reduction along approximately 8.4 miles of the approximately 19-mile RD 17 levee system. Many of the proposed project activities would occur along the San Joaquin River east levee. The overall project purpose is to implement improvements to the RD 17 levee system to meet applicable Federal and State design recommendations for levees protecting urban areas. Additional project objectives, in support of the overall project purpose, are to: (1) construct levee improvements where needed to increase the levee's resistance to underseepage and through-seepage; (2) provide seepage exit gradients of less than 0.5 at the water surface elevation associated with the 100-year flood event; and (3) implement the U.S. Army Corps of Engineers (USACE) levee vegetation management recommendations.

As stated above, one of the project objectives is to implement USACE levee vegetation management recommendations; these recommendations only pertain to levees in the federal flood control system. Approximately 2.6 miles of the 8.4-mile project area is dryland levee and, therefore, is not part of the federal flood control system and would not be subject to the USACE levee vegetation management recommendations. Implementing the USACE levee vegetation management recommendations along approximately 5.8 miles of the San Joaquin River east levee would involve removing woody vegetation on the landside levee slopes and within 15 feet of the waterside toes of levees. At this point, it is unknown whether USACE would grant a variance to the removal of vegetation along the project area. Therefore, RD 17 is requesting technical assistance in evaluating the potential Endangered Species Act (ESA) implications of adhering to USACE vegetation management standards for levees along roughly 5.8 miles of the overall project area.

Federally-listed species that could be affected by vegetation removal include: valley elderberry longhorn beetle *(Desmocerus californicus dimorphus),* riparian brush rabbit *(Sylvilagus bachmani riparius),* and the following special-status fish: Delta smelt *(Hypomesus transpacificus)*, Central Valley steelhead Distinct Population Segment (DPS) (*Oncorhynchus mykiss*), Southern DPS of North American green sturgeon (*Acipenser medirostris*), and Essential Fish Habitat (EFH) for Central Valley fall-/late fall-run Chinook salmon Evolutionarily Significant Unit (ESU) *(Oncorhynchus tshawytscha).* The potential effects of the proposed project on these species are as follows:

- **Valley elderberry longhorn beetle:** Although protocol level surveys for elderberry shrubs (the obligate host plant for valley elderberry longhorn beetle) have not yet been conducted, isolated shrubs and clumps of shrubs have been mapped during various natural resources surveys conducted by AECOM biologists in 2008 and 2010. Shrubs have been found along both sides of the San Joaquin River east levee. Approximately 16 individual shrubs and shrub clusters, which are within the project area, could be removed to comply with the USACE vegetation management standards.

- **Riparian brush rabbit:** Patches of riparian forest and scrub habitat with dense vegetation along the San Joaquin River and adjacent levee provide suitable habitat for riparian brush rabbit. This species is also known to seasonally use tall weedy/ruderal habitats that are adjacent to woody cover. Riparian brush rabbits are known to occur in the project vicinity. Small patches of potential riparian brush rabbit habitat, which occur on the water side of the levee, would be removed to comply with the USACE vegetation management standards. Portions of potential landside habitat might also be removed. While the total amount has not been quantified, the partial or total removal of isolated pockets of potential habitat could occur along up to 5.8 miles of the project area.

- **Special-status fish:** Compliance with the USACE vegetation management standards would require the removal of vegetation along the waterside levee and would result in the loss of shaded riverine aquatic (SRA) habitat. While the total amount has not been quantified, the removal of potential SRA habitat could occur along up to 5.8 miles of the project area.

USACE Planning Division will initiate ESA consultation in association with 408 authorization for the proposed project. USACE and RD 17 propose to use the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP) for mitigation of project impacts on covered species, such as valley elderberry longhorn beetle. Therefore, USACE would need to be extended take coverage under the SJMSCP through an addendum of its biological opinion to the SJMSCP's biological opinion. As the SJMSCP does not cover special-status fish or the conversion of occupied riparian brush rabbit habitat, these species would need to be addressed through the ESA consultation.

USACE and RD 17 are requesting technical assistance with evaluating the potential impacts to riparian brush rabbit and special-status fish should vegetation be removed along 5.8 miles of San Joaquin River east levee (i.e., in the event that a variance to the USACE vegetation management standards is not granted). Specifically, the project proponent is requesting technical assistance in developing a compensation strategy that could adequately offset the potential loss of habitat for riparian brush rabbit and special-status fish species along 5.8 miles of the San Joaquin River east levee. To aid in your evaluation, we have attached the wetland delineation and updated maps for the proposed project area. The delineation was verified by USACE on April 9, 2010.

Attachment

1. AECOM. 2009. Preliminary Delineation of Waters of the United States, Including Wetlands: RD 17 100-Year Levee Seepage Project. October. Prepared for Reclamation District 17, Stockton, CA. 72 pages.

2. AECOM. 2010. Updated Wetland Delineation Maps (Nos. 1–9) for the RD 17 100-Year Levee Seepage Project. March. Prepared for Reclamation District 17, Stockton, CA. 9 pages.

Attachment 1

RD 17 Levee Project Request for TA

Preliminary Delineation of
Waters of the United States, Including Wetlands

RD 17 100-Year Levee Seepage Project

Prepared for:

Reclamation District No. 17
235 E. Weber Avenue
Stockton, CA 95202

October 2009

EDAW | AECOM

Preliminary Delineation of
Waters of the United States, Including Wetlands

RD 17 100-Year Levee Seepage Project

Prepared for:

Reclamation District No. 17 (RD 17)
235 E. Weber Avenue
Stockton, CA 9520

Contact:

Dante Nomellini
Secretary and Counsel for RD 17
209/465-5883

Prepared by:

EDAW
2022 J Street
Sacramento, CA 95811

Contact:

Sean Bechta
Project Manager
916/414-5800

October 2009

EDAW | AECOM

08110058.02
10.22.09

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ACRONYMS AND ABBREVIATIONS

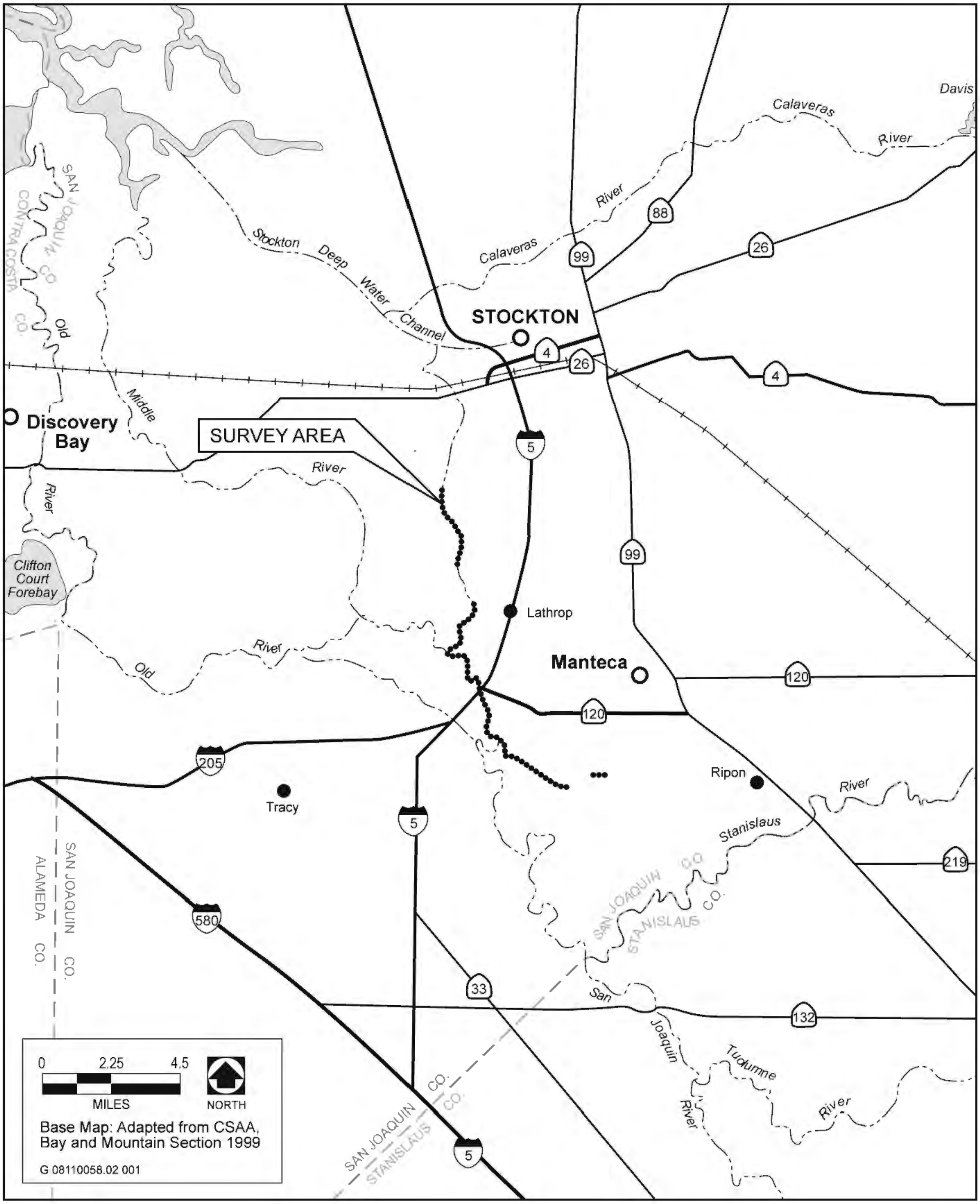
CEQA	California Environmental Quality Act
CWA	Clean Water Act
EPA	U.S. Environmental Protection Agency
FAC	facultative
FACU	facultative upland
FACW	facultative wetland
FEMA	Federal Emergency Management Agency
GPS	global positioning system
I-5	Interstate 5
msl	mean sea level
NEPA	National Environmental Policy Act
NI	no indicator
NL	not listed
NOAA	National Oceanic and Atmospheric Administration
NRCS	National Resources Conservation Service
OBL	obligate
OHWM	Ordinary High Water Mark
RD 17	Reclamation District No. 17
SCS	Soil Conservation Service
TNW	Traditional Navigable Water
UPL	upland
USACE	U.S. Army Corps of Engineers
USC	United States Code
USGS	U.S. Geological Survey
WRCC	Western Regional Climate Center
WGS	World Geodetic System

INTRODUCTION

Reclamation District No. 17 (RD 17) is responsible for levee operation and maintenance along the east side of the San Joaquin River in an area ranging from the City of Stockton south to the City of Manteca (Exhibit 1). RD 17 is currently undertaking a program of levee improvements at various locations to increase the levee system's resistance to underseepage. In some locations, a single form of levee improvement is proposed, such as slurry cutoff walls installed through the levee crown. In other locations, two or more improvement options are being considered, such as seepage berms and setback levees. The survey area used for this delineation encompasses the ground disturbance area required for all levee improvement options being considered at this time.

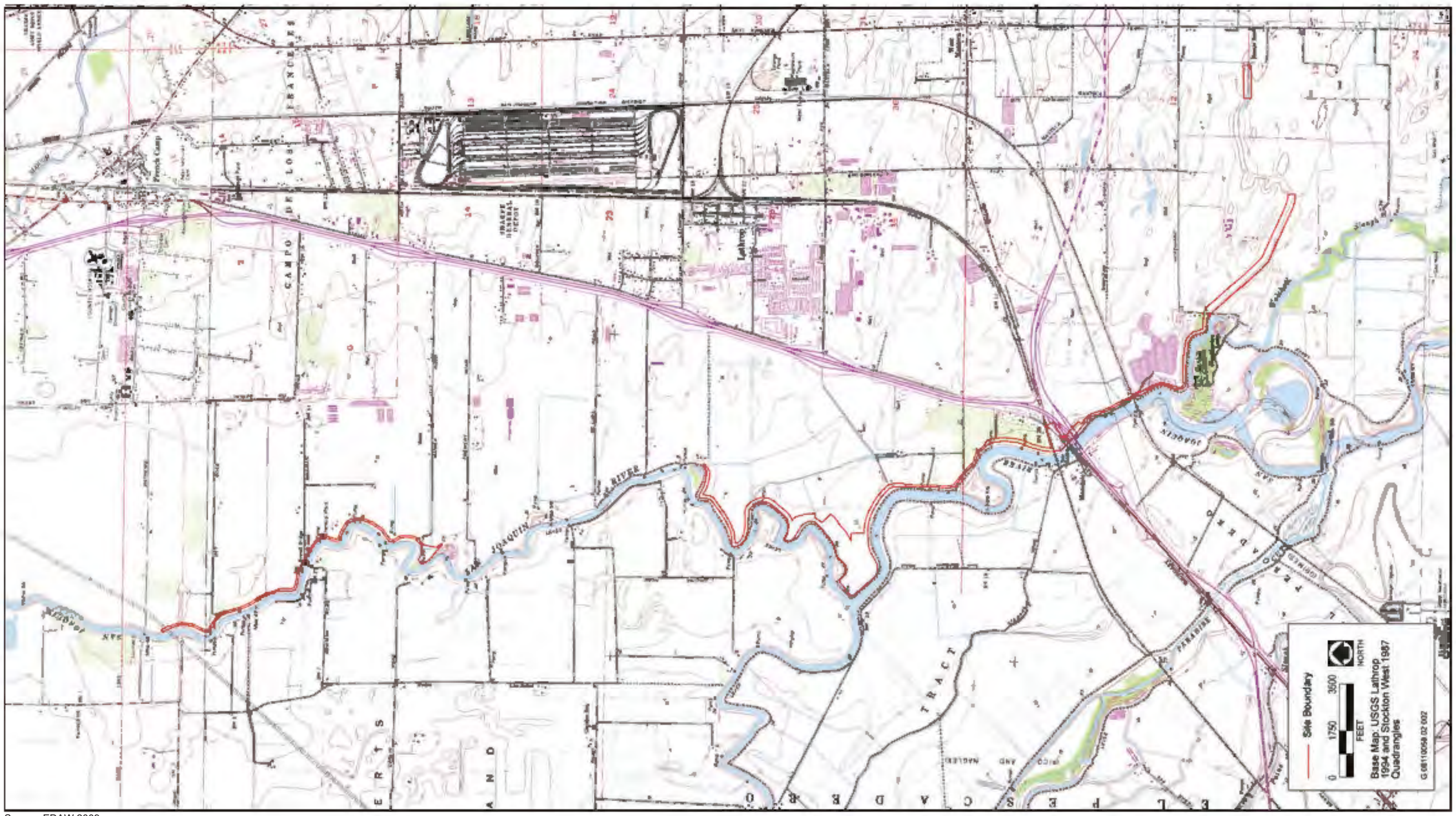
The northernmost extent of the survey area is located just south of the City of Stockton and the southernmost extent of the survey area is located in an area adjacent to the southwest edge of the Manteca city limit (Exhibit 1). The survey area ranges from approximately 5 to 25 feet above mean sea level (msl) and is located on the U.S. Geological Survey (USGS) 7.5-minute Stockton West and Lathrop Quadrangles, Townships 1 North, 1 and 2 South, Range 6 East (Exhibit 2). The nearest traditionally navigable water (TNW) of the United States is the San Joaquin River.

Because the existing levees are components of the Federal Flood Control project, various types of repair activities can require U.S. Army Corps of Engineers (USACE) review and approval for the protection of public facilities as required by 33 United States Code (USC) 408. It is anticipated that USACE approval will be required for some repair options being considered by RD 17 and therefore, USACE must complete an environmental analysis according to the National Environmental Policy Act (NEPA). RD 17 is the lead agency for implementing requirements of the California Environmental Quality Act (CEQA).



Source: EDAW 2009

Project Location **Exhibit 1**



Source: EDAW 2009

Site and Vicinity Map **Exhibit 2**

DELINEATION METHODS

Before conducting the field delineation survey, EDAW wetland ecologists reviewed color aerial photography (at a scale of 1 inch = 200 feet) of the survey area and the San Joaquin County soil survey (Soil Conservation Service [SCS] 1992) to determine areas of potential USACE jurisdiction. A wetland delineation was conducted in the survey area on March 19, 2008 by EDAW wetland ecologist Mark Bibbo and on September 22, 2009 by EDAW wetland ecologist Sarah A.N. Bennett. Precipitation in 2008 was above normal for the month of February and below normal for the month of March (National Oceanic and Atmospheric Administration [NOAA] 2008). The average precipitation in the Stockton region is 13.95 inches (Western Region Climate Center [WRCC] 2009). The precipitation accumulation for the 2009 year at the time of the 2009 field survey was 6.95 inches, approximately 2 inches below average (WRCC 2009, NOAA 2009). Field surveys were conducted on days with clear skies.

The USACE 1987 wetland delineation manual (Environmental Laboratory 1987) and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (Environmental Laboratory 2006, 2008) were used to delineate wetlands that could be subject to USACE jurisdiction under Section 404 of the CWA. The 1987 manual and Arid West Regional Supplement provide technical guidelines and methods for the three-parameter approach to determining the location and boundaries of jurisdictional wetlands. This approach requires that an area must support positive indicators of hydrophytic vegetation, hydric soils, and wetland hydrology to be a wetland. Potential jurisdictional areas were identified and mapped in the field and later digitized onto the aerial photograph. Sample point locations were recorded digitally using a global positioning system (GPS) data logger (Trimble XH) and imported onto an electronic version of the aerial photograph. GPS data were recorded in World Geodetic System (WGS) 84 datum.

To determine whether hydrophytic vegetation dominated the area, plant species at sample sites were listed on data forms and the wetland indicator status was recorded for the dominant species using the U.S. Fish and Wildlife Service *National List of Plants that Occur in Wetlands: California (Region 0)* (Reed 1988). Hydrophytic species include those listed as obligate (OBL), facultative wetland (FACW, FACW*), or facultative (FAC, FAC*, FAC^{+}, but not FAC^{-}). The designation of a species corresponds to the probability that a species will occur in a wetland habitat. The indicator categories are defined as:

- OBL: greater than 99% occurrence in wetlands,
- FACW: between 66% and 99% occurrence in wetlands, and
- FAC: between 34% and 66% occurrence in wetlands.

The Arid West Supplement gives equal weight to all FAC-listed species (i.e., plus [$^{+}$] and minus [$^{-}$] modifiers are not used)—FAC^{-}, FAC, and FAC^{+}—plants are all considered to be FAC. A sample site was considered to have hydrophytic vegetation if greater than 50% of the dominant species had an indicator status of FAC or wetter.

Species that usually occur in nonwetlands (67–99% estimated probability), but are occasionally found in wetlands (1–33% estimated probability), are identified as facultative upland (FACU). Obligate upland (UPL) species may occur in wetlands in another region, but almost always (>99%) occur–under natural conditions–in nonwetlands in California (Region 0). A no indicator (NI) is recorded for those species for which insufficient information was available to determine an indicator status. A not listed designation (NL) indicates a species is not listed in Reed (1988). These four indicators—UPL, FACU, NI, and NL—are used to identify species not considered hydrophytic. According to standard protocol, a species with an NL designation is considered UPL when completing the "Prevalence Index Worksheet" portion of the wetland determination data form (Environmental Laboratory 2006, 2008). Botanical nomenclature follows *The Jepson Manual: Higher Plants of California* (Hickman 1993).

Wetland hydrology was assessed by recording observations such as drainage patterns, watermarks, flooded or saturated soil conditions, and other indicators of wetland hydrology. In addition, potentially jurisdictional areas were all evaluated in terms of the feature's status as a navigable waterway, adjacency, or hydrological connection to a navigable waterway.

Waters of the United States were delineated based on the ordinary high water mark (OHWM). OHWMs for drainages typically correspond with characteristics such as shelving, scour lines, and other natural linear features which define the bed and bank portion of the channel that floods under normal conditions (USACE 2005).

Soils were examined by digging soil test pits to determine whether hydric soils exist in a sampling location. Soils were described in terms of depth, matrix color, redoxymorphic color (when present), and moisture status at each sampling location. Other diagnostic features indicative of hydric soils, such as the presence of concretions and oxidized rhizospheres (a redoximorphic feature, according to Vepraskas [1992]), were also recorded on data forms. Hydric soil determinations were based on the indicators provided by the 1987 wetland delineation manual, 2008 Arid West Supplement, the *Field Indicators of Hydric Soils in the United States: A Guide for Identifying and Delineating Hydric Soils* (NRCS 2006), and Vepraskas (1992). Soil units mapped to the study area by the soil survey were cross-referenced to *The National Hydric Soils List by State (California)* to determine if the soil was listed as a hydric map unit (NRCS 2008).

The *U.S Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook* was consulted to aid the preliminary determination that an area would be subject to USACE jurisdiction under Section 404 of the CWA (USACE 2007). The significant nexus test—outlined in a memorandum jointly authored by the U.S. Environmental Protection Agency (EPA) and USACE—was applied to each potentially jurisdictional habitat type (Grumbles and Woodley 2007, 2008). Features within the survey area that are potentially subject to USACE jurisdiction under Section 404 of the CWA are ditches and wetlands adjacent to the San Joaquin River, a TNW. Fifteen data forms were completed within the survey area; data forms are provided in Appendix A.

SOIL SURVEY RESULTS

According to the Soil Survey of San Joaquin County (SCS 1992) the soils within the survey area belong to the Columbia, Dello, Egbert, Meritt, Valdez, and Grangeville soil series. Descriptions of soil map units that occur within the survey area are provided below. A soils map showing the survey area is included in Appendix B.

All soils within the survey area are listed as hydric on the National Hydric Soils List (National Resources Conservation Service [NRCS] 2008). Soils within the survey area have been modified extensively by levees, thereby making the soils within the survey area subject to “atypical situation” as described in the 1987 wetland delineation manual (Environmental Laboratory 1987). The soils within the survey area formed under conditions that were subject to regular flood events, as is supported by the mapped unit soil series descriptions. However, the current hydrology of the survey area is not the condition under which soil formation took place; the natural hydrology of this area has been altered by the presence of flood control structures. Therefore, careful consideration is warranted when making a hydric soil determination for the purposes of defining USACE jurisdiction of wetlands under Section 404 of the CWA.

MERRITT SILTY CLAY LOAM, PARTIALLY DRAINED, 0 TO 2 PERCENT SLOPES (MAP UNIT 197)

The Merritt series consists of very deep, poorly drained soils on floodplains. These soils are artificially drained and are very deep. They formed in alluvium derived form mixed rock sources. Slope ranges from 0 to 2 percent. Included in this unit are small areas of Egbert, Ryde, Grangeville, and Guard soils. Included areas account for approximately 15 percent of the total acreage of this map unit. Permeability is moderately slow in the Merritt soils. The soils are under intensive cultivation and are irrigated, producing a wide variety of field and row crops. Merritt soils belong to the fine-silty, mixed, superactive, thermic Fluvaquentic Haploxerolls taxonomic class.

VALDEZ SILT LOAM, ORGANIC SUBSTRATUM, PARTIALLY DRAINED, 0 TO 2 PERCENT SLOPES (MAP UNIT 261)

The Valdez series consists of very deep, poorly drained soils that formed in recent alluvial material from mixed rock sources. Valdez soils are near rivers, sloughs and old stream channels in river deltas and flood plains and have slopes of 0 to 2 percent. Included in this unit are small areas of Itano, Kingile, Peltier, Piper, Rindge, Ryde, and Shinkee soils. Included areas account for approximately 15 percent of the total acreage of this map unit. Valdez soils are poorly drained under natural conditions, with slow to very slow runoff and moderately slow permeability. The water table fluctuates from 3 feet to below 5 feet in many drained areas. Irrigated areas are used for intensive row and field crops. Valdez soils belong to the fine-silty, mixed, nonacid, thermic Aeric Fluvaquents taxonomic class.

DELLO CLAY LOAM, DRAINED, 0 TO 2 PERCENT SLOPES, OVERWASHED (MAP UNIT 148)

The Dello series consist of very deep, very poorly drained soils that formed in alluvium from granitic rock sources. Dello soils are in small depressions and have slopes of 0 to 2 percent. Included in this unit are small areas of Columbia, Egbert, Merritt, and unnamed stratified substratum. Included areas account for approximately 15 percent of the total acreage of this map unit. Dello soils are very poorly drained, with slow runoff and rapid permeability (clay substratum phase has slow permeability below a depth of 40 inches). In some areas a water table is more than 6 feet from the surface because of flood control structures and/or installed drains. Areas with these soils are primarily used for irrigated field and row crops. Dello soils belong to the mixed, thermic Typic Psammaquents taxonomic class.

EGBERT SILTY CLAY LOAM, PARTIALLY DRAINED, 0 TO 2 PERCENT SLOPES (MAP UNIT 153)

This very deep, artificially drained soil occurs on high floodplains and in backwater swamps. A system of levees and large upstream dams has reduced or virtually eliminated incidents of inundation in most areas. The water table has been lowered due to levees, open and closed drains, and pumps; the lowered water table has altered the drainage of this soil. This soil formed in somewhat poorly drained alluvium derived from mixed rock sources. Included in this unit are small areas of Grangeville, Stockton, Willows, Columbia, Merritt, and Schribner soils. Included areas account for approximately 15 percent of the total acreage of this map unit. Permeability is slow in the Egbert soil. The effective rooting depth is limited by a high seasonal water table in winter and early spring. The water table is high because of seepage and is generally maintained at a depth of 36 to 60 inches by pumping; however, the water table is subject to fluctuation throughout the year. Runoff is very slow and the hazard of water erosion is slight. This soil may provide wetland functions and values when not altered by artificial drainage and groundwater pumping as natural vegetation found in areas of this mapped unit are generally composed of hydrophytic plants, sedges, annual grasses, and forbs. Egbert soils belong to the fine, mixed, non-acid, thermic Cumlic Haplaquolls taxonomic class.

COLUMBIA FINE SANDY LOAM, DRAINED, 0 TO 2 PERCENT SLOPES (MAP UNIT 130)

This very deep, artificially drained soil occurs on natural levees on low floodplains along rivers and sloughs. The water table has been lowered due to levees, open and closed drains, and pumps. The lowered water table has altered the drainage of this soil. This soil formed in somewhat poorly drained alluvium derived from mixed rock sources. A system of levees and large upstream dams has or virtually eliminated incidents of inundation in most areas. Included in this unit are small areas of Columbia soils that have a clayey substratum and inclusions of Sailboat and Valpac soils. Included areas account for 15 percent of the total acreage of this map unit. Permeability is moderately rapid in the Columbia soil. The effective rooting depth is limited by a high seasonal water table. The water table is high because of seepage and is generally maintained below a depth of 36 inches by pumping; the water table can be found at a depth of 20–36 inches for short periods. Runoff is very slow or slow and the hazard of water erosion is slight to non-existent. This soil is subject only to rare periods of flooding. This soil may provide wetland functions and values when not altered by artificial drainage and groundwater pumping. Columbia soils belong to the course-loamy mixed, non-acid, thermic Aquic Xerofluvents taxonomic class.

GRANGEVILLE FINE SANDY LOAM, PARTIALLY DRAINED, 0 TO 2 PERCENT SLOPES (MAP UNIT 166)

The Grangeville series consists of very deep, somewhat poorly drained soils that formed in moderate coarse textured alluvium dominantly from granitic rock sources. Grangeville soils are on alluvial fans and floodplains and have slopes ranging from 0 to 2 percent. Some areas are saline and saline-sodic affected. Included in this unit are small areas of Columbia, Dello, Egbert, Merrit and Valdez soil series. Included areas account for 85% of this map unit. Grangeville soils are somewhat poorly drained. This soil has altered drainage because of the dams and reservoirs in the Sierra Nevada, pumping from the water table, tile and interceptor drains, and filling and leveling of sloughs in the vicinity. This soil has negligible to very low runoff; moderately rapid permeability and moderate permeability in saline-sodic phases. Formerly most areas of Grangeville soils were occasionally flooded, but now stream flow is controlled by large flood control structures to the extent that most areas are not flooded more than once in about 25 to 75 years. The water table is at depths of 24 to 48 inches unless drained. If drained, the water table is at depths of 48 to greater than 60 inches.

GALT CLAY, 0-2% SLOPES (MAP UNIT 160)

This moderately deep, moderately well drained soil occurs on basin rims and low terraces. This soil formed in fine textured alluvium derived from mixed rock sources. Included in this unit are small areas of Archerdale, Vignolo, Hollenbeck, and Stockton soils. Included areas account for approximately 15 percent of the total acreage of this map unit. Permeability is slow in the Galt soil. The effective rooting depth is limited by the depth of the hardpan, which is generally located 20 to 40 inches below the soil surface. Runoff is very slow and the hazard of water erosion is slight. The shrink-swell capacity of this soil is high. This soil may provide wetland functions and values when not altered by artificial drainage. Galt soils belong to the fine, montmorillonitic, thermic Typic Chromoxerents taxonomic class.

A typical soil profile has a grayish brown clay surface layer approximately 25 inches thick. The underlying material is brown clay about 9 inches thick. A weakly cemented hardpan is found at a depth of range of 20 to 40 inches below the soil surface.

DELINEATION RESULTS

Approximately 4.847 acres of potentially jurisdictional waters of the United States are present within the 231.948-acre survey area (Table 1). Potentially jurisdictional features within the survey area include 2.254 acres of drainage ditch, 0.024 acre of freshwater marsh, and 2.569 acres of open water pond. These features meet the three-parameter wetland definition outlined by the wetland delineation manual and Arid West Regional Supplement and/or have an OHWM that meets the definition of waters of the United States. Because these features are adjacent to the San Joaquin River, a TNW, these areas would be considered wetlands adjacent to waters of the United States (Grumbles and Woodley 2007, 2008). Sites qualifying as waters of the United States according to Section 404 of the CWA are depicted on the set of maps in Exhibits 3a to 3i. Delineation sample sites are also included in these exhibits and are cross-referenced to the wetland determination data forms provided in Appendix A. Habitat descriptions for jurisdictional and nonjurisdictional habitats are included below; a habitat map is provided in Appendix C. Representative photographs of habitat types are provided in Appendix D, and a list of species observed within the survey area is provided as Appendix E.

Table 1 Potentially Jurisdictional Features within the Survey Area		
Feature	**ID**	**Acres**
Drainage ditches	DD2	0.007
	DD3	0.005
	DD4	0.078
	DD5	1.860
	DD6	0.010
	DD7	0.016
	DD8	0.278
Drainage Ditch Total		**2.254**
Freshwater marsh	FM1	0.024
Pond	P1	2.569
Total Potentially Jurisdictional Habitats		**4.847**
Source: Compiled by EDAW in 2009		

DRAINAGE DITCHES

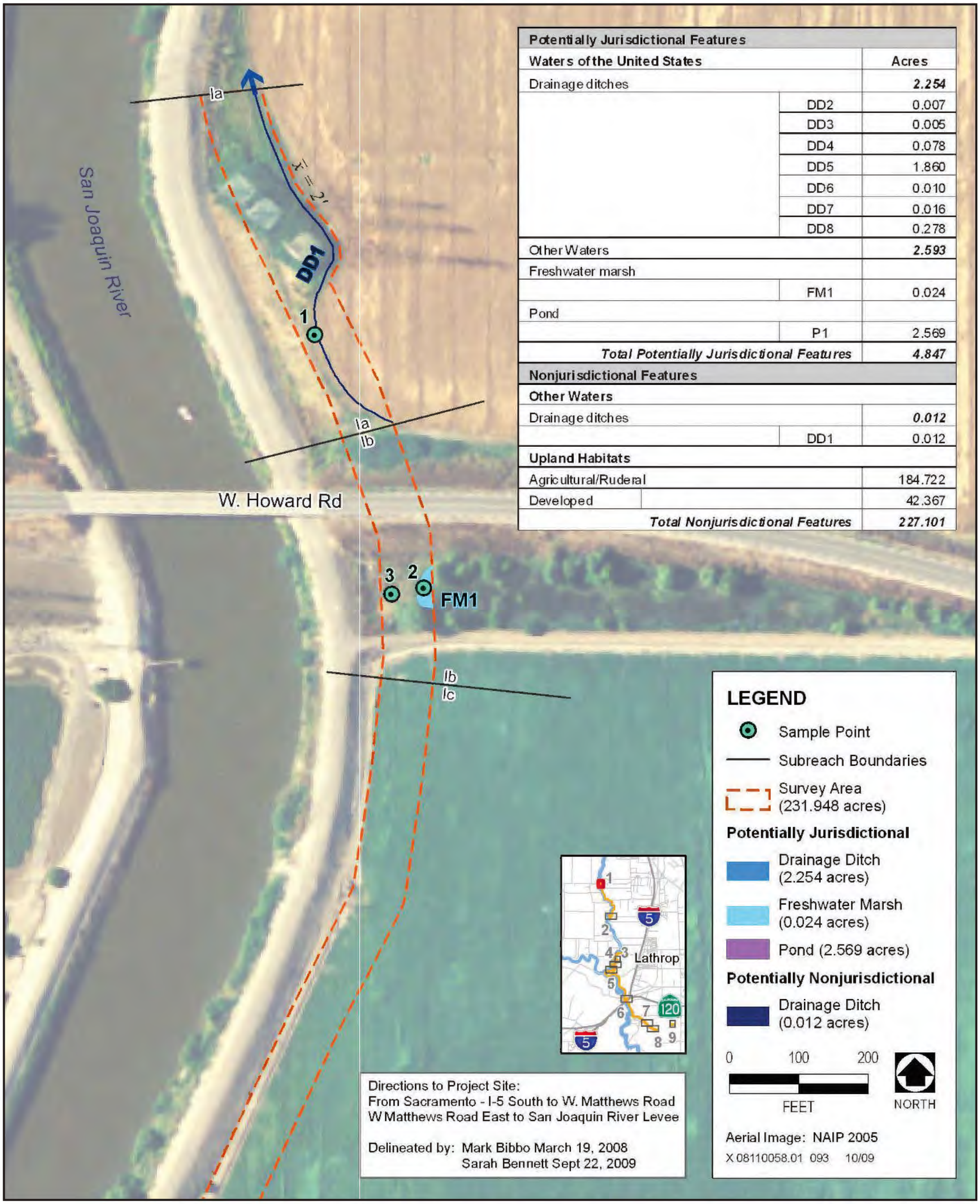
Eight drainage ditches were mapped within the survey area. These ditches primarily function as drainage ditches for the adjacent agricultural fields. Three of the ditches (DD2, DD3, and DD4) exhibited indicators of hydric vegetation, hydric soils and hydrology (Exhibits 3b and 3c). A fourth drainage ditch, DD1, lacked indicators of hydric vegetation, hydric soils and hydrology (Exhibit 3a). This feature is discussed further in the section describing nonjurisdictional features. In ditches DD2, DD3, and DD4, the vegetation was dominated by plant species indicative of seasonal wetlands. Species observed included a mix of obligate and facultative species such as umbrella sedge (*Cyperus eragrostis*)(FACW), rabbitsfoot grass (*Polypogon monspeliensis*)(FACW), water primrose (*Ludwigia peploides* ssp. *peploides*) (OBL), curlytop knotweed (*Polygonum lapathifolium)*(FACW), prickly lettuce (*Lactuca serriola*) (FAC), and curly dock (*Rumex crispus*) (FACW). In addition, drainage ditches in reaches 4 and 5 (DD3 and DD4) had occasional cover of arroyo willow (*Salix lasiolepis*)(FACW) and sandbar willow (*Salix exigua*) (OBL).

Hydric soil indicators observed in drainage ditches included a sandy gleyed matrix in DD2, and redoximorphic features in a sandy soil in DD3 and DD4. In DD2, soil saturation was observed in the top 14 inches and water stained leaves served as indicators of hydrology. Soil surface cracks served as indicators of hydrology in DD3 and DD4.

An OHWM was observed and measured for DD2–D8. DD2–DD4 had an OHWM of approximately 2 feet wide. DD5 and DD7 are larger irrigation/drainage ditches; these features had an OHWM of approximately15 feet. DD6 and DD8 have an OHWM of approximately 10 feet. The boundaries of the OHWM was based on observed physical characteristics of the feature such as the presence of a bed and bank, a change in plant community, and a natural line impressed on the bank (USACE 2005). For the purposes of Section 404 of the Clean Water Act, the lateral limits of jurisdiction over non-tidal water bodes extends to the OHWM in the absence of adjacent wetlands (Grumble and Woodley 2007, 2008).

The drainage ditches are supplied with water from the San Joaquin River via runoff from irrigation of the adjacent agricultural fields. Due to their proximity to the toe of the levee and the San Joaquin River, these wetland features may be connected to the San Joaquin River via sub-surface hydrology. The drainage ditches within the survey area total approximately 2.254 acres. Wetlands and water features adjacent to waters of the United States (in this case the San Joaquin River, a TNW) are considered jurisdictional under Section 404 of the CWA and the Rapanos and Carabell decisions (Grumbles and Woodley 2007, 2008).

Data forms 4, 6, 8, 10, and 15 in Appendix A provide information on the drainage ditches within the survey area. Data forms 5, 7, and 9 provide information on the surrounding upland area.



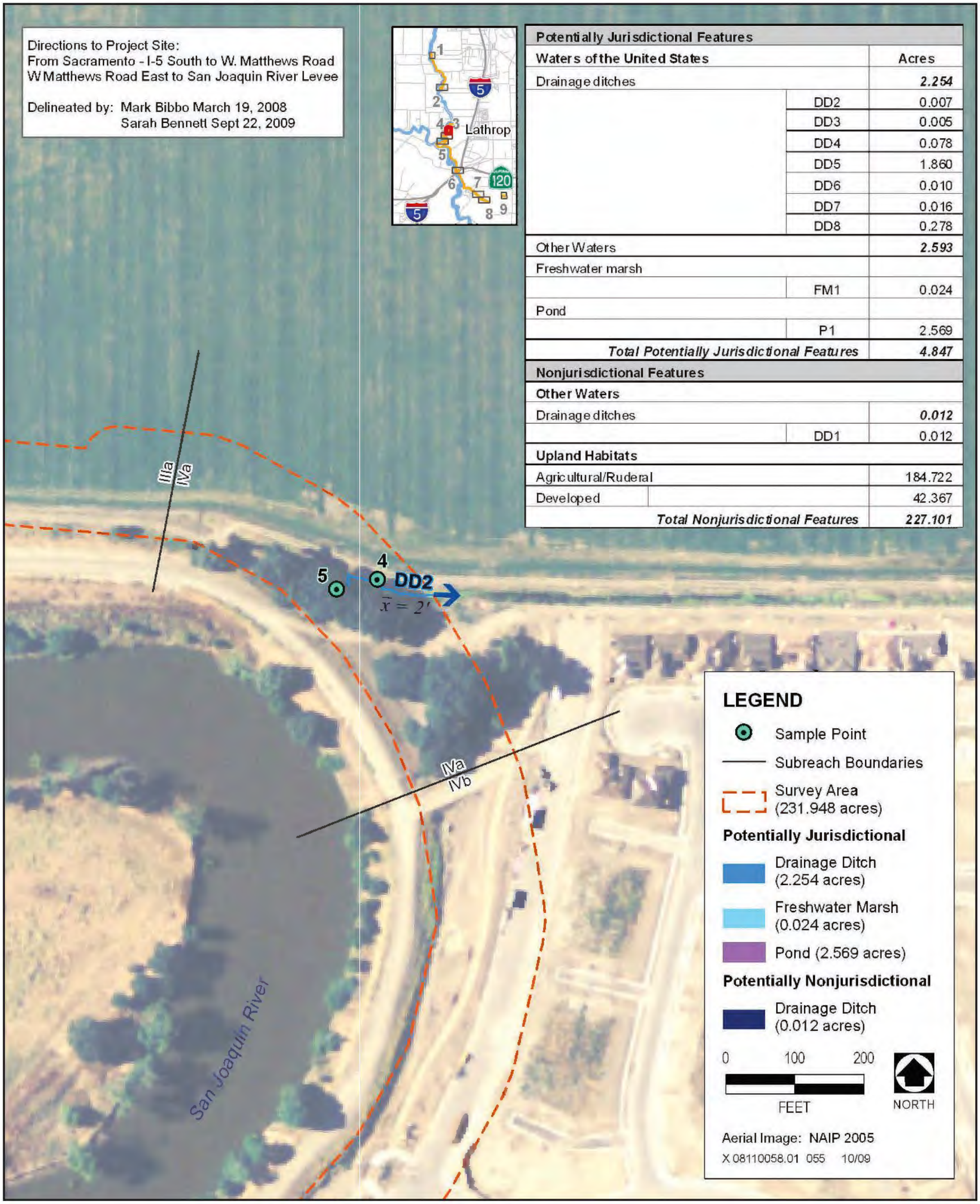
Potentially Jurisdictional Features		
Waters of the United States		**Acres**
Drainage ditches		***2.254***
	DD2	0.007
	DD3	0.005
	DD4	0.078
	DD5	1.860
	DD6	0.010
	DD7	0.016
	DD8	0.278
Other Waters		***2.593***
Freshwater marsh		
	FM1	0.024
Pond		
	P1	2.569
Total Potentially Jurisdictional Features		***4.847***
Nonjurisdictional Features		
Other Waters		
Drainage ditches		***0.012***
	DD1	0.012
Upland Habitats		
Agricultural/Ruderal		184.722
Developed		42.367
Total Nonjurisdictional Features		***227.101***

Source: Engeo 2008, EDAW 2009

Wetland Delineation Map (1 of 9) **Exhibit 3a**

Source: Engeo 2008, EDAW 2009

Wetland Delineation Map (2 of 9) **Exhibit 3b**



Potentially Jurisdictional Features		
Waters of the United States		**Acres**
Drainage ditches		***2.254***
	DD2	0.007
	DD3	0.005
	DD4	0.078
	DD5	1.860
	DD6	0.010
	DD7	0.016
	DD8	0.278
Other Waters		***2.593***
Freshwater marsh		
	FM1	0.024
Pond		
	P1	2.569
Total Potentially Jurisdictional Features		***4.847***
Nonjurisdictional Features		
Other Waters		
Drainage ditches		***0.012***
	DD1	0.012
Upland Habitats		
Agricultural/Ruderal		184.722
Developed		42.367
Total Nonjurisdictional Features		***227.101***

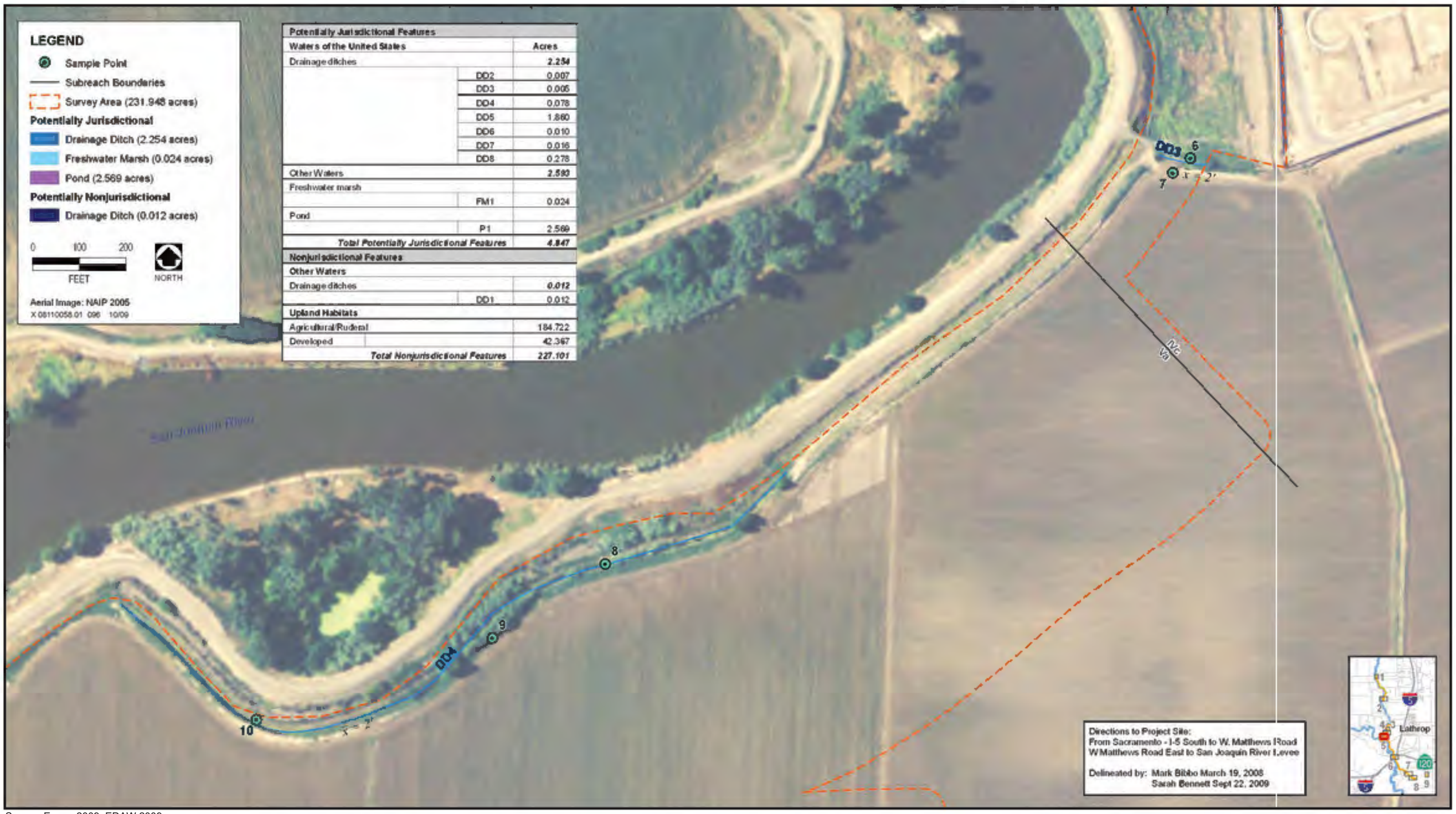
Source: Engeo 2009, EDAW 2009

Wetland Delineation Map (3 of 9) **Exhibit 3c**

Potentially Jurisdictional Features		
Waters of the United States		Acres
Drainage ditches		2.254
	DD2	0.007
	DD3	0.005
	DD4	0.078
	DD5	1.860
	DD6	0.010
	DD7	0.016
	DD8	0.278
Other Waters		2.593
Freshwater marsh		
	FM1	0.024
Pond		
	P1	2.569
Total Potentially Jurisdictional Features		4.847
Nonjurisdictional Features		
Other Waters		
Drainage ditches		0.012
	DD1	0.012
Upland Habitats		
Agricultural/Ruderal		184.722
Developed		42.367
Total Nonjurisdictional Features		227.101

Source: Engeo 2009, EDAW 2009

Wetland Delineation Map (4 of 9) **Exhibit 3d**



Source: Engeo 2009, EDAW 2009

Wetland Delineation Map (5 of 9)

Exhibit 3e

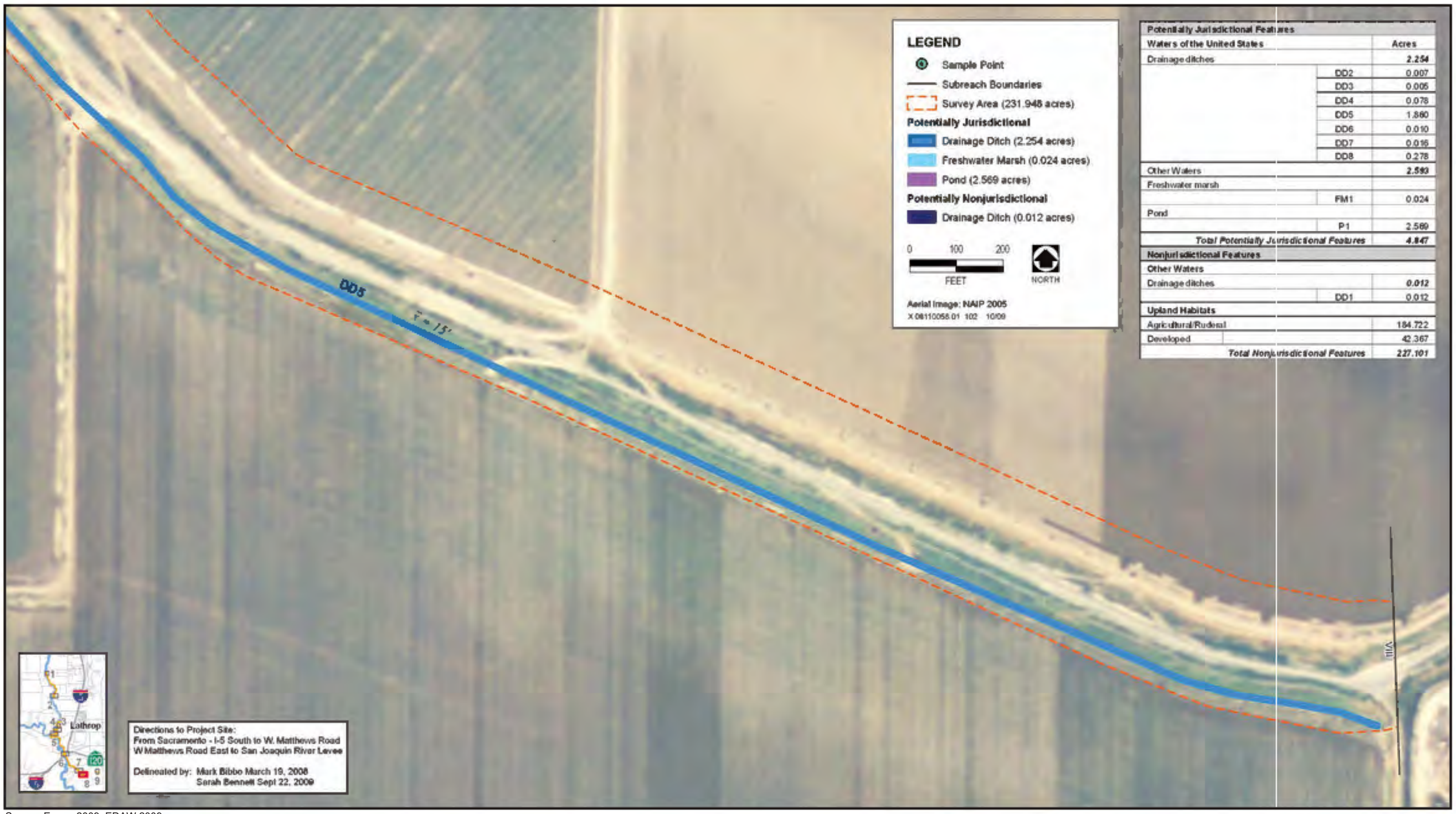
Source: Engeo 2009, EDAW 2009

Wetland Delineation Map (6 of 9) **Exhibit 3f**

Potentially Jurisdictional Features		
Waters of the United States		Acres
Drainage ditches		**2.254**
	DD2	0.007
	DD3	0.005
	DD4	0.078
	DD5	1.860
	DD6	0.010
	DD7	0.016
	DD8	0.278
Other Waters		**2.593**
Freshwater marsh		
	FM1	0.024
Pond		
	P1	2.569
Total Potentially Jurisdictional Features		***4.847***
Nonjurisdictional Features		
Other Waters		
Drainage ditches		***0.012***
	DD1	0.012
Upland Habitats		
Agricultural/Rudeal		184.722
Developed		42.367
Total Nonjurisdictional Features		***227.101***

Source: Engeo 2009, EDAW 2009

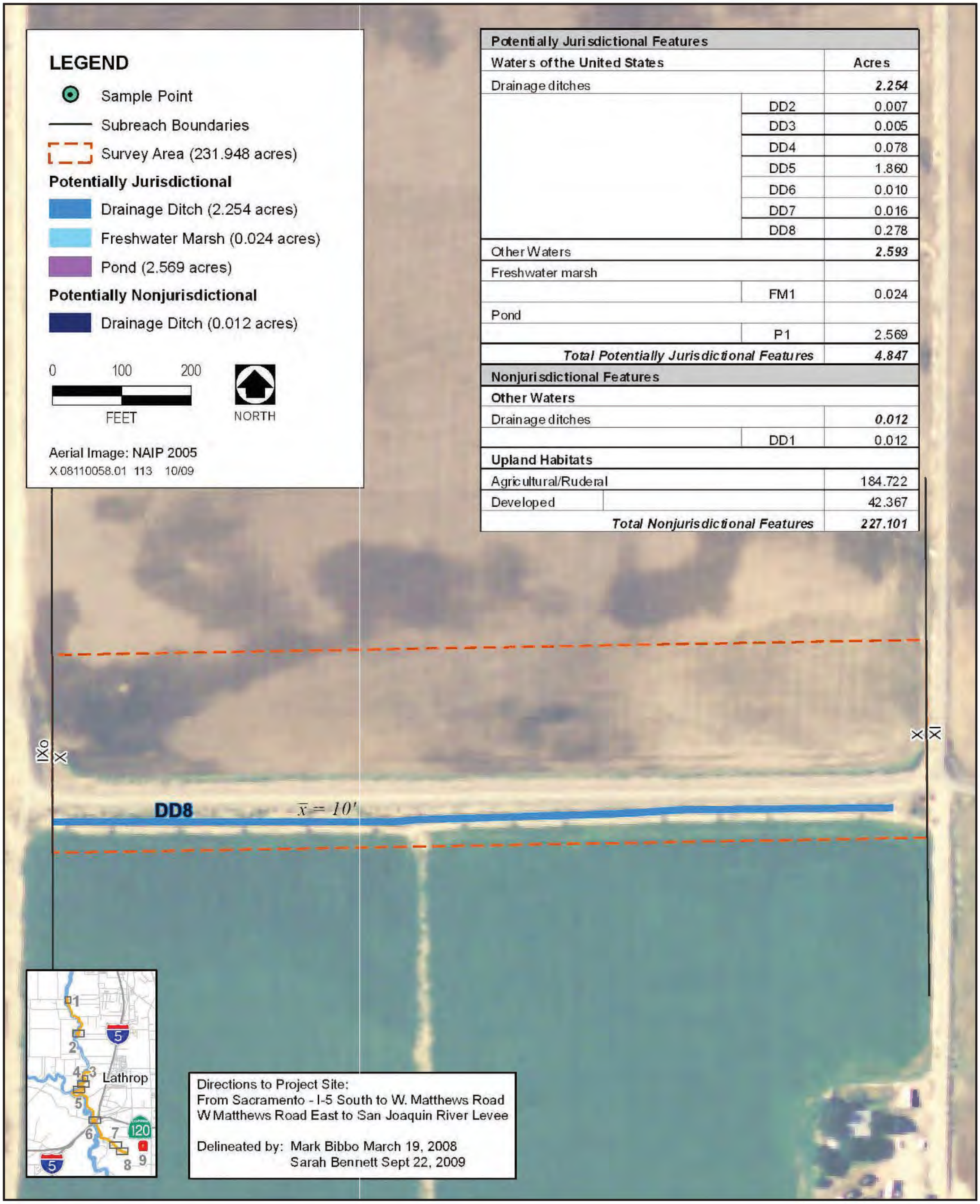
Wetland Delineation Map (7 of 9) **Exhibit 3g**



Potentially Jurisdictional Features		
Waters of the United States		Acres
Drainage ditches		***2.254***
	DD2	0.007
	DD3	0.005
	DD4	0.078
	DD5	1.860
	DD6	0.010
	DD7	0.016
	DD8	0.278
Other Waters		***2.593***
Freshwater marsh		
	FM1	0.024
Pond		
	P1	2.569
Total Potentially Jurisdictional Features		***4.847***
Nonjurisdictional Features		
Other Waters		
Drainage ditches		***0.012***
	DD1	0.012
Upland Habitats		
Agricultural/Ruderal		184.722
Developed		42.367
Total Nonjurisdictional Features		***227.101***

Source: Engeo 2009, EDAW 2009

Wetland Delineation Map (8 of 9) **Exhibit 3h**



Potentially Jurisdictional Features		
Waters of the United States		**Acres**
Drainage ditches		***2.254***
	DD2	0.007
	DD3	0.005
	DD4	0.078
	DD5	1.860
	DD6	0.010
	DD7	0.016
	DD8	0.278
Other Waters		***2.593***
Freshwater marsh		
	FM1	0.024
Pond		
	P1	2.569
Total Potentially Jurisdictional Features		***4.847***
Nonjurisdictional Features		
Other Waters		
Drainage ditches		***0.012***
	DD1	0.012
Upland Habitats		
Agricultural/Ruderal		184.722
Developed		42.367
Total Nonjurisdictional Features		***227.101***

Source: Engeo 2009, EDAW 2009

Wetland Delineation Map (9 of 9) **Exhibit 3i**

FRESHWATER MARSH

A small portion of freshwater marsh habitat, totaling 0.024 acre, is located in a depression within the survey area boundary (Exhibit 3a). Freshwater marshes are herbaceous wetlands that occur along the edges of rivers and lakes and are dominated by emergent vegetation such as grasses, reeds, rushes, and sedges. Marshes are typically perennial wetlands, but may dry out for short periods of time (Cowardin 1979).

The freshwater marsh observed in the survey area is a small piece of a larger marsh (located outside the survey area) that is dominated by narrowleaf cattail (*Typha angustifolia*) (OBL) and common tule (*Scirpus acutus*) (OBL). A few riparian shrubs and trees, including red willow (*Salix laevigata*) (NL), arroyo willow (*Salix lucida* spp. *lasiandra*) (FACW), and box elder (*Acer negundo*) (FACW), occur on the edge of the marsh outside of the survey area boundary. This habitat is characterized by primary indicators of wetland hydrology, including the presence of inundated and saturated soils as well as sediment deposits and drainage patterns.

The freshwater marsh is hydrologically connected to the San Joaquin River via irrigation and drainage ditch pumps. In addition to receiving flow from nearby ditches, this habitat may be maintained by surface and sub-surface water flows from adjacent uplands that naturally drain into the area due to topographic gradients. The freshwater marsh meets the three-parameter wetland definition outlined by the wetland delineation manual and Arid West Regional Supplement. The freshwater marsh is adjacent to the San Joaquin River separated only by an artificial levee. Wetlands adjacent to TNWs are considered jurisdictional under Section 404 of the CWA and the Rapanos and Carabell decisions (Grumbles and Woodley 2007, 2008).

Data form 2 in Appendix A provides information on the freshwater wetland feature. Data form 3 provides information on the surrounding upland area.

POND

One artificial pond was documented in Reach IIb of the survey area. The pond is a result of anthropogenic earth moving activities and is not a natural feature on the landscape. The pond is an open water habitat surrounded by a landscaped yard and weeping willows (*Salix babylonica*) (FACW). The pond may be connected to the San Joaquin River via subsurface hydrology. The pond is likely subject to USACE jurisdiction under Section 404 of the CWA because it is a deepwater aquatic habitat adjacent to the San Joaquin River, a TNW.

POTENTIALLY NONJURISDICTIONAL HABITATS

Potentially nonjurisdictional habitats account for 227.101 acres of the study area (Table 2). The habitats described below are considered nonjurisdictional under Section 404 of the CWA because they do not meet the three parameter criteria for wetlands. The developed habitat type mapped on approximately 42.367 acres of the survey area includes land uses such as residences, landscaped grounds around residences, and other areas of non-agricultural, non-natural land use. A habitat map is included in Appendix C.

Table 2
Potentially Nonjurisdictional Habitats within the Survey Area

Habitat	Acres
Agricultural/Ruderal	184.722
Developed	42.367
Drainage Ditch (DD1)	0.012
Total Nonjurisdictional Habitats	**227.101**

Source: Data compiled by EDAW in 2009

AGRICULTURAL/RUDERAL

The majority of the survey area, approximately 184.722 acres, consists of actively farmed or fallow agricultural land, and ruderal areas on the edges of fields. Actively farmed lands include row crops, grain crops, and orchards. Fallow fields are dominated by a variety of non-native annual grasses such as wild oats (*Avena fatua*) (NL), ripgut brome (*Bromus diandrus*) (NI), and broadleaf weeds including wild radish (*Raphanus sativa*) (NL), field bindweed (*Convolvulus arvensis*) (NL), and black mustard (*Brassica nigra*) (NL).

Ruderal areas are those that have been stripped of their native vegetative cover and that are either covered by gravel or dirt or dominated by weedy non-native species. Ruderal areas are common along the landside of the San Joaquin River levee throughout the survey area, as the vegetation in this area is maintained periodically through prescribed fire and/or mowing. The levee slopes are generally dominated by non-native grasses and forbs such as wild oats, Italian ryegrass (*Lolium multiflorum*) (FAC), blessed milk thistle (*Silybum marianum*) (NL), velvet leaf (*Abutilon theophrasti*) (NI), Russian knapweed (*Acroptilon repens*) (NL), and yellow star-thistle (*Centaurea solstitialis*) (NL). Ruderal areas in the survey area are not likely to fall under USACE jurisdiction as a wetland or waters of the United States because this habitat lacks hydrophytic vegetation and hydric soils, does not have wetland hydrology, and lacks an OHWM.

Data forms 3, 5, 7, and 9 provide information on the upland agricultural and ruderal areas.

DEVELOPED

Developed areas within the study area total approximately 42.367 acres. Developed areas include paved roads, parking lots, buildings, and areas cleared of natural vegetation in preparation for development. Developed areas are not likely to fall under USACE jurisdiction as a wetland or waters of the United States because this habitat lacks hydrophytic vegetation, hydric soils, and does not have wetland hydrology; developed areas are also located outside an OHWM.

DRAINAGE DITCH, DD1

One of the drainage ditches totaling approximately 0.012 acre, DD1, in Reach Ia did not meet the three parameter wetland criteria, nor did this feature have a surface hydrological connection to other waters of the United States. DD1 also lacked indicators of an OHWM. This ditch is located along the edge of a fallow agricultural field; this feature was presumed abandoned because it lacks an OHWM. This feature is not likely subject to USACE jurisdiction under Section 404 of the CWA because it does not meet the three parameter wetland criteria as defined by the 1987 wetland delineation manual and the Arid West Regional Supplement (Environmental Laboratory 1987, 2006) nor does DD1 have an OHWM. Data form 1 provides information on this potentially nonjurisdictional abandoned drainage ditch feature.

JURISDICTIONAL DETERMINATION

The 231.948-acre survey area contains approximately 4.847 acres of waters of the United States, comprised of 0.024 acre of freshwater marsh, 2.569 acres of pond, and 2.254 acres of drainage ditches that are potentially subject to USACE jurisdiction under Section 404 of the CWA. The freshwater marsh meets the three parameter criteria of wetlands (i.e., presence of hydrophytic vegetation, hydric soils, and wetland hydrology) outlined in the 1987 wetland delineation manual and Arid West Regional Supplement (Environmental Laboratory 1987, 2006, 2008). The seven drainage ditches that have an OHWM are also potentially subject to USACE jurisdiction under Section 404 as waters of the United States. The open water pond in Reach IIb is potentially subject to USACE jurisdiction under Section 404 because this feature is likely connected via a subsurface hydrological connection to the San Joaquin River. The San Joaquin River is listed by the USACE Sacramento District office as an established navigable waterway (USACE 2008). The waters and wetlands identified as potentially jurisdictional within the survey area are therefore considered adjacent to the San Joaquin River, a TNW.

DD1 was presumed abandoned because it lacks an OHWM and is located in an agricultural field that appears to have been fallow for several growing seasons. DD1 is not likely to be subject to USACE jurisdiction under Section 404 of the CWA because this feature does not have wetland characteristics (i.e., hydrophytic vegetation, hydric soils, and wetland hydrology) and lacks an OHWM.

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NOAA. *See* National Oceanic and Atmospheric Administration.

NRCS. *See* Natural Resources Conservation Service.

SCS. *See* Soil Conservation Service.

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APPENDIX A

Wetland Delineation Data Forms

Map 1

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD 17 Levee Repair Project City/County: San Joaquin County Sampling Date: 5/19/2008

Applicant/Owner: RD 17 State: CA Sampling Point: 1

Investigator(s): M.Bibbo/ J. Downs Section, Township, Range: (DD1)

Landform (hillslope, terrace, etc.): flat river terrace Local relief (concave, convex, none): flat Slope (%): ____

Subregion (LRR): ____ Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: ____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? no Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? no (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	Is the Sampled Area within a Wetland? Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks: Ag ditch on edge of fallow field.

P41Z1

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. Sorghum halepensis	20	y	FACU
2. Polypogon monspeliensis	10	n	FACW
3. Lythrum hyssopifolium	45	y	FACW
4. Conyza canadensis	5	n	FAC
5. Brassica nigra	5	n	UPL
6. Silybum marianum	2	n	UPL
7. Oenothera biennis	1	n	FACU
8.			
Total Cover:	80		
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 2 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	55	x 2 = 110
FAC species	5	x 3 = 15
FACU species	21	x 4 = 84
UPL species	7	x 5 = 35
Column Totals:	88 (A)	244 (B)

Prevalence Index = B/A = 2.8

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ✓ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5YR 4/3	100	none				sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ______ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______

Water Table Present? Yes ______ No ✓ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Ditch collects runoff from adj ag field, likely doesn't flow into any other waters

Indicators of OHWM not observed.

Map 1

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD 17 Levee Repair Project City/County: San Joaquin County Sampling Date: 5/19/2008

Applicant/Owner: RD 17 State: CA Sampling Point: 2

Investigator(s): M.Bibbo/ J. Downs Section, Township, Range: FMI

Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): ______ Slope (%): ______

Subregion (LRR): ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? no Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? no (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ______
Hydric Soil Present?	Yes ✓	No ______
Wetland Hydrology Present?	Yes ✓	No ______

Is the Sampled Area within a Wetland? Yes ✓ No ______

Remarks: Cattail Marsh in depression behind levee

P4122

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus fremontii	2		
2. Salix ~~gooddingii~~ laevigata	10	y	OBL
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. Typha angustifolia	90	y	OBL
2. Malva neglecta	<1		
3. Epilobium brachycarpum	<1		
4.			
5.			
6.			
7.			
8.			
Total Cover:			
Woody Vine Stratum			
1. Rubus discolor	2		
2.			
Total Cover:			

% Bare Ground in Herb Stratum ______ % Cover of Biotic Crust ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ______

Remarks:

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/1	98	10YR 4/6	2	C	PL/M	clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ______ Depth (inches): ______

Water Table Present? Yes ______ No ______ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ✓ No ______ Depth (inches): 1"

Wetland Hydrology Present? Yes ✓ No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Depression behind levee Might be receiving moisture from seepage through levee.

WETLAND DETERMINATION DATA FORM – Arid West Region

Map 1

Project/Site: RD 17 Levee Repair Project City/County: San Joaquin County Sampling Date: 5/19/2008

Applicant/Owner: RD 17 State: CA Sampling Point: 3

Investigator(s): M.Bibbo/ J. Downs Section, Township, Range: ______

Landform (hillslope, terrace, etc.): toe of levee Local relief (concave, convex, none): flat Slope (%): 0

Subregion (LRR): ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? no Are "Normal Circumstances" present? Yes ______ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? no (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓
Is the Sampled Area within a Wetland?		✓

Remarks: Upland paired point to 2

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. Dactylis glomerata	10		FACU
2. Bromus diandrus	20	yes	UPL
3. Bromus hordeaceous	10		UPL
4. Silybum marinum	40	yes	UPL
5. Rumex crispus	10		FACW
6. Brassica nigra	5		UPL
7. Lactuca serriola	5		FAC
8.			
Total Cover:	90		
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum ______ % Cover of Biotic Crust ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	10	x 2 = 2
FAC species	5	x 3 = 15
FACU species	10	x 4 = 40
UPL species	75	x 5 = 375
Column Totals:	100 (A)	432 (B)

Prevalence Index = B/A = 4.32

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ______ No ✓

Remarks: Ruderal levee veg

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/3	100	none				clay loam ✓	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type: compacted
Depth (inches): 6

Hydric Soil Present? Yes ______ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): __________
Water Table Present? Yes _____ No _____ Depth (inches): __________
Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): __________

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Upland.

Map 5

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD 17 Levee Repair Project City/County: San Joaquin County Sampling Date: 5/19/2008

Applicant/Owner: RD 17 State: CA Sampling Point: 4 (DD2)

Investigator(s): M.Bibbo/ J. Downs Section, Township, Range: ______

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): flat Slope (%): 0

Subregion (LRR): ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? no Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? no (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ___		Is the Sampled Area within a Wetland? Yes ✓ No ___
Hydric Soil Present? Yes ✓ No ___		
Wetland Hydrology Present? Yes ✓ No ___		

Remarks: Overflow drainage ditch, fed by the San Joaquin River

P4149

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. Ludwigia peploides	10	y	OBL
2. Polygonum lapathifolium	10	y	OBL
3. Polypogon monspeliensis	2		FACW
4. Rumex crispus	<1		FACW
5.			
6.			
7.			
8.			
Total Cover:	22		
Woody Vine Stratum			
1. Rubus discolor	5		
2.			
Total Cover:			

% Bare Ground in Herb Stratum 80 % Cover of Biotic Crust 5

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks:

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0->18	5Y 3/1	60	10YR 5/4	40	C	M	Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ✓ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ___

Remarks: Hydrogen sulfide odor also present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ______

Water Table Present? Yes ___ No ___ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 1"

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Ditch is dug out the uplands ~ 6' deep ~2' wide.
OHWM indicators = Δ in plant community, bed & banks, deposition.

Map 5

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD 17 Levee Repair Project City/County: San Joaquin County Sampling Date: 5/19/2008

Applicant/Owner: RD 17 State: CA Sampling Point: 5

Investigator(s): M.Bibbo/ J. Downs Section, Township, Range: ______

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): flat Slope (%): 0

Subregion (LRR): ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: M.U. 130 Columbia fine sandy loam NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? no Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? no (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No ✓
Hydric Soil Present?	Yes ___	No ✓
Wetland Hydrology Present?	Yes ___	No ✓

Is the Sampled Area within a Wetland? Yes ___ No ✓

Remarks: Upland paired point to SP4

P 4150

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus lobata	10	y	FAC
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. Bromus diandrus	90	y	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	90		
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum ______ % Cover of Biotic Crust ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	10	x 3 =	30
FACU species		x 4 =	
UPL species	90	x 5 =	450
Column Totals:	100 (A)		480 (B)

Prevalence Index = B/A = 4.8

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ___ No ✓

Remarks:

SOIL

Sampling Point: 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-6	10YR 4/3	100					Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type: compaction
Depth (inches): 6

Hydric Soil Present? Yes ___ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Upland paired point

Map 5

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD 17 Levee Repair Project City/County: San Joaquin County Sampling Date: 5/19/2008

Applicant/Owner: RD 17 State: CA Sampling Point: 6

Investigator(s): M.Bibbo/ J. Downs Section, Township, Range: DO3

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): flat Slope (%): 0

Subregion (LRR): ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: M.U. 130 Columbia fine sandy loam NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ___
Hydric Soil Present?	Yes ✓	No ___
Wetland Hydrology Present?	Yes ✓	No ___

Is the Sampled Area within a Wetland? Yes ✓ No ___

Remarks: Drainage ditch at edge of disced field & new development.

P 4153

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus fremontii	2		FACW
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. Salix lasiolepis	60	y	OBL
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. Lactuca serriola	2	n	FAC
2. Brassica nigra	2	n	Upl
3. Urtica dioica	2	n	FACW
4.			
5.			
6.			
7.			
8.			
Total Cover:	6		
Woody Vine Stratum			
1. Rubus discolor	10		
2.			
Total Cover:	75		

% Bare Ground in Herb Stratum 25 % Cover of Biotic Crust ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks: Willow scrub veg

SOIL

Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	90	10YR 5/4	10	C	M	Sandy loam	Carbon accum.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ✓ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ✓ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ✓ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): ___
Water Table Present?	Yes ___	No ✓	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No ✓	Depth (inches): ___

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: ditch 6' deep × 2' wide
OHWM indicators - bed & banks, change in plant community, ~~water~~

Map 5

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD 17 Levee Repair Project City/County: San Joaquin County Sampling Date: 5/19/2008

Applicant/Owner: RD 17 State: CA Sampling Point: 7

Investigator(s): M.Bibbo/ J. Downs Section, Township, Range: ______

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): flat Slope (%): 0

Subregion (LRR): ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? no Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? no (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No ✓
Hydric Soil Present?	Yes ___	No ✓
Wetland Hydrology Present?	Yes ___	No ✓

Is the Sampled Area within a Wetland? Yes ___ No ✓

Remarks: Upland paired pt.
edge of recently disced field ruderal upland veg

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. Brassica nigra	10	y	upl
2. Nicotiana glauca	2	n	FAC
3. Malva neglecta	1	n	UPL
4. Sorghum halepensis	1	n	FACU
5. Acroptilon	5	y	upl
6.			
7.			
8.			
Total Cover:	20		
Woody Vine Stratum			
1.			
2.			
Total Cover:	20		

% Bare Ground in Herb Stratum 80 % Cover of Biotic Crust ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ___ No ✓

Remarks:

SOIL

Sampling Point: 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/3						Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ______ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ______ Depth (inches): ______________
Water Table Present? Yes ______ No ______ Depth (inches): ______________
Saturation Present? (includes capillary fringe) Yes ______ No ______ Depth (inches): ______________

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Upland.

Map 6

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD 17 Levee Repair Project City/County: San Joaquin County Sampling Date: 5/19/2008

Applicant/Owner: RD 17 State: CA Sampling Point: 8

Investigator(s): M.Bibbo/ J. Downs Section, Township, Range: DD4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): flat Slope (%): 0

Subregion (LRR): ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? no Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? no (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ✓ No ____	

Remarks: Drainage ditch adj. to ag fields
P415B

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus fremontii	2		FACW
2.			
3.			
4.			
Total Cover:	2		
Sapling/Shrub Stratum			
1. Salix exigua	80	y	OBL
2.			
3.			
4.			
5.			
Total Cover:	80		
Herb Stratum			
1. Cyperus eragrostis	10	y	OBL
2. Brassica nigra	15	y	upl
3. Rumex crispus	2	n	FACW
4. Cynodon dactylon	5	n	FAC
5. Silybum marianum	1	n	upl
6.			
7.			
8.			
Total Cover:	35		
Woody Vine Stratum			
1. Rubus discolor	2		
2.			
Total Cover:	95		

% Bare Ground in Herb Stratum 60 % Cover of Biotic Crust 5

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: Willow scrub veg over most of the length of the ditch.

SOIL

Sampling Point: 8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR 3/2	80	10YR 5/6	20	C	M	Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ✓ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ✓ No ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ✓ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ______ Depth (inches): ______

Water Table Present? Yes ______ No ______ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ✓ No ______ Depth (inches): 14"

Wetland Hydrology Present? Yes ✓ No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: ~4' deep ~2' wide
OHWM indicators, = change in plant community, bed & banks

Map 6

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD 17 Levee Repair Project City/County: San Joaquin County Sampling Date: 5/19/2008

Applicant/Owner: RD 17 State: CA Sampling Point: 9

Investigator(s): M.Bibbo/ J. Downs Section, Township, Range: ____

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): flat Slope (%): 0

Subregion (LRR): ____ Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: ____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? NO (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks: Upland paired point to SP8

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. Brassica nigra	20	y	NL
2. Silybum marianum	10	y	UPL
3. Picris echioides	5		FAC
4. Lactuca serriola	5		FAC
5. Convolvulus arvensis	2		NL
6. Conyza canadensis	2		NL
7. Malva neglecta	<1		NL
8.			
Total Cover:	50		
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: 9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/3	100		None				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type: compaction
Depth (inches): 6"

Hydric Soil Present? Yes ___ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Upland

Map 6

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD 17 Levee Repair Project City/County: San Joaquin County Sampling Date: 5/19/2008

Applicant/Owner: RD 17 State: CA Sampling Point: 10

Investigator(s): M.Bibbo/ J. Downs Section, Township, Range: DD4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): flat Slope (%): 0

Subregion (LRR): ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? no Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? no (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	Is the Sampled Area within a Wetland? Yes ✓ No ___
Hydric Soil Present?	Yes ✓ No ___	
Wetland Hydrology Present?	Yes ✓ No ___	

Remarks: Another point in DD4 w/o willow scrub veg. further to the west.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. Brassica nigra	10	n	UPL
2. Cyperus eragrostis	20	y	OBL
3. Polypogon monspeliensis	25	y	FACW
4. Epilobium brachycarpum	5	n	UPL
5. Gnaphalium luteo-album	5	n	FACW
6. Conyza canadensis	2	n	FAC
7. Oenothera biennis	1	n	FAC
8. Nicotiana glauca	1	n	FAC
Total Cover:	70		
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 20 % Cover of Biotic Crust 5

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks:

SOIL

Sampling Point: ________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR 3/2	90	10YR 5/6	10	C	M	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ✓ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes ✓ No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ✓ Surface Soil Cracks (B6)
- ✓ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ________

Water Table Present? Yes ____ No ✓ Depth (inches): ________

Saturation Present? (includes capillary fringe) Yes ____ No ✓ Depth (inches): ________

Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
~ 4' deep ~ 2' wide
OHWM indicators same as SP8

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD17 Levee Repair Project City/County: San Joaquin County Sampling Date: 9/27/09

Applicant/Owner: RD17 State: CA Sampling Point: 11

Investigator(s): S. Bennett Section, Township, Range: — T2S, R6E (Lathrop)

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): LRR-C Lat: 37.78782 Long: -121.30562 Datum: WGS84

Soil Map Unit Name: Grangeville fine sandy loam NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No X		Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present? Yes ____ No ____		
Wetland Hydrology Present? Yes ____ No X		

Remarks:
Non-native mix of grasses and forbs.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1. Nicotina glauca	3	N	FAC
2. Baccharis pilularis	1	N	NL
3.			
4.			
5.			
= Total Cover	4		
Herb Stratum (Plot size: ____)			
1. Bromus hordeaceous	5	N	NL
2. Centaurea solstitialis	10	N	NL
3. Brassica nigra	7	N	NL
4. Salsola tragus	10	N	NL
5. Bromus diandrus	25	Y	NL
6. Lepidium latifolia	15	N	FACW
7. Rumex crispus	1	N	FACW
8. Hordeum marinum	1	N	FAC
= Total Cover	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 0-3 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
Helitrope cr
Silybum murinum
Avena barbata
Conyza canadensis
Datura
these species also present. Diverse consortium of non-native invasives.

SOIL

Sampling Point: 11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-Surface	—						gravel	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) **(LRR C)**
___ 1 cm Muck (A9) **(LRR D)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) **(LRR C)**
___ 2 cm Muck (A10) **(LRR B)**
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ____________
Depth (inches): ____________

Hydric Soil Present? Yes ______ No ______

Remarks:
No soil pit. Surface is gravel.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) **(Nonriverine)**
___ Sediment Deposits (B2) **(Nonriverine)**
___ Drift Deposits (B3) **(Nonriverine)**
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) **(Riverine)**
___ Sediment Deposits (B2) **(Riverine)**
___ Drift Deposits (B3) **(Riverine)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ________
Water Table Present? Yes ____ No X Depth (inches): ________
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ________

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD17 Levee Repair Project City/County: San Joaquin County Sampling Date: 9/22/09
Applicant/Owner: RD17 State: CA Sampling Point: 12
Investigator(s): S. Bennett Section, Township, Range: – T2S, R6E Lathrop
Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0-2
Subregion (LRR): LRR-C Lat: 37.78783 Long: -121.30599 Datum: WGS84
Soil Map Unit Name: Grangeville fine sandy loam NWI classification: NA.
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	Is the Sampled Area within a Wetland?	Yes ____ No X
Hydric Soil Present?	Yes ____ No ____		
Wetland Hydrology Present?	Yes ____ No X		

Remarks:
Riparian woodland at toe of natural levee / artificial levee. (within Mossdale crossing Park boundaries)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus lobata	20	Y	FAC
2. Populus fremontii	20	Y	FACW
3. Salix laevigata	10	Y	NL
4. Juglans californica	5	N	FAC
	55	= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1. Nicotina glauca	2	N	FAC
2.			
3.			
4.			
5.			
	2	= Total Cover	
Herb Stratum (Plot size: ____)			
1. Bromus diandrus	70	Y	NL
2. Silybum marianum	10	N	FAC
3. Rumex crispus	5	N	FAC
4.			
5.			
6.			
7.			
8.			
	85	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 15 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	20	x 2 = 40
FAC species	42	x 3 = 126
FACU species		x 4 =
UPL species	80	x 5 = 400
Column Totals:	142 (A)	566 (B)

Prevalence Index = B/A = 3.98

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
Overstory is dominated by hydrophytic veg, but understory is a mix of FAC and upland grasses and forbs. Overstory likely tapped into water table, given proximity to the SJ river.

SOIL

Sampling Point: 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ______ No ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ____________

Water Table Present? Yes ______ No X Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ____________

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD17 Levee Repair Project City/County: San Joaquin County Sampling Date: 9/22/09

Applicant/Owner: RD17 State: CA Sampling Point: 13

Investigator(s): S. Bennett Section, Township, Range: — T1S, R6E (Lathrop)

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): LRR-C Lat: 37.81473 Long: -121.31719 Datum: WGS84

Soil Map Unit Name: Egbert silty clay loam NWI classification: NA.

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		
Wetland Hydrology Present?		X
Is the Sampled Area within a Wetland?		X

Remarks:
Ruderal area between levee and housing development. Area appears to be mowed / burned to maintain vegetation as fire control. Reach 3

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1. Salix exigua	>1	N	OBL
2. Nicotiana glauca	>1	N	FAC
3.			
4.			
5.			
= Total Cover	1		
Herb Stratum (Plot size: ____)			
1. Bromus diandrus	25	Y	NL
2. Anthoxanthum ordoratum	>1	N	FACW
3. Silybum murianum	15	Y	FAC
4. Brassica nigra	5	N	NL
5.			
6.			
7.			
8.			
= Total Cover	45		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 55 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species	15	x 3 = 45
FACU species		x 4 =
UPL species	30	x 5 = 150
Column Totals:	45 (A)	195 (B)

Prevalence Index = B/A = 4.3

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

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SOIL

Sampling Point: 13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ________
Depth (inches): ________

Hydric Soil Present? Yes ____ No ____

Remarks:
No soil pit

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD17 Levee Repair Project City/County: San Joaquin County Sampling Date: 9/22/09

Applicant/Owner: RD17 State: CA Sampling Point: 14

Investigator(s): S. Bennett Section, Township, Range: — T1S, R6E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0-2

Subregion (LRR): LRR-C Lat: 37.85165 Long: -121.32181 Datum: WSG84

Soil Map Unit Name: Egbert Silty clay loam NWI classification: L1OW

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes ___ No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:
Artificial pond, adjacent to SJ river. Reach 2

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix babylonica	5	Y	FACW
2. Salix lasiolepis	1	N	OBL
3.			
4.			
	6 = Total Cover		
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 94 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ___	x 1 = ___
FACW species ___	x 2 = ___
FAC species ___	x 3 = ___
FACU species ___	x 4 = ___
UPL species ___	x 5 = ___
Column Totals: ___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:
open water

SOIL

Sampling Point: 14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ No ___

Remarks:

open water - unknown depth

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: RD17 Levee Repair Project City/County: San Joaquin County Sampling Date: 9/27/09

Applicant/Owner: RD17 State: CA Sampling Point: 15

Investigator(s): S. Bennett Section, Township, Range: T2S, R6E (Lathrop)

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0-2

Subregion (LRR): LRR-C Lat: 37.85164 Long: -121.32181 Datum: WGS84

Soil Map Unit Name: ______ NWI classification: PUBx

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes ___	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? Yes X No ___

Remarks:
Agricultural ditch

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ___)			
1. Crypsis vaginiflora	10	Y	OBL
2. Cynodon dactylon	20	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	30		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 70 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: 15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No ___

Remarks:

No soil pit

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- X Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- X Other (Explain in Remarks) OHWM=15'

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ______
Water Table Present?	Yes ___	No X	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ______

Wetland Hydrology Present? Yes X No ___

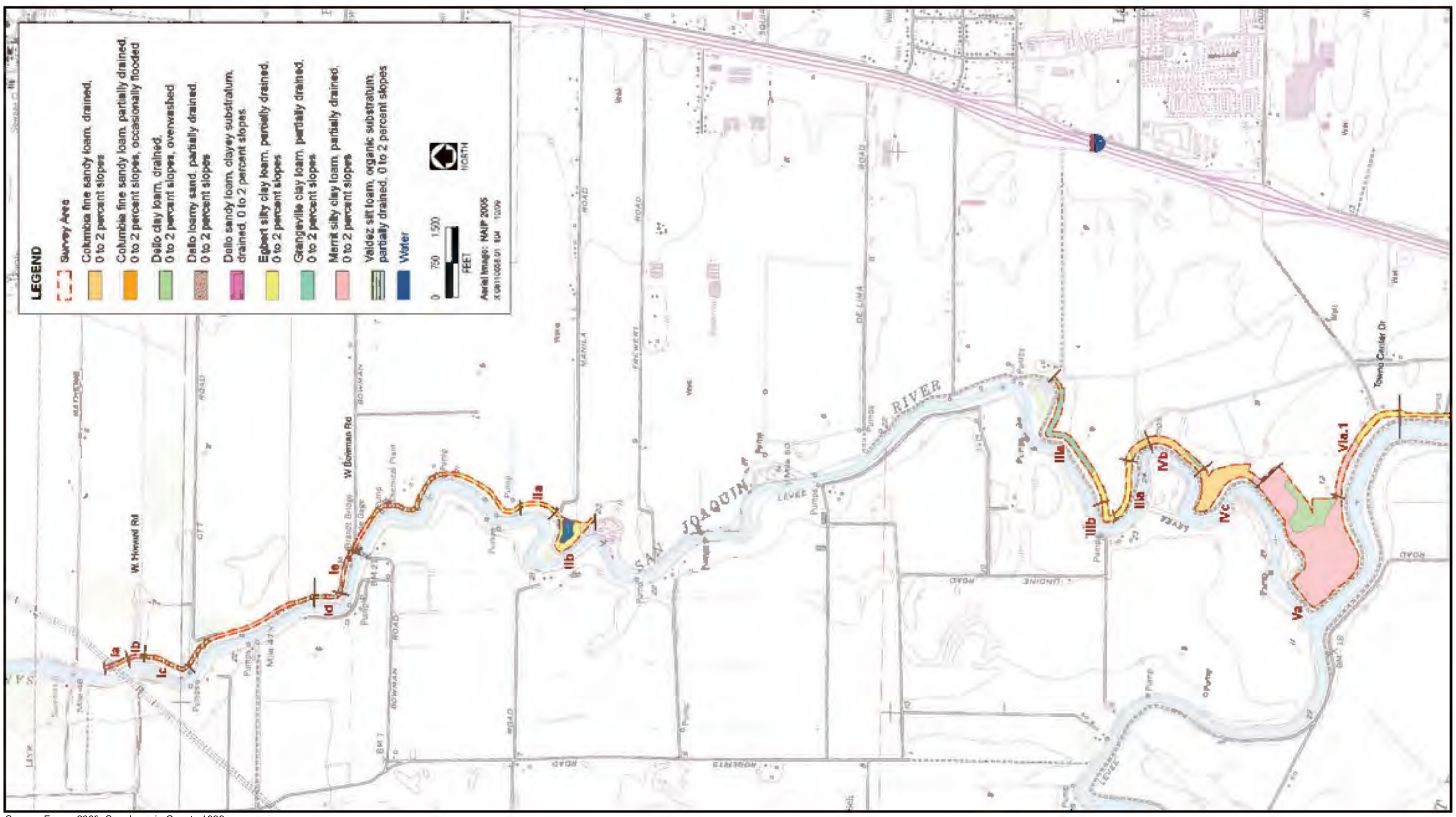
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Agricultural ditch, flap gates to water adjacent to mato. crop.

APPENDIX B

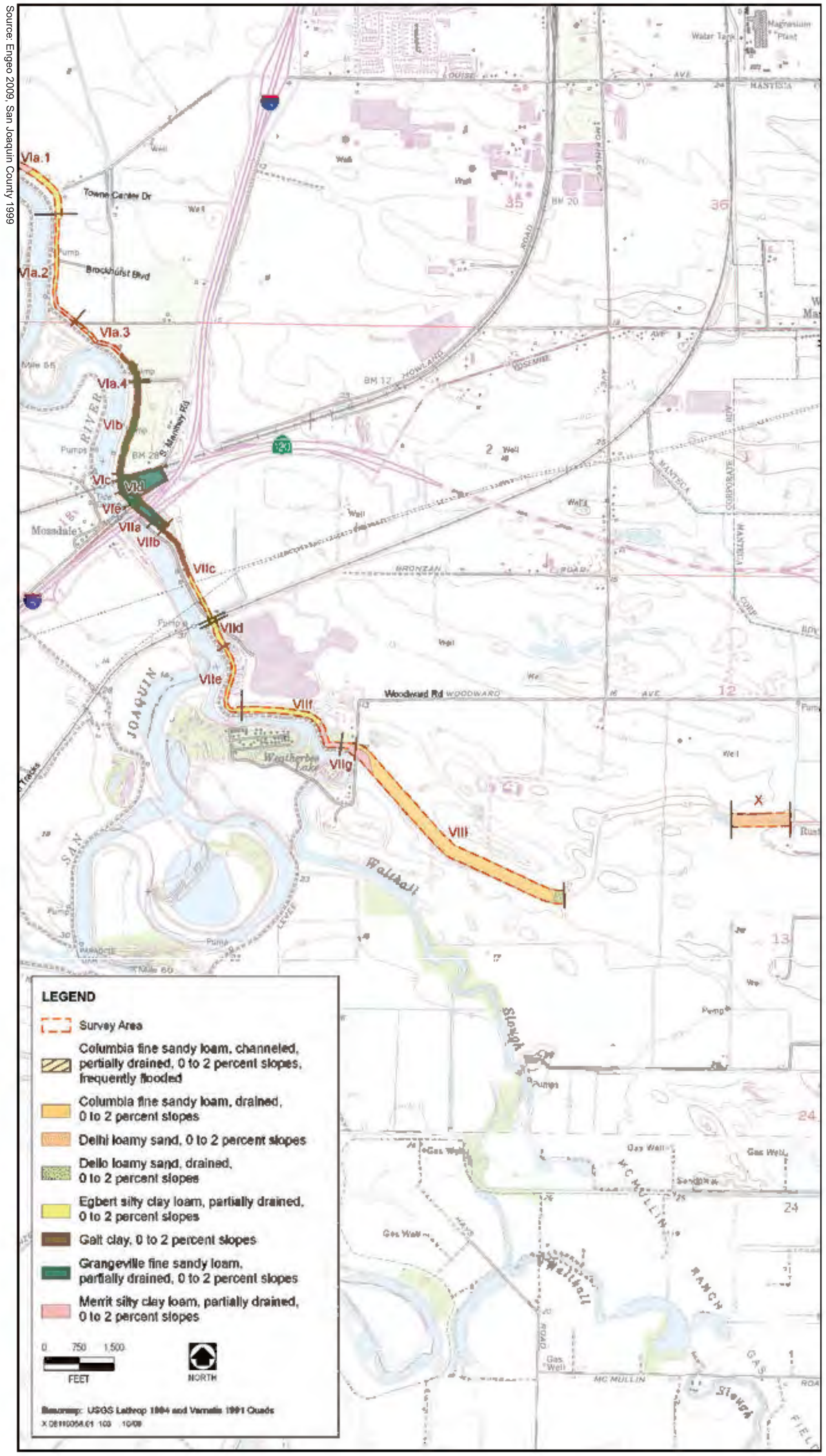
Soils Maps



Source: Engeo 2009, San Joaquin County 1999

Soils – North Half

Exhibit B-1



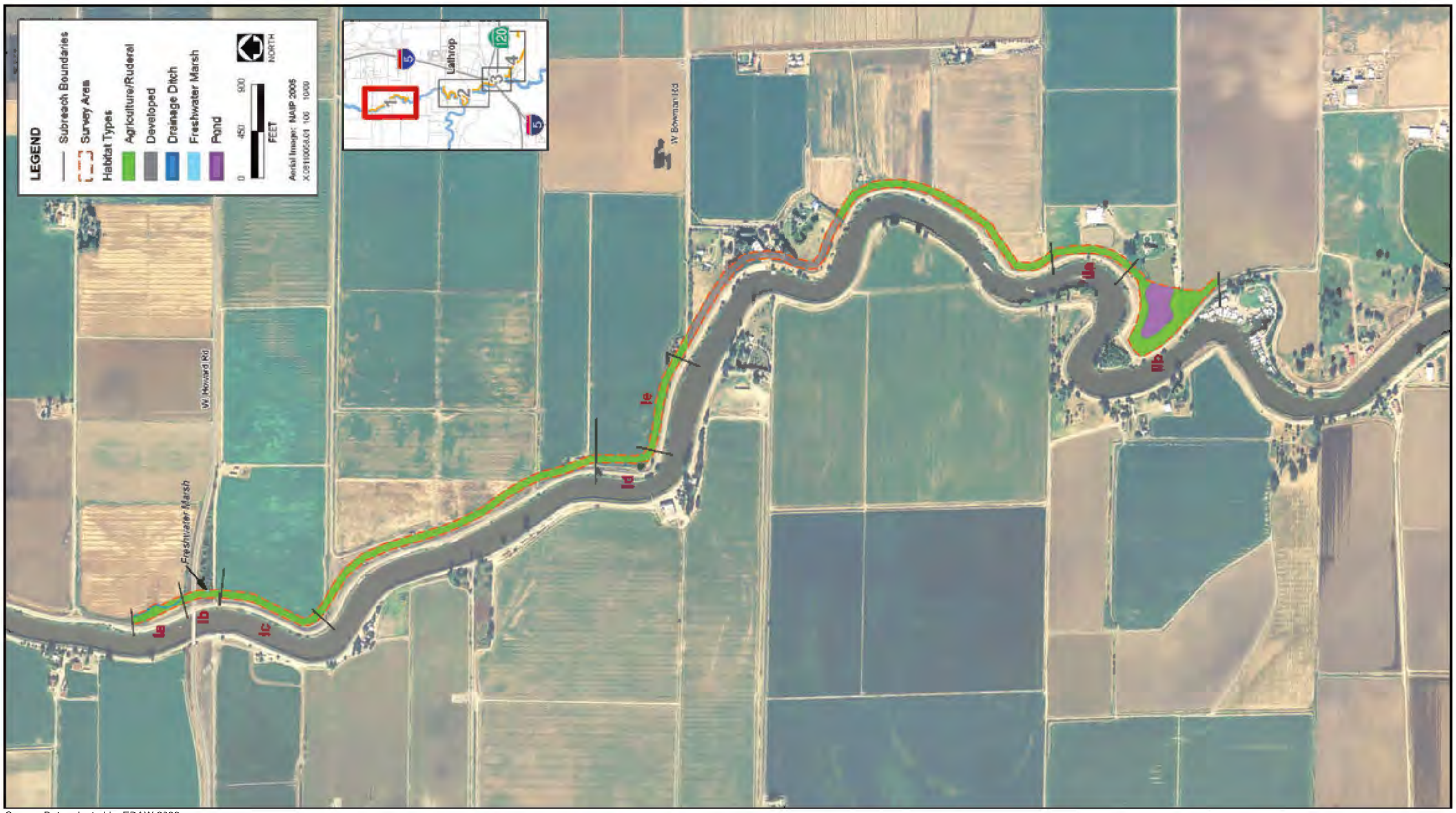
Source: Engeo 2009, San Joaquin County 1999

Exhibit B-2

Soils – South Half

APPENDIX C

Habitat Maps



Source: Data adapted by EDAW 2009

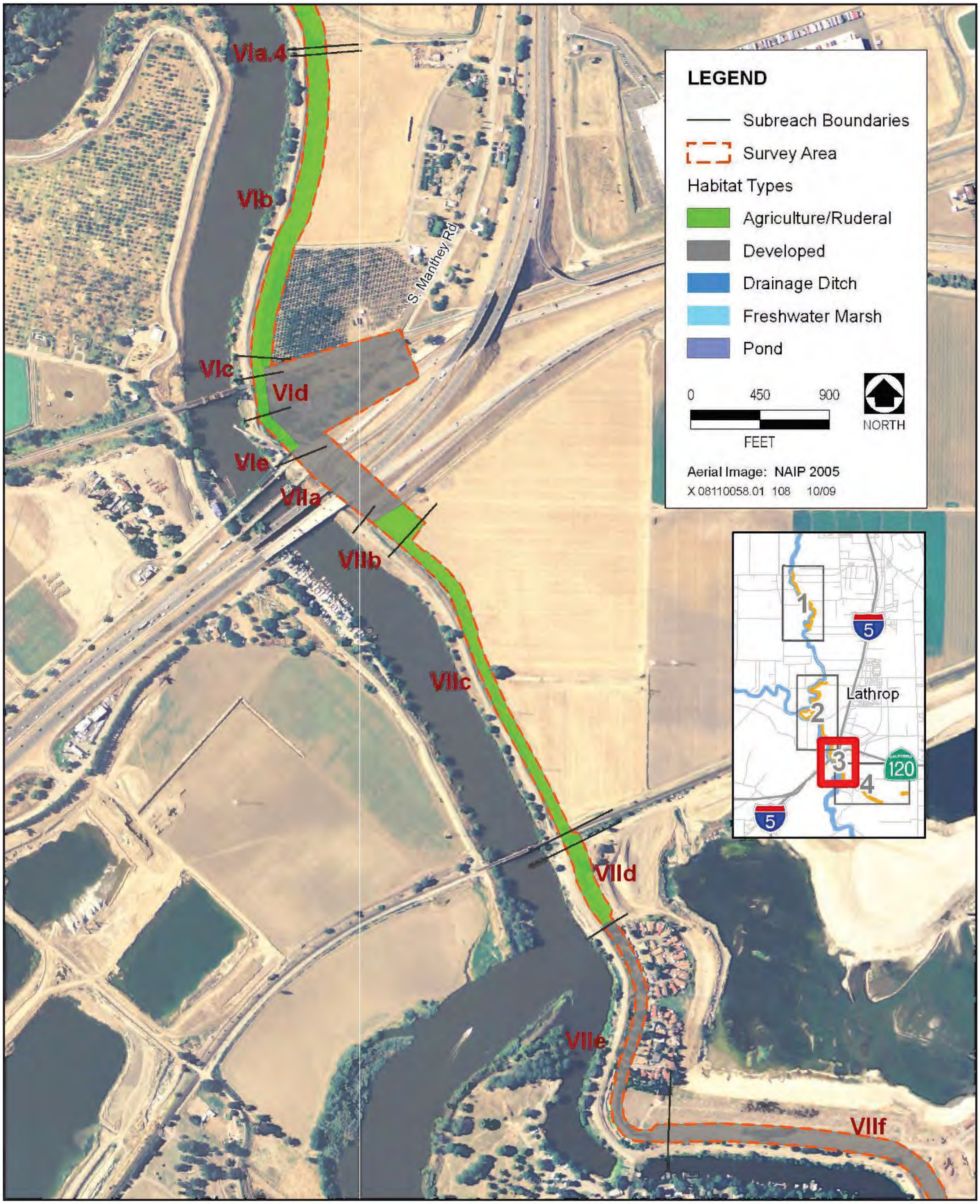
Habitat Maps (North)

Exhibit C-1

Source: Data adapted by EDAW 2009

Habitat Maps (Central North)

Exhibit C-2



Source: Data adapted by EDAW 2009

Habitat Maps (Central South) **Exhibit C-3**

Source: Data adapted by EDAW 2009

Habitat Maps (South) **Exhibit C-4**

APPENDIX D

Representative Photographs


An agricultural field in Reach Ia depicts the dominant land use in the survey area.


Freshwater marsh habitat on the land side of the levee in Reach Ib is dominated by narrow-leaved cattail.

The drainage ditch in Reach IVa (DD2) was dry at the time of the field survey but had saturated soils indicating recent saturation and was dominated by obligate wetland plant species such as floating water primrose.

Riparian shrubs such as arroyo willow and young Fremont's cottonwood trees are present in DD3 in IVc.

APPENDIX E

Plant Species Observed

Common Name	Scientific Name	Wetland Status
Velvetleaf	*Abutilon theophrasti*	NI
Box elder	*Acer negundo*	FACW
Russian knapweed	*Acroptilon repens*	NL
Silver hairgrass	*Aira caryophyllea*	NL
Scarlet pimpernel	*Anagallis arvensis*	FAC
Sweet vernal grass	*Anthoxanthum odoratum*	FACU
Giant reed	*Arundo donax*	FACW
Slender oat	*Avena barbata*	NL
Wild oat	*Avena fatua*	NL
Coyote bush	*Baccharis pilularis*	NL
Black mustard	*Brassica nigra*	NL
Ripgut brome	*Bromus diandrus*	NL
Soft chess	*Bromus hordeaceus*	NL
Italian thistle	*Centaurea repens*	NL
Yellow star-thistle	*Centaurea solstitialis*	NL
Chicory	*Cichorium intybus*	NL
Field bindweed	*Convolvulus arvensis*	NL
Canadian horseweed	*Conyza canadensis*	FAC
Pricklegrass	*Crypsis vaginiflora*	OBL
Bermuda grass	*Cynodon dactylon*	FAC
Umbrella sedge	*Cyperus eragrostis*	FACW
Orchard grass	*Dactylis glomerata*	FACU
Jimson weed	*Datura stramonium*	NL
Barnyard grass	*Echinochloa crus-galli*	FACW
Broadleaf filaree	*Erodium botrys*	NL
Annual fireweed	*Epilobium brachycarpum*	NL
Slender willow-herb	*Epilobium ciliatum*	FACW
Bedstraw	*Galium aparine*	FACU
Cut-leaf geranium	*Geranium dissectum*	NL
Cudweed everlasting	*Gnaphalium luteo-album*	FACW
Great Valley gumweed	*Grindelia camporum*	FACU
Telegraph weed	*Heterotheca grandiflora*	NL
Mediterranean barley	*Hordeum marinum*	FAC
Foxtail barley	*Hordeum murinum*	NL
California black walnut	*Juglans californica*	FAC
Toad rush	*Juncus bufonius*	FACW

Note:
FAC = facultative
FACU = facultative upland
FACW = facultative wetland
NI = no indicator
NL = not listed
OBL = obligate
UPL = upland

Common Name	Scientific Name	Wetland Status
Common rush	*Juncus effusus*	OBL
Prickly lettuce	*Lactuca serriola*	FAC
Duckweed	*Lemna minor*	OBL
Perennial pepperweed	*Lepidium latifolium*	FACW
Italian ryegrass	*Lolium multiflorum*	FAC
Japanese honeysuckle	*Lonicera japonica*	NI
Birds-foot trefoil	*Lotus corniculatus*	FAC
Water primrose	*Ludwigia peploides* ssp. *peploides*	OBL
Hyssop loosestrife	*Lythrum hyssopifolia*	FACW
Cheeseweed	*Malva parviflora*	NL
Bur-clover	*Medicago polymorpha*	NL
Alfalfa	*Medicago sativa*	NL
Indian sweetclover	*Melilotus indica*	FAC
Tree tobacco	*Nicotiana glauca*	FAC
Common evening primrose	*Oenothera biennis*	NL
Dallisgrass	*Paspalum dilatatum*	FAC
English plantain	*Plantago lanceolata*	FAC
Annual blue grass	*Poa annua*	FACW
Common knotweed	*Polygonum arenastrum*	NL
Curlytop knotweed	*Polygonum lapathifolium*	FACW
Rabbitsfoot grass	*Polypogon monspeliensis*	FACW
Fremont's cottonwood	*Populus fremontii*	FACW
Valley oak	*Quercus lobata*	FAC
Wild radish	*Raphanus sativa*	NL
Himalayan blackberry	*Rubus discolor*	FACW
Curly dock	*Rumex crispus*	FACW
Weeping willow	*Salix babylonica*	FACW
Sandbar willow	*Salix exigua*	OBL
Gooding's willow	*Salix gooddingii*	OBL
Red willow	*Salix laevigata*	NL
Arroyo willow	*Salix lasiolepis*	OBL
Blue elderberry	*Sambucus mexicana*	FAC
Blessed milk thistle	*Silybum marianum*	NL
Russian tumbleweed	*Salsola tragus*	NL
Sow thistle	*Sonchus oleraceus*	NL
Johnsongrass	*Sorghum halepense*	FACU

Note:

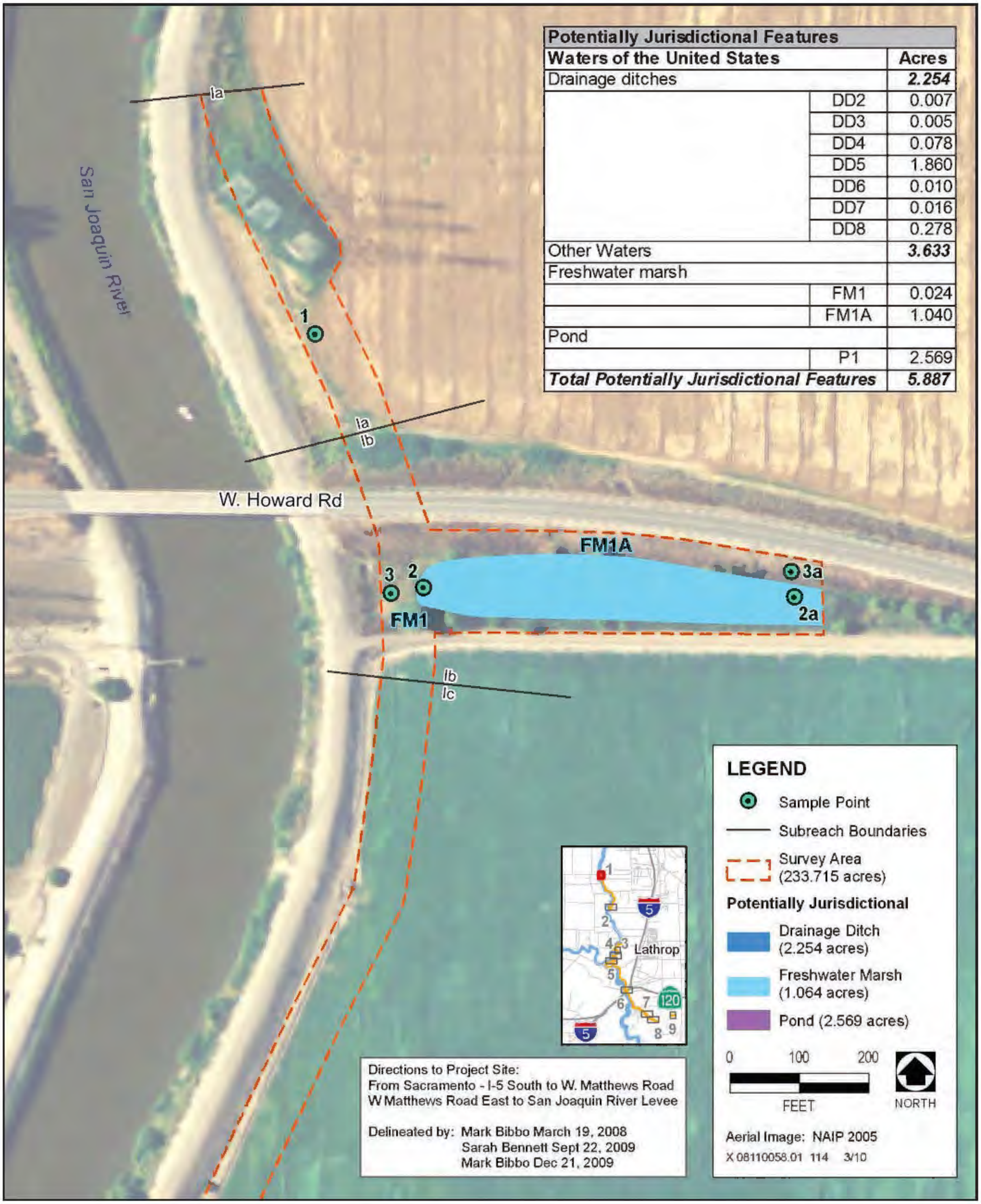
FAC = facultative
FACU = facultative upland
FACW = facultative wetland
NI = no indicator
NL = not listed
OBL = obligate
UPL = upland

Common Name	Scientific Name	Wetland Status
Field hedge parsley	*Torilis arvensis*	NL
Poison oak	*Toxicodendron diversilobum*	NL
Red clover	*Trifolium hirtum*	NL
Broad-leaf cattail	*Typha latifolia*	OBL
Narrow-leaf cattail	*Typha angustifolia*	OBL
Stinging nettle	*Urtica dioica*	FACW
South American vervain	*Verbena bonariensis*	FACW
Common vetch	*Vicia sativa*	NL
Wild grape	*Vitis californica*	FACW
Foxtail fescue	*Vulpia myuros*	FACU
Cocklebur	*Xanthium strumarium*	FAC

Note:
FAC = facultative
FACU = facultative upland
FACW = facultative wetland
NI = no indicator
NL = not listed
OBL = obligate
UPL = upland

Attachment 2

RD 17 Maps



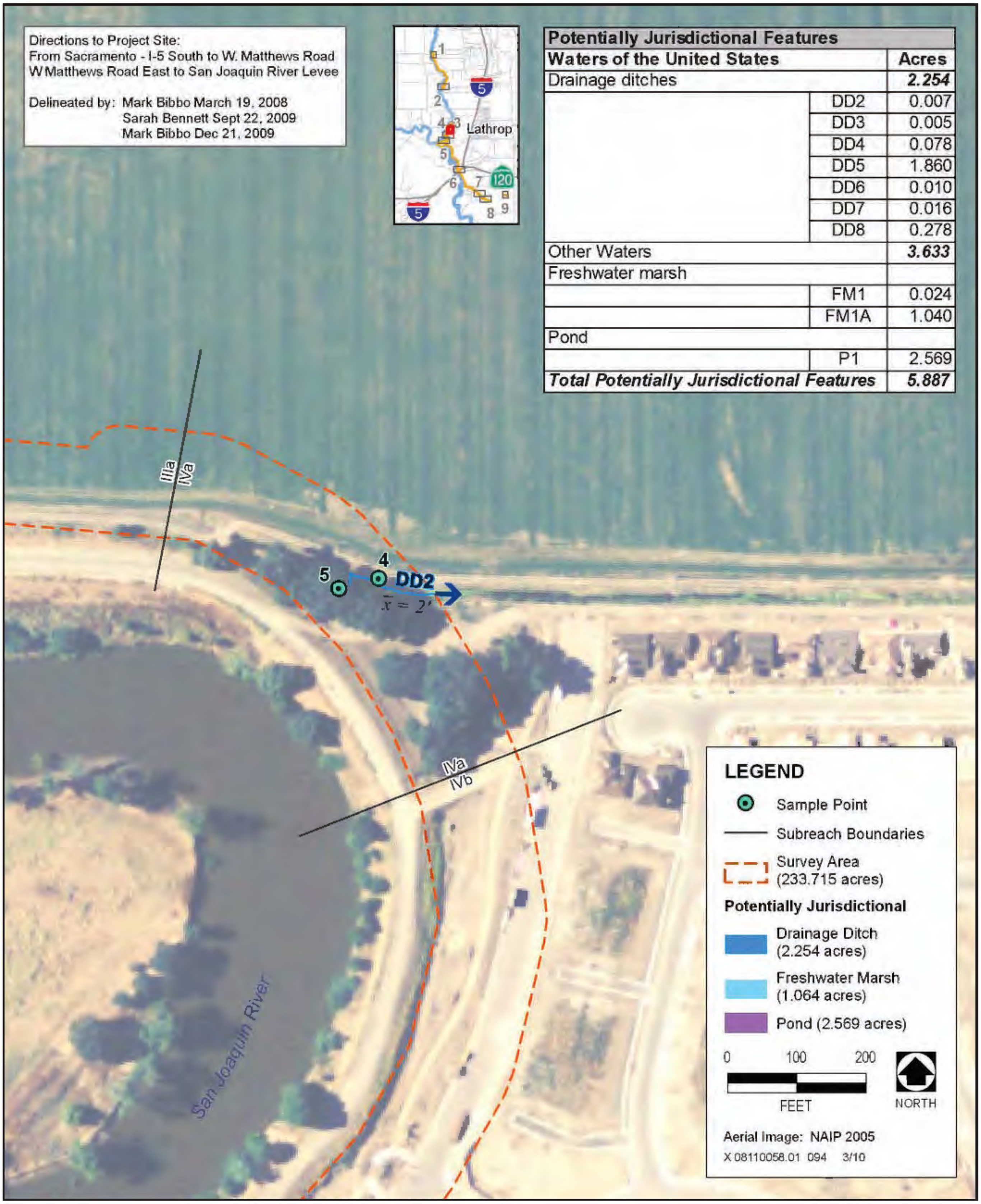
Potentially Jurisdictional Features		
Waters of the United States		**Acres**
Drainage ditches		***2.254***
	DD2	0.007
	DD3	0.005
	DD4	0.078
	DD5	1.860
	DD6	0.010
	DD7	0.016
	DD8	0.278
Other Waters		***3.633***
Freshwater marsh		
	FM1	0.024
	FM1A	1.040
Pond		
	P1	2.569
Total Potentially Jurisdictional Features		***5.887***

Source: Engeo 2008, AECOM 2010

Wetland Delineation Map (1 of 9) **Exhibit 3a**

Source: Engeo 2008, AECOM 2010

Wetland Delineation Map (2 of 9) **Exhibit 3b**



Source: Engeo 2009, AECOM 2010

Wetland Delineation Map (3 of 9) **Exhibit 3c**

Source: Engeo 2009, AECOM 2010

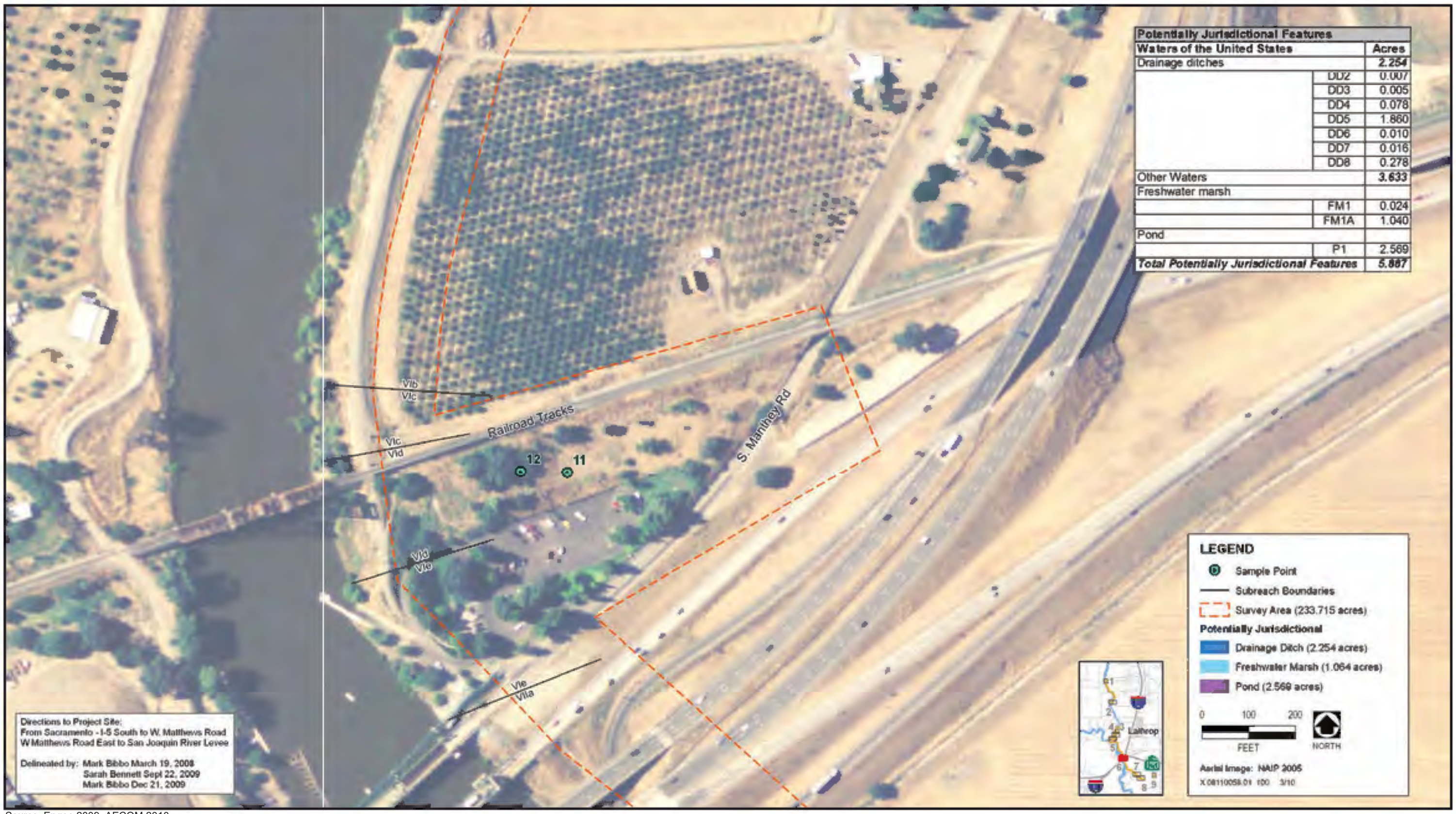
Wetland Delineation Map (4 of 9)

Exhibit 3d

Potentially Jurisdictional Features		
Waters of the United States		Acres
Drainage ditches		2.254
	DD2	0.007
	DD3	0.005
	DD4	0.078
	DD5	1.860
	DD6	0.010
	DD7	0.016
	DD8	0.278
Other Waters		3.633
Freshwater marsh		
	FM1	0.024
	FM1A	1.040
Pond		
	P1	2.569
Total Potentially Jurisdictional Features		5.887

Source: Engeo 2009, AECOM 2010

Wetland Delineation Map (5 of 9) **Exhibit 3e**



Potentially Jurisdictional Features		
Waters of the United States		**Acres**
Drainage ditches		2.254
	DD2	0.007
	DD3	0.005
	DD4	0.078
	DD5	1.860
	DD6	0.010
	DD7	0.016
	DD8	0.278
Other Waters		3.633
Freshwater marsh		
	FM1	0.024
	FM1A	1.040
Pond		
	P1	2.569
Total Potentially Jurisdictional Features		***5.887***

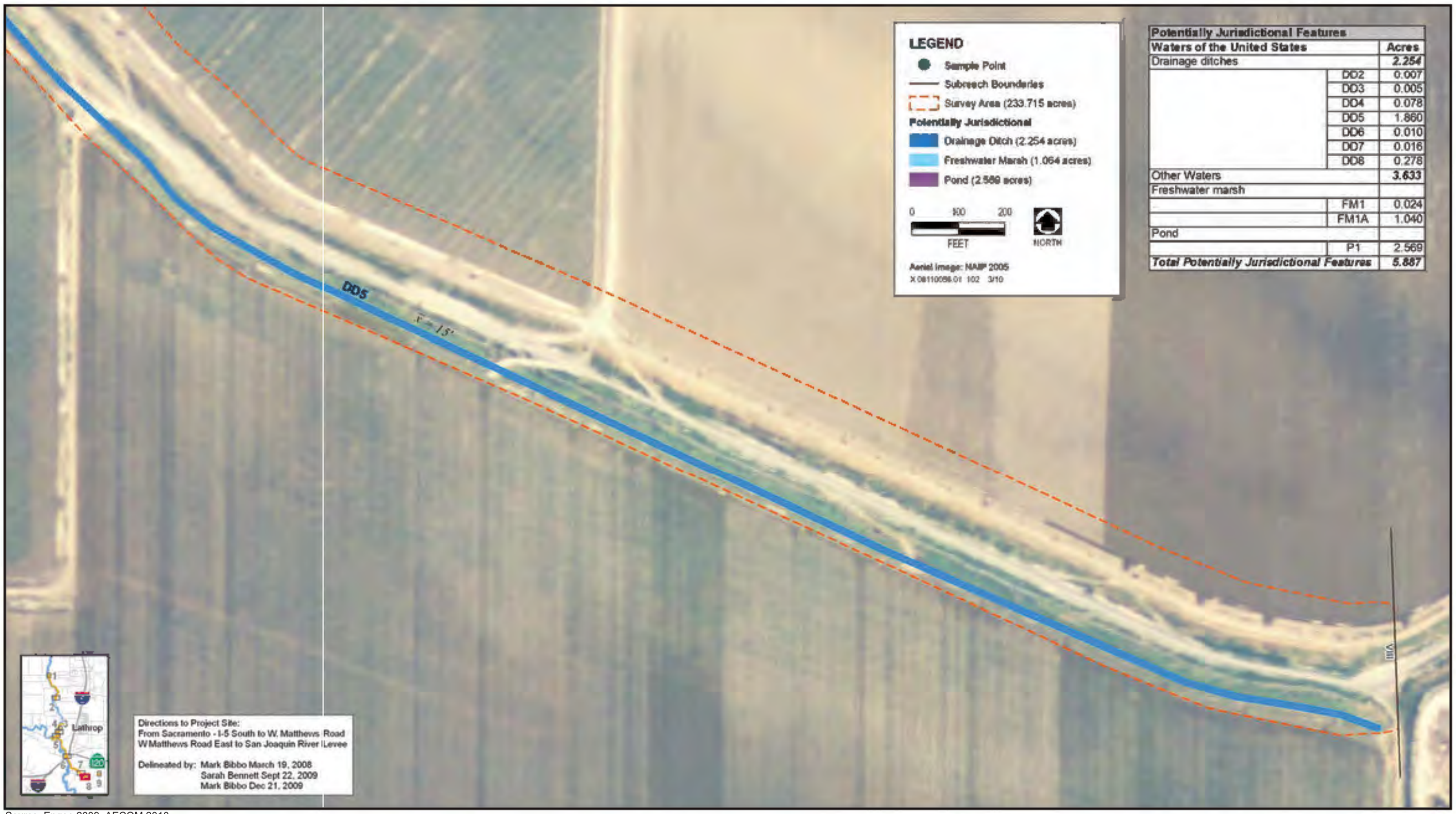
Source: Engeo 2009, AECOM 2010

Wetland Delineation Map (6 of 9) **Exhibit 3f**

Source: Engeo 2009, AECOM 2010

Wetland Delineation Map (7 of 9)

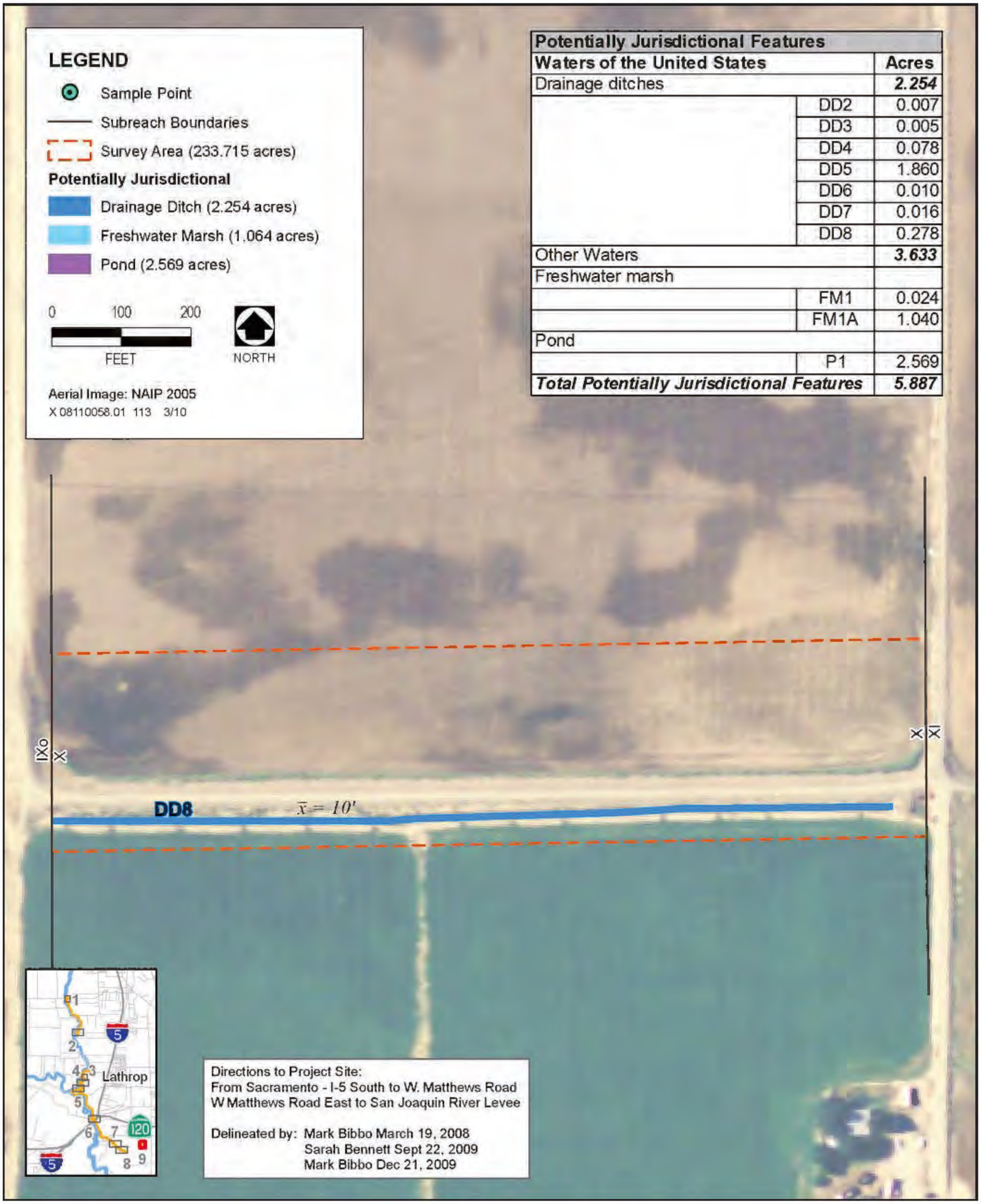
Exhibit 3g



Potentially Jurisdictional Features		
Waters of the United States		**Acres**
Drainage ditches		***2.254***
	DD2	0.007
	DD3	0.005
	DD4	0.078
	DD5	1.860
	DD6	0.010
	DD7	0.016
	DD8	0.278
Other Waters		***3.633***
Freshwater marsh		
	FM1	0.024
	FM1A	1.040
Pond		
	P1	2.569
Total Potentially Jurisdictional Features		***5.887***

Source: Engeo 2009, AECOM 2010

Wetland Delineation Map (8 of 9) **Exhibit 3h**



Potentially Jurisdictional Features		
Waters of the United States		**Acres**
Drainage ditches		***2.254***
	DD2	0.007
	DD3	0.005
	DD4	0.078
	DD5	1.860
	DD6	0.010
	DD7	0.016
	DD8	0.278
Other Waters		***3.633***
Freshwater marsh		
	FM1	0.024
	FM1A	1.040
Pond		
	P1	2.569
Total Potentially Jurisdictional Features		***5.887***

Source: Engeo 2009, AECOM 2010

Wetland Delineation Map (9 of 9) **Exhibit 3i**

2. Letter from NMFS to AECOM, Responding to Technical Assistance Request. June 11, 2010.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Sacramento Area Office
650 Capitol Mall, Suite 8-300
Sacramento, California 95814-4706

JUN 11 2010

Kelly Fitzgerald-Holland
AECOM
2020 L Street, Suite 400
Sacramento, California 95811

Dear Ms. Fitzgerald-Holland:

This is in response to your May 14, 2010, letter requesting technical assistance from NOAA's National Marine Fisheries Service (NMFS) for the Preliminary Delineation of Waters of the United States, Including Wetlands for the Reclamation District (RD) 100-Year Levee Seepage project. The survey for the Preliminary Delineation ranges from the northernmost extent located just south of the City of Stockton to the southernmost extent located adjacent to the southwest edge of the Manteca city limit. The survey area is located on the U.S. Geological Survey 7.5-minute Stockton West and Lathrop Quadrangles, Townships 1 North, 1 and 2 South, Range 6 East.

The existing levees associated with this project are a part of the Federal Flood Control project. Some of the RD 17 100-year Levee Seepage Area project repair activities will require U.S. Army Corps of Engineers (USACE) review and approval for the protection of public facilities as required by 33 United State Code 408. Thus, USACE must complete National Environmental Policy Act (NEPA) environmental analysis. RD 17 will be the lead agency for completing requirements of the California Environmental Quality Act (CEQA).

NMFS has reviewed the information provided with your May 14, 2010, letter. NMFS as an agency has no authority over the methods or conclusions related to a Wetland Delineation. However, we appreciate the early involvement in the RD 17 100-Year Levee Seepage project because the eventual NEPA and CEQA analysis will involve Endangered Species Act (ESA) issues relevant to NMFS.

As the project progresses, it is anticipated that the project applicants will seek out formal comments or consultation as required under the ESA of 1973, as amended (16 U.S.C. 1531 et seq.). Be advised that NMFS can only enter formal section 7 consultation with another federal agency or its designee. Future section 7 consultation for the RD 100-Year Levee Seepage project will involve possible effects of the proposed project on the federally listed threatened Central Valley (CV) steelhead (*Oncorhynchus mykiss*) and Southern distinct population segment (DPS) of North American green sturgeon (*Acipenser Medirostris*). The project is also within the boundaries of designated CV steelhead (*O. mykiss*) and Southern DPS of North American green sturgeon (*A. Medirostris*) critical habitat.

We recommend that for future ESA and Magnuson-Stevens Fishery Conservation and Management Act consultations, the applicants analyze permitted activities to evaluate the direct, indirect, interrelated, interdependent, and cumulative effects related to Federally protected anadromous fish species and their habitat.

If you have any questions regarding this correspondence contact Mike Hendrick, Fisheries Biologist, by telephone at (916) 930-3605 or by e-mail at Michael.Hendrick@noaa.gov.

Sincerely,

For

Maria Rea
Central Valley Office Supervisor

cc: Copy to file – ARN 2010SA00186
NMFS-PRD, Long Beach, California

3. Letter from USACE to USFWS, requesting initiation of formal consultation. March 27, 2015. Includes one attachment (February 2015 Biological Assessment).

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

Environmental Resources Branch

Ms. Maria Rae, Assistant Regional Administrator
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

Dear Ms. Rae:

I am writing to continue informal consultation under Section 7 of the Endangered Species Act, for a combined Department of Army permit application and a Section 408 permission request for Phase 3 of the Reclamation District 17 (RD 17) Levee Seepage Repair Project. We are also requesting to consult with your agency under the Magnusson-Stevens Fishery Conservation and Management Act (MSA) for Pacific Coast Salmon (*Oncorhynchus* spp.) essential fish habitat (EFH). The project is proposed by RD 17, and is located along the San Joaquin River in RD 17 in San Joaquin County, California. A copy of the February 2017, "Phase 3 – RD 17 Levee Seepage Repair Project, Final Biological Assessment" (BA), prepared by GEI, is enclosed.

The Sacramento District (Corps) originally requested to informally consult in a letter dated March, 27, 2015. The National Marine Fisheries Service (NMFS) responded in a letter, dated July 7, 2015, and requested additional information (Appendix D-3). Our specific responses to each element of the information request are provided in Appendix D-4 of the enclosed biological assessment (BA). This information has also been incorporated into the main body of the BA, as appropriate. The BA also includes an updated description of the proposed action.

Based on the available information, we have determined that the action may affect, but is not likely to adversely affect, Federally listed Central Valley steelhead distinct population segment (DPS) (*Oncorhynchus mykiss*), Central Valley spring-run Chinook salmon ESU (*Oncorhynchus tshawytscha*), Sacramento River winter-run Chinook salmon ESU (*Oncorhynchus tshawytscha*) and the Southern DPS of North American green sturgeon (*Acipenser medirostris*). The proposed action will not result in destruction or adverse modification of designated critical habitat for any of these species and will not adversely affect designated Chinook salmon EFH. We request your written concurrence with our determinations. If new information becomes available indicating that other listed species or critical habitat may be affected, we will follow the procedures under 50 CFR 402.16, Reinitiation of Consultation.

The RD 17 Levee Seepage Repair Project is a program of levee repairs and improvements for 19 miles of levee along the San Joaquin River and Walthall Slough. This program is being implemented in three phases. The overall purpose of the program is to repair levee geometry to meet Federal and State levee standards, and to improve levee performance to better address under- and through-seepage. Most improvements are on, or landward of, the existing levee. The Phase 1 Project was completed in 2009. The Phase 2 Project was completed in summer 2010. The Phase 3 Project is the subject of this consultation.

To implement the Phase 3 Project, RD 17, through the Central Valley Flood Protection Board, is requesting permission from the U.S. Army Corps of Engineers pursuant to Section 14 of the Rivers and Harbors Act of 1899 (title 33 of the United States Code [USC], Section 408 [33 USC 408], referred to as Section 408, for alterations of Federal projects. RD 17 is also seeking a permit under Section 404 of the Clean Water Act (33 USC 1344) for placement of fill into jurisdictional waters of the United States.

The following information is provided to your office to initiate consultation:

A description of the action to be considered: The proposed levee modifications would involve: (1) installing approximately 3.3 miles of soil and bentonite cutoff walls; (2) constructing 0.64 miles of seepage berms; (3) constructing a 1,240 foot-long setback levee to restore at least 4.52 acres of floodplain; and (4) filling 0.77 acres of Waters of the United States, including wetlands, and other associated upland fill. A more detailed description of the proposed action is provided in Table 2 ("Summary of Major Activities Proposed for Each Element; Preferred Alternative") of the Enclosed BA. This work would eliminate or reduce levee deficiencies, including through- and under-seepage, slope stability, erosion and encroachments, within the construction footprint.

Details of RD 17's preferred alternative are provided in the enclosed BA and accompanying CD. The CD contains the 65 percent engineering designs plans for the preferred alternative. RD 17 proposes to construct the project over two construction seasons.

A description of the specific area that may be affected by the action: The work proposed as part of the Phase 3 Project would involve modifying approximately 5.3 miles of the Federal levee on the east bank of the San Joaquin River to reduce the potential for flooding, flood damage, and public risk in RD 17. Exhibit 2 of the enclosed BA shows the location of the proposed Phase 3 work. It also depicts levee work completed as part of the earlier Phase 1 and Phase 2 projects. Site specific details are shown in the enclosed BA in Exhibits 4a through 4c, and 13a through 13c.

A description of any listed species or critical habitat that may be affected by the action: We have determined that the proposed action may affect, but is not likely to adversely affect, Central Valley steelhead DPS, Central Valley spring-run Chinook salmon ESU, and the Southern DPS of North American green sturgeon.

A description of the manner in which the action may affect any listed species or critical habitat and analysis of any cumulative impacts: The Phase 3 Project would involve constructing several cutoff walls, which would entail degrading the top one-third to one-half of the levee. The degrade would begin at the waterside edge of the levee crown and would be accomplished without disturbing the waterside levee face. Exhibit 8 in the enclosed BA shows this measure. Implementing cutoff walls as part of the Phase 3 Project would disturb soils along the top of the levee which, through wind and water erosion, could enter the San Joaquin River. Soil disturbed during construction of seepage berms and other features on the landside of the levee could enter drainage ditches and ultimately be pumped into the San

Joaquin River. Therefore, erosion could temporarily increase turbidity and sedimentation in nearby waterways if soils are transported in river flows or stormwater runoff. Through the implementation of water quality best management practices, including a Stormwater Pollution Prevention Plan, the proposed conservation measures (see pages 30 and 31 of the enclosed BA), would avoid direct and indirect take of fish during construction.

A setback levee would be constructed along one segment and the existing project levee would be modified to allow high water to flow onto the floodplain between the existing levee and the new setback levee. Fish and other aquatic organisms would likely flow onto the floodplain. The offset area would be contoured to drain back into the San Joaquin River as the water recedes in a manner that would avoid trapping fish landward of the existing levee. This is described in greater detail on page 23 of the enclosed BA.

Relevant reports including any environmental impact statement, environmental assessment, or biological assessment prepared: A copy of the February 2017, "Phase 3 – RD 17 Levee Seepage Repair Project, Final Biological Assessment" (BA), prepared by GEI, is enclosed.

Any other relevant available information on the action, the listed species, or critical habitat: See the enclosed BA.

This constitutes the best scientific and commercial data available. If you need additional information, or determine that conditioning the permit and letter of permission or modifying the project would preclude the need for formal consultation, please contact us immediately.

A copy of this letter, with the enclosure, will be furnished to Mr. Howard Brown, National Marine Fisheries Service, 650 Capitol Mall, Suite 5-100, Sacramento, California 95814-4700. Copies of the letter will also be furnished: to Dr. Steve Schoenberg, U.S. Fish and Wildlife Service, 2800 Cottage Way, Suite W-2605, Sacramento, CA 95825-1846; Mr. Dante Nomellini, c/o Nomellini, Grilli & McDaniel, P.O. Box 1416, Stockton, CA 95201; Mr. Henry Long, President, Reclamation District No. 17, P.O. Box 1461, Stockton, CA 95201; and Dr. Andrea Shephard, GEI Consulting, Inc. 2868 Prospect Park Drive, Suite 400, Rancho Cordova, CA 95670.

If you have any questions, please contact Ms. Tanis Toland, Environmental Manager, at (916) 557-6717 or by email at Tanis.J.Toland@usace.army.mil.

Sincerely,

Mark T. Ziminske

Mark T. Ziminske
Chief, Environmental Resources Branch

Enclosure

Final Biological Assessment

Phase 3–RD 17 Levee Seepage Repair Project

Prepared for:

Reclamation District (RD) No. 17

Prepared for submittal to:
U.S. Army Corps of Engineers

US Army Corps of Engineers ®
Sacramento District

AECOM

February 2015

Final Biological Assessment

Phase 3–RD 17 Levee Seepage Repair Project

Prepared for:

Reclamation District (RD) No. 17
c/o Nomellini, Grilli & McDaniel
235 E. Weber Avenue
Stockton, CA 95202

Attn: Dante John Nomellini, Sr.
Secretary and Counsel for RD 17
209/465-5883

Prepared for submittal to:

U.S. Army Corps of Engineers
CESPK-PD
1325 J Street
Sacramento, CA 95814

Attn: Tanis Toland
916/557-6717

Prepared by:

AECOM
2020 L Street, Suite 400
Sacramento, CA 95811

Contact:

Kelly A. Fitzgerald-Holland
Senior Wildlife Biologist
916/414-5800

60209010.001

02.12.15

February 2015

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Appendix D – Project Correspondence

ACRONYMS AND OTHER ABBREVIATIONS

BA	biological assessment
Bay-Delta	San Francisco Bay/Sacramento–San Joaquin Delta
BMP	best management practice
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CVFPB	Central Valley Flood Protection Board
CVP	Central Valley Project
DDT	dichlorodiphenyltrichloroethane
Delta	Sacramento–San Joaquin Delta
DPS	distinct population segment
DWR	California Department of Water Resources
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	evolutionary significant unit
ETL	Engineering Technical Letter
FEMA	Federal Emergency Management Agency
FR	*Federal Register*
HTL	high tide line
LSRP	Levee Seepage Repair Project
MAF	million acre-feet
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
PAL	provisional accredited levee
Phase 3 Project	Phase 3 of Reclamation District No. 17 Levee Seepage Repair Project
RD 17	Reclamation District No. 17
RWQCB	regional water quality control board
Section 404	Section 404 of the Clean Water Act (33 USC 1344)
Section 408	Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408)
Settlement	Stipulation of Settlement in *NRDC et al. v. Kirk Rodgers et al*.
SJMSCP	San Joaquin Multi-Species Habitat Conservation and Open Space Plan
SJRRP	San Joaquin River Restoration Program
SRA	shaded riverine aquatic
SWIF	System Wide Improvement Framework
SWP	State Water Project
SWPPP	storm water pollution prevention plan
SWRCB	State Water Resources Control Board
TMDL	total maximum daily load
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
VELB	valley elderberry longhorn beetle
VELB Guidelines	U.S. Fish and Wildlife Service *Conservation Guidelines for the Valley Elderberry Longhorn Beetle*

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INTRODUCTION

The purpose of this biological assessment (BA) is to review Phase 3 of the proposed Reclamation District No. 17 (RD 17) Levee Seepage Repair Project (LSRP) (Phase 3 Project) in sufficient detail to determine the extent to which the proposed action may affect any of the federally listed species described below under "Species Considered." (See "Project Background and History" below for a brief summary of the previous Phase 1 and Phase 2 Projects.)

RD 17, which is located in south-central San Joaquin County, California (**Exhibit 1**; see Appendix A for all exhibits), includes 19 miles of levees along the east bank of the northern end of the San Joaquin River and along the north bank of Walthall Slough. These levees have been divided into seven distinct "reaches" identified by Roman numerals (i.e., I, II, III…, VII), and subdivided further into 19 "elements," identified by the reach number followed by a lowercase letter and, where needed to further distinguish elements, an Arabic numeral (e.g., Ia, IIa, IIb, …, Va, VIa.1, VIa.2, VIa.4, …, VIe, VIIa, VIIb, …, VIIg) (**Exhibit 2**).

This BA has been prepared in accordance with requirements set forth under Section 7 of the federal Endangered Species Act (ESA) (16 United States Code [USC] 1536[c]). It serves to initiate formal consultation with the U.S. Fish and Wildlife Service (USFWS) and informal consultation with the National Marine Fisheries Service (NMFS) on effects of the Phase 3 Project on federally listed species. This BA also serves to initiate consultation with NMFS on essential fish habitat (EFH) conservation recommendations for Pacific salmon (*Oncorhynchus* spp.), as required by the Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 USC 1801). (See the "Essential Fish Habitat Assessment" section below.)

Section 7(a)(2) of the ESA directs federal agencies to ensure that their activities are not likely to jeopardize the continued existence of any listed species, or to result in the destruction or adverse modification of critical habitat. This section of the ESA also requires agencies with regulatory authority over listed species to issue biological opinions evaluating the direct and indirect effects of federal actions, and actions that are interrelated or interdependent with the federal action. The biological opinions must determine whether the actions being evaluated may appreciably reduce the listed species' likelihood of surviving or recovering in the wild by reducing their productivity, numbers, or distribution.

To implement the Phase 3 Project, RD 17 is requesting permission from the U.S. Army Corps of Engineers (USACE) for:

- alteration of federal project levees, pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408, referred to in this BA as "Section 408"); and

- placement of fill in jurisdictional waters of the United States, pursuant to Section 404 of the Clean Water Act (33 USC 1344, referred to in this BA as "Section 404").

All Phase 3 Project work occurring on the water side of the levee will be above the high tide line (HTL). Therefore, no additional authorizations under Section 10 of the Rivers and Harbors Act of 1899 are required.

These activities are described in more detail under "Description of the Proposed Action." This BA analyzes direct, indirect, interrelated/interdependent, and cumulative effects of the proposed action on federally listed species.

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SPECIES CONSIDERED

This document considers species that have been termed "threatened" or "endangered" under the jurisdiction of USFWS and NMFS. On February 27, 2014, biologists consulted the online database maintained by USFWS's Sacramento Office to conduct a query of the Lathrop (462D) and West Sacramento (462A) 7.5-minute quadrangles (USFWS 2014) (Appendix B). Using the California Department of Fish and Wildlife's (CDFW's) California Natural Diversity Database (CNDDB) (2014) and the California Native Plant Society's database of rare and endangered plant species (CNPS 2014), biologists also conducted a query of the topographic quadrangles in which the action area occurs (Lathrop and Stockton West) and the surrounding quadrangles; these database queries were conducted on February 27, 2014, and March 3, 2014, respectively (Appendix B). This query identified all listed species in the area surrounding the action area, which is defined here in accordance with ESA guidelines as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 Code of Federal Regulations [CFR] 402.02).

Based on these database queries and the biologists' familiarity with local flora and fauna, 21 plant and wildlife species that are federally listed as endangered or threatened, or are federally proposed for listing, were considered as part of this assessment (**Table 1**).

The following federally proposed and federally listed species are known to occur or have the potential to occur in the Phase 3 Project area (USFWS 2014):

- valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*),
- riparian brush rabbit (Sylvilagus bachmani riparius),
- delta smelt (Hypomesus transpacificus),
- Central Valley steelhead distinct population segment (DPS) (*Oncorhynchus mykiss*),
- longfin smelt (Spirinchus thaleichthy),
- Sacramento River winter-run Chinook salmon evolutionarily significant unit (ESU) (*O. tshawytscha*),
- Central Valley spring-run Chinook salmon ESU (*O. tshawytscha*), and
- the Southern DPS of North American green sturgeon (*Acipenser medirostris*).

The other federally listed species identified in Table 1 were eliminated from further consideration because they are not likely to occur in the Phase 3 Project area because of a lack of suitable habitat, local range restrictions, regional extirpations, or lack of connectivity between areas of suitable or occupied habitat, or because the action area is located outside of the extant range of the species (see "Action Area" section below). The USFWS-regulated species with the potential to occur on-site are discussed in more detail in this BA.

SPECIES HABITAT AND POTENTIAL FOR OCCURRENCE IN THE AREA

The following is a summary of relevant habitat conditions in the action area for species that could occur, are likely to occur, or are known to occur in the Phase 3 Project area. Full species accounts for federally listed species addressed in this BA are presented in the section titled "Species Accounts."

- **Valley elderberry longhorn beetle:** Elderberry shrubs provide habitat for VELB. Elderberry shrubs are known to occur along the San Joaquin River, on both the waterside and landside of levees in the Phase 3

Project area. Focused surveys for elderberry shrubs were conducted along all levee reaches on March 8, 2011; the area was resurveyed on January 29, 2014. A total of 18 elderberry shrubs were observed within 100 feet of the Phase 3 Project area: nine shrubs on the waterside of the levee and nine shrubs on the landside. None of the shrubs had evidence of beetle exit holes. One of the landside shrubs does not have stems greater than one inch in diameter at ground level; therefore, it is not considered suitable VELB habitat.

Table 1
Fish and Wildlife Species Federally Listed or Proposed for Listing that Were Considered in the Evaluation of the RD 17 Levee Seepage Repair Project

Species	Status	Habitat	Potential to Occur in the Lower San Joaquin River[1]
Plants			
Large-flowered fiddleneck *Amsinckia grandiflora*	Endangered[2] SJMSCP-covered[4]	Annual herb with bright orange, trumpet-shaped flowers that bloom in late spring. Historically found on north-facing slopes in the upper elevations of grasslands near the blue oak belt in Contra Costa, Alameda, and San Joaquin Counties.	No potential to occur. No suitable habitat is present within the action area.[3]
Palmate-bracted bird's-beak *Cordylanthus palmatus*	Endangered[2]	Annual herb that blooms from late spring through summer. Grows on seasonally flooded, saline-alkali soils in lowland plains and basins at elevations of less than 500 feet. Known from scattered locations in the Sacramento and San Joaquin Valleys; however, unlikely to occur in San Joaquin County because of lack of alkali habitat.	No potential to occur. No suitable habitat is present within the action area.[3]
Invertebrates			
Conservancy fairy shrimp *Branchinecta conservatio*	Endangered SJMSCP-covered[4]	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present within the action area.[3]
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	Threatened SJMSCP-covered[4]	Inhabits elderberry shrubs, primarily in riparian woodland and scrub habitat.	Could occur; elderberry shrubs present occasionally along the San Joaquin River on the waterside and landside of the Phase 3 Project levee; however, no evidence of beetle exit holes was observed in these shrubs.
Vernal pool fairy shrimp *Branchinecta lynchii*	Threatened SJMSCP-covered[4]	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present within the action area.[3]
Vernal pool tadpole shrimp *Lepidurus packardi*	Endangered SJMSCP-covered[4]	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present within the action area.[3]
Fish			
Central Valley steelhead *Oncorhynchus mykiss*	Threatened	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.	Likely to occur. Occurs in the Sacramento and San Joaquin Rivers, tributaries, and the Delta. Occurs seasonally in the San Joaquin River in the action area[3]; no spawning habitat is in the action area. Designated critical habitat is in the action area.

Table 1
Fish and Wildlife Species Federally Listed or Proposed for Listing that Were Considered in the Evaluation of the RD 17 Levee Seepage Repair Project

Species	Status	Habitat	Potential to Occur in the Lower San Joaquin River[1]
Central Valley fall-/ late fall–run Chinook salmon *Oncorhynchus tshawytscha*	Species of Concern[2]	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.	Likely to occur. Occurs in the Sacramento and San Joaquin Rivers, tributaries, and the Delta. Occurs seasonally in the San Joaquin River in the action area[3]; no spawning habitat is in the action area. Essential fish habitat for this species is within the Phase 3 Project area.
Delta smelt *Hypomesus transpacificus*	Threatened[2] SJMSCP-covered[4, 5]	Spawns in tidally influenced freshwater wetlands and seasonally submerged uplands; rears seasonally in inundated floodplains, tidal marsh, and the Delta.	Could occur. Occurs in tidally influenced segments of the Sacramento and San Joaquin Rivers, tributaries, and Delta. Although no spawning habitat is in the action area, delta smelt has potential to occur in the San Joaquin River in the action area.[3] Designated critical habitat is in the action area.
Longfin smelt *Spirinchus thaleichthys*	Candidate/ Proposed Threatened[2] SJMSCP-covered[4, 5]	Pelagic estuarine. Ranges from the Delta in California northward to the Cook Inlet in Alaska.	Could occur. Occurs in tidally influenced segments of the Sacramento and San Joaquin Rivers, tributaries, and the Delta. Although no spawning habitat is in the action area, longfin smelt has potential to occur in the San Joaquin River in the action area.[3]
Sacramento River winter-run Chinook salmon *Oncorhynchus tshawytscha*	Endangered[2]	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.[5]	Could occur, but unlikely. Occurs in the Sacramento River, tributaries, and the Delta. No spawning habitat is in the action area. Unlikely to occur in the San Joaquin River in the action area[3]; however, occasional adult and/or juvenile strays may be present.
Central Valley spring-run Chinook salmon *Oncorhynchus tshawytscha*	Threatened[2]	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.	Could occur, but unlikely. Occurs in the Sacramento River, tributaries, and the Delta. Currently unlikely to occur in the San Joaquin River in the action area[3]; no spawning habitat is in the action area. However, occasional adult and/or juvenile strays may be present. The SJRPP[6] includes the reintroduction of this species (an experimental population) to the San Joaquin River, so this species may occur in the river as early as 2014.
Green sturgeon *Acipenser medirostris*	Threatened SJMSCP-covered[4, 5]	Requires seasonally inundated floodplains, rivers, tributaries, and the Delta.[5]	Could occur. Occurs in the Sacramento and San Joaquin Rivers, tributaries, and the Delta. Has potential to occur in the San Joaquin River in the action area.[3] Designated critical habitat is in the action area.
Amphibians and Reptiles			
California red-legged frog *Rana draytonii (=R. aurora draytonii)*	Threatened SJMSCP-covered[4]	Prefers semi-permanent and permanent stream pools, ponds, and creeks with emergent riparian vegetation and typically without predatory fish. Requires adequate hibernacula such as small-mammal burrows and moist leaf litter.	No potential to occur. Although potential aquatic habitat in the Phase 3 Project area is limited to one constructed pond, likely with predatory fish, the action area is outside of the species' extant range.

Table 1 Fish and Wildlife Species Federally Listed or Proposed for Listing that Were Considered in the Evaluation of the RD 17 Levee Seepage Repair Project			
Species	**Status**	**Habitat**	**Potential to Occur in the Lower San Joaquin River[1]**
California tiger salamander *Ambystoma californiense*	Threatened[2] SJMSCP-covered[4]	In winter, breeds in vernal pools and stock ponds that are fish-free and inundated for a minimum of 12 weeks. In summer, aestivates in rodent borrows in grassland habitat.	Unlikely to occur. Potential aquatic habitat in the Phase 3 Project area is limited to one constructed pond, likely with predatory fish; a small area of freshwater marsh in Element Ib[7]; and agricultural ditches. Much of the action area consists of urban and agricultural land not suitable as potential upland habitat. A 1996 CNDDB record documents California tiger salamander adjacent to State Route 120 in roadside seasonal wetland; however, it is approximately 2 miles east of the San Joaquin River and geographically isolated.
Giant garter snake *Thamnophis gigas*	Threatened[2] SJMSCP-covered[4]	Streams, sloughs, ponds, and irrigation/drainage ditches; also requires upland refugia not subject to flooding during the snake's inactive season.	Unlikely to occur. While potential habitat for this species is present in the Phase 3 Project area, none of it is suitable. The only documented occurrences of giant garter snake are separated from the Phase 3 Project area by extensive urbanized development (City of Stockton) and large rivers that do not provide suitable habitat and are a greater distance than the species is known to disperse. For additional information that summarizes the rationale that supports the "unlikely to occur" determination for this species in the Phase 3 Project area, refer to Appendix C in this document.
Birds			
Least Bell's vireo *Vireo bellii pusillus*	Endangered[2]	Nests in riparian habitat adjacent to riverine and freshwater marsh.	Unlikely to occur. Although suitable habitat is present, the last recorded observation of this species in the action area was in 1878, with no extant occurrences.
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	Threatened SJMSCP-covered[4]	Insect-feeder that forages in dense riparian oak forest canopy along major rivers. Species is considered extirpated from San Joaquin County.	No potential to occur. Although potential dispersal and foraging habitat is in the Phase 3 Project area, the action area is outside of the species' extant range.
Mammals			
San Joaquin kit fox *Vulpes macrotis mutica*	Endangered SJMSCP-covered[4]	Annual grassland or grassy open stages with scattered shrubby vegetation; needs loose-textured sandy soils for burrowing, and suitable prey base.	No potential to occur. Although potential dispersal and foraging habitat is in the Phase 3 Project area, the action area is outside of the species' extant range.
Riparian brush rabbit *Sylvilagus bachmani riparius*	Endangered[2] SJMSCP-covered[4, 5]	Inhabits riparian oak forest with dense understory of wild roses, grapes, and blackberries; small home ranges, seldom moving more than a few feet from cover, avoiding large openings in shrub cover and frequenting small clearings	Known to occur. Occupied riparian habitat is present on the waterside of Elements IIIa and IIIb, and suitable habitat is present immediately adjacent to the project area in several elements; species also is known to occur on an oxbow between Elements VIa.1 and VIa.4[7] and in waterside habitat between Elements IIab and IIIa.

Table 1 Fish and Wildlife Species Federally Listed or Proposed for Listing that Were Considered in the Evaluation of the RD 17 Levee Seepage Repair Project			
Species	**Status**	**Habitat**	**Potential to Occur in the Lower San Joaquin River[1]**
Riparian (=San Joaquin Valley) woodrat *Neotoma fuscipes riparia*	Endangered SJMSCP-covered[4]	Requires healthy riparian forests, where it nests in cavities in trees, snags, or logs, spaces in talus, or lodges built of downed woody materials. Known to exist in and immediately adjacent to Caswell Memorial State Park, along the Stanislaus River in San Joaquin County.	No potential to occur. The action area is outside of the species' extant range.

Notes: CNDDB = California Natural Diversity Database; Delta = Sacramento–San Joaquin Delta; Phase 3 Project = Phase 3 of the proposed Reclamation District No. 17 Levee Seepage Repair Project; SJMSCP = San Joaquin Multi-Species Habitat Conservation and Open Space Plan; SJRRP = San Joaquin River Restoration Program

1 **Potential for Occurrence Definitions:**

No potential to occur; Suitable habitat is not present in the Phase 3 Project area and/or the Phase 3 Project area is not within the historical or current range of the species.

Unlikely to occur: Potential habitat present, but species unlikely to be present in the Phase 3 Project area because of current status of the species, a very restricted distribution, and/or essential habitat components are not present.

Could occur: Suitable habitat is available in the Phase 3 Project area; however, there are few or no other indicators that the species may be present.

Likely to occur: Habitat conditions, behavior of the species, known occurrences in the Phase 3 Project area, or other factors indicate a relatively high likelihood that the species would occur in the Phase 3 Project area.

Known to occur: The species, or evidence of its presence, was observed in the Phase 3 Project area during reconnaissance-level surveys or was reported by others.

2 These species have a similar status listing under the California Endangered Species Act, except for delta smelt and western yellow-billed cuckoo, which are both state listed as endangered, and longfin smelt and San Joaquin kit fox, which are both state listed as threatened.

3 Action Area: The action area is defined here in accordance with ESA guidelines as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). The action area includes all areas that would be directly or indirectly affected by the components of the Phase 3 Project. Areas downstream of the Phase 3 Project area may also be indirectly affected by the flood risk management component of the project through improved water quality and flood risk management conditions.

4 SJMSCP-covered: These species are covered under the SJMSCP (San Joaquin County 2000).

5 SJMSCP-covered with limitations: The SJMSCP does not cover the conversion of occupied riparian brush rabbit habitat, limits the amount of delta smelt habitat, and does not authorize take of green sturgeon.

6 See "San Joaquin River" subsection under "Environmental Baseline" section below, for more information.

7 Elements: The RD 17 levees have been divided into 7 distinct "reaches" identified by Roman numerals (i.e., I, II, III), and subdivided further into 19 "elements," identified by the reach number followed by a lowercase letter and, in some cases, an Arabic numeral (e.g., Ia, IIa, Va, VIa.1…); see **Exhibit 2**.

Sources: CNDDB 2014, CNPS 2014, USFWS 2014; data compiled by AECOM in 2014

- **Riparian brush rabbit:** Trapping conducted in February 2003 and February 2004 detected occurrences of riparian brush rabbit near the Phase 3 Project area in waterside riparian habitat adjacent to Elements IIIa and IIIb, between Elements IIab and IIIa, and between Elements VIa.1 and VIa.4 (CNDDB 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004). The waterside habitat along Elements IIIa and IIIb is dominated by willow within interspersed California blackberry and grasses. The trapping locations between Elements IIab and IIIa are dominated by willows, cottonwoods, valley oaks, wild rose, and California and Himalayan blackberry. The trapping locations between Elements VIa.1 and VIa.4 are on an oxbow with dense riparian vegetation. Similar riparian habitat is present adjacent to the waterside of Phase 3 Project area Elements IIab, IVc, and Va. North of Element IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, or isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species.

- **Delta smelt:** Delta smelt are found from Suisun Bay upstream through the Sacramento–San Joaquin Delta (Delta). Delta smelt disperse widely into freshwater in late fall and winter as the spawning period approaches, and may move as far upstream as Mossdale on the San Joaquin River (Bennett 2005). Therefore, this species has the potential to occur in the Phase 3 Project area.

- **Longfin smelt:** Longfin smelt occur in the Delta and tidally influenced segments of the Sacramento and San Joaquin Rivers. The occurrence of longfin smelt in the San Joaquin River is rare, but it does occur on occasion when river salinity extends farther upstream, either as a result of Delta pumps or because of drought. Therefore, this species has the potential to occur in the Phase 3 Project area.

- **Anadromous salmonids:** The action area (see "Action Area" section below) does not provide suitable spawning habitat for salmonids because it lacks the cold freshwater and gravel substrate characteristic of salmonid spawning areas in upper river basins. However, adult and juvenile Central Valley fall-run Chinook salmon and Central Valley steelhead could occur in the action area during migrations along the San Joaquin River and its tributaries. Winter-run and spring-run Chinook salmon are known to occur only in the Sacramento River and its tributaries (Moyle 2002). Because the action area is along the San Joaquin River, several miles upstream of its confluence with the Sacramento River, adult migrants along the Sacramento River are not expected to move into the action area. However, with the implementation of the San Joaquin River Restoration Project (SJRRP) (see "San Joaquin River" subsection under "Environmental Baseline" below), an experimental population of spring-run Chinook salmon will be reintroduced to the San Joaquin River beginning in 2014 to achieve one of the goals of the SJRRP, which is "to restore and maintain fish populations in 'good condition' in the mainstem San Joaquin River…including naturally reproducing and self-sustaining populations of salmon and other fish" (NMFS 2013).

- **Green sturgeon:** Green sturgeon is known to occur in the San Joaquin River and therefore has the potential to occur in the lower San Joaquin River and Delta at the project site (Moyle 2002). Green sturgeon spawning in the San Joaquin River is not well documented.

CRITICAL HABITAT

"Critical habitat" is defined in Section 3(5)A of the ESA as the specific areas in the geographical area occupied by the species where physical or biological features are found that are essential to the conservation of the species and that may require special management considerations or protection. Specific areas outside of the geographical area occupied by the species may also be included in critical-habitat designations, based on a determination that such areas are essential for the conservation of the species.

The proposed action addressed in this BA falls within designated critical habitat for delta smelt, which was designated on December 19, 1994 (59 *Federal Register* [FR] 65256). Critical habitat is designated to include most tidally influenced areas of the Delta.

The proposed action addressed in this BA falls within designated critical habitat for the Central Valley steelhead DPS. Critical habitat for the Central Valley steelhead DPS was designated on August 12, 2005; a final designation was published on September 2, 2005 (70 FR 52604), with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins, including the segment of the San Joaquin River in the action area (see "Action Area" section below).

The proposed action addressed in this BA falls within designated critical habitat for the Southern DPS of North American green sturgeon. Critical habitat for green sturgeon was designated on October 9, 2009 (74 FR 52300).

Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins, including the segment of the San Joaquin River in the action area.

The action area is not within designated critical habitat for the remaining species listed in **Table 1** for which such a designation has been made: large-flowered fiddleneck, Conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, VELB, Sacramento River winter-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU, California red-legged frog, California tiger salamander, and least Bell's vireo. Critical habitat has not been designated for palmate-bracted bird's-beak, longfin smelt, Central Valley fall-/late fall–run Chinook salmon ESU, giant garter snake, western yellow-billed cuckoo, San Joaquin kit fox, riparian brush rabbit, or riparian woodrat.

SAN JOAQUIN MULTI-SPECIES CONSERVATION PLAN

All of the above species, except the anadromous salmonid fish species, are covered on some level under the *San Joaquin Multi-Species Habitat Conservation and Open Space Plan* (SJMSCP) (San Joaquin County 2000). The SJMSCP was developed to avoid, minimize, and mitigate impacts on plant and wildlife habitat projected to occur in San Joaquin County between 2001 and 2051, resulting from the anticipated conversion of open space land to non–open space uses. Ninety-seven species are covered by the SJMSCP. The plan is intended to provide comprehensive mitigation, in accordance with local, state, and federal regulations, for impacts of SJMSCP-permitted activities on these species. USFWS and CDFW participated in development of the SJMSCP, approved the mitigation, and agreed to issue incidental take permits for species and activities covered by the SJMSCP.

The geographic area covered in the SJMSCP extends up to the landside levee crown of the San Joaquin River levee and would include the Phase 3 Project area. However, the SJMSCP does not cover federal flood risk management projects or activities involving tidally jurisdictional wetlands or other waters of the United States, and thus, the Phase 3 Project is not a covered activity under the SJMSCP. The SJMSCP outlines a mechanism by which a federal flood risk management project such as the Phase 3 Project could obtain take coverage under the SJMSCP (see Section 8.2.3 of the SJMSCP). However, because the SJMSCP does not cover special-status fish, the conversion of riparian brush rabbit habitat, or impacts on other species on the waterside of the levee, RD 17 and USACE would not rely on the SJMSCP to assess and offset Phase 3 Project effects on federally listed and state-listed species. Rather, through this BA and the associated Section 7 consultations with USFWS and NMFS, RD 17 and USACE would seek take authorization for Phase 3 Project activities. Species listed under the California Endangered Species Act that are also covered species under the SJMSCP would be evaluated through consultation with CDFW.

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CONSULTATION TO DATE

The list below summarizes correspondence, meetings, and discussions between regulatory agencies, RD 17, and consultants that relate to potential impacts of the Phase 3 Project on species addressed in this document. The most recent consultation is listed first.

2/27/14 Letter from USFWS to AECOM regarding *Species List for RD 17 100-Year Levee Seepage Area Project*[1].

3/1/11 Tour of proposed action area with representatives of AECOM, USACE, USFWS, NMFS, and CDFW.

1/24/11 Meeting with representatives of USFWS and AECOM to discuss project permitting coordination, the potential impacts of the project on federally listed species, and the development of a conservation strategy.

12/9/10 Meeting with representatives of CDFW and AECOM to discuss project permitting coordination, the potential impacts of the project on state-listed species, use of the SJMSCP, and the development of a conservation strategy.

8/24/10 Meeting with representatives of USACE, USFWS, NMFS, and AECOM to discuss the potential impacts of the project on listed species and the development of a conservation strategy.

6/11/10 Letter from NMFS to AECOM, responding to May 14, 2010, letter requesting technical assistance (Appendix D).

5/14/10 Letter from AECOM, prepared on behalf of RD 17, to USFWS and NMFS requesting informal technical assistance in evaluating the potential impacts on listed species that could result from implementing USACE vegetation management standards, and in developing a conservation strategy that could adequately offset the potential loss of habitat. Copies of the wetland delineation report and maps were provided with the letter (Appendix D).

[1] "RD 17 100-Year Levee Seepage Area Project" is a reference to the RD 17 Levee Seepage Repair Project. This former name was used in documents published prior to preparation of the Final Environmental Impact Statement for Phase 3 of the RD 17 Levee Seepage Repair Project.

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DESCRIPTION OF THE PROPOSED ACTION

U.S. ARMY CORPS OF ENGINEERS ACTION

RD 17, in cooperation with the California Department of Water Resources (DWR) and the Central Valley Flood Protection Board (CVFPB), is the local project sponsor for the Phase 3 Project. RD 17 has requested permission from the CVFPB and USACE to alter segments of the San Joaquin River Levee System, which is a federal project levee. The proposed action for USACE is to make a permit decision on Phase 3 of the LSRP under the authority of Clean Water Act Section 404 and Section 408 of Title 33 United States Code. Under Section 408, USACE may allow the permanent use or occupancy of a USACE flood risk management project with approval by the Secretary of the Army on recommendation of the Chief of Engineers, provided that such use or occupancy would not be injurious to the public interest. USACE has determined that a 408 decision would be required for alterations to the RD 17 levees. The activities requiring Section 408 and/or 404 authorization, described in more detail below, include proposed alterations/improvements to USACE flood risk management facilities and fill of jurisdictional waters during earth-moving activities for levee construction. Activities for the Phase 3 Project will be processed through an encroachment permit with the CVFPB. USACE would conduct a technical engineering review as part of the CVFPB's consideration of the encroachment permit application, in accordance with USACE regulations contained in 33 CFR 208.10.

PROJECT LOCATION

RD 17 is located in south-central San Joaquin County, California, in the center of the California Central Valley, at the north end of the San Joaquin River Basin, and within the far southeast limit of the Sacramento–San Joaquin Delta (Delta) (**Exhibit 1**). The boundaries of RD 17 are marked by French Camp Slough on the north, approximately 3 miles southwest of the central business district of the City of Stockton; the San Joaquin River on the west; Walthall Slough on the south (just below State Route 120); and Airport Way/McKinley Avenue on the east, just outside the City of Manteca. RD 17 is responsible for maintaining the levees along Walthall Slough, the San Joaquin River, and French Camp Slough, as well as a dryland levee along the southern boundary of Manteca (**Exhibit 2**). The dryland levee is an overland earthen berm north and east of the San Joaquin River.

Under almost all conditions water does not come in contact with the dryland levee. It only functions as a flood risk management feature if water from the San Joaquin River or Walthall Slough leaves the banks of these waterways and inundates lands to the north and east toward Manteca. The dryland levee then acts as an elevated earthen feature that prevents these flood waters from moving farther north.

PROJECT BACKGROUND AND PURPOSE

PROJECT BACKGROUND AND HISTORY

The RD 17 system for reducing the risk of flood damage, like other flood protection systems in the San Joaquin Valley, was initially designed to facilitate agricultural development on the extensive valley floodplains and support river navigation. Levees set closely along the rivers were designed to contain flows generated by common floods, and bypasses were constructed to carry overflows generated by large floods. The close-set levees ensured that water velocities would help scour the river bottom and move sediment through the system, reducing dredging costs for sustaining navigation. Starting in about 1863, RD 17 began constructing or reconstructing the RD 17 levee system.

Some of the levees in the Delta are considered "federal project levees." These levees were constructed or reconstructed (e.g., existing or damaged farm levees were improved) by USACE and are intended to meet federal standards. Construction of the federal levee system that encompasses the current RD 17 levees along Walthall

Slough, the San Joaquin River, and French Camp Slough began in 1944 and was completed in 1963. The levee system has since been upgraded substantially to meet Federal Emergency Management Agency (FEMA) requirements for flood protection during a 100-year flood event. In 1990, after extensive analysis, the RD 17 levees were accredited by FEMA as meeting the 100-year requirements for urban development.

During a high-water event on the San Joaquin River in January 1997, seepage and boils occurred at several locations along the RD 17 levees. USACE, DWR, and RD 17 successfully contained the seepage and boils and the levees did not break. After the 1997 event, USACE, the CVFPB, and RD 17 funded a project, the Reconstruction of the California Central Valley Levees San Joaquin Basin #4, Reclamation District #17 Project, to repair the seepage and boil areas. The project was constructed by USACE and work was completed in 2003.

After reviewing the data supporting the 1990 accreditation and subsequent information, FEMA notified RD 17 of its intention to confirm full accreditation of the RD 17 levees as meeting FEMA's requirements for 100-year flood protection. On June 19, 2007, DWR wrote to the City of Lathrop, with a copy to FEMA, stating that it could not support recertification of the RD 17 levees or the granting of provisional accreditation because of concerns about seepage exit gradients.[2] The basis of DWR's concern was analysis showing seepage exit gradients greater than 0.5, which indicated a higher likelihood of seepage or boils occurring during a high-water event. Based on DWR's concern, FEMA then denied full accreditation and instead granted provisional accredited levee (PAL) status. A PAL is a levee that FEMA has previously credited with providing a 100-year level of flood risk reduction (flood with a 1% chance of occurring in any given year, or 0.01 annual exceedance probability). In the fall of 2007, in response to the PAL status, RD 17 initiated a levee seepage repair program and requested funding through DWR's Early Implementation Program.

RD 17 subsequently implemented Phases 1 and 2 of the LSRP. After completion of the Phase 1 and 2 levee improvements, RD 17 submitted a recertification application to FEMA. In September 2010, RD 17 received a response letter declaring that FEMA had accredited the area protected by the RD 17 levee system, including the dryland levee, thereby removing the PAL status.

The Phase 1 Project involved constructing two seepage berms located in Elements III and VI of the LSRP (**Exhibit 2**). The project reconstructed and extended the landside levee toe berms with earth and gravel fill, both landward and along the levee toe, to reduce seepage exit gradients. Work areas were designed to avoid any environmental resources of possible significance, including sensitive habitats and listed species. The project was determined to be categorically exempt from the California Environmental Quality Act (CEQA) and no federal authorizations or funding were required for the Phase 1 work; therefore, no National Environmental Policy Act (NEPA) analysis was triggered. The Phase 1 Project work was completed in January 2009.

The Phase 2 Project addressed work needed at nine levee reaches in the LSRP area. At eight of the nine reaches, the project constructed drained seepage berms along the landside levee toe. At one site that did not include seepage berm construction, RD 17 acquired an easement on land along the levee toe and performed various maintenance and site cleanup activities. A CEQA initial study/mitigated negative declaration that was completed for the Phase 2 Project concluded that no significant effects would occur on environmental resources after mitigation measures were implemented (RD 17 2009). Potential impacts on biological resources that resulted from Phase 2 Project implementation were mitigated through participation in the SJMSCP. No federal

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2 "Seepage exit gradient" is an expression in numeric form of the potential for under seepage to exit on the landside of a levee as seepage or a boil. The lower the number used to express seepage exit gradient, the more resistant the system is to seepage or boils; the higher the number, the more likely seepage or boils may occur during a high-water event. In formulas for seepage exit gradients, the numerator (top number in a fraction) typically addresses forces that cause or enhance seepage (e.g., water pressure), and the denominator typically addresses forces that resist seepage (e.g., soil resistance to water pressure, depth and weight of soil over the potential seepage area, distance from the levee toe). A lower seepage exit gradient (i.e., more resistance to seepage) is achieved when the numerator (positive seepage forces) is reduced and/or the denominator (resistance to seepage) is increased.

authorizations or funding were required for the Phase 2 work; therefore, no NEPA analysis was triggered. All Phase 2 Project work was completed in summer 2010.

PROJECT PURPOSE AND OBJECTIVES

The overall purpose of the Phase 3 Project is to implement landside and isolated waterside levee improvements in 19 LSRP elements affecting 5.3 miles of the approximately 19-mile RD 17 levee system to improve the existing levee integrity based on the new USACE standards and continue to provide flood risk reduction within RD 17 and surrounding areas. Levee improvements would address under seepage, through seepage, and levee geometry repair and remediation. USACE and RD 17 each view the project purpose from the purview of their respective responsibilities, as defined below.

USACE's objectives for the Phase 3 Project are to:

- decide whether or not to grant permission for RD 17's Phase 3 Project to alter the federal project levees within its levee system under Section 408, and
- decide whether or not to issue permits under Section 404.

RD 17's objectives for the proposed Phase 3 Project are to:

- correct levee geometry where needed to meet USACE design standards,
- increase the levee's resistance to under seepage and/or through seepage, and
- provide under seepage exit gradients equal to or less than 0.5 at the landside levee toe, and equal to or less than 0.8 at the landside drainage seepage berm at the water surface elevation associated with the design water surface.

All Phase 3 Project work would occur above the HTL, on the water side of the levee, therefore, authorization under Section 10 of the Rivers and Harbors Act of 1899 would not be required. Authorization under Section 404 of the Clean Water Act would also not be required on the water side of the levee because work would occur above the HTL. Section 404 authorization would be required on the land side of the levee. USACE verified a wetland delineation submitted for Phase 3 of the RD 17 LSRP on November 3, 2009 (preliminary jurisdictional determination form was issued by USACE on November 10, 2009), and three supplemental wetland delineations were prepared. The first supplemental delineation was submitted on January 22, 2010 (preliminary jurisdictional determination form was issued by USACE on April 9, 2010). The second supplemental wetland delineation was submitted on September 16, 2010 (preliminary jurisdictional determination form was issued by USACE on October 7, 2010). The third supplemental wetland delineation was submitted on April 4, 2014 (preliminary jurisdictional determination form was issued by USACE on April 7, 2014).

COMPLIANCE WITH USACE VEGETATION MANAGEMENT STANDARDS

With issuance of Engineering Technical Letter (ETL) 1110-2-571, and subsequently with ETL 1110-2-583, USACE updated its vegetation management standards for levees, requiring the removal of all vegetation except perennial grasses on the levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2009, USACE 2014). Per the ETL, the "trunk (or stem), stump, rootball and all roots greater than ½-inch in diameter—all such roots in, or within 15 feet of, the flood damage reduction structure shall be completely removed" through excavation.

Public Law 84-99 authorizes USACE to provide rehabilitation assistance for levees as long as the system is operated and maintained to acceptable or minimally acceptable standards. However, on March 21, 2014, USACE issued a memorandum, "Interim Policy for Determining Eligibility Status of Flood Risk Management Projects for the Rehabilitation Program Pursuant to Public Law (P.L) 84-99," to provide interim criteria for determining eligibility for PL 84-99 assistance. Under this interim policy, vegetation management will not be considered in making a PL84-99 eligibility determination. Therefore, RD 17 is continuing its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which involves trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up 5 feet above the ground [or 12 feet above the crown road]. However, within the Phase 3 Project area, landside vegetation would be removed; only waterside vegetation would be managed in accordance with RD 17 existing practices.

DESCRIPTION OF THE PROPOSED PHASE 3 PROJECT

The Phase 3 Project would address the under seepage and/or through seepage concerns raised by DWR and repair and/or remediate levee geometry to USACE design standards along approximately 5.2 miles of the RD 17 levee system, including portions of the San Joaquin River east levee and portions of the levee along the northerly bank of Walthall Slough. Under seepage occurs below the aboveground levee prism and is caused by the buildup of water pressure in the subsurface foundation soils when high river stages are present on the waterside of the levees. This pressure head causes water to flow through the earthen foundation layers under the levee and exit onto the ground surface on the landside of the levee prism (**Exhibit 3**). Such seepage is not uncommon and does not inherently imply that the levee is failing; however, excessive and uncontrolled under seepage can carry fine-grained material with the water flow that can undermine the levee and can lead to levee failure. Through seepage is the movement of water through the levee prism when high river stage conditions exist on the waterside of the levee (**Exhibit 3**). Depending on the duration of high water and the permeability of the levee embankment soil, seepage may exit onto the landside slope of the levee, thereby negatively affecting the stability of the landside levee slope.

The BA does not address the dryland levee because it is not a USACE flood risk management project and therefore not subject to Section 408 authorization. Suitable habitat for federally listed species does not occur along the dryland levee. Levee improvements would consist primarily of in-place repair/remediation, but would include a single setback levee at Element IVc. As summarized in **Table 2** and depicted in **Exhibits 4a** through **4d**, the Phase 3 Project's landside levee improvements include a combination of construction of seepage berms, installation of chimney drains and both shallow and deep cutoff walls, the raising of landside grade, and construction of a setback levee with seepage berm and an underlying cutoff wall along 19 elements of the RD 17 levee system. These levee improvement components, as well as additional project components such as levee geometry corrections and stormwater management, are described in more detail following Table 2. The proposed action does not include any work that would consist of raising the existing levee. Limited work would be performed along the waterside of the levee above the HTL, in Element IVc where the setback levee would be constructed.

LEVEE IMPROVEMENT COMPONENTS

The Phase 3 Project levee improvements would include seepage berms, chimney drains, cutoff walls, a setback levee, and a raised landside grade. **Table 2** briefly summarizes the activities proposed for each project element. The respective levee improvement components are described below in more detail.

SEEPAGE BERMS

Reducing the risk of levee failure caused by both under seepage and through seepage may be addressed by constructing a drained seepage berm. A drained berm collects and conveys seepage, thereby reducing the flood risk associated with a high-water event. A drained seepage berm is built on the landside, adjacent to a levee, and consists of layers of sand filter material, drain rock, geosynthetic filter fabric, and a seepage berm soil fill (**Exhibit 3**).

The drained seepage berm reduces flood risk during sustained high-river-stage events by collecting seepage that otherwise would flow onto the landside ground surface at and beyond the levee's landside toe of slope, and then by conveying the seepage away from the levee. The layer of sand filter material placed on the natural ground surface serves to reduce the transmission of fine-grained soils into the drain rock, thereby maintaining the drain rock's ability to be a conductive soil unit that conveys collected seepage. Similarly, the filter fabric that separates the drain rock from the seepage berm fill soil prevents finer soils from migrating into the drain rock unit. The weight of the berm acts as ballast, reducing the potential for detrimental boils and piping.

The design width and height of a seepage berm are dependent on the relative permeability of the underlying soil layers and the amount of pressure head pushing water under the levee and through the near-surface soils during sustained high-river-stage events. The higher the water pressure head acting on the near-surface soils on the landside of the levee prism, the wider and/or deeper the seepage berm must be to reduce flood risk.

For the Phase 3 Project, drained seepage berm widths of 65–125 feet would be adequate to meet the design criteria in most cases (**Exhibit 5**). However, these types of berms may extend up to 300–400 feet inland of the landside toe of the levee. Seepage berms are typically constructed using select materials excavated from borrow sites or obtained from commercial sources. In the case of the Phase 3 Project, soil material would be purchased from commercial sources. A compacted-surface patrol road would be constructed near the outside edge of the seepage berm (see "Additional Project Components" below).

In urban areas, some seepage berms would also include a toe drain system (Element VIIg) or a V-ditch (Element Ie) to safely collect and discharge the seepage water into an urban storm drainage system. A toe drain pipe is a below-grade, perforated pipe surrounded by a layer of sand and drain rock (**Exhibit 6**). The toe drain pipe is a mechanism to safely collect and convey seepage water away from the levee and seepage berm. If the toe drain pipe were unable to convey the seepage water, it would exit the seepage berm through the drain rock at the face of the berm similar to a nonurban berm.

CHIMNEY DRAINS

Chimney drains are drainage systems that collect seepage waters that are flowing through the aboveground portion of the levee structure. These drains are used to collect and convey through seepage. A chimney drain consists of a 1- to 3-foot-thick layer of sand and drain rock. Filter fabric is placed between the soil and rock layer to avoid migration of the soil into the rock, which could clog the rock layer and reduce its ability to carry seepage flows. The chimney drain is placed directly on the landside slope of the levee and tied into an existing or new seepage berm at the landside base of the levee (**Exhibit 7**); the height of the proposed chimney drains would vary from 5 to 20 feet above the elevation of the landside levee toe. The chimney drain conveys the through seepage flows to a seepage berm, which is located at the landside base of the levee.

Installing a chimney drain in an existing seepage berm would involve adding the through seepage material on top of the existing seepage berm, and tying this material into the existing seepage berm material by excavating off the seepage berm fill material and physically tying the two drainage rock layers together. Where the remediation involves construction of a new seepage berm with a chimney drain, the chimney drain would be installed during construction of the new seepage berm.

CUTOFF WALLS

In select locations of the Phase 3 Project, cutoff walls would be placed within the levee prism (parallel to the river). Cutoff walls use specialized earthen materials (often bentonite clay, which has low permeability). Cutoff walls would be constructed vertically through the levee prism, extending into or through deeper foundational soils that have low-permeability soil (a layer through which seepage does not flow readily). Cutoff walls would thus significantly reduce the potential for under and through seepage flow during high-river-stage events. Two

Table 2 Summary of Major Activities Proposed for Each Element: Preferred Alternative		
Element	**Type of Remediation**	**Proposed Activities**
Ia	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width, and install a 590-foot-long seepage berms (minimum 65 feet wide) with chimney drain to meet required exit gradients.
Ib	under seepage and through seepage	Fill existing depression to 300 feet from toe of existing levee; place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width; and install a 125-foot-long seepage berm (minimum 60 feet wide) with chimney drain on top of fill to meet required exit gradients.
Ie, IIIb, IVa, and VIIb	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and construct seepage berms with lengths of 655 feet (Ie), 720 feet (IIIb), 525 feet (IVa), and 385 feet (VIIb), and chimney drains to meet required exit gradients. Minimum seepage berm widths would vary (65–75 feet) depending on the element. For Element Ie, construct v-ditch from seepage berm to existing swale.
IIa and IIb	under seepage and through seepage	Install cutoff wall with a length of 2,550 feet to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.
IVc	under seepage and through seepage	Construct 1,240-foot-long setback levee with seepage berm and cutoff wall to meet required exit gradients. Seepage berm would be a minimum of 65 feet wide or four times levee height, whichever would be greater. Install riprap on waterside of existing levee above the high tide line where it would intersect setback levee. After setback levee is completed, remove 410 linear feet of the existing levee on downstream side of oxbow.
Va and VIa.1	under seepage and through seepage	Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 24-foot levee crown width and install cutoff walls with a length of 9,520 feet to meet required exit gradients. Depth of cutoff walls would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls.
IIIa	through seepage	Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths and install chimney drain in existing 3,700-feet-long seepage berm to meet required exit gradients.
VIa.4	under seepage and through seepage	Install cutoff wall with length of 70 feet to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.
VIb, VIc, VId, and VIe	under seepage and through seepage	Install cutoff wall with length of 2,700 feet (VIbcde) to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall in levee prism would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown.
VIIe	under seepage and through seepage	Install DSM cutoff wall with a length of 2,500 feet to meet required exit gradients. Depth of cutoff wall would vary from 60–120 feet. Deep slurry mixing method would be used. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Project.
VIIg	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 26-foot levee crown width, and construct seepage berm with chimney drain with length 385 feet to meet required exit gradients. Minimum seepage berm width would be 65 feet.
Source: Data provided by Kjeldsen, Sinnock & Neudeck, Inc. in 2014		

methods for installing cutoff walls would be used along portions of the RD 17 levees: the open-cut method and the deep slurry mix method.

The open-cut method would be used to install shallow cutoff walls to a maximum depth of approximately 80 feet. This method involves excavating material in an open trench (the trench is filled with a bentonite slurry to maintain the side slopes of the excavation) and then replacing it with the select materials, typically a bentonite or cement-bentonite slurry (**Exhibit 8**). In this case, the top one-third to one-half of the levee height is "degraded," meaning that it is excavated to ensure that any weakness in the narrow upper portion of the levee would not fail during construction.

For the deep slurry mixing method, specialized equipment is used to excavate deep into the subsurface, allowing the cutoff walls to reach depths of up to 120 feet (**Exhibit 9**). The deep slurry mixing method involves mixing a soil-cement-bentonite mixture and replacing material as it is excavated during construction of the cutoff wall, thereby reducing the risk of failure during construction. This method does not require levee crown degradation.

Cutoff walls would be extended approximately 300 feet beyond the element boundary to provide the required overlap when seepage berms have been or are being installed along the landside of adjacent levee elements. Levee slopes where cutoff walls would be installed would also be modified as needed to achieve the required 3:1 slope.

SETBACK LEVEE WITH SEEPAGE BERM AND UNDERLYING CUTOFF WALL

A setback levee is a levee constructed some distance behind an existing levee. The setback is tied into the existing levee at the upstream and downstream ends of the setback area. All or a portion of the existing levee between these two points would be then typically removed to allow high-water events to inundate the newly expanded floodway. Soil from the old levee may be used as a source of fill for other flood protection improvement projects, depending on the quality and quantity of material generated from demolition of the old levee. In some cases, it may be necessary to continue maintaining the existing levee after a setback levee is constructed (e.g., to protect existing development in the setback area) and to use the newly constructed levee as a backup levee.

In the Phase 3 Project area, soil materials below a setback levee are anticipated to have properties similar to those of materials below the existing levees. Therefore, a setback levee would have no seepage-related benefit in the RD 17 area relative to other seepage control methods, and like the existing levees, a setback levee would require either a cutoff wall or seepage berm to sufficiently reduce the potential negative impacts of under seepage flows (**Exhibits 10** and **11**). Nonetheless, implementing a setback levee could provide some additional capacity in the river for floodwaters, and would also have the potential to provide environmental habitat in the area between the new and old levee locations. In the Phase 3 Project area, any newly expanded floodway created by a proposed setback levee would be designed to drain surface water after a high-water event to prevent fish stranding.

A setback levee with a seepage berm and an underlying cutoff wall is proposed for construction in Element IVc. As described in greater detail under Section 2.1.4 in the Draft Environmental Impact Statement/Environmental Impact Report (USACE and RD 17 2011), and consistent with Section 2.5.1 of the forthcoming Final Environmental Impact Statement (USACE *in prep.)* for the proposed project, setback levees were considered but eliminated from further consideration in several project reaches for the following reasons.

- Construction of a setback levee along certain stretches of the river were hydraulically constrained and would have greatly increased the project scope to the point of being cost prohibitive (Elements Ia, IVa, VIa.4, and VIb).
- Because of the proximity to the bifurcation at Old River, the change in hydraulic conditions that would result from constructing a setback levee at Elements Va and VIa.1 at this location would increase flows down the San Joaquin River during flood events, which could lead to increased flooding downstream (Elements Va and VIa.1).

- Land acquisition for construction of a setback levee was cost prohibitive (Elements Ie, IIab, IIIb, IVc, VIIb).
- Existing landside development constrained the option of constructing a setback levee (Elements VIIe and VIIg).
- A setback levee would have resulted in impacts on existing facilities and site constraints related to pedestrian and roadway crossings, Caltrans facilities, State boat launch facility, and other utilities (Element VIcde).

RAISED LANDSIDE GRADE

Directly adjacent to the landside toe of the levee in Element Ib, there is an approximately 5-foot-deep depression that was used as a borrow site to facilitate construction of the Howard Road Bridge. RD 17 would place fill within this depression to raise the landside grade.

ADDITIONAL PROJECT COMPONENTS

The following additional activities would occur as part of the Phase 3 Project:

- **Levee geometry corrections:** Many Phase 3 Project elements do not currently meet requirements for levee geometry (i.e., slopes, crown width). To correct levee geometry, levee fill material would be placed along the landside of existing levee slopes where needed to provide the minimum 3:1 slope and a minimum 20-foot-wide levee crown.
- **O&M access and utility corridors:** A 20-foot-wide permanent O&M access corridor would be established adjacent to the landside toe of seepage berms and levees (if not already present for levees). Any relocated power poles and other utility infrastructure would be located outside this easement.
- **Temporary construction easements:** Where needed, a 20-foot-wide temporary construction easement and construction turnaround area (up to 80 feet in diameter) would be included adjacent to the inland side of the permanent O&M access corridor, to provide access to the site during construction. These features would be removed and the sites returned to preproject conditions at the end of construction.
- **Stormwater management:** Drainage swales would be constructed around the outside of levee improvements, where needed, and other stormwater best management practices (BMPs) would be implemented to manage stormwater runoff during and after construction.
- **Right-of-way acquisition:** Lands within the Phase 3 Project footprint would be acquired as needed to accommodate levee improvements (e.g., seepage berms, setback levees) and establish the minimum 20-foot-wide O&M access corridor at the landside toes of all the improved levees, to prevent encroachment into the levee or seepage berm improvements. Privately owned lands would be acquired in fee but may be taken as easements if needed. Where the RD 17 project footprint would overlie land owned and managed by other agencies (i.e., the City of Lathrop, San Joaquin County, Union Pacific Railroad [UPRR]), either the land would have to be acquired in fee or easements would have to be obtained and secured. Real property acquisition and any relocation services (if needed—no relocations are anticipated) would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 USC 4601 et seq.) and implementing regulation, Title 49 of CFR Part 24, and California Government Code Section 7267 et seq.
- **Haul roads:** An estimated 700,000 cubic yards of imported material (i.e., soil, aggregate, and concrete) would be required to construct these levee improvements. These materials would be hauled to the work sites from commercial sources up to 11 miles away. Personnel, equipment, and imported materials would be transported to the Phase 3 Project area using various surface roads that connect with Interstate 5 or State Route 120. The primary corridors where construction activity would take place would include public

roadways, on and within 300 feet of the levees; existing unpaved roads used for access to work areas; and levee patrol roads atop the levee crown.

- **Landside vegetation removal:** Landside vegetation within the footprint of the proposed levee improvements, including maintenance roadway corridors and temporary access easements, would be cleared to prepare for levee improvement work under the Phase 3 Project. These areas would be hydroseeded with a standard erosion control mix after construction activities are completed, and temporary construction easements would be returned to preproject conditions. The proposed action would involve performing limited work on the waterside of the levee above the HTL (e.g., installation of riprap and degrade of a portion of the levee in Element IVc); however, no waterside woody or riparian vegetation would be removed as the areas where the riprap would be placed and the levee degraded are characterized by ruderal land cover.

- **Encroachment management:** Several features are within the Phase 3 Project footprint: power poles, overhead and underground utilities, and a variety of agriculture-related items (e.g., irrigation and drainage infrastructure, fences). Utility infrastructure (power poles) would be relocated as needed to accommodate the levee improvements, and any pipelines or other underground utility crossings would be replaced as needed. Other encroachments in the Phase 3 Project area would be removed or relocated as required to meet the criteria of USACE, the CVFPB, and FEMA.

PROPOSED SCHEDULE AND SEQUENCE OF PROJECT CONSTRUCTION

Construction of the Phase 3 Project is scheduled to begin in 2015 and is expected to be completed by December 2016, assuming receipt of all required environmental clearances, permits, and approvals for implementation. Some related activities, such as relocating power poles, might be conducted before levee work is initiated, and site restoration and demobilization could extend through spring 2017. The general levee construction window is seasonal (July 1–November 1) due to when high-water levels have the potential to occur within the San Joaquin River system. However, dependent on hydrologic conditions and subject to compliance with species work windows, a work window variance that allows for an extension outside the July 1–November 1 work period may be granted by CVFPB. CVFPB may stipulate that RD 17 comply with additional conditions and commitments as a component of any work window variance.

The proposed construction sequence, which would include concurrent work in several different elements to meet the project schedule, is as follows:

- **Relocation of power poles:** Power poles currently situated on the landside of the levee toe of some elements would need to be relocated to accommodate proposed seepage berms. To the extent feasible, power poles would be relocated beyond the toe of the new berms outside the maintenance access easement. Should placing poles on top of the seepage berms be required, either raised foundations or steel-reinforced concrete piers would be constructed to prevent the poles from affecting the seepage berms. RD 17 would oversee relocation of the power poles, in coordination with the appropriate utility and construction companies.

- **Site preparation at existing levee sites and in setback levee area:** Site preparation (clearing, grubbing, and stripping) of the levee elements would begin by clearing structures (see discussion in next bullet below) and woody vegetation from the footprint of the proposed improvements and the permanent O&M access and utility corridors. Vegetation would be retained in areas adjacent to but outside of the project footprint. This operation would require removal of some trees and relocation or removal of some elderberry shrubs. Large trees would be felled approximately 3 feet above ground level, with stumps temporarily left in place. Where feasible, small trees and elderberry shrubs would be relocated. Elderberry shrubs would be relocated in accordance with the avoidance and minimization measures outlined for VELB on page 21 of this BA. A minimal amount of belowground disturbance would occur. The clearing operation would be followed by grubbing operations to remove stumps, root balls, and any belowground infrastructure. The area would then be disked to chop surface vegetation and mix it with the near-surface organic soils. The disking operation would be followed by stripping the top 12 inches of earthen material from the landside slope of the existing levee and the footprint of the proposed seepage berms. Excess earthen materials (organic soils, and excavated material that does not meet levee embankment criteria) would be temporarily stockpiled and then respread on the surface of the new levee slopes and seepage berms, provided this material is not contaminated with vegetation. Any stripped material contaminated with vegetation and other debris generated during the clearing and grubbing operations would be hauled off-site to suitable landfills.

- **Removal or modification of landside structures and other facilities:** In a few elements, agricultural facilities (e.g., fences, drainage infrastructure) or parking lots are located within the footprint of the proposed landside levee improvements. These facilities would be removed from or relocated out of the project footprint before levee construction begins in those areas. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. Demolished concrete could be sent to a concrete recycling facility. If any wells or septic systems would be affected, they would be abandoned in accordance with the applicable state and county requirements.

- **Construction of the setback levee with seepage berm and underlying cutoff wall:** Construction of the setback levee embankment in Element IVc would begin as soon as sufficient lengths of levee foundation are prepared and weather conditions are suitable. Foundation preparation would include constructing a levee keyway that would be excavated 3–5 feet deep across the entire footprint of the proposed setback levee. A smaller but deeper excavated inspection trench, centered beneath the new waterside hinge point of the setback levee, would then be constructed beneath a small portion of the keyway in accordance with DWR standards. After the foundation layers are backfilled with engineered soil, a geotechnical geogrid fabric would be installed at ground level across the entire setback levee footprint. A second layer of geogrid fabric would be placed at mid-height of the new levee fill section to further reduce the potential for postconstruction settlement of the new levee. The embankment would be constructed of engineered fill, with the fill placed in 3-foot-maximum horizontal lifts by motor graders. Each lift would be moisture-conditioned using water trucks and compacted to the specified density using a suitable compactor, such as a sheep's foot, tamping foot, or rubber-tired roller. Next, quarry stone riprap would be applied in three segments to armor the newly completed setback levee's waterside slope and protect against erosion. Riprap would be placed on the waterside levee above the HTL in areas that are characterized by ruderal land cover (**Exhibit 12**). All waterside woodland would be avoided; all waterside trees would be avoided as well as any tree canopy that overlaps with riprap. Riprap placement will be done either by barge or by long-arm excavator from the top of the levee crown. Riprap dimensions for the three segments are: 340 feet long by 50 feet wide (0.39 acre), 140 feet long by 30 feet wide (0.096 acre), and 230 feet long by 50 feet wide (0.26 acre). A seepage berm would then be constructed on the landside of the setback levee. Fill material for setback levee and seepage berm construction would be obtained from commercial sources and delivered to the levee construction sites using haul trucks.

- **Setback levee site restoration and demobilization:** Upon completion of construction activities, the previously stripped topsoil material would be placed on top of the completed setback levee and associated seepage berms in Element IVc, and any disturbed levee slopes and the tops of the seepage berms would be hydroseeded. An aggregate-base patrol road would be constructed at the landside edge of the seepage berm and setback levees and on the new setback levee crown. The existing levee would be fully restored at the tie-in points to the new setback levee where fill benching was required. The existing levee crown patrol road would be redressed with aggregate base to restore to preconstruction levels. Any disturbed riprap would also be supplemented to ensure a uniform layer across the connection point with the new setback levee. Immediately upon final construction, the setback levee's fill slopes would be covered with erosion control measures until application of the hydroseed. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to preproject conditions. Demobilization would likely occur in various locations as construction proceeds along various elements.

- **Removal of existing levee at setback levee elements, site restoration, and demobilization:** Upon certification of the new setback levee and seepage berm in Element IVc, a 410-linear-foot-long section of the existing outboard levee (which is approximately 2,400 linear feet long in Element IVc) on the downstream side of the existing oxbow would be partially degraded. The area where the levee would be degraded is characterized by ruderal land cover (**Exhibit 12**); some landside vegetation would be removed (as is accounted for in the "Effects – Direct and Indirect Effects on Species in the Action Area" section of this Biological Assessment, but all waterside trees and overlapping tree canopy would be avoided. At least 4.52 acres of riparian vegetation could be established in the area between the new setback levee and the river (**Exhibit 12**). This work would be completed after flood season (in July 1 through November 1) and above the HTL, using primarily scrapers, excavators, and bulldozers to remove the levee section and all present levee encroachments.

- **Construction of seepage berms, seepage berms with chimney drains, and chimney drains within existing seepage berms:** Fill material for levee improvements would be obtained from commercial sources and delivered to the levee construction sites using haul trucks. The material would then be spread by motor graders and compacted by sheep's foot rollers to build new seepage berms and seepage berms with chimney drains. A water truck would be used to properly moisture-condition the soils for compaction. Installing the chimney drains in existing seepage berms would also require the use of an excavator or scraper to remove the existing seepage berm fill material so that the chimney drain fill material could be tied into the drainage rock layer of the existing seepage berm.

- **Construction of cutoff walls:** Cutoff wall construction is anticipated to occur 24 hours a day, 7 days a week, with occasional shutdowns for equipment maintenance when necessary. Lights and possibly power generators would be used during nighttime construction hours. Additional equipment would include slurry batch plants to prepare bentonite or bentonite cement mix, pumps, and support vehicles. Four to five batch plants or slurry ponds would be required for the project; these would be located near the site of cutoff wall construction. Each batch plant or slurry pond with associated pumps and support equipment would occupy an area of approximately 100 square feet and would be reclaimed after completion of cutoff wall construction. Cutoff walls may be installed concurrently in two or more different directions within an element. RD 17 proposes to use the deep slurry mix method to install one cutoff wall located at Element VIIe, which would avoid the need to degrade the top of the levee. For the remaining shallow cutoff walls, RD 17 would use conventional slurry trench walls (open-cut method). The number of cutoff wall rig setups would depend on the project schedule and contractor preference. Each deep-slurry-mix cutoff wall rig would move continuously along the proposed alignment to ensure an uninterrupted cutoff wall and to reduce prolonged disturbance to residences near some cutoff wall segments. Each cutoff wall rig can move 50–100 feet horizontally during a 12-hour work shift, while each conventional slurry trench rig can move 75–200 feet horizontally during a 12-hour work shift. Disturbances to residences are expected to be minor because of the limited number of residences near the cutoff wall installation areas. However, where lights, noise, and/or vibration would exceed allowable nighttime standards for the applicable local jurisdiction, work hours would be restricted to daytime work hours.

- **Traffic control during construction:** Traffic control and detours could be required in the immediate vicinity of some levee improvements. Examples of traffic-control measures to be considered if needed are the use of flaggers for one-way traffic control, the use of advance construction signs and other public notices to alert drivers to activity in the area, and the use of "positive guidance" detour signage on alternate access roads to reduce inconvenience to the driving public. Detours for through traffic are not likely to be required.

- **Site restoration and demobilization:** Upon completion of construction activities, previously stripped topsoil material not contaminated with vegetation would be placed on top of the completed seepage berms and any disturbed levee slopes. Any previously nonagricultural, vegetated areas disturbed during construction would be hydroseeded. An aggregate-base patrol road would be constructed at the landside edge of any seepage berms. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to preproject conditions. Demobilization would likely occur in various locations as construction proceeds along various elements.

AVOIDANCE AND MINIMIZATION MEASURES

GENERAL

A qualified biologist, retained by RD 17, would be on-site to ensure compliance with the avoidance and minimization measures described below, particularly where construction activities would occur adjacent to sensitive habitats that would be avoided.

A worker awareness training program would be conducted for construction crews before the start of construction activities. The program would include a brief overview of special-status species and sensitive resources (including riparian habitats) in the Phase 3 Project area, measures to avoid and minimize impacts on those resources, and conditions of relevant regulatory permits.

Further, traffic speeds on unpaved roads would be limited to 15 miles per hour, to reduce dust emissions and to minimize potential effects on listed species, such as the riparian brush rabbit.

VALLEY ELDERBERRY LONGHORN BEETLE

For elderberry shrubs that are located in the Phase 3 Project area, RD 17 would implement the following avoidance and minimization measures that are described in USFWS's *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (VELB Guidelines), dated July 9, 1999, to avoid and minimize effects on VELB:

- All elderberry shrubs that are located adjacent to construction areas, but can be avoided, would be protected through establishment of a fenced avoidance area. The fencing would be placed at least 20 feet from the dripline of the shrubs. All elderberry shrubs to be protected during construction would be identified and marked by a qualified biologist. Orange construction barrier fencing would be placed at the edge of the respective buffer areas and no construction activities would be permitted within the buffer zone other than those activities necessary to erect the fencing. In cases where the elderberry dripline is less than 20 feet from the work area, k-rails would be placed at the shrub's dripline to provide additional protection to the shrubs from construction equipment and activities. Temporary fences around the elderberry shrubs and k-rails at shrub drip lines would be installed as the first order of work. Buffer area fences around elderberry shrubs would be inspected weekly by a qualified biologist during ground-disturbing activities until adjacent project construction is complete or the fences are removed upon approval by the qualified biologist and resident engineer.

- No insecticides, herbicides, or other chemicals that might harm the beetle or its host plant would be used within 100 feet of elderberry shrubs.

- Elderberry shrubs that require removal would be transplanted to a USFWS-approved site during the dormant period for elderberry shrubs (i.e., November 1 to February 15) and in accordance with the requirements in the VELB Guidelines (USFWS 1999).

- Each elderberry stem measuring 1 inch or greater in diameter at ground level that is adversely affected (i.e., transplanted) would be replaced with elderberry seedlings and seedlings of associated species, in accordance with the VELB Guidelines (USFWS 1999).

Regarding provision for off-site compensatory mitigation for habitat losses, see the "Compensation Measures" section below.

Riparian Brush Rabbit

The following measures would be implemented to avoid and minimize potential adverse effects to riparian brush rabbit in potential habitat within and adjacent to the Phase 3 Project footprint (i.e., Great Valley cottonwood and Great Valley oak riparian forest communities):

- Potential riparian brush rabbit habitat would be identified and avoided wherever possible. The primary engineering and construction contractors would ensure, through coordination with a qualified biologist approved by USFWS and retained by RD 17, that construction would be implemented in a manner that minimizes disturbance of such areas to the extent feasible.
- Temporary fencing would be used during construction to prevent disturbance of potential habitat adjacent to construction areas. Construction personnel, vehicles, and equipment would remain within the identified construction area. In addition, a silt fence or other suitable temporary barrier would be installed around the construction area where it borders suitable habitat for brush rabbits to exclude brush rabbits from the construction site; this silt fence or temporary barrier would either be incorporated into the temporary fencing, or be installed as a separate fence. Temporary signage would be placed along the rabbit exclusion fence at 150-foot intervals, warning contractors to stay within the construction area. The temporary rabbit exclusion fence and associated signage would be inspected by the qualified biologist and construction contractor each morning before the beginning of construction activities, and would be repaired and maintained as necessary. A biological monitor would inspect the fence at least once a week. The temporary rabbit exclusion fence and signage would be removed after construction activities are no longer occurring adjacent to the exclusion area.
- Where suitable habitat for riparian brush rabbit must be removed, vegetation would be removed by hand 2 weeks before construction to ensure that no riparian brush rabbits are present within the construction area at the time of construction. A qualified biologist, retained by RD 17, would be on-site during vegetation removal. Areas of temporary habitat disturbance in the Phase 3 Project area would be revegetated with native plant species and restored to preproject conditions.

Regarding provision for on-site compensatory mitigation for habitat losses, see the “Compensation Measures” section below.

Federally Listed Fish—Delta Smelt, Longfin Smelt, Anadromous Salmonids, and Green Sturgeon

Water Quality

The following measures would be implemented to avoid and minimize potential adverse effects on water quality:

- Any work within the existing floodway (i.e., placing riprap on the waterside levee above the HTL at Element IVc) of the San Joaquin River would not take place during the designated flood season (i.e., November 1 to July 1) and would not begin until evaluation of upstream conditions (e.g., reservoir storage and snowpack) indicated that inundation of these areas would be unlikely to occur during construction.
- RD 17 would comply with all local, state, and federal regulations and environmental requirements regarding turbidity-reduction measures, including the following:
    - obtaining and complying with relevant agency permits (e.g., CDFW streambed alteration agreement, Central Valley Regional Water Quality Control Board [RWQCB] Clean Water Act Section 401 certification, and Section 404 permit);
    - developing and implementing a storm water pollution prevention plan (SWPPP) that identifies specific BMPs to avoid and minimize impacts to water quality during construction activities; and

- complying with the conditions of the National Pollutant Discharge Elimination System (NPDES) general stormwater permit for construction activity.

► RD 17 would file a notice of intent with the Central Valley RWQCB to discharge stormwater associated with construction activity. Final design and construction specifications would require the implementation of standard erosion, siltation, and good housekeeping BMPs. Construction contractors would be required to prepare and implement a SWPPP and comply with the conditions of the NPDES general stormwater permit for construction activity (Order No. 2009-0009-DWQ). The SWPPP would describe the construction activities to be conducted, BMPs that would be implemented to prevent discharges of contaminated stormwater into waterways, and inspection and monitoring activities that would be conducted.

At a minimum, the following specific BMPs are proposed for implementation:

- Conduct all work according to site-specific construction plans that identify areas for clearing, grading, and revegetation so that ground disturbance is minimized.
- Install silt fences near riparian areas or existing drainages to control erosion and trap sediment and reseed cleared areas with native vegetation.
- Conduct maintenance on a regular basis to ensure proper installation and function of BMPs, and during storm events, conduct maintenance daily.
- Immediately repair and replace BMPs that have failed (within 48 hours of the event) with sufficient devices and materials (e.g., silt fence, coir rolls, and erosion blankets) provided throughout project construction to enable immediate corrective action for failed BMPs.
- Restrict stockpiling of construction materials (e.g., portable equipment, vehicles, and supplies, including chemicals) to designated construction staging areas, exclusive of any riparian, wetland, or other areas supporting waters.
- Stabilize disturbed soils of construction areas before the onset of the winter rainfall season.
- Stabilize and protect stockpiles from exposure to rain and potential erosion.

The SWPPP also would specify appropriate hazardous materials handling, storage, and spill response practices to reduce the possibility of adverse impacts from use or accidental spills or releases of contaminants. Specific measures applicable to the project would include but would not be limited to the following:

- Require compliance by RD 17 contractors with all applicable State Water Resources Control Board (SWRCB) and Central Valley RWQCB standards and other applicable water quality standards.
- Develop and implement strict on-site handling rules to keep potentially contaminating construction and maintenance materials out of drainages and other waterways.
- When refueling and servicing equipment, use absorbent material or drip pans underneath such equipment to contain spilled fuel, oil, and other fluids; and collect any fluid drained from machinery in leak-proof containers and deliver to an appropriate disposal or recycling facility.
- Maintain controlled construction staging and fueling areas at least 100 feet away from channels or wetlands to minimize accidental spills and runoff of contaminants in stormwater.
- Prevent substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses.

- Maintain spill cleanup equipment in proper working condition. Clean up all spills immediately according to the spill prevention and response plan, which would be prepared by RD 17 or its contractor or representative and approved by the RWQCB prior to commencement of project ground-breaking.
- Immediately (within 24 hours) notify NMFS, USFWS, CDFW, and the Central Valley RWQCB of any reportable spills and cleanup occurrences. Record all such spills, and the success of the efforts to clean them, in postconstruction compliance reports.
- Develop a slurry spill contingency plan, which would be prepared by RD 17 or its contractor or representative before commencement of project groundbreaking, to respond to a potential for bentonite slurry spill and prevent slurry from entering watercourses.
- Store and transport construction materials handled by RD 17 or its contractors in a manner that minimizes potential water quality impacts. Locate storage areas away from drainages and waterways, outside the floodplain, and away from sensitive resources, and make use of containment facilities.

BMPs would be applied to meet the "maximum extent practicable" and "best conventional technology/best available technology" requirements and address compliance with water quality standards. RD 17 would implement a monitoring program that would be implemented during and after construction to ensure that the Phase 3 Project would comply with all applicable standards and that the BMPs would be effective.

COMPENSATION MEASURES

VALLEY ELDERBERRY LONGHORN BEETLE

As described above under "Avoidance and Minimization Measures—Valley Elderberry Longhorn Beetle," compensation for effects on VELB would be provided in accordance with the VELB Guidelines (USFWS 1999). Elderberry shrubs that cannot be avoided would be transplanted to a USFWS-approved site and VELB habitat conservation credits would be purchased from a USFWS-approved VELB habitat conservation bank. RD 17 would purchase a comparable amount of VELB habitat conservation credits from the French Camp Conservation Bank to offset the adverse effects of transplanting elderberry shrubs. Purchasing VELB habitat credits at a USFWS-approved habitat conservation bank would fully compensate for the loss of VELB habitat resulting from construction activities associated with the Phase 3 Project.

RIPARIAN BRUSH RABBIT

Compensation for effects on riparian brush rabbit habitat would consist of restoring natural habitats in the Phase 3 Project area, and preserving and/or restoring natural habitats in the project vicinity.

On-site compensation for adverse effects on riparian brush rabbit habitat would include restoration of riparian habitat in the proposed setback levee area in Element IVc. Once the new setback levee is constructed and certified in Element IVc, a small section of the existing levee would then be partially degraded. Between 25 feet from the landside toe of the existing levee and 25 feet from the waterside toe of the new setback levee are approximately 4.52 acres of ruderal grassland that can be restored as riparian habitat (**Exhibit 12**). The restored riparian habitat would consist of willows, cottonwoods, valley oaks, wild rose, California blackberry, and grasses, which is comparable to the composition of habitats where riparian brush rabbit is documented to occur along the RD 17 levees. Apart from a small notch along the north side, the existing levee would remain in place, thus providing upland refugia for the species during high-water events. The 4.52-acre area would be contiguous with existing waterside riparian habitat along Element IVc; this waterside riparian habitat along Element IVc extends northward through Elements IVa, IIIa, and IIIb, and southward through Elements Va and VIa.1. There are documented occurrences of riparian brush rabbit in the waterside riparian habitat in Elements IIIa and IIIb, north of Element IIIa and south of Element VIa.1; therefore, reestablishing and protecting riparian habitat in Element IVc would provide expanded and connected habitat for this species.

RD 17 is also evaluating options for providing off-site compensatory habitat to offset effects of the Phase 3 Project on riparian brush rabbit. Additional off-site compensatory habitats would include preserving existing waterside riparian habitats and/or restoring natural riparian habitats. These options would be evaluated in coordination with USFWS during the Section 7 consultation.

MITIGATION AND MONITORING PLAN

A mitigation and monitoring plan would be prepared in coordination with USFWS, NMFS, USACE, and CDFW to guide RD 17 and its partners as they establish and manage the proposed action's compensation. The mitigation and monitoring plan would address the habitat restoration in Element IVc and off-site compensatory habitat components. This plan would:

- describe specifications for the restoration of habitat components, including details about the restoration of riparian habitats, with a list of the species and drawings/designs to show the location of the species and planting density;
- establish specific success criteria for the habitat components, including:
  - performance standards to determine whether the habitat improvement was trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in design or maintenance revisions);
  - monitoring and maintenance protocols; and
  - measureable goals to ensure vegetation survival to provide and replace riparian habitats;
- specify remedial measures to be undertaken if success criteria are not met (e.g., adaptive management, physical adjustments, additional monitoring); and
- describe short- and long-term management and maintenance of the habitat lands.

The plan will be included in the Final Environmental Impact Statement and Final Environmental Impact Report and reviewed and approved by USFWS and NMFS before groundbreaking in portions of the Phase 3 Project area that could affect the species addressed in this BA. RD 17 would provide for the conservation of the restored riparian habitat in the setback levee area within Element IVc and for off-site habitat compensation. The compensation habitat would ultimately be transferred to a suitable land management organization for long-term management and monitoring.

This habitat creation and enhancement would fully compensate for the loss of habitat for riparian brush rabbit resulting from construction activities associated with the Phase 3 Project.

ACTION AREA

The action area is defined here in accordance with ESA guidelines as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action” (50 Code of Federal Regulations [CFR] 402.02). The action area includes all areas that would be directly or indirectly affected by the components of the Phase 3 Project. Areas downstream of the Phase 3 Project area might also be indirectly affected by the flood risk management component of the project through improved water quality and flood risk management conditions. The extent of this potential effect is difficult to quantify. However, the inclusion of waterways within 15 river miles of the project site would likely exceed the areas affected by the improvements.

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ENVIRONMENTAL BASELINE

HYDROLOGY

SACRAMENTO–SAN JOAQUIN DELTA

The Delta extends inland from the confluence of the Sacramento and San Joaquin Rivers west of Antioch to Sacramento on the Sacramento River and to near Mossdale on the San Joaquin River. The Phase 3 Project area is in the southeastern portion of the Delta, within the legal boundary of the Delta as defined by Section 12220 of the California Water Code.

The legal Delta encompasses an area of approximately 851,000 acres (of which approximately 135,000 acres consist of waterway, marshland, or other water surfaces). The Delta is divided into a Primary Zone and a Secondary Zone, as defined by the Delta Protection Act of 1992. Land uses in the Primary Zone are regulated to protect the area for agriculture, wildlife habitat, and recreational uses. The Secondary Zone is the area outside the Primary Zone and within the legal Delta. Where urban development activities occur in the Secondary Zone, efforts should be taken to ensure that these activities do not adversely affect Delta waters, Primary Zone habitat, or recreational uses. The San Joaquin River delineates the boundary between the Primary Zone to the west and the Secondary Zone to the east. Accordingly, the Phase 3 Project is located in the Secondary Zone.

The Sacramento River contributes roughly 75–80% of the Delta inflow in most years and the San Joaquin River contributes about 10–15%; the Mokelumne, Cosumnes, and Calaveras Rivers, which flow into the eastern side of the Delta, contribute the remainder. The rivers flow through the Delta and into Suisun Bay, San Pablo Bay, San Francisco Bay, and the Pacific Ocean. Historical annual Delta inflow averaged approximately 23 million acre-feet (MAF) between 1945 and 1995, with a minimum inflow of approximately 6 MAF in 1977 and a maximum of approximately 70 MAF in 1983. Water flowing into the Delta is used for urban and agricultural use, recreation, navigation, and wildlife and fisheries. The Delta provides drinking water for about 23 million Californians.

Freshwater inflows to the Delta vary greatly, depending on precipitation, snowmelt, and Central Valley Project (CVP) and State Water Project (SWP) water operations. During the summer months, most inflow to the Delta comes from regulated releases from SWP and CVP reservoirs. Both projects also withdraw large volumes of water from the Delta for agricultural and urban use. Precipitation in the project region occurs primarily during the months of November through March, with the average annual precipitation ranging from about 8 inches near Tracy to approximately 17 inches near Lodi. Near Lathrop, the annual precipitation is approximately 12 inches.

Water movement in the Delta responds to five primary forcing mechanisms:

- freshwater inflows to the ocean;
- Delta exports and upstream diversions;
- operation of water control facilities such as dams, export pumps, and flow barriers; and
- the regular tidal movement of seawater into and out of the Delta.

In addition, winds and salinity behavior in the Delta can generate secondary currents that, despite being of low velocity, can be of considerable significance with respect to transporting contaminants and mixing different sources of water. Changes in flow patterns in the Delta, whether caused by export pumping, winds, atmospheric pressure, flow barriers, tidal variations, inflows, or local diversions, can influence water quality at drinking water intakes.

The Delta is a hydrologically complex region of interlacing channels, marshland, and islands. The Delta has been reclaimed into more than 60 islands and tracts, interlaced with about 700 miles of waterways. Some channels are edged with aquatic and riparian vegetation, but most are bordered by steep banks of earth or riprapped levees. Vegetation is generally removed from channel margins to increase flood flow capacity and facilitate levee maintenance. About 520,000 acres are devoted to farming. An approximately 1,100-mile network of levees protects the reclaimed land, most of which lies near or below sea level, from flooding. Some of the island interiors are as much as 25 feet below sea level.

Nearly 16.5 miles of the 19 miles of levees protecting RD 17 are considered federal project levees; the 2.6-mile dryland levee is not a federal levee. Federal project levees were either constructed by the federal government (typically through USACE) or built by others and later brought under federal jurisdiction.

San Joaquin River

The San Joaquin River originates in the Sierra Nevada and enters the San Joaquin Valley at Friant Dam. Most of the flow in the lower San Joaquin River is derived from inflow from the Merced, Tuolumne, and Stanislaus Rivers (Northeastern San Joaquin County Groundwater Banking Authority 2004). The 330-mile-long San Joaquin River, which drains a watershed area of 13,540 square miles from the Sierra Nevada to the Delta, contributes approximately 15% of the inflow to the Delta (Delta Protection Commission 2000). Flowing through portions of Fresno, Madera, Merced, Stanislaus, San Joaquin, Sacramento, and Contra Costa Counties, the river has flows ranging from 1,500 cubic feet per second (cfs) in dry years to more than 40,000 cfs in wet years (Friant Water Users Authority and Natural Resources Defense Council 2002).

Hydrologic conditions in the San Joaquin River basin are dominated by snowmelt from the Sierra Nevada. Before major water storage projects were completed on the San Joaquin River and its major tributaries, lower San Joaquin River flows generally peaked in late spring/early summer and dropped to low levels in the fall. Since the completion of Friant Dam (1944), McClure Reservoir (1967 on the Merced River), Don Pedro Reservoir (1971 on the Tuolumne River), and New Melones Reservoir (1979 on the Stanislaus River), the lower San Joaquin River's seasonal flow pattern has changed substantially. Before 1944, based on 1923–1944 records, flow in the lower San Joaquin River tended to peak in May and June, with an average monthly flow of almost 11,000 cfs, and declined rapidly to an average monthly flow of approximately 1,200–1,300 cfs in August and September. Since 1979, the average monthly flow has peaked in March at just over 10,000 cfs, with a more gradual decline to approximately 2,400 cfs in August. In addition, the San Joaquin River is tidally influenced from the Delta and the San Francisco Bay. Tidal fluctuation in the San Joaquin River has been modeled to approximately the Vernalis tide gauge and the Airport Way crossing of the San Joaquin River, which is approximately 13 river miles upstream of the project site.

The SJRRP was established in late 2006 to implement the Stipulation of Settlement in *NRDC et al. v. Kirk Rodgers et al*. (Settlement). Authorization for implementing the Settlement is provided in the San Joaquin River Restoration Settlement Act, included in Public Law 111-11. The goal of the SJRRP is to reoperate and increase the release of water from Friant Dam in accordance with the Settlement, and in a manner consistent with federal, state, and local laws, and future agreements with downstream agencies, entities, and landowners (Reclamation and DWR 2011). The Settlement establishes two primary goals:

- *Restoration Goal*—To restore and maintain fish populations in "good condition" in the mainstem San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish. To achieve the Restoration Goal, the Settlement calls for releases of water from Friant Dam to the confluence of the Merced River (referred to as Interim and Restoration Flows), a combination of channel and structural modifications along the San Joaquin River below Friant Dam, and reintroduction of Chinook salmon.

- *Water Management Goal*—To reduce or avoid adverse water supply impacts on all of the Friant Division long-term contractors that may result from the Interim and Restoration Flows provided for in the Settlement. To achieve the Water Management Goal, the Settlement calls for recirculation, recapture, reuse, exchange, or transfer of the Interim and Restoration Flows to reduce or avoid impacts on water deliveries to all of the Friant Division long-term contractors caused by the Interim and Restoration Flows.

The SJRRP would release Interim and Restoration Flows to the San Joaquin River from Friant Dam in accordance with the flow schedule presented in Exhibit B of the Settlement. The Settlement establishes the Recovered Water Account and recovered-water program, which make water available to all Friant Division long-term contractors who provide water to meet Interim or Restoration Flows so that the impacts of Interim and Restoration Flows on such contractors can be reduced or avoided.

Local Drainage

Stormwater runoff in the RD 17 area is commonly collected in agricultural ditches, channels, municipal stormwater sewers, or human-made ponds before being pumped to the San Joaquin River. Runoff from the area east of the San Joaquin River, along levee Elements Ie and VIIb, is directed west through agricultural swales and ditches, and then pumped into the river by means of private agricultural pumps. Runoff from developed lands adjacent to Elements IVa, IVc, and VIa.4 is directed to the City of Lathrop's storm drainage system, held in detention basins, and ultimately pumped into the San Joaquin River through a municipal stormwater outfall. Runoff in the area around Element VIIe, which encompasses the Oakwood Lake development, first flows into the artificial lake in the center of the development, then is pumped into the river if lake levels become too high.

WATER QUALITY

Surface Water Quality

Water quality in the Delta and portions of the San Joaquin River are heavily influenced by CVP and SWP operations. Generally, Delta water quality is best during the winter and spring months and poorer during the irrigation season and early fall. Water quality in the San Joaquin River is influenced by factors such as rain and snowmelt runoff, reservoir operations, and irrigation return flows in the San Joaquin River basin. Agricultural return flows commonly discharge elevated salt loads into the San Joaquin River. The SWRCB has set flow and water quality objectives at Vernalis, located just upstream of the Phase 3 Project area. To meet the Vernalis objective, the U.S. Bureau of Reclamation supplements flows on the San Joaquin River with releases from New Melones Reservoir on the Stanislaus River (Northeastern San Joaquin County Groundwater Banking Authority 2004).

The latest version of the Section 303(d) list for California issued by the SWRCB (approved October 26, 2006) identifies an impaired status for waterways in the eastern Delta, including the lower San Joaquin River. Potential sources of pollution for all of the listed constituents in the basin include agriculture, urban runoff/storm sewers, resource extraction, and unknown sources. The eastern Delta, including the lower San Joaquin River, is on the Section 303(d) list for impairment from boron, chlorpyrifos, diazinon, dichlorodiphenyltrichloroethane (DDT), electrical conductivity, unknown toxicity, Group A pesticides, exotic species, and mercury. Downstream of the Phase 3 Project area, the Stockton Deep Water Ship Channel is being addressed by a total maximum daily load (TMDL) plan for dissolved oxygen and is no longer on the Section 303(d) list. TMDLs have been initiated for organophosphorus pesticides (i.e., diazinon and chlorpyrifos), salinity and boron, and selenium in the lower San Joaquin River watershed and for total dissolved solids and mercury in Delta channels. TMDLs for the other listed pollutants are scheduled to be developed at various times over the next 10 years, in accordance with the priorities contained in the Section 303(d) list.

Major monitoring programs in the San Joaquin River include DWR's Municipal Water Quality Investigations Program and Water Rights Decision 1485 Water Quality Monitoring Program. The City of Stockton also monitors ambient water quality to assess potential effects of discharges from the Stockton Regional Wastewater Control Facility. Data are collected at five water quality monitoring sites along the San Joaquin River near the Phase 3 Project area. The Mossdale Bridge sampling site at the Interstate 5 crossing over the San Joaquin River is near Elements VIcde and VIIb. The Vernalis sampling site is located near the town of Vernalis, just upstream of the Phase 3 Project area. Some of the broad categories that are monitored are discussed briefly below.

HABITAT

Dense riparian forests once flanked the San Joaquin River in this area. In contrast, the habitat today consists of linear areas and occasional remnant patches of riparian forests and related riparian scrub that grow on or adjacent to the levee, primarily on the waterside. A few larger areas of these riparian forests are present where the river turns away from the levee and creates a point bar and an upland floodplain area. Riprap or large boulders cover the lower half of most of the waterside of the San Joaquin River east levee in the Phase 3 Project area, and ruderal vegetation grows in open areas, especially upslope of the riprap and on large open areas on the landside of the levee. Other areas of levee on the waterside are barren and/or covered with stumps and dead vegetation, likely as a result of levee maintenance that has included cutting scrub and low vegetation, burning, and applying herbicide. Some of the lands on the waterside of the levee are privately held and are affected by grazing and other landowner activities.

The landside reaches of the Phase 3 Project area levees are primarily barren or covered with ruderal vegetation. Beyond the base of the levees, riparian vegetation is rare but occasionally present in small, isolated patches. Other trees include occasional single or isolated stands of native oaks and nonnative trees that have been planted around farms, agricultural fields, and residential or other types of development. Habitat and land cover types present in the Phase 3 Project area include riparian forests, nonnative woodlands, agricultural lands, ruderal and developed areas, and aquatic features (including marsh, wetlands, and ponds) (**Exhibits 13a** through **13d**).

VEGETATION AND LAND COVER

As described below, terrestrial vegetation and land cover types in the Phase 3 Project area and vicinity include Great Valley cottonwood riparian forest (remnant), Great Valley oak riparian forest (remnant), nonnative woodland, agricultural (row crops, orchards, dirt roads, and irrigation ditches), and ruderal and developed (residential housing, parks, boat launch facilities, and roads).

- **Great Valley cottonwood riparian forest:** Remnant patches of Great Valley cottonwood riparian forest within the Phase 3 Project area are dominated by large Fremont cottonwood (*Populus fremontii*) trees and Goodding's willow (*Salix gooddingiii*). Most of the otherwise linear or smaller patchy areas of this community lack Fremont cottonwood and are represented by Goodding's willow, red willow (*S. laevigata*), arroyo willow (*S. lasiolepis*), narrow leaved-willow (*S. exigua*), scattered valley oak (*Quercus lobata*), Oregon ash (*Fraxinus* latifolia), and buttonbush (*Cephalanthus occidentalis*). Native ground cover species, found mainly in the larger remnant patches of riparian forest, include California blackberry (*Rubus ursinus*) and wild rose (*Rosa californica*). Common nonnative understory species found in most elements include Himalayan blackberry (*Rubus discolor*) and tree tobacco (*Nicotina glauca*). Most of the Great Valley cottonwood riparian forest community could also be characterized as Great Valley riparian scrub, which does not include Fremont cottonwood and is characterized by a shorter canopy and more uniform structure. This habitat, however, is part of the Great Valley cottonwood riparian forest that was extensive and connected along this entire reach of the San Joaquin River. Therefore, this BA describes all riparian habitat as such. The largest stands of Fremont cottonwood trees in the Phase 3 Project area are present in Elements IIIb, IVc, Va, and VIa.1.
- **Great Valley oak riparian forest:** Great Valley oak riparian forest is located within the Phase 3 Project area, occurring only on the landside of the levees. This is a medium to tall (rarely to 100 feet) broadleaved, winter deciduous, closed-canopy riparian forest dominated by valley oak. Understories include scattered Northern

California black walnut (*Juglans nigra*) and western sycamore (*Platanus racemosa*) as well as young valley oaks. Understory plants include California rose (*Rosa californica*), blackberry (*Rubus* spp.), and western poison oak (*Toxicodendron diversilobum*) (Hickman 1993; Holland 1986). Two significant oak groves of very large, healthy valley oak trees are present on the landside of Elements IIIb and IVa and account for most of the Great Valley oak riparian forest. Several groups of smaller valley oak trees and individual valley oaks scattered along the landside of other Phase 3 Project elements also contribute to this community.

- **Nonnative woodland:** Along the landside of Elements Ie, VIa.1, VIde, and VIIg, nonnative trees have been planted around farms, agricultural fields, and residential or other types of development. These woodlands lack understory vegetation, other than grasses and ruderal vegetation.

- **Agricultural cropland:** Cropland in the Phase 3 Project area is dominated by alfalfa fields, orchards, and row crops, such as tomatoes. Ruderal species grow along the edges of fields and irrigation ditches, some of which contain water and associated aquatic plants. The largest areas of agricultural lands are present in Elements Va and VIa.1, and Element VIcde.

- **Ruderal vegetation:** Ruderal vegetation is characterized by nonnative weedy and sometimes invasive vegetation and nonnative annual grasses. Common weed species include yellow star-thistle (*Centaurea solstitialis*), black mustard (*Brassica nigra*), shortpod mustard (*Hirschfeldia incana*), Italian thistle (*Carduus pycnocephalus*), milk thistle (*Silybum marianum*), and Himalayan blackberry. Common grass species include ripgut brome (*Bromus diandrus*), foxtail barley (*Hordeum murinum* ssp. *leporinum*), Bermuda grass (*Cynodon dactylon*), and Johnsongrass (*Sorghum halepense*). The levee slopes are dominated by ruderal vegetation. Large open areas in Elements IIIa and IVc are also composed primarily of ruderal vegetation, as are smaller open areas in Elements VIcde and VIIe that border roads, parking lots, and agricultural land.

- **Developed areas:** Developed areas in the Phase 3 Project area consist of residential areas bordering Elements IVa, IVc, Va and VIa.1, and VIIe; parks located in Elements IVc and VIa.2, the latter of which is also a boat launching facility; and ranch houses and related facilities located in or adjacent to Elements Ie, IIab, Va and VIa.1, and dryland levee Element XI. Vegetation in residential areas and parks consists of turf grasses, landscape trees, and occasional valley oak trees. Ranch lands often contain English walnut trees (*Juglans regia*), a variety of landscaped trees, and occasional native valley oak trees.

AQUATIC HABITATS

The principal surface water bodies associated with the Phase 3 Project area are the San Joaquin River and Walthall Slough. Project Elements Ia through IVc are located downstream of the confluence of the San Joaquin River and Old River. Element V is located directly adjacent to this confluence. Elements VIa.1 through VIIe are upstream of the confluence of the San Joaquin River and Old River. Small portions of Elements VIIe and VIIg are located along Walthall Slough. An approximately 3.5-acre constructed pond is located adjacent to Element IIab, but outside of the project footprint (**Exhibit 13a**).

In the Phase 3 Project area, the San Joaquin River is characterized as a wide channel (approximately 300 feet) with little riparian canopy or overhead vegetation and minimal bank cover. Aquatic habitat in the San Joaquin River is characterized primarily by slow-moving glides and pools, is depositional in nature, and has limited water clarity and habitat diversity. Altered flow regimes, flood risk management, and bank protection efforts along much of the San Joaquin River have reduced riparian vegetation and associated shaded riverine aquatic (SRA) habitat, sediment transport, channel migration and avulsion, and large woody debris recruitment, and have isolated the channel from its floodplain. This has resulted in a decline in habitat quality for fish species using the San Joaquin River near the Phase 3 Project area. However, fish use this segment of the river, even if only as a migratory pathway to and from upstream spawning and rearing areas.

Wetland vegetation in the Phase 3 Project area is limited to coastal and valley freshwater marshes, several agricultural ditches, and the edges of one constructed pond. Freshwater marsh is isolated in a depression on the landside of the levee in Element 1b between Howard Road to the north and a dirt farm road on the south. A limited amount of freshwater marsh also is present around the edges of a constructed pond, located on a large private estate and equestrian center that is east of the Phase 3 Project area levee in Element IIab. A second area of freshwater marsh is located just outside of the Phase 3 Project area in Element Va, and in an area of backwater on the San Joaquin River. Agricultural ditches are located along the edges of fields and orchards.

FISH POPULATIONS

The lower San Joaquin River and Delta serve as a migration corridor and/or provide other types of habitat (e.g., rearing, spawning) for steelhead, delta smelt, white sturgeon (*Acipenser transmontanus*), and green sturgeon. Numerous other resident native and nonnative species are also found in the San Joaquin River. Among the native species present in the river are blackfish (*Orthodon microlepidotus*), threespine stickleback (*Gasterosteus aculeatus*), and San Joaquin roach (*Lavinia symmetricus* sp.); while nonnative species include striped bass (*Morone saxatilis*), white catfish (*Ameiurus catus*), and bluegill (*Lepomis macrochirus*). In late-2014, experimental populations of spring-run Chinook salmon will be reintroduced to the San Joaquin River, as a component of the SJRRP (see "San Joaquin River" subsection above).

The small, unnamed pond in Element IIab (**Exhibit 13a**) may contain fish and other aquatic species. Given its isolated nature and size, this pond likely supports only nonnative warm-water fish that probably have been introduced. Typical fish that are found in similar ponds include bluegill, western mosquitofish (*Gambusia affinis*), and catfish (*Ameiurus* or *Ictalurus* spp.), among other nonnative warm-water species.

WILDLIFE

Common wildlife species expected in the Phase 3 Project area are those typically associated with agriculture (alfalfa, row crops, and orchards) and ruderal habitat, which account for 57% of the Phase 3 Project area's footprint. Species include California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), western harvest mouse (*Reithrodontomys megalotis*), and California meadow vole (*Microtus californicus*). These small mammals are prey for a variety of raptor species known to occur in the area, including Swainson's hawk (*Buteo swainsoni*). Riparian habitats in the Phase 3 Project area provide nesting habitat for a wide variety of bird species.

SPECIES ACCOUNTS

This section presents species accounts for the federally listed species considered in this BA, including relevant life history and habitat use, as well as the species' potential for occurrence in the action area. The action area (see the "Action Area" section above) encompasses the entire area that may be affected by the Phase 3 Project, including more distant locations where indirect effects might occur. However, the species accounts below focus on the habitat present in the Phase 3 Project area itself and describe the potential for federally listed species to occur in the general vicinity. Only when the habitat quality or species distribution is specifically known for the action area is it described.

VALLEY ELDERBERRY LONGHORN BEETLE

VELB has four life stages: egg, larva, pupa, and adult. This species, which is federally listed as threatened, is nearly always found on or close to its host plant, the elderberry (*Sambucus* sp.). Females lay their eggs on the bark, and larvae hatch and burrow into the stems. The larval stage can last 2 years, after which the larvae enter the pupal stage and transform into adults. Adults are active (feeding and mating) from March to June (USFWS 2006). It appears that to function as VELB habitat, host elderberry shrubs must have stems that are 1.0 inch or greater in diameter at ground level. Use of the plants by the beetle is rarely apparent. Frequently, the only exterior evidence of the shrub's use by the beetle is an oval exit hole created by the larva just before the pupal stage. Field studies conducted along the Cosumnes River and in the Folsom Lake area suggest that larval galleries can be found in elderberry stems with no evidence of exit holes, because the larvae either succumb before constructing an exit hole or are not far enough along in the developmental process to construct an exit hole (USFWS 1996a).

VELB is patchily distributed throughout the remaining riparian forests of the Central Valley from Redding to Bakersfield, and appears to be only locally common (i.e., found in population clusters that are not evenly distributed across the Central Valley). Extensive loss of Central Valley riparian forests has occurred since 1900, with riparian forests declining by 80–96% depending on the region (USFWS 2006). Although it is wide-ranging, VELB is thought to have suffered a long-term decline because of human activities that have caused widespread alteration and fragmentation of riparian habitats and, to a lesser extent, upland habitats that support the beetle. Low density and limited dispersal capability may cause the beetle to be particularly vulnerable to population isolation as a result of habitat fragmentation. Insecticide and herbicide use in agricultural areas and along road rights-of-way may be factors limiting the beetle's distribution. The age and quality of individual elderberry shrubs/trees and stands as a food plant for beetle may be a factor in its limited distribution.

Elderberry shrubs are known to occur along the San Joaquin River, on both the waterside and landside of levees in the Phase 3 Project area. Focused surveys for elderberry shrubs were conducted along all levee reaches on March 8, 2011; the area was resurveyed on January 29, 2014. A total of 18 elderberry shrubs were observed within 100 feet of the Phase 3 Project area: nine shrubs on the waterside of the levee and nine shrubs on the landside. None of the shrubs had evidence of beetle exit holes. One of the landside shrubs does not have stems greater than one inch in diameter at ground level; therefore, it is not considered suitable VELB habitat. See **Exhibit 14** for locations of the elderberry shrubs that were observed within 100 feet of the Phase 3 Project area during field surveys in 2014.

CRITICAL HABITAT

Critical habitat for VELB was designated at the time of listing. Two areas along the American River in the Sacramento metropolitan area were designated as critical habitat for this species. The Phase 3 Project area is not located within designated critical habitat for VELB.

RECOVERY PLAN FOR VALLEY ELDERBERRY LONGHORN BEETLE

The *Recovery Plan for Valley Elderberry Longhorn Beetle* (USFWS 1984) lacks specific goals and does not include objective, measurable recovery criteria (USFWS 2006). The recovery plan identified additional essential habitat for this species in an area along Putah Creek, Solano County, and an area along the American River Parkway, Sacramento County. USFWS released a 5-year status review for VELB on October 2, 2006 (USFWS 2006). This review reported an increase in known beetle locations, from 10 at the time of listing in 1980 to 190 in 2006. Because of the presumed increase in the estimated population and the concurrent protection and restoration of several thousand acres of riparian habitat suitable for VELB, USFWS's status review determined that this species is no longer in danger of extinction and recommended that the species no longer be listed under the ESA. On October 2, 2012, the USFWS issued a proposed rule to delist VELB (78 FR 66058); however, on September 17, 2014, the USFWS withdrew this proposal, stating that the scientific information and analysis relied upon in the October 2012 proposed was not strong enough to support a decision to delist the species (79 FR 55874).

RIPARIAN BRUSH RABBIT

Riparian brush rabbits, which are federally listed as endangered, inhabit riparian communities in the northern San Joaquin Valley that are dominated by thickets of willows and large clumps of shrubs and vines such as wild rose, blackberries, coyote bush, and wild grape. Historically, riparian brush rabbits inhabited dense, brushy areas of valley riparian forests, marked by extensive thickets of wild rose, blackberries, and willows (Sandoval et al. 2006).

Suitable habitat for riparian brush rabbits is characterized by an abundance of woody ground litter, mats of low-growing vines and shrubs, and areas of higher ground not subject to regular or heavy flooding (Sandoval et al. 2006). On a seasonal basis, they also may use dense, tall stands of herbaceous plants adjacent to patches of riparian shrubs (Williams and Hamilton 2002). They tend to avoid large openings in the understory cover, frequenting only small clearings in the vegetation while foraging (USFWS 1998). An essential component of habitat for riparian brush rabbits is high-ground refugia from flooding, which provide protection from predators and dry habitat during prolonged rainstorms (USFWS 1998).

The only known populations of riparian brush rabbits are confined to Caswell Memorial State Park on the Stanislaus River in Stanislaus County, approximately 10 miles southeast of the Phase 3 Project area, and in the south Delta along the San Joaquin River and overflow channels (Williams and Hamilton 2002; Williams et al. 2002; Lloyd and Williams 2003; Vincent-Williams et al. 2004; CNDDB 2014) (**Exhibit 15**). The population in the south Delta is found in Paradise Cut along the rights-of-way of the two railroads that cross Paradise Cut and Tom Paine Slough, and in an oxbow on the San Joaquin River near Mossdale Landing (CNDDB 2014). Riparian brush rabbits have also been found along the San Joaquin River north of the oxbow population, in waterside riparian habitat near the Phase 3 Project area adjacent to Elements IIIa and IIIb, between Elements IIab and IIIa, and between Elements VIa.1, and VIa.4 (CNDDB 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004) (**Exhibit 15**). Other historical habitats along the San Joaquin River and tributaries are believed to no longer be suitable for riparian brush rabbits because of irrigated agriculture, livestock grazing, and impoundment and channelization of streams. High-ground refugia also may be lacking in these areas (Williams and Hamilton 2002).

In Paradise Cut, existing habitat for riparian brush rabbits is confined to levee bases, the channel banks of Paradise Cut, and pockets of low ground along the bottom of Paradise Cut. Generally, areas of suitable habitat in these locations are very narrow (15–100 feet wide). Most of the channels in Paradise Cut are in effect dead-end sloughs fed by Old River, with large portions containing water year round, which results in the isolation of some upland areas (i.e., islands). The existing habitat for rabbits is covered in water on average once every 4 years, when flood flows in the San Joaquin River are sufficient to overtop the Paradise Weir. Brush rabbits probably use the UPRR right-of-way as high-water refugia during flooding events (Williams and Hamilton 2002).

Occupied habitat for riparian brush rabbit is documented adjacent to the Phase 3 Project area along the waterside levee in Elements IIIa and IIIb, between Elements IIab and IIIa, and between Elements VIa.1, and VIa.4. The waterside habitat along Elements IIIa and IIIb is dominated by willow within interspersed California blackberry and grasses. The waterside habitat between Elements IIab and IIIa is dominated by willows, cottonwoods, valley oaks, wild rose, and California and Himalayan blackberry. The waterside habitat between Elements VIa.1 and VIa.4 is on an oxbow with dense riparian vegetation. Other patches of riparian vegetation along the San Joaquin River and adjacent to Phase 3 Project area levees, such as the Great Valley cottonwood forest and Great Valley oak riparian forest communities depicted in **Exhibits 12a** through **12d**, provide potentially suitable habitat for riparian brush rabbit, including the small areas of riparian habitat that are present on the waterside of Phase 3 Project area Elements IIab, IVc, and Va.

Riparian brush rabbits forage along the edges of shrub cover and in small clearings in the vegetation cover rather than in large openings. They feed on herbaceous vegetation such as grasses, sedges, clover, forbs, and buds, bark, and leaves of woody plants (Sandoval et al. 2006; USFWS 1998). This species has a small home range and mainly remains hidden under protective shrub cover, seldom venturing more than 1 meter (3.3 feet) from cover (Sandoval et al. 2006). North of Element IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the UPRR tracks (i.e., Elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species.

CRITICAL HABITAT

Critical habitat has not been designated for riparian brush rabbit.

RECOVERY PLAN FOR RIPARIAN BRUSH RABBIT

The *Recovery Plan for Upland Species of the San Joaquin Valley, California* addresses the riparian brush rabbit (USFWS 1998). At the time the recovery plan was prepared, only the Caswell Memorial State Park population was known to exist. One of the most important conservation actions identified in the plan was establishment of other viable populations within the park's range. The recovery plan recommended the following actions (USFWS 1998):

- Initiate a reintroduction program that includes researching genetic diversity among remaining individuals.
- Implement a captive breeding program to translocate individuals to new populations.
- Establish at least three additional wild populations in the San Joaquin Valley in restored and expanded suitable habitat within the rabbit's historical range.

In 1999, the Endangered Species Recovery Program began implementing the *Controlled Propagation and Reintroduction Plan for the Riparian Brush Rabbit* (Williams et al. 2002), which was recommended in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS 1998). The primary goal of the program is to prevent extinction by providing animals for reintroduction to establish new populations or augment existing populations. In July 2002, captive-bred rabbits were released at the San Luis National Wildlife Refuge, near Los Banos in the central San Joaquin Valley, and in 2005, a population of captive-bred rabbits was introduced to a private ranch along the San Joaquin River in Stanislaus County, adjacent to the San Joaquin River National Wildlife Refuge (USFWS 2007). This effort is ongoing.

DELTA SMELT

Delta smelt were formally listed as threatened under the ESA on March 5, 1993 (59 FR 440). On December 19, 1994 (59 FR 65256), USWFS designated critical habitat. Delta smelt are found only from Suisun Bay upstream through the Sacramento–San Joaquin estuary in Contra Costa, Sacramento, San Joaquin, Solano, and Yolo Counties.

Delta smelt are endemic to the upper Sacramento–San Joaquin River estuary and occur primarily in open surface waters of Suisun Bay, in the Sacramento River downstream of Isleton, and in the San Joaquin River downstream of Mossdale (Bennett 2005), including the Project site. Their historic range is thought to have extended from Suisun Bay upstream to at least the city of Sacramento on the Sacramento River and Mossdale on the San Joaquin River. They used to be one of the most common pelagic fish (fish living in open water away from the bottom) in the upper Sacramento–San Joaquin estuary (USFWS 2004). The delta smelt population generally is concentrated in the estuary west of the confluence of the Sacramento and San Joaquin Rivers in high-outflow years and in the north Delta in low-outflow years (Sweetnam 1997, 1998; Bennett 2005). Delta outflow determines the location of the salinity gradient and may strongly influence delta smelt distribution. USFWS data indicate that delta smelt are found in the San Francisco Bay/Sacramento–San Joaquin Delta (Bay-Delta) estuary where salinity is generally less than 2 parts per thousand. Except when spawning in freshwater, delta smelt are most frequently caught in or are slightly upstream of the entrapment zone (Bennett 2005). In the CDFW delta-wide 20mm delta smelt survey, delta smelt larvae have been observed only occasionally and in very low abundance in the vicinity of the project site (less than 4 larvae in 10,000 cubic meters sampled on April 4, 2014).

CRITICAL HABITAT

Although the Phase 3 Project area is near the upper limit of the known distribution of delta smelt, it is included in the area designated as critical habitat for the species (Critical Habitat Determination for the Delta Smelt, 59 FR 65256, December 19, 1994). In the critical-habitat designation, USFWS identified the following primary constituent elements essential to conservation of delta smelt: physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration (59 FR 65256). The primary constituent elements are organized by habitat conditions required for each life stage. USFWS has identified specific areas in the Delta for spawning habitat, larval and juvenile transport, and adult migration for delta smelt. The Phase 3 Project area and larger action area include places identified for larval and juvenile transport and adult mitigation, but do not include specific areas important for delta smelt spawning habitat (59 FR 65256).

RECOVERY PLAN FOR DELTA SMELT

The *Sacramento–San Joaquin Delta Native Fishes Recovery Plan* includes the restoration of abundance and distribution of delta smelt (USFWS 1996b). Action items in the recovery plan for delta smelt refer to four zones in the Delta. Sampling stations within these zones were chosen to measure restoration because they have a record of delta smelt catches and are sampled consistently. These zones do not include any portion of the Phase 3 Project area or action area.

LONGFIN SMELT

On April 2, 2012, the USFWS issued its finding that the longfin smelt warranted protection under the ESA, and added it as a candidate species for protection under the ESA (77 FR 19755). Longfin smelt are found in California's bay, estuarine, and nearshore coastal environments from San Francisco Bay north to Lake Earl near the Oregon border. The southernmost detection of the species was a single fish from Monterey Bay (Eschmeyer et al. 1983), although spawning has not been documented south of San Francisco Bay. The San Francisco estuary and the Delta support the largest longfin smelt population in California. Longfin smelt are more broadly distributed throughout the Bay-Delta estuary and are found in water with higher salinities than delta smelt. Longfin smelt are most often concentrated in Suisun and San Pablo Bays and north San Francisco Bay during nonspawning periods (Moyle 2002). No fish surveys have been conducted by RD 17 within the river stretch adjacent to the Phase 3 Project area; however, CDFW's delta-wide sampling program, including the 20mm delta smelt survey, longfin smelt larva survey, summer tow net survey, and spring Kodiak Trawl sampling, occurs in the vicinity of this area. Longfin smelt have a short life span, with most reaching maturity at 2 years of age, when they spawn and then die. During the second year of life, adults tend to inhabit the higher salinity western portion of the estuary system; they occasionally have been found in nearshore ocean surveys (Rosenfield and Baxter 2007). Adults spend their life in bays, estuaries, and nearshore coastal areas and migrate into low-salinity or freshwater reaches of coastal rivers and tributary streams to spawn. Spawning occurs in the lower portions of the Sacramento and San Joaquin Rivers and adjacent sloughs typically between November and June, with peak spawning occurring from February through April (Baxter 1999; DWR 2009; Moyle 2002; Wang 1986). On the San Joaquin River, spawning occurs below Medford Island, approximately 20 miles downstream from the project site (Moyle 2002). Locations and movements of all life stages of longfin smelt are influenced by a wide range of hydrologic and environmental variables (Rosenfield 2010), all of which show high variation among and within years; accordingly, temporal and spatial distributions of longfin smelt show high variation among and within years.

CRITICAL HABITAT

Because the longfin smelt has not been listed, no critical habitat has been designated.

RECOVERY PLAN FOR LONGFIN SMELT

The *Sacramento–San Joaquin Delta Native Fishes Recovery Plan* includes the restoration of abundance and distribution of longfin smelt (USFWS 1996b). Action items in the recovery plan for longfin smelt refer to five zones in the Delta. Sampling stations within these zones were chosen to measure restoration because they have a record of longfin smelt catches and are sampled consistently. These zones do not include any portion of the Phase 3 Project area or action area.

CENTRAL VALLEY STEELHEAD DISTINCT POPULATION SEGMENT

On March 19, 1998, NMFS listed the Central Valley steelhead DPS as threatened (63 FR 13347). Central Valley steelhead DPS are considered to be winter-run steelhead (McEwan and Jackson 1996). Like other anadromous salmonid species, these fish mature in the ocean before entering freshwater on their spawning migrations. The major factor influencing steelhead populations in the San Joaquin River system is loss of habitat caused by construction of impassable dams on the mainstem and major tributaries.

Historically, Central Valley steelhead were found throughout the Sacramento and San Joaquin drainages, where waterways were accessible to migrating fish. Steelhead historically were present in the upper San Joaquin River basin, upstream of the current location of Friant Dam. Steelhead commonly migrated far up tributaries and into headwater streams where cool, well-oxygenated waters were present year round.

Currently, in the Central Valley, viable populations of naturally produced steelhead are found only in the Sacramento River and its tributaries. Wild steelhead populations appear to be restricted to tributaries of the Sacramento River below Keswick Dam, such as Antelope, Deer, and Mill Creeks, and to the Yuba River below Englebright Dam (McEwan and Jackson 1996). No significant populations of steelhead remain in the San Joaquin River basin; however, small persistent runs still occur on the Stanislaus River and perhaps the Tuolumne River (McEwan and Jackson 1996).

Juvenile steelhead rear throughout the year and may spend 1–3 years in freshwater before emigrating to the ocean. Smoltification, the physiological adaptation that juvenile salmonids undergo to tolerate saline waters, occurs in juveniles as they begin their downstream migration. Smolting steelhead generally emigrate from March to June (Barnhart 1986; Reynolds et al. 1993).

The San Joaquin River near the Phase 3 Project area is used by adult and juvenile steelhead primarily as a migration corridor between the ocean and cold-water habitat in the upstream tributaries. Juvenile steelhead would likely use the edges of rivers and sloughs for rearing as they emigrate (Moyle 2002).

CRITICAL HABITAT

Critical habitat for the Central Valley steelhead DPS was designated on August 12, 2005; a final designation was published on September 2, 2005 (70 FR 52604), with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins. The Phase 3 Project area is located within designated critical habitat for the Central Valley steelhead DPS.

RECOVERY PLAN FOR CENTRAL VALLEY STEELHEAD DISTINCT POPULATION SEGMENT

A public draft of the recovery plan for the ESUs of Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon and the DPS of Central Valley steelhead was prepared by NMFS in October 2009 (NMFS 2009). The draft plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives.

CENTRAL VALLEY FALL-/LATE FALL–RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

On September 16, 1999 (64 FR 50393), NMFS determined that listing was not warranted for the Central Valley fall-/late fall–run Chinook salmon ESU; however, the ESU was designated as a future candidate for listing because of concerns about specific risk factors. On April 14, 2004 (69 FR 19975) the ESU was reclassified as a species of concern. The ESU includes all naturally spawned populations of fall-run Chinook salmon in the Sacramento and San Joaquin River basins and their tributaries, east of the Carquinez Strait. The Central Valley fall-/late fall–run Chinook salmon ESU is currently the only run of Chinook salmon in the San Joaquin River system.

Adult Central Valley fall-/late fall–run Chinook salmon enter the Sacramento and San Joaquin river systems from September through January and spawn from October through February. In general, San Joaquin River populations tend to mature at an earlier age and spawn later in the year than Sacramento River populations (Baker and Morhardt 2001). These differences may be phenotypic responses to the generally warmer temperature and lower flow conditions found in the San Joaquin River basin, relative to the Sacramento River basin.

Juveniles typically rear in freshwater for 3–6 months (fall-run) and up to 12 months (late fall–run) before entering the ocean. Juveniles migrate downstream from January through June. Juvenile Chinook salmon prefer water depths of 0.5 foot to 3.3 feet and velocities of 0.26 foot to 1.64 feet per second (Raleigh et al. 1986). Important winter habitat for juvenile Chinook salmon includes flooded bars, side channels, and overbank areas with relatively low water velocities. Juvenile Chinook salmon have been found to rear successfully in floodplain habitat, which routinely floods but is dry at other times. Growth rates appear to be enhanced by the conditions found in floodplain habitat (Sommer et al. 2001).

Cover structures, space, and food are necessary components for Chinook salmon rearing habitat. Suitable habitat includes areas with instream and overhead cover in the form of undercut banks, downed trees, and large, overhanging tree branches. The organic materials forming fish cover also help provide sources of food, in the form of both aquatic and terrestrial insects. Juvenile Chinook salmon grow more quickly in floodplain habitat than in river habitat. The water temperature is typically higher in floodplain habitat than in main-channel habitats. Although increased temperature increases metabolic requirements, the productivity in flooded habitat also is increased, resulting in higher growth rates (Sommer et al. 2001). The production of drift invertebrates has been found to be one to two times greater in the Yolo Bypass than in the river (Sommer et al. 2001). Also, grasses and other vegetation that are flooded support invertebrates that are also a substantial source of food for rearing juveniles. Increased areas resulting from flooded habitat also can reduce the competition for food and space and potentially decrease the possible encounters with predators (Sommer et al. 2001). Juvenile Chinook salmon that grow faster are likely to migrate downstream sooner, which helps to reduce the risks of predation and competition in freshwater systems.

Fall-run Chinook salmon adults primarily pass through the Phase 3 Project area on their way to spawn in upstream tributaries of the San Joaquin River (Moyle 2002). Juvenile fall-run Chinook salmon emigrate from San Joaquin River tributaries (e.g., the Stanislaus, Merced, and Tuolumne Rivers) and other river tributaries through the San Joaquin River during the late winter and spring (February through mid-June) (San Joaquin River Group Authority 2009). Juvenile Chinook salmon use the edges of rivers and sloughs for rearing as they emigrate downstream (Moyle 2002).

CRITICAL HABITAT

No critical habitat has been designated for Central Valley fall-/late fall–run Chinook salmon.

ESSENTIAL FISH HABITAT

EFH has been designated for Central Valley fall-/late fall–run Chinook salmon ESU and is within the Phase 3 Project area along the San Joaquin River. Fall-run EFH includes migration, holding, and rearing habitat for the San Joaquin River (fall-run only) (NMFS 2014). Late fall–run EFH includes opportunistic/intermittent spawning, holding, and rearing habitat for the San Joaquin River (NMFS 2014).

RECOVERY PLAN FOR CENTRAL VALLEY FALL-/LATE FALL–RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

Although the Central Valley fall-/late fall–run Chinook salmon is not listed as threatened or endangered under the ESA, the *Sacramento–San Joaquin Delta Native Fishes Recovery Plan* outlines conservation measures and restoration objectives and criteria for the species, including the San Joaquin River run, which CDFW recognizes as a distinct stock (USFWS 1996b). Reasons for decline identified by the plan include habitat loss, suitability of habitat, survival of outmigrants, harvest, hatcheries, and water quality. Conservation measures include:

- testing of an electrical fish barrier and a physical barrier upstream of the confluence of the Merced River to prevent straying of adult fish,
- construction and rehabilitation of spawning riffles,
- construction of a temporary barrier at Old River to prevent entrainment of outmigrating smolts, and when possible,
- coordination of water releases to provide attraction or outmigration flows.

These efforts have been funded by a wide range of federal, state, and private agencies (USFWS 1996b).

SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

The Sacramento River winter-run Chinook salmon was formally listed as threatened in November 1990 (55 FR 46515), and was reclassified as endangered under the ESA on January 4, 1994 (59 FR 440).

In the Delta, winter-run adults begin to move through the system in early winter (November–December), with the first upstream adult migrants appearing in the upper Sacramento River during late December (Vogel and Marine 1991, cited in NMFS 2003). Adult winter-run presence in the upper Sacramento River system peaks in March. The timing of migration may vary somewhat because of changes in river flows, dam operations, and water year type. Spawning occurs primarily from mid-April to mid-August, with peak activity occurring in May and June in the river reach between Keswick Dam and the Red Bluff Diversion Dam (Vogel and Marine 1991, cited in NMFS 2003).

Juvenile winter-run Chinook salmon occur in the Delta from October through early May, based on data collected from trawls, beach seines, and salvage records at state and federal water projects (DFG 1998). The peak of juvenile arrivals is from January to March. Juveniles tend to rear in the freshwater upper Delta areas for about the first 2 months (Kjelson et al. 1981, 1982). As they mature, winter-run Chinook fry and fingerlings prefer to rear farther downstream where ambient salinity is up to 1.5 to 2.5 parts per thousand (Healey 1980, 1982; Levings et al. 1986). Fry remain in the estuary until they reach a fork length of about 118 millimeters (i.e., at 5–10 months of age). Emigration from the Delta may begin as early as November and continue through May (Fisher 1994; Myers et al. 1998).

With the exception of occasional strays, adult winter-run Chinook salmon generally do not occur in the San Joaquin River or in this portion of the Delta, and therefore, do not occur in the action area.

CRITICAL HABITAT

Critical habitat for the winter-run Chinook salmon ESU was designated by NMFS on June 16, 1993 (58 FR 33212), with an effective date of July 16, 1993. Critical habitat is designated to include the Sacramento River from Keswick Dam (River Mile 302) to Chipps Island (River Mile 0) and all waters westward, including San Francisco Bay north of the Bay Bridge to the Golden Gate Bridge. The proposed action is not within designated critical habitat.

ESSENTIAL FISH HABITAT

Although EFH has been identified for Sacramento River winter-run Chinook salmon ESU (NMFS 2014), NMFS's EFH map does not show EFH for this species within the Phase 3 Project area.

RECOVERY PLAN FOR SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

A public draft of the recovery plan for the ESUs of Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon and the DPS of Central Valley steelhead was prepared by NMFS in October 2009 (NMFS 2009). The draft plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives. Recovery goals and restoration actions for this species ESU are described for the Sacramento River basin and do not apply to the action area, since reintroduction of winter-run Chinook salmon is not planned for the action area.

CENTRAL VALLEY SPRING-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

NMFS listed Central Valley spring-run Chinook salmon as threatened on September 16, 1999 (50 FR 50394).

Central Valley spring-run Chinook salmon were historically the second most abundant run of Central Valley Chinook salmon (Fisher 1994). They occupied the headwaters of all major river systems in the Central Valley where no natural barriers existed. Adults returning to spawn ascended the tributaries to the upper Sacramento

River, including the Pit, McCloud, and Little Sacramento Rivers. They also occupied Cottonwood, Battle, Antelope, Mill, Deer, Stony, Big Chico, and Butte Creeks and the Feather, Yuba, American, Mokelumne, Stanislaus, Tuolumne, Merced, San Joaquin, and Kings Rivers. Spring-run Chinook salmon migrated farther into headwater streams where cool, well-oxygenated water was available year round.

Surveys indicate that populations of remnant, nonsustaining spring-run Chinook salmon may be found in Cottonwood, Battle, Antelope, and Big Chico Creeks (DWR 1997); more sizable, consistent runs of naturally produced fish are found only in Mill and Deer Creeks. All these creeks are tributaries in the Sacramento River basin. The Feather River Fish Hatchery sustains the spring-run population on the Feather River, but the genetic integrity of that run is questionable (DWR 1997).

Like winter-run Chinook salmon, adult spring-run Chinook salmon other than occasional strays generally do not occur in the San Joaquin River basin, and therefore, do not occur in the action area.

CRITICAL HABITAT

Critical habitat for the Central Valley spring-run Chinook salmon was designated on August 12, 2005; a final designation was published on September 2, 2005, with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include selected waters in the Sacramento River basin from approximately Redding (River Mile 302) to approximately Chipps Island (River Mile 0) at the westward margin of the Delta and includes the Sacramento River. The Phase 3 Project area is located outside of designated critical habitat.

ESSENTIAL FISH HABITAT

Although EFH has been identified for Central Valley spring-run Chinook salmon ESU (NMFS 2014), NMFS's EFH map does not show EFH for this species within the Phase 3 Project area.

RECOVERY PLAN FOR CENTRAL VALLEY SPRING-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

A public draft of the recovery plan for the ESUs of Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon and the DPS of Central Valley steelhead was prepared by NMFS in October 2009 (NMFS 2009). The draft plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives. Recovery goals and restoration actions are outlined for the Sacramento River basin and do not apply to the action area.

As discussed above in the "San Joaquin River" subsection of the "Environmental Baseline" section, one of the goals of the SJRRP is "to restore and maintain fish populations in "good condition" in the mainstem San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish" (Reclamation and DWR 2011). The Settlement stipulates reintroduction of spring-run and fall-run Chinook salmon, with a priority given to restoring self-sustaining populations of wild spring run Chinook salmon.

NORTH AMERICAN GREEN STURGEON DISTINCT POPULATION SEGMENT

On April 7, 2006, NMFS listed the Southern DPS of the North American green sturgeon as threatened under the ESA. In North America, green sturgeon are found from Ensenada, Mexico, to southeast Alaska. The Southern DPS includes individual reproductive populations south of the Eel River. The populations north of the Eel River, grouped as the Northern DPS, currently do not warrant listing.

Green sturgeon are found in the lower reaches of large rivers, including the Sacramento–San Joaquin River basin, and in the Eel, Mad, Klamath, and Smith Rivers. Green sturgeon adults and juveniles are found throughout the upper Sacramento River, as indicated by observations incidental to winter-run Chinook monitoring at Red Bluff Diversion Dam in Tehama County (NMFS 2005). Green sturgeon spawn predominantly in the upper Sacramento River and are found primarily in the mainstem Sacramento River.

The green sturgeon is a primitive, bottom-dwelling fish characterized by its large size (up to 7 feet long and 350 pounds); a long, round body; and "scutes" or plates along dorsal and lateral sides. It is known to migrate up to 600 miles between freshwater and salt water environments and is commercially caught in the Columbia River and coastal Washington (PFMC 2003). Very little is known about the life history of the green sturgeon relative to other fish species. Like all sturgeon species, it is anadromous, but it is also the most marine-oriented of the sturgeon species (NMFS 2005). It spends most of its life in salt water and returns to spawn in freshwater. It is slow growing and late maturing, and may spawn as little as every 4–11 years. Individuals congregate in the bays of these systems in summer, while some may travel upstream to spawn in spring and summer.

Green sturgeon spawning has been documented only in the Klamath, Sacramento, and Rogue Rivers during recent times (NMFS 2005). Green sturgeon spawning in the San Joaquin River is not well documented.

Information about population trends for the Southern DPS of green sturgeon is less definitive than information about the Northern DPS, and the populations face a larger number of potential threats. In addition to the sizeable threats faced by the Northern DPS, green sturgeon populations in the Southern DPS face smaller population sizes, potentially lethal temperature limits, entrainment by water projects, and influences of toxic material and exotic species. Population sizes are unknown for this DPS but are clearly much smaller than for the Northern DPS, and therefore, are more susceptible to catastrophic events. This makes the lack of information about population trends an even greater risk factor.

Green sturgeon may occur in the San Joaquin River between Stockton and the Highway 140 bridge (IEP 2013), including in the Phase 3 Project area. No documentation exists for green sturgeon spawning in the San Joaquin River, but spawning probably occurred before construction of large-scale hydropower and irrigation development. White sturgeon persist in the San Joaquin River at population levels of 10% of Sacramento River population levels. Young green sturgeon have been taken occasionally in the Santa Clara Shoal area in the Delta, but these fish may have originated somewhere else (NMFS 2005).

Critical Habitat

Critical habitat for green sturgeon was designated on October 9, 2009 (74 FR 52300). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins, including the segment of the San Joaquin River in the action area.

Recovery Plan for North American Green Sturgeon Distinct Population Segment

A recovery plan has not been developed for green sturgeon.

EFFECTS

DIRECT AND INDIRECT EFFECTS ON SPECIES IN THE ACTION AREA

Under the ESA, direct effects are those that are caused by the project and that occur at the same time as the action (see, e.g., construction-related effects). Indirect effects are those that are caused by the proposed action and are later in time, but are reasonably certain to occur (e.g., operational effects). Avoidance and minimization measures for both direct and indirect effects are presented in the "Avoidance and Minimization Measures" section above.

VALLEY ELDERBERRY LONGHORN BEETLE

There are no known documented occurrences of VELB in the Phase 3 Project area, but the species could use elderberry shrubs in the action area. Elderberry shrubs that could support beetles are sparsely scattered throughout the action area, along both the waterside and landside of the San Joaquin River levee.

Eighteen elderberry shrubs are present in or adjacent to the footprint of the Phase 3 Project. The nine elderberry shrubs located along the waterside of the Phase 3 Project levees would be avoided and protected during construction (see "Avoidance and Minimization Measures—Valley Elderberry Longhorn Beetle"). The nine elderberry shrubs located along the landside of the levee would require removal to accommodate construction of the Phase 3 Project's seepage berms, cutoff walls, and setback levee (**Table 3**; **Exhibit 14**). However, one of these landside shrubs does not have stems greater than one inch in diameter at ground level; therefore, it is not considered suitable VELB habitat.

Table 3
Survey Results for Landside Elderberry Shrubs that Would be Removed from the Phase 3 Project Levee Improvements Area

Shrub Number	Number of Stems per Diameter Category (inches)			Beetle Exit Holes Present?	Riparian?[1]
	≥ 1 and ≤ 3	≥ 3 and ≤ 5	≥ 5		
9	0	0	0	No	No
10	73	6	0	No	No
11	25	17	8	No	No
13	12	4	4	No	No
14	5	4	2	No	No
15	32	11	2	No	No
16	13	4	1	No	No
17	25	4	5	No	No
18	6	5	0	No	No
Total	**191**	**55**	**22**		

Notes:
[1] Riparian = waterside of levee. Nonriparian = landside of levee.
Source: Data compiled by AECOM in 2014

The eight elderberry shrubs on the landside have a total of 268 stems that are greater than 1 inch in diameter at ground level. These shrubs would require removal during the construction of the Phase 3 Project, resulting in direct effects on VELB. If the stems are occupied by beetles, any early-stage individuals are likely to be killed when the shrub is removed. Complete loss of the shrubs to be removed should be avoided by transplanting during the shrubs' dormant season; however, transplanted elderberry shrubs can experience stress or health problems because of changes in soil, hydrology, microclimate, or associated vegetation, and mortality of transplanted shrubs precludes their future use by the beetle. Removing shrubs in which larvae are present could result in larvae mortality if the health of the shrubs is adversely affected; alternately, adverse effects on elderberry shrubs could have an overall effect on the beetle, even if larvae are absent at the time of impact, if the shrubs are relied upon for reproduction. In addition, it takes 5 or more years for replacement elderberry plantings to reach a size conducive to use as VELB habitat. Therefore, there would be a temporary loss of habitat available to the beetle. The Phase 3 Project would comply with avoidance and minimization measures described for VELB and compensation for removal of these stems would be provided in accordance with the VELB Guidelines (USFWS 1999). A net reduction in the number of elderberry shrubs would be avoided by requiring establishment of 367 elderberry seedlings and 367 associated native plantings. RD 17 would purchase VELB habitat conservation credits comparable to this amount of seedlings from a USFWS-approved VELB habitat conservation bank to compensate for effects on VELB.

RIPARIAN BRUSH RABBIT

As shown in **Table 4**, the Phase 3 Project levee improvements would result in the removal of 3.28 acres of landside riparian habitat—specifically Great Valley cottonwood riparian forest and Great Valley oak riparian forest—that is suitable for riparian brush rabbit. This riparian habitat is located on the landside of the levee, where levee improvements (e.g., chimney drains, seepage berms) would be constructed. In general, most of the landside riparian vegetation is sparse and lacks understory vegetation other than grasses and ruderal vegetation, which would act as cover for riparian brush rabbit and is not suitable for this species (Hansen, pers. comm., 2011). However, there is potential for some of these landside woody habitats to support suitable habitat for riparian brush rabbit, particularly because these are located adjacent to waterside riparian habitats that either are known to be occupied by this species or are highly suitable habitat. All landside riparian habitat was considered to be suitable where it is adjacent to waterside riparian habitat that is known to be occupied or highly suitable for riparian brush rabbit (i.e., Element IIab through Element VIe). North of Element IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the UPRR tracks (i.e., Elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species. No waterside woody or riparian habitat would be removed as a result of levee improvement activities.

Table 4
Effects of Implementing the Phase 3 Project on Suitable Riparian Brush Rabbit Habitats

	Acres of Directly Affected Suitable Habitat
Waterside woodlands[1]	0.00
Landside woodlands[1,2]	3.28
TOTAL	3.28

Notes:
1 Suitable riparian brush rabbit habitats are characterized as Great Valley cottonwood riparian forest and Great Valley oak riparian forest.
2 Most of the landside riparian vegetation is sparse and lacks understory and is not suitable for this species (Hansen, pers. comm., 2011). However, any landside riparian habitat was considered to be suitable where it is adjacent to waterside riparian habitat that is known to be occupied by or highly suitable for riparian brush rabbit (i.e., Element IIab through Element Vie). North of Element IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the Union Pacific Railroad tracks (i.e., Elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species.
Source: Data compiled by AECOM in 2014

Nearly 54 acres of ruderal annual grassland would also be affected by Phase 3 Project implementation. All effects on ruderal annual grassland that would result from levee improvements are assumed to be temporary because annual grassland would be reestablished in these areas after project completion. Although riparian brush rabbit may use annual grassland as a source for foraging habitat, the key component of habitat suitability for this species in the Phase 3 Project area is based on the presence of riparian woody vegetation, and not the surrounding grasslands. Riparian brush rabbits forage along the edges of shrub cover and in small clearings in the vegetation cover, rather than in large openings, feeding on herbaceous vegetation such as grasses, sedges, clover, forbs, buds, bark, and leaves of woody plants (Sandoval et al. 2006; USFWS 1998). Further, because this species is known to have a small home range and seldom ventures more than 1 meter (3.3 feet) from cover (Sandoval et al. 2006), the riparian brush rabbit likely uses only a small component of the grassland and its use of such habitat is concentrated along the edges of the riparian areas.

The loss of potential riparian brush rabbit habitat in the Phase 3 Project area could restrict the range of this species because the RD 17 area currently contains the northernmost known extent of the population on the San Joaquin River. It also could isolate other populations residing in residual habitats in the project vicinity. However, the proposed conservation measures (see the "Avoidance and Minimization Measures" and "Compensation Measures" sections above) would minimize direct take in conjunction with compensation for adverse effects. Implementing such measures is anticipated to avoid a net reduction in the number of riparian brush rabbits. The Phase 3 Project includes the restoration of approximately 4.52 acres of riparian habitat in the setback area at Element IVc (**Exhibit 12**). The expansion and restoration of riparian habitat in Element IVc would augment the waterside riparian corridor along the San Joaquin River and provide additional riparian habitat opportunities for the riparian brush rabbit between two known occurrences of this species (i.e., between Elements IIIa/IIIb and Elements VIa.1/VIa.4 [CNDDB 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004]). As stated under the "Compensation Measures" section above, in addition to the habitat restoration proposed in Element IVc, RD 17 is investigating additional habitat compensation opportunities at off-site locations.

FEDERALLY LISTED FISH SPECIES

Fish species/ESUs addressed in this BA would likely use similar habitat in the action area. Therefore, the direct and indirect effects on delta smelt, longfin smelt, Central Valley fall-/late fall–run Chinook salmon, Central Valley steelhead, and green sturgeon are discussed together. Effects on Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon, which are unlikely to occur in the action area but may occasionally occur as strays, would be similar.

TEMPORARY CONSTRUCTION-RELATED EFFECTS

The Phase 3 Project would involve constructing several cutoff walls, which would entail degrading the top one-third to one-half of the levee, beginning with a 1:1 cut at the waterside crown. Implementing cutoff walls as part of the Phase 3 Project would disturb soils along the top of the levee, which through wind and water erosion could enter the San Joaquin River. Soil disturbed during construction of seepage berms and other features on the landside of the levee could enter drainage ditches and ultimately be pumped into the San Joaquin River. Therefore, erosion could temporarily increase turbidity and sedimentation in nearby waterways if soils are transported in river flows or stormwater runoff.

Fish population levels and survival have been compared to various levels of turbidity and siltation in waterways. Prolonged exposure to high levels of suspended sediment could create a loss of visual capability in fish, leading to a reduction in feeding and growth rates, and to a thickening of the gill epithelia, which may cause the loss of respiratory function; clogging and abrasion of gill filaments; and increases in stress levels, reducing the tolerance of fish to disease and toxicants (Waters 1995). Also, high levels of suspended sediments could cause the movement and redistribution of fish populations or other aquatic organisms, and could affect physical habitat (Waters 1995). Sediment loading could interfere with photosynthesis of aquatic flora and displace aquatic fauna. Many fish and other aquatic species are sight feeders, and turbid waters reduce the ability of these fish to locate and feed on prey. Some fish, particularly juveniles, could become disoriented and leave areas where their main food sources were located, ultimately reducing their growth rates. Increased turbidity and sedimentation cause fish to avoid an area, thus reducing available habitat. Fish will not occupy areas unsuitable for survival unless they have no other option. Therefore, construction-related erosion could result in elevated river turbidity in critical species-specific and life stage-specific habitats, potentially precluding a species from occupying that habitat. In addition, the potential would exist for contaminants such as bentonite slurry, fuels, oils, and other products used in construction to be introduced into the waterway directly or through surface runoff. Contaminants might be toxic to fish, or might alter oxygen diffusion rates and cause acute and chronic toxicity to aquatic organisms, thereby reducing growth and survival.

Through the implementation of water quality BMPs, including a SWPPP, the proposed conservation measures (see the "Avoidance and Minimization Measures" section above) would avoid direct and indirect take of fish during construction. The impact would not be expected to have an effect on the overall existence and survival of these species.

PERMANENT CONSTRUCTION-RELATED EFFECTS

Most waterside woodlands in the Phase 3 Project area are assumed to provide SRA habitat functions. Apart from the placement of 1.136 acre of riprap above the HTL along the waterside levee at Element IVc, the Phase 3 Project would not involve performing any work on the waterside of the levee, and no waterside woodlands or SRA habitat would be removed. Therefore, construction-related effects on the habitats of federally listed fish species would be limited to minor disturbance of the waterside levee at two locations that are above the HTL and that are characterized by ruderal vegetation.

Because all Phase 3 Project construction activities would occur above the HTL and no SRA habitat would be removed, the Phase 3 Project would not result in adverse effects on Central Valley steelhead, Delta smelt, longfin smelt, Sacramento River winter-run and Central Valley fall- and spring-run Chinook salmon, or green sturgeon.

CUMULATIVE EFFECTS

Cumulative effects include the effects of present, pending, and future state, tribal, local, or private actions that are reasonably certain to occur within the action area under consideration. The effects of projects that require a federal action are not considered in the cumulative effects evaluation during Section 7 consultation evaluation because they are subject to separate consultation (USFWS and NMFS 1998). For example, the Central Lathrop Specific Plan (Phase 1), addresses the development of 1,521 acres of land immediately east of the RD 17 levee Elements IIIa and IIIb, south of Dos Reis and north of the housing development adjacent to Element IVa. The USFWS issued a biological opinion for this project (USFWS File No. 1-1-06-F-0114), which analyzed the effects of the project on riparian brush rabbit and VELB. Therefore, this development is not considered cumulative to the proposed project. Also, the nonfederal action must be located in the action area, or project site, that is evaluated in the Section 7 consultation process (USFWS and NMFS 1998). Several present, pending, and future projects that are located in or near the action area under consideration in this consultation could result in effects similar to those of the proposed action.

SUMMARY OF PRESENT, PENDING, AND FUTURE PROJECTS IN THE PROPOSED PHASE 3 PROJECT AREA

FLOOD DAMAGE REDUCTION SYSTEM IMPROVEMENTS

Two other proposed projects related to improvements to flood damage reduction systems are located near RD 17: the Lower San Joaquin River Feasibility Study, which would determine needed improvements for future flood protection systems in an effort to reach or exceed the future 200-year level of flood protection; and the Smith Canal Closure Structure, which would install a flood control gate in the Delta in Stockton north of the Deep Water Ship Channel to prevent flood flows from entering the Smith Canal in the event of an imminent or existing levee breach and during 100-year flood events.

DEVELOPMENT PROJECTS

Development projects within the RD 17 boundaries include projects in the cities of Manteca, Stockton, and Lathrop, and in unincorporated areas of San Joaquin County. These projects have been described and analyzed in their respective environmental documents, including:

- River Islands Project;
- San Joaquin County General Plan 2010, adopted in 1992 and as amended;
- *City of Stockton General Plan*, adopted in 1990 and as amended through November 3, 1998;
- *City of Lathrop General Plan*, adopted in 1991 and as amended through January 2003;
- Central Lathrop Specific Plan, adopted in November 2004;
- West Lathrop Specific Plan, adopted in 1995;
- *Manteca General Plan*, adopted in 1988 and as amended through December 20, 1993;
- City of Lathrop Water, Wastewater, and Recycled Water Master Plan, adopted in 2001 and as amended through November 9, 2004;
- expansion of the City of Manteca Wastewater Treatment Plant; and

- *2001 Regional Transportation Plan*, San Joaquin Council of Governments, 2001.

San Joaquin County covers approximately 909,000 acres, with approximately 809,000 acres, or nearly 90%, of the county used or available for agriculture (row and field crops, orchards, vineyards, and grazing lands). The remaining lands are dominated by various types of development (approximately 59,000 acres), natural habitats (woodlands, riparian), and open water (lakes, rivers, Delta waterways). Most county residents and development are located in incorporated cities (Escalon, Lathrop, Lodi, Manteca, Ripon, Stockton, and Tracy). The SJMSCP anticipated that 147,000 acres of various categories of open space lands (including agriculture, range lands, and natural) in the county would be converted to non–open space uses between 2001 and 2051, based on full buildout of each of the general plans in the county and construction of all anticipated utility, transportation, and other public projects. In addition, approximately 59,000 acres of infill of urban lands were presumed to occur in this 50-year time frame.

Many projects near the Phase 3 Project site, including those described above, have been implemented recently or are in various stages of planning and entitlement, including the River Islands project. These current, pending, and potential future projects may affect federally listed species and require a federal action, and would therefore be subject to Section 7 consultation. In addition, most projects within San Joaquin County are expected to seek incidental take authorization, pursuant to incidental take permits used under the SJMSCP. Planning efforts in San Joaquin County have addressed the cumulative effects of development in the county, through preparation and adoption of the SJMSCP. The effects of these projects are not considered cumulative to the Phase 3 Project because they would undergo federal review and permitting as necessary, which would ensure that adverse effects are fully mitigated and would not threaten successful implementation of the SJMSCP.

ANALYSIS OF CUMULATIVE EFFECTS

GROWTH INDUCEMENT

Direct growth inducement would result if a project involves construction of new housing. Indirect growth inducement would occur, for instance, if implementing a project were to result in any of the following:

- substantial new permanent employment opportunities (e.g., commercial, industrial, or governmental enterprises);
- substantial short-term employment opportunities (e.g., construction employment) that indirectly would stimulate the need for additional housing and services to support the new temporary employment demand; and/or
- removal of an obstacle to additional growth and development, such as removing a constraint on a required public utility or service (e.g., construction of a major sewer line with excess capacity through an undeveloped area).

Indirect effects might include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Local land use decisions are within the jurisdiction of the cities and county in the Phase 3 Project area: the City of Stockton, the City of Lathrop, the City of Manteca, and San Joaquin County. Each of these cities and county has adopted a general plan consistent with state law. These general plans provide an overall framework for growth and development within the jurisdiction of each agency, including the Phase 3 Project area. Within the RD 17 boundaries, as elsewhere, population growth and urban development are also influenced by national, regional, and local economic conditions.

Because the Phase 3 Project would not involve the construction of housing, it would not directly induce growth. Construction activities would generate short-term employment, but it is anticipated that construction jobs would be filled from the existing local employment pool and would not indirectly induce growth or result in a population increase, nor would implementation of the project indirectly induce growth by creating permanent new jobs.

The Phase 3 Project would accommodate growth currently approved or planned for undeveloped lands within the boundaries of RD 17. These lands have been identified as the places most suitable for urban growth in the general plans and additional planning policy documents of the cities of Lathrop, Manteca, and Stockton, and San Joaquin County. The Phase 3 Project would allow development to proceed when economic and market conditions are favorable.

Development within the boundaries of RD 17 is directed by the *Central Lathrop Specific Plan* and the *West Lathrop Specific Plan* in the City of Lathrop, the *City of Stockton General Plan*, the *City of Manteca General Pla*n, and the *San Joaquin County General Plan*. The Cities of Lathrop and Manteca are where the majority of planned or proposed development projects would be located. Environmental documents were prepared to address the general plans in these areas.

This information provides substantial evidence that the Phase 3 Project would accommodate anticipated growth in a manner that would be consistent with adopted local growth management plans and with the state's emerging State Plan of Flood Control. Thus, the Phase 3 Project, despite accommodating buildout of adopted specific plans and general plans in the cities of Lathrop, Manteca, and Stockton, is not growth inducing itself.

CUMULATIVE EFFECTS ON LISTED SPECIES

Implementing the plans and projects described above would permanently disturb undeveloped land that is currently or has recently been in agricultural use. These projects would have cumulative effects on agricultural resources (by converting agricultural land to nonagricultural uses) and remnant native habitats (such as woodlands and marshes), which would have the potential to cause permanent adverse cumulative effects on the species, including federally listed species, for which these lands provide habitat.

Large areas of native riparian and wetland vegetation in the Phase 3 Project area and Central Valley region have been lost or degraded in the past 150 years. USFWS estimates that more than 90% of wetland and riparian habitat has been lost in the Central Valley compared to historic levels (USFWS 1989). Most losses have occurred as a result of CVP and SWP facility construction and alteration of flow patterns below dams, particularly channelization, and then clearing or filling behind levees for the conversion to agriculture and urban land uses. This habitat conversion has substantially affected many plant and wildlife species, resulting in various species being listed as threatened or endangered under the ESA as well as the California Endangered Species Act.

Present and future conversions of open space lands in San Joaquin County and the region consist primarily of converting agricultural lands to residential and urban development. Several flood risk management projects are being implemented across the Central Valley, including San Joaquin County, to improve the integrity of levees. Some of these flood risk management projects, however, would implement compensatory mitigation in the form of habitat creation and preserves designed to actually increase these habitats and their values related to ecosystem functions and special-status species. Upstream of the Phase 3 Project area, the San Joaquin River Restoration Program would result in future structural and channel improvements to benefit special-status fish and wildlife species (Reclamation and DWR 2011).

Still, even with these benefits, the overall losses of sensitive habitats in the Phase 3 Project region, the numerous threatened and endangered species that are present, the ongoing declines of other species, and the continuing conversions of habitats and open space lands to various developments are evidence that past, present, and reasonably foreseeable future projects combine to result in significant cumulative impacts on biological resources.

When combined with past, present, and future projects, the implementation of the Phase 3 Project has the potential to contribute to the loss or degradation of sensitive riparian and wetland habitats and adversely affect special-status species. Numerous special-status fish occur in the San Joaquin River, and special-status wildlife, including VELB, riparian brush rabbit, and special-status fish species, are either known or have the potential to occur in the Phase 3 Project area.

The Phase 3 Project has the potential to temporarily degrade water quality and fish habitat and populations in the San Joaquin River through the indirect release (i.e., runoff) of soil or contaminants. The extensive array of development projects anticipated in the region and other flood risk management projects would have a similar potential to release materials into the San Joaquin River. Potential increases in sedimentation, turbidity, and contaminants could expose and adversely affect fish and aquatic habitats. Alterations to the San Joaquin River channel have resulted over time in homogenous, trapezoidal channels with little instream structure; narrow and sparse bands of riparian vegetation that provide only limited SRA habitat functions; limited recruitment of large woody debris; and limited habitat conditions for native fish species and other aquatic organisms. The Phase 3 Project would not remove any waterside riparian habitat or SRA habitat along the lower San Joaquin River. Further, because historic channel alterations have resulted in marginal habitat conditions that provide only limited habitat functions for most native fish species and other aquatic organisms, the Phase 3 Project would offset the overall loss and degradation of suitable habitat, including degraded water quality for special-status fish species in the action area through the expansion and restoration of waterside riparian habitat in the setback area at Element IVc.

Effects on terrestrial wildlife and fish species, including federally listed and state-listed species, would be associated with removal of landside vegetation as needed to clear ground for the Phase 3 Project, construction disturbances to wildlife and their habitats, and permanent and temporary losses of foraging and breeding habitat for the affected species. Approximately 3.28 acres of landside riparian forest would be removed as a result of project implementation. Although most of the habitat is considered low quality, even small losses could contribute to species declines and losses of habitat, similar to those that have led to the need to protect these species under the ESA.

However, the Phase 3 Project incorporates compensatory measures (see the “Compensation Measures” section above) to offset losses of riparian habitats. These measures include creating approximately 4.52 acres of riparian habitat in the setback area at Element IVc (**Exhibit 12**), as well as other off-site habitat compensation opportunities. These efforts would increase the amount of higher quality habitat available along these reaches of the San Joaquin River.

CONCLUSIONS AND DETERMINATION

In conclusion, based on the biology and ecology of the federally listed species that have the potential to occur in the Phase 3 Project area, the environmental baseline for the action area, and the effects of the proposed action and its cumulative effects, implementing the Phase 3 Project may affect and is likely to adversely affect VELB and riparian brush rabbit, and would result in no effect on delta smelt, Central Valley fall-/late fall–run Chinook salmon, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and green sturgeon. Designated critical habitat in the action area has been designated for delta smelt, Central Valley steelhead, and green sturgeon; however, none would be adversely modified or destroyed.

- **Valley elderberry longhorn beetle:** The Phase 3 Project may affect and is likely to adversely affect VELB through the transplantation of eight elderberry shrubs. Although VELB habitat credits would be purchased comparable to 367 elderberry seedlings and 367 associated native plantings would be purchased from a USFWS-approved VELB habitat conservation bank to compensate for effects to VELB and effects to 268 elderberry stems (greater than 1 inch in diameter at ground level), there could be an effect on the species. Removal of shrubs in which larvae are present could result in larvae mortality if the health of the shrubs is adversely affected and there would be a temporary loss of habitat available to the beetle during the establishment of seedlings.

- **Riparian brush rabbit:** The Phase 3 Project may affect and is likely to adversely affect riparian brush rabbit through the removal of 3.28 acres of landside riparian habitat that is suitable for the species, contributing to the further reduction of available habitat for this species.

However, the Phase 3 Project would involve restoring approximately 4.52 acres of compensatory riparian habitat (**Exhibit 12**) to offset project-related habitat losses. Once the new setback levee in Element IVc is constructed and certified, a small section of the existing levee would then be partially degraded. Between 25 feet from the landside toe of the existing levee and 25 feet from the waterside toe of the new setback levee are approximately 4.52 acres that could be restored as riparian habitat (**Exhibit 12**). The restored riparian habitat would consist of willows, cottonwoods, valley oaks, wild rose, and California blackberry, and grasses, which is comparable to the composition of habitats where this species is documented to occur along the RD 17 levees. Apart from a small notch along the north side, the existing levee would remain in place, thus providing upland refugia for the species during high-water events. The 4.52-acre area would be contiguous with existing waterside riparian habitat along Element IVc; this waterside riparian habitat along Element IVc extends northward through Elements IVa, IIIa, and IIIb, and southward through Elements Va and VIa.1. There are documented occurrences of riparian brush rabbit in the waterside riparian habitat in Elements IIIa and IIIb, north of Element IIIa and south of Element VIa.1; therefore, reestablishing and protecting riparian habitat in Element IVc would provide expanded and connected habitat for this species.

RD 17 is also evaluating options for providing off-site compensatory habitat to offset Phase 3 Project effects on riparian brush rabbit. Additional off-site compensatory habitats would include preserving existing waterside riparian habitats and/or restoring natural riparian habitats. These options would be evaluated in coordination with USFWS during the Section 7 consultation.

- **Federally listed fish species:** The Phase 3 Project would result in no effect on federally proposed and federally listed fish species considered in this BA. Effects are not expected to occur because of the avoidance and minimization measures incorporated into the Phase 3 Project. The Phase 3 Project includes several measures that would avoid potential direct environmental effects during project construction. The potential impacts of increased sedimentation or turbidity, and/or release of contaminants on fish and other aquatic organisms, would be avoided and minimized through the use of BMPs (e.g., source control, detention basins, revegetation, and spill containment plan) that would maintain surface water quality conditions in receiving waters and minimize disturbance to fish and other aquatic habitats. No waterside riparian or SRA habitat would be removed.

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ESSENTIAL FISH HABITAT ASSESSMENT

The Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 USC 1801), requires that EFH be identified and described in federal fishery management plans. Federal agencies must consult with NMFS on any activity that they fund, permit, or carry out that may adversely affect EFH. The EFH regulations require that federal agencies obligated to consult on EFH also provide NMFS with a written assessment of the effects of any action on EFH (50 CFR 600.920). NMFS is required to provide EFH conservation and enhancement recommendations to federal agencies. The statute also requires federal agencies receiving NMFS EFH conservation recommendations to provide a detailed written response to NMFS within 30 days of receipt, detailing how they intend to avoid, mitigate, or offset the impact of activity on EFH (Section 305[b][4][B]).

EFH is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purposes of interpreting the definition of EFH, "waters" includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers all habitat types used by a species throughout its life cycle.

The Pacific Fishery Management Council has identified and described EFH, adverse impacts, and recommended conservation measures for salmon in Amendment 14 to the *Pacific Coast Salmon Plan* (PFMC 2003). Freshwater EFH for Pacific salmon in the Central Valley includes waters currently or historically accessible to salmon within the Central Valley ecosystem, as described in Myers et al. (1998), and includes the segment of the San Joaquin River in the action area. Central Valley fall-/late fall–run Chinook salmon is a species managed under the *Pacific Coast Salmon Plan* that occur in the San Joaquin River.

THE PROPOSED ACTION

The proposed action is described in detail in the "Description of the Proposed Action" section of this BA. The action area, environmental baseline, and species accounts, respectively, are described in the "Action Area," "Environmental Baseline," and "Species Accounts" sections of this BA.

ESSENTIAL FISH HABITAT DESIGNATION IN THE ACTION AREA

EFH has been identified for Central Valley fall- and late fall–run Chinook salmon. Fall-run EFH includes migration, holding, and rearing habitat for the San Joaquin River (NMFS 2014). Late fall–run EFH includes opportunistic/intermittent spawning, holding, and rearing habitat for the San Joaquin River (NMFS 2014). No EFH has been designated in the action area for other fish species addressed in this BA.

EFFECTS OF THE PROPOSED ACTION

Effects of the proposed action are described in the "Effects" and "Cumulative Effects" sections of this BA.

PROPOSED CONSERVATION MEASURES

Proposed conservation measures are presented in the "Description of the Proposed Action" and "Effects" sections of this BA. The measures include avoidance and minimization measures.

CONCLUSIONS

On review of the effects, the proposed action will not affect the spawning, rearing, and migratory EFH functions of Chinook salmon currently or previously managed under the Magnuson-Stevens Fishery Conservation and Management Act in the San Joaquin River.

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APPENDIX A

Exhibits

Refer to **Appendix A of Attachment 9 of Appendix J of this FEIS: Exhibits, on page 1363 of this PDF.**

APPENDIX B

Species Lists

Refer to **Appendix B of Attachment 9 of Appendix J of this FEIS: Exhibits, on page 1385 of this PDF.**

APPENDIX C

Evaluation of Potential for Giant Garter Snake Occurrence in the Phase 3 Project Area

Refer to **Appendix C of Attachment 9 of Appendix J of this FEIS: Exhibits, on page 1401 of this PDF.**

APPENDIX D

Project Correspondence

APPENDIX D-1

Letter Requesting Technical Assistance,
Dated May 14, 2010

Refer to **Attachment 1 of Appendix J of this FEIS:**
Letter from AECOM to USFWS and NMFS Requesting Technical Assistance. May 14, 2010. Includes two attachments (2009 Preliminary Wetland Delineation and 2010 Updated Wetland Delineation), on page 955 of this PDF.

APPENDIX D-2

Letter Responding to Technical Assistance Request,
Dated June 11, 2010

***Refer to* Attachment 2 of Appendix J of this FEIS:**
Letter Responding to Technical Assistance Request. June 11, 2010, on page 1067 of this PDF.

4. Letter from NMFS to USACE, Requesting Additional Information. July 7, 2015.

Letter from NMFS to USACE Requesting Additional Information,
July 7, 2015

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814-4700

JUL 7 2015

JUL 10 2015

Alicia E. Kirchner
Chief, Planning Division
Department of the Army
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814-2922

Dear Ms. Kirchner:

This letter is in response to your letter dated March 27, 2015, requesting the initiation of informal consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*), concerning Phase 3 of the Reclamation District 17 (RD 17) Levee Seepage Repair Project (Project). This letter was received by NMFS' California Central Valley Office (Mr. Howard Brown) on April 7, 2015. The U.S. Army Corps of Engineers (Corps) has determined that the proposed project "may affect, but is not likely to adversely affect" federally listed as threatened California Central Valley (CV) steelhead (*Oncorhynchus mykiss*), threatened CV spring-run Chinook salmon (*O. tshawytscha*), and threatened Southern distinct population segment (DPS) of North American green sturgeon (*Acipenser medirostris*). In addition, the Corps has determined that the Project actions "will not result in destruction or adverse modification" of designated critical habitat for California Central Valley steelhead and southern DPS of North American green sturgeon. Finally, the Corps has determined that the proposed Project actions "will not adversely affect designated Chinook salmon EFH" for both short-term and long-term construction actions.

NMFS has reviewed the BA included with the consultation request letter and concluded it lacks sufficient detail to determine the extent to which the proposed project may affect federally listed species and their designated critical habitats. In addition, we find that the information provided in the BA is incomplete and we have not received all the information that would be necessary to initiate section 7 consultation on the proposed project, as outlined in the regulations governing interagency consultation (50 CFR §402.12). It is the responsibility of the Federal agency requesting consultation to provide NMFS with all information necessary to initiate consultation.

Separation of the Environmental baseline from the Proposed Action

The BA has described physical and biological conditions that exist in the Project area. Separating the impacts of the current environmental baseline from the effects of the ongoing action as represented by the presence of the levees is an important consideration. The baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and the ecosystem within the action area. The baseline does not include the effects of the action under review in the consultation. Three principles to consider when describing the baseline are as follows:

(1) In general, impacts attributable to the existence of the levees or to non-discretionary operations are incorporated within the impacts already in the environmental baseline rather than the effects attributable to the proposed action. The environmental baseline includes, not only the past and present impacts of existing structures over which the Corps lacks discretion, but also their continuing effects into the future.

(2) The Corps should clearly describe the scope of discretion over the proposed action and conduct a rigorous review to establish areas of non-discretion. The Corps bears a high burden of proof to demonstrate areas of non-discretion, and it is incumbent upon the Corps to demonstrate that it clearly lacks discretion over its activities.

(3) Where the scope of the Corps' discretion is not clear, effects should be attributed to the proposed action.

In general terms, the past, present, and future presence and effects associated with existing flood control structures should be included in the Environmental Baseline sections of the BA and biological opinion, and therefore not considered to be part of, or an effect of the Corps' proposed action. However, it can be difficult to clearly determine the difference between baseline conditions and a project's operational effects. Therefore, it is important for the Corps, to clearly define the boundaries of their discretion (or non-discretion) and to articulate specifically how the Corps is prohibited from taking action associated with the continued existence of flood control structures, and not simply that there is no specific authority. If it is not possible for the Corps to clearly separate these areas, then the Corps should attribute those effects to the proposed action.

Specific Section 7 Consultation Requirements

Section 7 consultation is initiated through a request that must include the following six pieces of information as described in CFR 402.14(c):

(1) A description of the proposed action to be covered;
(2) A description of the specific area that may be affected by the proposed action;
(3) A description of any listed species or critical habitat that may be affected by the proposed action;
(4) A description of the manner in which the action may affect any listed species or critical habitat, and an analysis of any direct, indirect, or cumulative effects;

   (a) Direct Effects: Effects to listed species of designated critical habitat that occur during implementation of the project;
   (b) Indirect Effects: Effects to listed species that occur later in time or offsite, but are reasonably certain to occur;
   (c) Cumulative Effects: For purposes of the ESA, cumulative effects are defined as the effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within an action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions are not included here because they require separate consultation pursuant to Section 7 of the ESA;

(5) Relevant reports, including any environmental impact statements, environmental assessments, biological assessments or other analysis prepared regarding the proposal; and
(6) Any other relevant studies or other information available on the action, the affected listed species, or critical habitat.

In order to complete the consultation, the comments and questions presented below need to be addressed by the Corps. The comments and questions are presented numerically to correspond to the six "Specific Section 7 Consultation Requirements" that are presented above.

1. A description of the proposed action to be covered.

   a. The Corps should provide a more detailed presentation of the proposed setback levee located in element IVc than was given on page 18 (table 2), and on page 19. In particular, to aid with the effects analysis for this particular action, the BA should include: 1a

      i. The elevations of the newly "exposed" flood plains in the area of the setback levee;
      ii. The expected frequency of inundation during high water events.
      iii. The expected durations of inundation under different high water stages;
      iv. Potential for stranding in any depressions or perched areas within the setback levee area.

   b. The Corps should provide a better explanation in the BA as to why setback levees were not pursued in elements Va and VIa.1. Hydraulic modeling data should be presented to substantiate the claim that a setback levee would increase flood flows down the mainstem San Joaquin River under all potential setback levee designs in this location. If multiple setback levee scenarios were not modeled that could take advantage of the opportunities of a setback levee in this location, such modeling should be conducted. 1b
   c. The BA should clarify the roles of the San Joaquin Multi-species Habitat Conservation Plan implementation as to listed anadromous species under NMFS jurisdiction; none of NMFS' species are part of the plan, therefore any habitat mitigation implemented under the plan would need to consider our species separately. If the mitigation conducted under the plan does not benefit NMFS' species, this should be stated. If applicable, separate mitigation efforts should be clearly defined for NMFS' listed species. 1c
   d. The BA should clearly indicate which actions under the proposed Project will comply with the general work window stated on page 21 (July 1 through November 1) and which elements of the Project will be implemented outside of this work window. It appears that some Project elements are anticipated to be implemented outside this window as suggested by the request for work window variances from the Central Valley Flood Control Board (page 21). 1d

2. A description of the specific area that may be affected by the proposed action.
    a. The BA indicates that the action area will extend 15 miles away from the actual project area (page 29). This would include the waterways encompassed by essentially the entire South Delta (San Joaquin River mainstem between Lathrop and French Camp to Old River in the west near Discovery Bay and Clifton Court). If this is carried forward as the action area, then the environmental baseline, species occurrences, and project effects will have to be modified to correspond to this enlarged footprint, and the appropriate effects analysis conducted. 2a

3. A description of any listed species or critical habitat that may be affected by the proposed action.
    a. The BA should use the most current scientific and commercially available data in its status reviews of the species. The West Coast Region of NMFS has issued publically available 5-year status reviews for the listed Chinook salmon and steelhead populations in the Central Valley, as well as a 5-year status review for the southern DPS of green sturgeon. (available at: http://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/2011_status_reviews_of_listed_salmon_steelhead.html and http://www.westcoast.fisheries.noaa.gov/protected_species/green_sturgeon/green_sturgeon_pg.html. 3a
    b. The status of the species should reference the final version of the Recovery Plan for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and California Central Valley steelhead issued in July 2014, rather than the draft Recovery Plan referenced in the BA. Available at: http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/california_central_valley/california_central_valley_recovery_plan_documents.html. 3b
    c. The status of Central Valley spring-run Chinook salmon regarding the presence of this population in the San Joaquin River basin should be updated to reflect the current reintroduction efforts. Juvenile spring-run Chinook salmon have been released into the system for the past two years (2014 and 2015) with returns possibly occurring this year as 2-year old jills and jacks (2015) come back from the ocean. 3c
    d. The description of EFH for Pacific salmon has been updated and revised with Amendment 18 to the salmon fishery management plan (September 2014). Available at: http://www.pcouncil.org/salmon/fishery-management-plan/adoptedapproved-amendments/. The BA should reflect this revised material for Pacific salmon EFH. 3d

4. A description of the manner in which the action may affect any listed species or critical habitat, and an analysis of any direct, indirect, or cumulative effects.
    a. The construction related effects described in the BA for listed fish species is very cursory. The BA should explain in more detail the expected effects related to turbidity based on: 4a

i. Timing of construction and fish presence in the adjacent waterways will be different for each population of listed fish. Depending on which population of fish is moving through the action area, the effects will be different based on the co-occurrence of construction activities and fish presence. In some instances it will be direct effects, in others it will be indirect since construction and fish presence may not overlap with each other. 4a
ii. Indirect effects are likely to occur in the winter due to exposed soils carrying turbidity either directly into the adjacent waters, or via an indirect route as stormwater discharges into the adjacent receiving waters through outfalls.

b. The BA does not adequately describe the effects of contaminants on exposed fish that are discharged into the adjacent waterways. Contaminants are most likely to move into the adjacent waterways during precipitation events and will expose different life stages of fish based on the timing of the storms. The effects of the different classes of contaminants will have different toxicological and physiological effects on exposed fish. These effects need to be assessed in the BA. 4b
c. The effects of the setback levee on the different runs of listed fish as well as fall-run Chinook for EFH must be assessed. This should include at a minimum:

   i. Changes in growth rate for fish rearing on the floodplain.
   ii. Risk of predation from predators on the floodplain.
   iii. Risk of stranding during the high water recession phase. 4c
   iv. How frequently the floodplain becomes available to emigrating fish and for how long at different water elevations.
   v. Using the above information, an integration and synthesis of the variable effects of the setback levee should be performed which determines the net benefits to listed fish and fall-run Chinook salmon.

d. The BA does not adequately describe the indirect effects of enhanced levee safety on the induced growth of surrounding communities. On page 15 the BA indicates that implementing Phase 3 has the intent of "improving the existing levee integrity based on the new USACE standards and continue to provide flood risk reduction within RD 17 and the surrounding areas." By improving flood safety and meeting new Corps standards, the ability to get flood insurance is enhanced and existing and new homes yet to be built would benefit. This encourages further development in the RD 17 service area that may not occur if flood insurance was determined to be a riskier venture due to lessened levee safety. The BA should more fully explain the interaction between enhanced levee flood protection and regional growth patterns. 4d
e. The BA describes cumulative effects that are likely to occur in the future (*i.e.*, future housing developments related to different regional and local "General Plans") but fails to explain how these cumulative effects will affect aquatic species. The cumulative effects section of the BA describes how aspects of the 4e

Phase 3 activities will impact riparian habitat and water quality. That discussion would be more appropriate for the BA's Project effects section. The BA should explain how the housing developments and increases in human population would affect the aquatic and riparian habitats (*i.e.*, increase in traffic on area roadways, increases in impervious surfaces affecting storm runoff patterns, increases in urban and domestic contaminants, increased stormwater runoff volumes and discharge to surface waters, increased demand for drinking water, increased 4e production of sanitary waste water that requires treatment with eventual disposal, *etc.*). In examining these effects, the BA should conduct a separate analysis for listed species under NMFS' jurisdiction since the San Joaquin Multi-Species Conservation Plan does not include these species, and thus impacts to these species are not evaluated under that plan (see page 52 of BA) and would not undergo any federal review.

5. Relevant reports, including any environmental impact statements, environmental assessments, biological assessments or other analysis prepared regarding the proposal.
    a. The Corps should provide the Draft Environmental Impact Statement/ 5 Environmental Impact Report with this BA to help clarify details of the project that are referenced in the BA (*e.g.*, the setback levee analysis for the Project including any hydraulic analyses completed to date).

6. Any other relevant studies or other information available on the action, the affected listed species, or critical habitat.
    a. See above for inclusion of the best available scientific information regarding the 6 most recent 5-year species accounts and EFH information.
    b. Incorporate most recent species viability assessments conducted by NMFS for listed species in the Central Valley.
    c. Incorporate recent studies regarding steelhead and Chinook salmon survival through the lower San Joaquin using acoustic tags.

Essential Fish Habitat

The analysis of the effects of the proposed Project regarding impacts to EFH for Pacific salmon relies on the analysis described for impacts to fish and critical habitat. The analysis should examine how changes to the habitat essential features necessary to support the various life stages of Pacific salmon are altered and how this changes the survival of the Pacific salmon stocks exposed to the Project's effects to provide support for their determination on EFH effects. The Corps should explain how loss/gain of riparian habitat and SRA, and the armoring of river 7 shorelines would impact habitat that fish utilize for the different stages of their life history. For example, assessment of the loss of overhanging shaded canopy on local water temperatures, loss of input of organic materials with terrestrial origins (allochthonous input) on the functioning of the local food web, hydrodynamic and ecological effects of channel armoring which prevents formation of riparian benches, river sinuosity, and normal sediment budget in the impacted river reaches would be appropriate. This level of analysis is missing from the BA's assessment of Project impacts to EFH.

The ESA consultation process for this project will not be initiated until we receive all of the required information to initiate consultation, or a statement explaining why that information cannot be made available, and a written assessment of the effects of the action on EFH [50 CFR 600.920(g)(1)(2)]. Once we receive all of the information necessary to initiate and complete consultation, we will review it and contact you with a determination of our findings on this project.

If you have any questions or comments regarding this letter, please contact Jeffrey Stuart at (916) 930-3607 or via e-mail at J.Stuart@noaa.gov.

Sincerely,

Maria Rea
Assistant Regional Administrator
West Coast Region

Courtesy Copy to file ARN: 151422-WCR2015-SA00127

5. **Letter from USFWS to USACE, Requesting Additional Information. October 2, 2015.**

Letter from USFWS to USACE Requesting Additional Information, October 2, 2015

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Bay Delta Fish and Wildlife Office
650 Capitol Mall 8th floor 8-300
Sacramento, California 95814

In Reply Refer To:
08FBDT00-2015-TA-0303

OCT 0 2 2015

Ms. Alicia Kirchner
Chief, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814-2922

Subject: Information Request for the Proposed Reclamation District 17 Phase 3 Levee Seepage Repair Project, San Joaquin County, California

Dear Ms. Kirchner:

This is in response to your February 27, 2015, letter requesting formal consultation with the U.S. Fish and Wildlife Service (Service) on the U.S. Army Corps of Engineers' (Corps) Reclamation District 17 (RD 17) Phase 3 Levee Seepage Repair Project, San Joaquin County, California. At issue are effects of the proposed project on the federally-listed as threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) and endangered riparian brush rabbit (*Sylvalagus bachmani riparius*). The Service received your request on March 3, 2015. This 1
response is provided under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act).

The Biological Assessment (BA) which was provided with your request does not contain a level of detail sufficient to prepare a biological opinion and does not contain sufficient information necessary to initiate formal consultation as outlined in the regulations governing interagency consultations (50 CFR§ 402.14). In order to fully evaluate the potential effects to listed species as a result of the proposed project, the Service provides the following comments and information requests below:

1. Additional description of current and future water side maintenance: The proposed project consists of 5.3 miles of intermittent flood protection work on the right (east) bank levee of RD 17 involving land side seepage berms, conventional and deep slurry mixing cutoff walls, and
wetland fill. The BA provides a reasonable level of detail about the locations of the proposed 2
work and direct effects on habitat on the land side. However, the BA does not provide a sufficient description of the direct, cumulative, and/or indirect effects on habitat on the water side. The BA (p. 16) assumes that interim criteria established for determining eligibility for Public Law 84-99 means that the waterside vegetation would be managed in accordance with RD

17 existing practices after the proposed project is constructed. Those practices are described in 2 cont.
the BA as involving an allowance of some of the waterside vegetation to remain.

In the 2011 draft Environmental Impact Statement/Report on the proposed project, the Corps
stated that the future conditions of levee vegetation were uncertain and (p. 1-15) "....could be a
continuation of the Framework, full compliance with vegetation management guidelines in ETL 3
1110-2-571, or another approach." Compliance with ETL 1110-2-571 [superseded by ETL
1110-2-583, dated April 30, 2014], could involve seeking Corps permission to retain vegetation
on the lower two thirds of the waterside slope, however, this permission cannot be presumed.

The Corps should verify that it is consulting on the effect of both construction as well as
maintenance of the proposed project. The Corps should thoroughly describe and clarify the
current and future maintenance practices on the project levee. This should include a summary of
records of inspection and maintenance, and the areas affected, so that the frequency and extent of
the current maintenance can be confirmed, and a description of the maintenance practices 4
expected in the future with an analysis of potential effects to listed species. If future
maintenance practices change from what is described in the BA in a way that changes the effect
on a listed species, the Corps should reinitiate consultation with the Service (50 CFR§ 402.16).

2. <u>Additional analysis and justification on quantification of listed species habitat effects and
proposed compensation</u>: The Corps proposes to compensate for 3.28 acres of landside riparian
brush rabbit habitat loss with 4.52 acres of riparian habitat to be restored water side of a setback
levee to be constructed at element IVc. The 3.28 acres of loss are distributed between elements
IIIa-b and Va-VIa.1, a distance of several river miles, while the compensation is in a more
limited distance of about 0.4 river miles. Although some habitat would remain on the water side,
the amount of this remaining habitat was not quantified in the BA. Moreover, as described 5
above (#1), it is uncertain how much water side vegetation would remain dependent on the
prescribed maintenance, although it is apparent from the BA exhibits that some of the vegetation
is outside of any potential maintenance zone. The Corps should estimate the amount of habitat
not only in the construction footprint, but also in the near vicinity between the water edge
landward to 15 feet beyond the landside toe. This is well within the action area, which includes
all areas of direct and indirect effects. The requested information would allow the Service to
better evaluate the effect of the project and its maintenance on listed species.

The Service would consider the importance of the proposed setback levee and compensation area
at element IVc being within the project area where impact occurs. If the compensation is
successful and the habitat becomes occupied, it could benefit the riparian brush rabbit and reduce
the potential for local extirpation and reduction in range. However, the ratio of compensation to
impact for this site is only 1.3:1. This is a relatively modest ratio considering the known
sightings of riparian brush rabbit within or near habitat which would be lost due to the project, 6
the effect of the project on continuity of remaining habitat, and future cumulative effects that
would result from dense housing and commercial development behind the improved levee.
Some of the types of impact associated with these cumulative effects would include increased
disturbance from human use (e.g., trails, camping, fire), intensified maintenance practices, and
impact of non-native animals including escaped pets and pest rodents. Additionally, the
conversion of large tracts of agricultural and other non-urban lands may constrain dispersal of

the rabbit. Although management measures can be implemented to minimize these effects, they cannot be eliminated. Despite evidence of rabbit occupation as noted in BA Exhibit 15, the habitat in the project area is already severely fragmented. Thus, the persistence of the riparian brush rabbit cannot be presumed with the proposed project and compensation.

Compensation ratios of 3:1 or more as well as thorough management and monitoring (see #3, 6 cont.
below) are likely necessary to offset direct impacts under these circumstances. For example, a 3:1 ratio is specified in the current habitat conservation plan for San Joaquin County for non-wetland natural lands such as oak woodlands (Table 3-1 *in* San Joaquin County Multispecies Habitat Conservation and Open Space Plan, November 14, 2000). To achieve a higher ratio would involve additional compensation beyond that proposed, and the Service's preference for this would be to maximize opportunities on or near to the location of the effects before considering off-site options. The BA (pp. 28, 54) mentions that the local sponsor, RD 17, is studying options for additional off-site compensation but it does not provide specifics. We request the Corps provide a more detailed justification for its compensation proposal of 4.52 acres at element IVc only, and identify potential locations of additional compensation sites under consideration. If exact locations are not yet known, we request information in the form of at 7
least general areas and conceptual approaches (creation, enhancement, and protection) that are under consideration as off-site compensation.

It appears from the exhibits in the BA that the determination of affected riparian brush rabbit habitat was based on the dripline of woody species of plants identified in aerial imagery. Conversely, our initial inspection of BA Exhibit 12 (p. A-18) suggests that the compensation area includes gaps between plant (unless complete coverage by shrub was assumed). However, the riparian brush rabbit regularly forages in herbaceous/ruderal habitat near the riparian areas. 8
The rabbit would be expected to move regularly between riparian fragment areas that are closer together and occasionally over larger distances during dispersal movement. Therefore, additional information is also needed on how effects and compensation quantities were determined in the BA. The Corps should specify whether ruderal areas between nearby riparian shrubs were included or excluded from the effect area, and the method by which this determination was made.

3. <u>Additional information on management and monitoring</u>: The BA (p.28) refers to a proposal to develop a mitigation and monitoring plan specific to habitat restoration in association with element IVc and off-site compensatory habitat components. A moderate, additional level of specificity is needed on what measures would be included in this plan, the responsible parties, protections, and assurances of funding of implementation. Some of the elements of the plan 9
would include the planting design, irrigation, measureable objectives, monitoring of those objectives, and remedial measures in the case of any shortfall. Additional management elements may include the need to thin excess vegetation or remove non-natives, establishment of firebreaks, inspections, regular patrols for human activities, and monitoring of habitat and effects to listed species. The level of detail in the additional information should be sufficient to reasonably conclude that the 4.52-acre area at element IVc will achieve measureable objectives, and that it will have adequate oversight. The Corps should also state whether or not elderberry shrubs will be included in the mitigation plan for this site. 10

Some level of additional monitoring should also apply to all project phases, to verify that
maintenance practices needed to sustain project performance, do not adversely affect listed
species habitat, and that the effects of ongoing maintenance are within what has been analyzed
for the project. This will likely necessitate regular assessment and reporting of both riparian 11
habitat generally and elderberry plants specifically along the full length of RD 17 levees. The
Corps should consider this need and provide additional information on habitat monitoring after
the project is completed.

4. Additional information on future flood control projects: The BA (pp. 14-15) discusses the
need for the proposed project to address seepage issues to maintain accreditation for a 100-year
level of flood risk reduction. However, the State requires a 200-year level of protection for 12
urban or urbanizing areas. The Corps should provide additional information on whether there
are any other projects or actions, beyond the proposed project, which would be needed to attain
the 200-year level of protection. If so, the Corps should also state whether these other projects or
actions could affect listed species.

5. Additional information on on-site compensation opportunities: The BA (pp. 19-20) provides
a limited discussion of cost and hydraulic factors to justify exclusion of setback levees at various
locations as a means to provide compensatory habitat. In light of the already very sparse habitat
in the project area, the Service has a keen interest in improving the amount and continuity of this
habitat within the project area where possible. This could include setbacks of any dimension, as 13
well as enhancement of habitat in waterside areas outside the levee prism. Please provide more
detailed information on the exclusion of setbacks on the basis of cost or hydraulics. We also
request information on opportunities for enhancing and creating habitat within the existing
floodway in the project area through planting and management.

Until all of the above requested information is received, the Service cannot begin consultation on
the Reclamation District 17 Phase 3 Levee Seepage Repair Project. If you have any questions 14
regarding this response, please contact Steven Schoenberg, Senior Fish and Wildlife Biologist, at
(916) 414-6564.

Sincerely,

K. S. Turner

Kim S. Turner
Assistant Field Supervisor

6. Conceptual Mitigation and Monitoring Plan for levee setback area. June 2016.

Conceptual Mitigation and Monitoring Plan for Levee Setback Area

Phase 3–RD 17 Levee Seepage Repair Project

Prepared for:

Reclamation District (RD) No. 17

Prepared for submittal to:
U.S. Army Corps of Engineers

US Army Corps of Engineers®
Sacramento District

GEI Consultants

in association with

AECOM

June 2016

Conceptual Mitigation and Monitoring Plan for Levee Setback Area

Phase 3–RD 17 Levee Seepage Repair Project

Prepared for:

Reclamation District (RD) No. 17
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June 2016

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Appendix A – Exhibits

ACRONYMS AND OTHER ABBREVIATIONS

BMP	best management practice
CDFW	California Department of Fish and Wildlife
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
Delta	Sacramento–San Joaquin Delta
DPS	distinct population segment
ESU	evolutionary significant unit
LSRP	Levee Seepage Repair Project
MMP	Mitigation Monitoring Plan
NMFS	National Marine Fisheries Service
Phase 3 Repair Project	Phase 3 of Reclamation District No. 17 Levee Seepage Repair Project
RD 17	Reclamation District No. 17
RM	River Mile
SJMSCP	San Joaquin Multi-Species Habitat Conservation and Open Space Plan
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
VELB	valley elderberry longhorn beetle
VELB Guidelines	U.S. Fish and Wildlife Service *Conservation Guidelines for the Valley Elderberry Longhorn Beetle*

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INTRODUCTION

This Conceptual Mitigation Monitoring Plan (Conceptual MMP) has been prepared for Phase 3 of the proposed Reclamation District 17 (RD 17) Levee Seepage Repair Project (LSRP) (Phase 3 Repair Project) (See the "Proposed Project Requiring Mitigation" section below for a brief summary of the previous Phase 1 and Phase 2 Repair Projects.) In order to issue a Biological Opinion for the Phase 3 Repair Project, the U.S. Fish and Wildlife Service (USFWS) requested more detailed information regarding habitat compensation for the riparian brush rabbit (*Sylvilagus bachmani riparius*). This Conceptual MMP is intended to provide that detail and to also describe mitigation for valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (VELB). Specific design details are still in progress for the proposed Mitigation Site and will be provided to the USFWS and other regulatory agencies in a Final Mitigation Monitoring Plan (Final MMP).

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PROPOSED PROJECT REQUIRING MITIGATION

RD 17 is located in south-central San Joaquin County, California (**Exhibit 1**). The boundaries of RD 17 are marked by French Camp Slough on the north, approximately 3 miles southwest of the central business district of the City of Stockton; the San Joaquin River on the west; Walthall Slough on the south (just below State Route 120); and Airport Way/McKinley Avenue on the east, just outside the City of Manteca. RD 17 is responsible for levee operation and maintenance of over 19 miles of levees along Walthall Slough, the San Joaquin River, and French Camp Slough, as well as a dryland levee along the southern boundary of Manteca (**Exhibit 2**). These levees have been divided into 11 distinct "reaches" identified by Roman numerals (i.e., I, II, III…, XI), and subdivided further into "elements," identified by the reach number followed by a lowercase letter and, where needed to further distinguish elements, an Arabic numeral (e.g., Ia, IIa, IIb, …, Va, VIa.1, VIa.2, VIa.4, …, VIe, VIIa, VIIb, …, XIa) (**Exhibit 2**). Reaches VIII through XI, which make up the dryland levee, are not included in the USACE flood risk management project, and therefore not subject to 408 authorization. Further, the Phase 3 Repair Project does not include improvements to these dryland levee elements, and no permits under Section 404 would be required.

Since 2007, RD 17 has been undertaking the LSRP to increase the levee system's resistance to under seepage and through -seepage and bring RD 17's approximately 19-mile levee system into compliance with the new USACE seepage criteria. Phases 1 and 2 of the LSRP were completed in summer 2010. The purpose of the Phase 3 Repair Project is to implement landside and isolated waterside levee improvements in 19 LSRP elements affecting 5.3 miles (along the San Joaquin River and Walthall Slough) of the approximately 19-mile RD 17 levee system to improve the existing levee integrity based on the new U.S. Army Corps of Engineers (USACE) standards and continue to provide flood risk reduction within RD 17 and surrounding areas. Levee improvements would address under seepage, through seepage, and levee geometry repair and remediation.

PROJECT DESCRIPTION

The Phase 3 Repair Project levee improvements would include seepage berms, chimney drains, cutoff walls, a setback levee, and a raised landside grade. **Table 1** briefly summarizes the activities proposed for each project element.

Table 1
Summary of Major Activities Proposed for Each Element

Element	Type of Remediation	Proposed Activities
Ia	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width, and install a 590-foot-long seepage berms (minimum 65 feet wide) with chimney drain to meet required exit gradients.
Ib	under seepage and through seepage	Fill existing depression to 300 feet from toe of existing levee; place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width; and install a 125-foot-long seepage berm (minimum 60 feet wide) with chimney drain on top of fill to meet required exit gradients.

Table 1 Summary of Major Activities Proposed for Each Element		
Element	**Type of Remediation**	**Proposed Activities**
Ie, IIIb, IVa, and VIIb	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and construct seepage berms with lengths of 655 feet (Ie), 720 feet (IIIb), 525 feet (IVa), and 385 feet (VIIb), and chimney drains to meet required exit gradients. Minimum seepage berm widths would vary (65–105 feet) depending on the element. For Element Ie, construct v-ditch from seepage berm to existing swale.
IIab	under seepage and through seepage	Install cutoff wall with a length of 2,550 feet to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.
IVc	under seepage and through seepage	Construct 1,240-foot-long setback levee with seepage berm and cutoff wall to meet required exit gradients. Depth of the cutoff wall will be 60 feet. Cutoff wall will involve degrading the top 1/3 to 1/2 of the levee crown and will begin with a 1:1 cut at the waterside crown. Seepage berm would be a minimum of 65 feet wide. Install riprap on waterside of existing levee above the high tide line where it would intersect setback levee. After setback levee is completed, remove 400 linear feet of the existing levee above the high tide line on downstream side of oxbow. Grade approximately 8 acres of setback area, to drain to the river through the downstream opening in the remnant levee, and restore approximately 11.5 acres of riparian scrub and Great Valley Valley Oak woodland in area between the landside toe of the setback levee and the river.
Va and VIa.1	under seepage and through seepage	Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and install cutoff walls with a length of 9,520 feet to meet required exit gradients. Depth of cutoff walls would vary from 60–85 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls.
IIIa	through seepage	Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths and install chimney drain in existing 4,680-feet-long seepage berm to meet required exit gradients.
VIa.4	under seepage and through seepage	Install cutoff wall with length of 70 feet to meet required exit gradients. Depth of cutoff wall would vary from 90–100 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.
VIb and VIcde	under seepage and through seepage	Install cutoff wall with length of 3,720 feet (VIb and VIcde) to meet required exit gradients. Depth of cutoff wall would vary from 70–80 feet. Cutoff wall in levee prism would involve both deep slurry mix construction as well as degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown.
VIIe	under seepage and through seepage	Install cutoff wall with a length of 1,900 feet to meet required exit gradients. Depth of cutoff wall would vary from 60–120 feet. Deep slurry mixing method would be used. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding

Table 1 Summary of Major Activities Proposed for Each Element		
Element	**Type of Remediation**	**Proposed Activities**
		the levee at these locations or used for fill at other locations in the Phase 3 Repair Project.
VIIg	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width, and construct seepage berm with chimney drain with length 395 feet to meet required exit gradients. Minimum seepage berm width would be 65 feet.
Source: Data provided by Kjeldsen, Sinnock & Neudeck, Inc. in 2014		

PROJECT IMPACTS

This MMP addresses Phase 3 Repair Project impacts to potential habitat for riparian brush rabbit and VELB, as described below. The Phase 3 Repair Project will also require compensatory mitigation for permanent impacts to waters of the United States that are under the jurisdiction of the USACE and Regional Water Quality Control Board. A brief overview of these impacts and proposed mitigation are also provided. In addition to identified permanent impacts, the Final Environmental Impact Report (RD 17 *in prep*) and Final Environmental Impact Statement (USACE *in prep.)* for the Phase 3 Repair Project identify potentially significant impacts, and the mitigation measures that will be implemented to reduce those impacts to a less-than-significant level, for landside woodlands, special-status plants, fish, and other special-status wildlife species.

RIPARIAN BRUSH RABBIT

The Phase 3 Repair Project levee improvements would result in the removal of 3.28 acres of landside riparian habitat, specifically Great Valley cottonwood riparian forest and Great Valley Valley oak riparian forest, that is suitable for riparian brush rabbit (**Table 2; Exhibits 3a, 3b, 3c,**). This riparian habitat is located on the landside of the levee, where levee improvements (e.g., chimney drains, seepage berms) would be constructed. In general, most of the landside riparian vegetation is sparse and lacks understory vegetation other than grasses and ruderal vegetation, which would act as cover for riparian brush rabbit and is not suitable for this species (Hansen, pers. comm., 2011).

However, there is potential for some of these landside woody habitats to support suitable habitat for riparian brush rabbit, particularly because these are located adjacent to waterside riparian habitats that either are known to be occupied by this species or are highly suitable habitat. All landside riparian habitat was considered to be suitable where it is adjacent to waterside riparian habitat that is known to be occupied or highly suitable for riparian brush rabbit (i.e., Element IIab through Element VIe; **Exhibit 4a, 4b, 4c, and 5**). North of Element IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the Union Pacific Railroad tracks (i.e., Elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species. No waterside woody or riparian habitat would be removed as a result of levee improvement activities.

Table 2 Phase 3 Repair Project Impacts on Suitable Riparian Brush Rabbit Habitats	
	Acres of Directly Affected Suitable Habitat[1,2]
Waterside woodlands	0.00
Landside woodlands	3.28
TOTAL	3.28

Notes:

[1] Suitable riparian brush rabbit habitats are characterized as Great Valley cottonwood riparian forest and Great Valley Valley oak riparian forest.

[2] Most of the landside riparian vegetation is sparse and lacks understory and is not suitable for this species (Hansen, pers. comm., 2011). However, any landside riparian habitat was considered to be suitable where it is adjacent to waterside riparian habitat that is known to be occupied by or highly suitable for riparian brush rabbit (i.e., Element IIab through Element VIe). North of Element IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the Union Pacific Railroad tracks (i.e., Elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species.

Source: Data compiled by AECOM in 2014

Nearly 54 acres of ruderal annual grassland would also be affected by Phase 3 Repair Project implementation. All effects on ruderal annual grassland that would result from levee improvements are assumed to be temporary because annual grassland would be reestablished in these areas after project completion. Although riparian brush rabbit may use annual grassland as foraging habitat, the key component of habitat suitability for this species in the Phase 3 Repair Project area is based on the presence of riparian woody vegetation, and not the surrounding grasslands. Riparian brush rabbits forage along the edges of shrub cover and in small clearings in the vegetation cover, rather than in large openings, feeding on herbaceous vegetation such as grasses, sedges, clover, forbs, buds, bark, and leaves of woody plants (Sandoval et al. 2006; USFWS 1998). Further, because this species is known to have a small home range and seldom ventures more than 1 meter (3.3 feet) from cover (Sandoval et al. 2006), the riparian brush rabbit likely uses only a small component of the grassland and its use of such habitat is concentrated along the edges of the riparian areas.

The loss of potential riparian brush rabbit habitat in the Phase 3 Repair Project area could restrict the range of this species because the RD 17 area currently contains the northernmost known extent of the population on the San Joaquin River. It also could isolate other populations residing in residual habitats in the project vicinity. An overview of the proposed mitigation is described below under the “Mitigation Site Overview, Goals, and Objectives” section.

VALLEY ELDERBERRY LONGHORN BEETLE

Eighteen elderberry shrubs are present in or adjacent to the footprint of the Phase 3 Repair Project (**Exhibit 6**). The nine elderberry shrubs located along the waterside of the Phase 3 Repair Project levees would be avoided and protected during construction. The nine elderberry shrubs located along the landside of the levee would require removal to accommodate construction of the Phase 3 Repair Project’s seepage berms, and setback levee (**Table 3**). However, one of these landside shrubs does not have stems greater than one inch in diameter at ground level; therefore, it is not considered suitable VELB habitat. Compensation for removal of these stems 1 inch or greater in diameter at ground level will be provided in accordance with the USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (VELB Guidelines) (USFWS 1999) through planting at the Mitigation Site and/or purchase of habitat conservation credits from the French Camp Conservation Bank to offset the potential impacts from transplanting elderberry shrubs. An overview of the proposed mitigation is described below under the “Mitigation Site Overview, Goals, and Objectives” section.

Table 3 Survey Results for Landside Elderberry Shrubs that Would be Removed from the Phase 3 Repair Project Area					
Shrub Number	Number of Stems per Diameter Category (inches)			Beetle Exit Holes Present?	Riparian?[1]
	≥ 1 and ≤ 3	≥ 3 and ≤ 5	≥ 5		
9	0	0	0	No	No
10	73	6	0	No	No
11	25	17	8	No	No
13	12	4	4	No	No
14	5	4	2	No	No
15	32	11	2	No	No
16	13	4	1	No	No
17	25	4	5	No	No
18	6	5	0	No	No
Total	**191**	**55**	**22**		

Notes:

[1] Riparian = waterside of levee. Nonriparian = landside of levee.

Source: Data compiled by AECOM in 2014

OTHER PROJECT IMPACTS NOT COVERED IN THIS MITIGATION MONITORING PLAN

Jurisdictional Wetlands and Waters

The Phase 3 Repair Project would result in the permanent loss of approximately 0.55 acre of freshwater marsh at Element Ib because of seepage berm installation and approximately 0.22 acre of agricultural ditches at Elements Ie, IVa, and Va-IVa.1 because of seepage berm installation and re-grading of the existing levee (**Table 4**). To provide compensatory mitigation for the unavoidable impacts to 0.77 acre of waters of the United States, RD 17 will purchase credits at a mitigation bank, at a ratio determined by the USACE in collaboration with RD 17. RD 17 has identified the Cosumnes Floodplain Mitigation Bank as having availability and being within the service area to accommodate the RD 17 Phase 3 Repair Project.

Table 4 Estimated Impacts of the Phase 3 Repair Project on Jurisdictional Waters of the United States and Waters of the State	
Sensitive Habitat/Community	Permanent Impact (acres)
Freshwater wetland	0.55
Agricultural/Drainage Ditches	0.22
Total	**0.77**

Source: Data compiled by AECOM in 2014

MITIGATION SITE OVERVIEW, GOALS, AND OBJECTIVES

Compensatory mitigation for permanent impacts to potential habitat for riparian brush rabbit and elderberry shrubs suitable for VELB will be provided within the levee setback area in Element IVc. The new levee would be set back approximately 700 feet east of the existing levee footprint, providing approximately 11.3 acres of habitat for riparian brush rabbit and VELB, including approximately 3.9 acres of Great Valley Valley Oak woodland, 7.4 acres of Great Valley riparian scrub. The setback would also include a 0.4 acre floodplain swale (**Exhibit 7**). Approximately 1.4 acres is included as contingency; a minimum of 3:1 restoration-to-impact mitigation ratio to offset impacts to riparian brush rabbit habitat will be accomplished at the Mitigation Site (**Table 2**). The expansion and restoration of riparian habitat in Element IVc would augment the waterside riparian corridor along the San Joaquin River and provide additional riparian habitat for the riparian brush rabbit between two known occurrences of this species (i.e., between Elements IIIa/IIIb and Elements VIa.1/VIa.4 [CNDDB 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004], **Exhibit 5**).

Along the north side of the levee setback area, a section of the existing levee will be removed after certification of the new setback levee. The levee breach will allow floodplain inundation within the setback area. To avoid fish stranding within the setback area, the setback area will be graded to drain toward the levee breach inlet, and a fish release swale will be constructed at the base elevation of the setback area. The fish release swale will not be permanently inundated and will not be connected to the San Joaquin River during the dry season. The elevation of the levee breach inlet is still under consideration based on site constraints, habitat requirements and balancing the needs of riparian brush rabbit to provide protection to any individuals during high water events, while providing a level of disturbance that would potentially support scrub habitat in a sustainable way. It is anticipated that the floodplain swale would be set at an elevation to inundate approximately every 3 to 4 years and the lower floodplain approximately every 6 years. Setback area grading will transition from the fish swale sloping up gently to the west. The lower floodplain would be limited in size and would transition to a larger upper floodplain bench that would provide habitat during inundation. The existing levee will serve as high ground refugia during any extreme flooding events.

Native riparian scrub vegetation will be established within the entire setback area floodplain. Species in the plant palette will be those preferred by the riparian brush rabbit as providing cover including: California blackberry (*Rubus ursinus*), California wild rose (*Rosa californica*), sandbar willow (*Salix exigua*), coyote brush (*Baccharis pilularis*), and golden currant (*Ribes aureum*), among others (Kelly et.al. 2011). Understory vegetation would include herbaceous species that have been identified as preferred forage by the riparian brush rabbit such as mugwort (*Artemisia douglasiana*), and gumplant (*Grindelia camporum*). To provide refugia during flood events, the old levee footprint would also be vegetated with riparian scrub and riparian woodland tree species. The upland refugia will include elderberry seedlings and associated species plantings to mitigate for the impacts to VELB habitat within the Project site. In addition to plantings within the setback area, waterside riparian vegetation would be enhanced and open areas planted.

The primary goal of the habitat creation and enhancement at the Mitigation Site is to fully compensate for the loss of habitat for riparian brush rabbit and VELB resulting from construction activities associated with the Phase 3 Repair Project by providing self-sustaining habitat in perpetuity for these species. The following are specific objectives associated with the mitigation site:

- Reconnect and restore historic floodplain habitat on the San Joaquin River within the approximately 7-acre levee setback area at Element IVc by breaching the existing levee.
- Establish at least 9.9 acres of self-sustaining Great Valley riparian scrub and Great Valley Valley oak woodland habitat to provide compensatory mitigation for Phase 3 Repair Project impacts on 3.28 acres of potential habitat for riparian brush rabbit at a 3:1 mitigation ratio.
- Vegetate the existing levee to provide densely planted high ground refugia for riparian brush rabbits during high water events.
- Incorporate elderberry transplants from the Phase 3 Repair Project impact footprint into the Great Valley Valley oak woodland habitat.

- Establish 367 elderberry seedlings and 367 associate plantings within the Great Valley Valley oak woodland habitat to provide compensatory mitigation for the removal of 9 elderberry shrubs within the Phase 3 Repair Project impact footprint that provide potential habitat for VELB.
- Prevent fish stranding within the Mitigation Site by grading the site to drain back to the San Joaquin River and include a fish release swale in the Mitigation Site.
- Protect the Mitigation Site in perpetuity with deed restrictions, a conservation easement, or similar preservation mechanism acceptable to USFWS.

COMPENSATORY MITIGATION DESCRIPTION

MITIGATION SITE BASELINE CONDITIONS

As described above, the Mitigation Site is located within the setback levee in Element IVc (**Exhibit 3b**) within the City of Lathrop. The horseshoe-shaped site is directly adjacent to the San Joaquin River on the north, west, and south. Directly east of the Mitigation Site will be the newly constructed setback levee.

TOPOGRAPHY AND LAND USE

The only significant topographic relief within the Mitigation Site is provided by the existing levee with a crown elevation of 30 feet above mean sea level. Slopes on either side of the levee are generally 2H:1V. On the landside, this slope becomes more gradual moving east down to an elevation of 12 feet. On the waterside, on the north side of the setback area, slopes become more gradual to the water's edge, and on the south side, after an initial break in slope adjacent to the levee crown, slopes remain steep down to the water.

The site is located west of a residential development and associated park facilities that were constructed in 2004. The existing levee prism, maintenance road, and an approximately 50-foot-wide berm east of the levee have been generally maintained clear of vegetation. Prior to 2004, the basin protected by the levees and areas north, south, and east of the Mitigation Site were in agricultural production. Since 2004, the basin has been periodically maintained by disking, but is not under agricultural production. Areas north and south of the Mitigation Site remain in agriculture.

GEOLOGY

The Mitigation Site is located within the Great Valley Geomorphic Province of California, within the San Joaquin River Valley. Sediments in the Great Valley vary between 3 and 6 miles in thickness and were derived primarily from erosion of the Sierra Nevada to the east, with lesser amounts of material from the Coast Ranges to the west (USACE and RD 17 2011). Geologic formations at the Mitigation Site are mapped as part of the Dos Palos Formation (Wagner et. al. 1991). This formation consists of Holocene alluvial deposits of unweathered, unconsolidated arkosic gravel, sand, silt, and clay, covering the flood basin of the lower San Joaquin River. The Dos Palos Formation generally occurs in a northwest-trending belt in the San Joaquin Valley between the Coast Range and Sierra Nevada alluvial fans. The arkosic composition of this formation indicates that the sediments originated from plutonic rocks of the Sierra Nevada and were deposited during overflow and channel migration of the San Joaquin River and associated sloughs (Lettis 1982:128-131).

No active faults have been mapped within the Mitigation Site (Jennings 1994), and it is not located in an Alquist-Priolo Earthquake Fault Zone (California Geological Survey 2007; Hart and Bryant 1999).

SOILS

The only soil map unit that occurs within the Mitigation Site is classified as (130) Columbia fine sandy loam, drained, 0-2 percent slopes. **Table 5** summarizes information on this soil map unit, and provides a brief description of the soil series according to the Soil Survey of San Joaquin County (NRCS 2015).

Table 5 Soil Map Units that Occur within the RD 17 Mitigation Site					
Name	**Map Unit**	**Soil Series**	**Taxonomic Class**	**Description**	**Hydric**
Columbia fine sandy loam, drained, 0 to 2 percent slopes	130	Columbia	Coarse-loamy, mixed, nonacid, thermic Aquic Xerofluvents	Very deep, artificially drained soils formed on somewhat poorly drained alluvium derived from mixed rock sources. Found on natural levees on low floodplains along rivers. It is considered prime farmland if irrigated. The depth to water table is more than 80 inches. Permeability is high and available water capacity is low.	Yes
Source: NRCS 2015					

Prior to mitigation implementation, soil fertility samples will be collected from the Mitigation Site to assess soil chemistry and fertility and, if necessary, make recommendations for any soil amendments that may need to be incorporated prior to habitat restoration.

HYDROLOGY

Hydrology at the Mitigation Site is influenced by surface water and groundwater. The new setback levee would restrict overland flow to the Mitigation Site from the east. Thus, surface water inputs at the Mitigation Site would be direct precipitation, and input from the levee breach inlet on the San Joaquin River on the south side of the setback area during higher flows. Groundwater at the Mitigation Site is closely correlated to the adjacent San Joaquin River. Surface water and groundwater hydrology at the Mitigation Site are described in more detail below.

Surface Water Hydrology

The Mitigation Site is located in the southeastern portion of the Sacramento-San Joaquin Delta (Delta) directly adjacent to the San Joaquin River, the only aquatic resource feature within or adjacent to the site. Located between River Mile (RM) 53 and 52, the Mitigation Site is immediately downstream of Old River, and approximately 5 miles downstream of the Paradise Cut Bypass. Precipitation in the Mitigation Site occurs primarily during the months of November through March, with an average annual precipitation of approximately 12 inches.

The San Joaquin River originates in the Sierra Nevada and enters the San Joaquin Valley at Friant Dam. Most of the flow in the lower San Joaquin River is derived from inflow from the Merced, Tuolumne, and Stanislaus Rivers (Northeastern San Joaquin County Groundwater Banking Authority 2004). The river has flows ranging from 1,500 cubic feet per second (cfs) in dry years to more than 40,000 cfs in wet years (Friant Water Users Authority and Natural Resources Defense Council 2002). In most years, the San Joaquin River contributes approximately 15 percent of inflow to the Delta; the Sacramento River contributes roughly 75–80 percent; and the Mokelumne, Cosumnes, and Calaveras Rivers, which flow into the eastern side of the Delta, contribute the remainder (Delta Protection Commission 2000).

Hydrologic conditions in the San Joaquin River basin are dominated by snowmelt from the Sierra Nevada. Before major water storage projects were completed on the San Joaquin River and its major tributaries, lower San Joaquin River flows generally peaked in late spring/early summer and dropped to low levels in the fall. Since the completion of Friant Dam (1944), McClure Reservoir (1967 on the Merced River), Don Pedro Reservoir (1971 on the Tuolumne River), and New Melones Reservoir (1979 on the Stanislaus River), the lower San Joaquin River's seasonal flow pattern has changed substantially. Before 1944, based on 1923–1944 records, flow in the lower San Joaquin River tended to peak in May and June, with an average monthly flow of almost 11,000 cfs, and declined rapidly to an average monthly flow of approximately 1,200–1,300 cfs in August and September. Since 1979, the average monthly flow has peaked in March at just over 10,000 cfs, with a more gradual decline to approximately 2,400 cfs in August.

The lower reaches of the San Joaquin River are also influenced by tidal regime. Tidal fluctuation in the San Joaquin River extends to the Vernalis tide gage and the Airport Way crossing of the San Joaquin River, approximately 13 river miles upstream of the Mitigation Site.

Near the Mitigation Site, the San Joaquin River is characterized as a wide channel (approximately 200 feet) with little riparian canopy or overhead vegetation and minimal bank cover. Aquatic habitat in the San Joaquin River is characterized primarily by slow-moving glides and pools, is depositional in nature, and has limited water clarity and habitat diversity. Altered flow regimes, flood risk management, and bank protection efforts along much of the San Joaquin River have reduced riparian vegetation and associated shaded riverine aquatic habitat, sediment transport, channel migration and avulsion, and large woody debris recruitment, and have isolated the channel from its floodplain.

Site Specific Surface Water Hydrology

An evaluation of Mitigation Site inundation frequency and duration based on the invert elevation of the levee breach was conducted by MBK Engineers (Appendix B). Frequency and duration of inundation was evaluated at three breach invert elevations: 8 feet (NAVD88), 10 feet (NAVD88) and 14 feet (NAVD88). Based on the hydraulic model analysis, the estimated flow at the location of the San Joaquin River near Vernalis U.S. Geological Survey (USGS) stream gage (Vernalis gage), about 17.5 miles upstream of the project area, at which water would enter the setback area through the remnant levee breach for the three breach invert elevations is shown in **Table 6**. Also included in **Table 6** are: an estimate of the return interval of the Vernalis flow, from a HEC-SSP Bulletin 17b analysis of the Vernalis gage record; and the corresponding computed flow in the San Joaquin River at the Mitigation Site.

Table 6
Estimated Flows for Inundation of the Mitigation Site

Breach Invert Elevation (feet, NAVD88)	Flow in San Joaquin River near Vernalis above which Mitigation Site Breach Flow Occurs (cfs)	Estimated Return Interval	Flow in San Joaquin River at Breach Location (cfs)
8	9,500	2 year	4,200
10	13,200	3 to 4 year	5,700
14	24,000	6 year	8,800

Note: cfs = cubic feet per second
Source: MBK Engineers 2016

To evaluate how often and how long the Mitigation Site would be expected to inundate, a review was made of the historical San Vernalis gage daily flow records since the completion of New Melones Dam in 1979; this represents a period where the San Joaquin River basin operating regime has been relatively unchanged. The evaluation used the mean daily flows for the period October 1, 1978, through September 30, 2015, or Water Years 1979 through 2015. The total number of days in the evaluation period is 13,514. **Table 7** summarizes the estimated number and percent of days in the evaluation study period in which the Mitigation Site would flood under different breach inverts.

Table 7 Estimated Total Duration of Mitigation Site Flooding for Evaluation Period of Record			
Breach Invert Elevation (feet, NAVD88)	San Joaquin River Flow at Vernalis above which Mitigation Site Breach Flow Occurs (cfs)	Number of Days Flow Equaled or Exceeded Since 10/1/1978	Percent of Days Flow Equaled or Exceeded Since 10/1/1978
8	9,500	1,619	12%
10	13,200	1,126	8.3%
14	24,000	423	3.1%
Note: cfs = cubic feet per second Source: MBK Engineers 2016			

A detailed table providing the estimated number of days in each water year that the Mitigation Site would flood for each of the three breach invert elevations, along with estimates of average and maximum depths of flooding in each water year is provided in **Appendix B**. The depths were computed relative to the breach invert elevation. Estimating the depth in the setback area was done with a two-step process:

1. Development of a regression correlation between the mean daily flow gage record at Vernalis and the mean daily stage at the California Department of Water Resources' San Joaquin River below Old River near Lathrop gage (Lathrop gage). This relationship was used to estimate a mean daily stage at the Lathrop gage based on mean daily flow at Vernalis. This was necessary because the Lathrop gage record starts in 2002.

2. Development of regression correlation between the stage at the Lathrop gage and the stage at the remnant levee breach. This relationship was derived from hydraulic model-computed data. It was used to translate the estimated stage at the Lathrop gage from step 1 to the remnant levee breach location.

A chronological plot of the Vernalis mean daily flow for the evaluation period of record is provided in **Appendix B** (Figures 1 and 2). Also indicated on these figures are the Mitigation Site flooding thresholds for each of the breach invert elevations.

Groundwater Hydrology

The groundwater basin at the Mitigation Site is within the Delta subregion, a part of the Central Valley aquifer system. Within this basin, the San Joaquin River divides the Tracy Subbasin to the west and the San Joaquin Subbasin to the east. Most of the fresh groundwater is unconfined (i.e., not bounded by an impermeable or less permeable confining geologic formation) and occurs at depths of less than 2,500 feet (DWR 2006:169–170). The shallower aquifers are used as sources of freshwater. Groundwater levels in the Mitigation Site generally are very shallow because of the low elevation and proximity to the San Joaquin River channel. High groundwater levels can be influenced by the water level in the river, subsurface groundwater flow from areas of higher elevation to the east, and local irrigation practices.

VEGETATION AND SENSITIVE HABITATS

Vegetation and land cover types within the Mitigation Site include remnant Great Valley cottonwood riparian forest, ruderal, and developed (i.e., the levee road) (**Exhibit 4b**). Relative to the dense riparian forest that once flanked the San Joaquin River in this reach, the community today consists of linear areas and occasional remnant patches of riparian forest and related riparian scrub that grow at the water's edge, outside of the levee maintenance zone. The waterside edge of the Mitigation Site consists of rip-rap along the southern half of the San Joaquin east levee and patchy remnant Great Valley cottonwood riparian forest and Great Valley riparian scrub along the northern half of the levee. Areas directly upslope of the rip-rap, along the levee slopes, and within the setback are dominated by ruderal vegetation. Beyond the base of the levees on the landside, there is a small isolated patch of remnant riparian vegetation.

Most of the Great Valley cottonwood riparian forest community could also be characterized as Great Valley riparian scrub, which does not include Fremont cottonwood and is characterized by a shorter canopy and more uniform structure; however, this habitat is part of the Great Valley cottonwood riparian forest that was extensive and connected along this entire reach of the San Joaquin River. Therefore, this document describes all riparian habitat as Great Valley cottonwood riparian forest community. Remnant patches of Great Valley cottonwood riparian forest within the Mitigation Site are dominated by large Fremont cottonwood (*Populus fremontii*) trees and Goodding's willow (*Salix gooddingii*~~*i*~~). Most of the otherwise linear or smaller patchy areas of this community lack Fremont cottonwood and are represented by Goodding's willow, arroyo willow (*S. lasiolepis*), narrow leaved-willow (*S. exigua*), and scattered valley oak (*Quercus lobata*), Oregon ash (*Fraxinus* latifolia), and buttonbush (*Cephalanthus occidentalis*). Native ground cover species, mainly found in the larger remnant patches of riparian forest, include California blackberry and wild rose. Common nonnative understory species found in most elements include Himalayan blackberry (*Rubus discolor*) and tree tobacco (*Nicotina glauca*).

Ruderal vegetation is characterized by nonnative weedy and sometimes invasive vegetation and nonnative annual grasses. Common weed species include yellow star-thistle (*Centaurea solstitialis*), black mustard (*Brassica nigra*), shortpod mustard (*Hirschfeldia incana*), Italian thistle (*Carduus pycnocephalus*), milk thistle (*Silybum marianum*), and Himalayan blackberry; common grass species include ripgut brome (*Bromus diandrus*), foxtail barley (*Hordeum murinum* ssp. *leporinum*), Bermuda grass (*Cynodon dactylon*), and Johnsongrass (*Sorghum halepense*).

SPECIAL-STATUS SPECIES

Special-status Plant Species

Of the 18 special-status plant species that were evaluated for their potential to occur in the Phase 3 Repair Project area, five were identified with potential to occur within the Mitigation Site (**Table 8**).

Table 8
Special-Status Plant Species with Potential to Occur in the Element IVc Mitigation Site

Species	Status[1]	Habitat	Potential for Occurrence[2]
Slough thistle *Cirsium crassicaule*	CRPR: 2	Freshwater marsh, riparian scrub, chenopod scrub, along sloughs and riverbanks	Unlikely to occur in low-quality freshwater marsh habitat; last recorded in 1933 near San Joaquin River-Old River confluence, not confirmed in subsequent 1974 surveys; thought to be possibly extirpated
Delta button celery *Eryngium racemosum*	CRPR: 1B State: E	Freshwater and brackish marshes, riparian scrub, tidal zones in mud or silt soil	Unlikely to occur in low-quality freshwater marsh habitat; 1892 and 1913 herbarium records are only source of occurrences (near San Joaquin River and I-5 crossing); thought to be possibly extirpated
Sanford's arrowhead *Sagittaria sanfordii*	CRPR: 1B	Freshwater ponds, marshes and ditches	Unlikely to occur in low-quality freshwater marsh habitat; last recorded in 1901 at an unknown location near the City of Stockton
Suisun marsh aster *Symphyotrichum lentum*	CRPR: 1B	Freshwater and brackish marshes and sloughs	Unlikely to occur in low-quality freshwater marsh habitat; 1892 (near City of Lathrop) and 1920 (near town of Banta) herbarium records are only source of occurrences
Wright's trichocoronis *Trichocoronis wrightii* var. *wrightii*	CRPR: 2	Freshwater marshes and swamps, riparian woodlands	Unlikely to occur in low-quality freshwater marsh habitat; herbarium records from 1892 to 1914 are only source of occurrences (near San Joaquin River and I-5 crossing)

Table 8
Special-Status Plant Species with Potential to Occur in the Element IVc Mitigation Site

Species	Status[1]	Habitat	Potential for Occurrence[2]

[1] Legal Status Definitions
California Department of Fish and Wildlife State Listing Categories
E Endangered (legally protected)
CRPR California Rare Plant Ranking
CRPR Categories
1B Plant species considered rare or endangered in California and elsewhere (but not legally protected under the federal or California Endangered Species Acts
2 Plant species considered rare or endangered in California but more common elsewhere (but not legally protected under the federal or California Endangered Species Acts)

[2] Potential for Occurrence Definitions
Unlikely to occur: Potentially suitable habitat present but species unlikely to be present on the project site because of current status of the species, poor quality of available habitat, and/or very restricted distribution
Could occur: Suitable habitat is available at the project site; however, few or no other indicators show that the species may be present
Likely to occur: Habitat conditions, behavior of the species, known occurrences in the project vicinity, or other factors indicate a relatively high likelihood that the species would occur at the project site
Known to occur: The species, or evidence of its presence, was observed at the project site during reconnaissance-level surveys or was reported by others

Sources: CNPS 2014; CNDDB 2014; USFWS 2014; Hickman 1993; data compiled by AECOM in 2014, and revised by GEI Consultants, Inc. in 2016

Three of these species were identified from documented California Natural Diversity Database (CNDDB) (CNDDB 2014) occurrences within a 2-mile radius of the Mitigation Site: Delta button celery (*Eryngium racemosum*), Wright's trichocoronis (*Trichocoronis wrightii* var. *wrightii*), and slough thistle (*Cirsium crassicaule*). Two additional species occurrences were identified from California Rare Plant Rank (CRPR) Inventory (CNPS 2014) within the Lathrop USGS 7.5-minute quadrangles, which contains the Mitigation Site: Suisun marsh aster (*Symphyotrichum lentum*) and Sanford's arrowhead (*Sagittaria sanfordii*). A search of the USFWS endangered species database for these USGS quadrangles produced no additional special-status plant species (USFWS 2014). **Table 6** lists each special-status plant species along with its regulatory, CRPR, or San Joaquin Multi-Species Habitat Conservation and Open Space Plan (SJMSCP) listing and CRPR status, its habitat requirements, and information related to each species' potential to occur in the Mitigation Site. All five special-status species are unlikely to occur because of the low-quality habitat found within the Mitigation Site; however, because the species could occur in freshwater marsh or riparian habitat along the San Joaquin River, their potential to occur in similar habitats within the Mitigation Site cannot be completely ruled out.

Special-status Wildlife Species

A total of 13 special-status wildlife species are known to occur or were evaluated for their potential to occur in the Phase 3 Repair Project area. Six of these species were documented from CNDDB (2014) occurrences within a 2-mile radius of the Phase 3 Repair Project area and from the CNDDB occurrences within the Lathrop USGS 7.5-minute quadrangle. Seven additional species were added based on a review of existing environmental documents, their coverage under the SJMSCP, and their potential to occur in habitats similar to those found within or adjacent to the Mitigation Site. A search of the USFWS endangered species database did not produce any additional special-status wildlife species (USFWS 2016).

Four of these species are Federally-listed or State-listed as threatened or endangered: VELB, Swainson's hawk (*Buteo swainsoni*), California tiger salamander (*Ambystoma californiense*), and riparian brush rabbit. The remaining species are California Species of Special Concern. **Table 9** summarizes the regulatory listing status, including coverage in the SJMSCP for each species, as well as their habitat requirements and the potential for them to occur in or adjacent to the Mitigation Site.

There is no designated critical habitat for special-status wildlife within or adjacent to the Mitigation Site.

Table 9 Special-Status Wildlife Species with Potential to Occur in the Element IVc Mitigation Site Area			
Species	**Status**	**Habitat**	**Potential for Occurrence**
Invertebrates			
Vernal pool fairy shrimp *Branchinecta lynchii*	Federal: T	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present within the Mitigation Site.
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	Federal: T	Inhabits elderberry shrubs, primarily in riparian woodland and scrub habitat	Known to occur; elderberry shrubs present occasionally along San Joaquin River on the waterside and landside of the levee in and adjacent to the Mitigation Site.
Vernal pool tadpole shrimp *Lepidurus packardi*	Federal: E	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present within the Mitigation Site.
Amphibians and Reptiles			
California tiger salamander *Ambystoma californiense*	Federal: T State: T	Winter: breeds in vernal pools and stock ponds that are fish-free and inundated for a minimum of 12 weeks; Summer: aestivates in rodent borrows in grassland habitat	No potential to occur. No suitable habitat is present within the Mitigation Site.
Northwestern pond turtle *Actinemys marmorata marmorata*	State: SSC	Ponds, marshes, rivers, streams, sloughs; nest in nearby uplands with suitable soils	Could occur; suitable habitat is present in backwater areas of the adjacent San Joaquin River.
California red-legged frog *Rana draytonii (=R. aurora draytonii)*	Federal: T State: SSC	Prefers semi-permanent and permanent stream pools, ponds, and creeks with emergent riparian vegetation and typically without predatory fish. Requires adequate hibernacula such as small-mammal burrows and moist leaf litter.	No potential to occur. No suitable habitat is present within the Mitigation Site.
Reptiles			
Giant garter snake *Thamnophis gigas*	Federal: T State: T	Streams, sloughs, ponds, and irrigation/drainage ditches; also requires upland refugia not subject to flooding during the snake's inactive season.	No potential to occur. No suitable habitat is present within the Mitigation Site.
Birds			
Tricolored blackbird *Agelaius tricolor*	State: SSC	Nests in dense cattails and tules, riparian scrub, and other low, dense vegetation; forages in grasslands and agricultural fields	Unlikely to occur; foraging habitat present in adjacent areas, but nesting is not expected because of low-quality habitat; closest nesting colony is approximately 3 miles southeast of the Mitigation Site along Yosemite Avenue in large area of giant reed with no water.
Burrowing owl *Athene cunicularia*	State: SSC	Nests and forages in grasslands, shrublands, and agricultural fields, especially where ground squirrel or other mammal burrows are present	Could occur; suitable foraging and nesting habitat present in adjacent areas; but no occurrences are documented in the Phase 3 Repair Project area or Mitigation Site.
Swainson's hawk *Buteo swainsoni*	State: T	Nests in riparian woodlands and isolated trees; forages in grasslands, shrublands, and agricultural fields	Known to occur; suitable foraging habitat and nesting habitat present in and adjacent to the Mitigation Site.

Table 9 Special-Status Wildlife Species with Potential to Occur in the Element IVc Mitigation Site Area			
Species	**Status**	**Habitat**	**Potential for Occurrence**
Northern harrier *Circus cyanus*	State: SSC	Nests and forages in a variety of open habitats, including marshes, grasslands, shrublands, and agricultural fields	Could occur; suitable foraging and nesting habitat present in and adjacent to the Mitigation Site.
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	Federal: T	Insect-feeder that forages in dense riparian oak forest canopy along major rivers. Species is considered extirpated from San Joaquin County.	Unlikely to occur. Although potential dispersal and foraging habitat is in the Mitigation Site is outside of the species' extant range.
White-tailed kite *Elanus leucurus*	State: FP	Nests in woodlands and isolated trees; forages in grasslands, shrublands, and agricultural fields	Could occur; suitable foraging and nesting habitat present in and adjacent to the Mitigation Site.
Song sparrow (Modesto population) *Melospiza melodia*	State: SSC	Nests in emergent freshwater marshes and riparian forests with dense understory	Could occur; suitable foraging and nesting habitat present; but no occurrences are documented in the Mitigation Site.
Least Bell's vireo *Vireo bellii pusillus*	Federal: E	Nests in riparian habitat adjacent to riverine and freshwater marsh.	Unlikely to occur. Although suitable habitat is present, the last recorded observation of this species in the action area was in 1878, with no extant occurrences.
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	State: SSC	Nests in freshwater wetlands with dense vegetation and deep water, often along borders of lakes and ponds and where large insects are abundant	Unlikely to occur; 1894 museum collection record from Lathrop area is only occurrence data.
Mammals			
Riparian brush rabbit *Sylvilagus bachmani riparius*	Federal: E State: E	Inhabits riparian forest with dense understory	Known to occur; occupied riparian habitat is present on the waterside of Elements IIIa and IIIb just north of the Mitigation Site; also known to occur on an oxbow south of the Mitigation Site between Elements VIa.1 and VIa.4.
Western mastiff bat *Eumops perotis californicus*	State: SSC	Wide variety of habitats; roosts primarily in crevices on cliff faces and boulders but occasionally in old buildings	Could occur; suitable foraging habitat present, but no potential roost sites.
Red bat *Lasiurus blossevillii*	State: SSC	Wooded areas at lower elevations; typically roosts in snags and riparian trees with moderately dense canopies	Could occur; suitable foraging and roosting habitat present.
Yuma myotis bat *Lasiurus blossevillii*	State: SSC	Variety of habitats at low to mid elevations; roosts in buildings, trees, mines, caves, bridges, and rock crevices	Could occur; suitable foraging and roosting habitat present.

Table 9
Special-Status Wildlife Species with Potential to Occur in the Element IVc Mitigation Site Area

Species	Status	Habitat	Potential for Occurrence

[1] Legal Status Definitions:
Federal—U.S. Fish and Wildlife Service
E Endangered (legally protected)
T Threatened (legally protected)

State—California Department of Fish and Wildlife
E Endangered (legally protected)
T Threatened (legally protected)
FP Fully Protected (legally protected, no take allowed)
SSC California Species of Special Concern (no formal protection)

[2] Potential for Occurrence Definitions:
Unlikely to occur: Potentially suitable habitat present but species unlikely to be present on the project site because of current status of the species and very restricted distribution.
Could occur: Suitable habitat is available at the project site; however, few or no other indicators show that the species may be present.
Likely to occur: Habitat conditions, behavior of the species, known occurrences in the project vicinity, or other factors indicate a relatively high likelihood that the species would occur at the project site.
Known to occur: The species, or evidence of its presence, was observed at the project site during reconnaissance-level surveys or was reported by others.

Sources: CNDDB 2014; USFWS 2014, 2016; data compiled by AECOM in 2014 and revised by GEI Consultants, Inc. in 2016

Special-Status Fish Species

A total of ten special-status fish species occur or have the potential to occur in the San Joaquin River near the Mitigation Site. Of the 10 species, Central Valley steelhead distinct population segment (DPS) (*Oncorhynchus mykiss)*, Central Valley spring-run Chinook salmon evolutionary significant unit (ESU) (*O. tshawytscha)*, Sacramento River winter-run Chinook salmon ESU (*O. tshawytscha)*, southern DPS of North American green sturgeon (*Acipenser medirostris)*, and Delta smelt (*Hypomesus transpacificus*) are Federally listed as threatened or endangered species. The USFWS delisted Sacramento splittail (*Pogonichthys macrolepidotus*) from its Federally threatened status on September 22, 2003; however, the listing status is currently being reviewed under court order. Longfin smelt (*Spirinchus thaleichthys*) is listed as threatened under the California Endangered Species Act. The National Marine Fisheries Service (NMFS) determined that listing is not warranted for Central Valley fall-/late fall-run Chinook salmon ESU (*O. tshawytscha)*; however, it is still designated as a species of concern because of concerns over specific risk factors. The two remaining species, San Joaquin roach (*Lavinia symmetricus* sp.) and hardhead (*Mylopharodon conocephalus*), are considered Species of Special Concern by the California Department of Fish and Wildlife. **Table 10** summarizes the regulatory listing status, habitat requirements, and the potential for occurrence for special-status fish species.

Table 10
Special-Status Fish Species Potentially Occurring in the San Joaquin River

Species	Status [1]		Habitat	Potential to Occur in the lower San Joaquin River
	USFWS/ NMFS	CDFW		
Central Valley steelhead *Oncorhynchus mykiss*	T	--	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento and San Joaquin Rivers, tributaries, and Delta. Occurs seasonally in the San Joaquin River in the project vicinity.
Central Valley fall-/ late fall–run Chinook salmon *Oncorhynchus tshawytscha*	SC	SSC	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento and San Joaquin Rivers, tributaries, and Delta. Occurs seasonally in the San Joaquin River in the project vicinity.
Sacramento River winter-run Chinook salmon *Oncorhynchus tshawytscha*	E	E	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento River, tributaries, and Delta. Unlikely to occur in the San Joaquin River in the project vicinity; however, occasional adult and/or juvenile strays may be present.

Table 10
Special-Status Fish Species Potentially Occurring in the San Joaquin River

Species	Status [1] USFWS/ NMFS	Status [1] CDFW	Habitat	Potential to Occur in the lower San Joaquin River
Central Valley spring-run Chinook salmon *Oncorhynchus tshawytscha*	T	T	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento River, tributaries, and Delta. Unlikely to occur in the San Joaquin River in the project vicinity; however, occasional adult and/or juvenile strays may be present.
Green sturgeon *Acipenser medirostris*	T	--	Rears seasonally inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento and San Joaquin Rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
Delta smelt *Hypomesus transpacificus*	T	T	Spawns in tidally influenced freshwater wetlands and seasonally submerged uplands; rears seasonally inundated floodplains, tidal marsh, and Delta.	Occurs in tidally influenced segments of the Sacramento and San Joaquin Rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
Longfin smelt *Spirinchus thaleichthys*	–C/PT	T	Spawns in tidally influenced freshwater wetlands and seasonally submerged uplands; rears seasonally inundated floodplains, tidal marsh, and Delta.	Occurs in tidally influenced segments of the Sacramento and San Joaquin Rivers, tributaries, and Delta downstream from the project area. Unlikely to occur in the San Joaquin River in the project vicinity.
Sacramento splittail *Pogonichthys macrolepidotus*	DT	SSC	Spawning and juvenile rearing from winter to early summer in shallow weedy areas inundated during seasonal flooding in the lower reaches and flood bypasses of the Sacramento River including the Yolo Bypass.	Occurs in the Sacramento and San Joaquin Rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
Hardhead *Mylopharodon conocephalus*	--	SSC	Spawning occurs in pools and side pools of rivers and creeks; juveniles rear in pools of rivers and creeks, and shallow to deeper water of lakes and reservoirs.	Occurs in the Sacramento and San Joaquin Rivers, tributaries, and Delta. Has potential to occur in the San Joaquin River in the project vicinity.
San Joaquin roach *Lavinia symmetricus* sp.	--	SSC	Spawning occurs in pools and side pools of small rivers and creeks; juveniles rear in pools of small rivers and creeks.	Occurs in tributaries to the Sacramento and San Joaquin Rivers. Not likely to occur in the San Joaquin River in the project vicinity.

Notes: CDFW – California Department of Fish and Wildlife; NMFS – National Marine Fisheries Service; USFWS – U.S. Fish and Wildlife Service

Legal Status Definitions

Federal Listing Categories (USFWS & NMFS)
- C Candidate (no formal protection)
- E Endangered (legally protected)
- PT Proposed threatened
- T Threatened (legally protected)
- DT Delisted from threatened status (potential to be relisted)
- SC Species of Concern

State Listing Categories (CDFW)
- E Endangered (legally protected)
- T Threatened (legally protected)
- SSC California Species of Special Concern (no formal protection)

Source: Moyle 2002; data compiled by AECOM in 2010 and revised by GEI Consultants, Inc. in 2016

The lower San Joaquin River serves as a migration corridor and/or provides other types of habitat (e.g., rearing, spawning) for Central Valley fall-/late fall-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU, Sacramento River winter-run Chinook salmon ESU, Central Valley steelhead DPS, Delta smelt, Sacramento splittail, white sturgeon (*Acipenser transmontanus*), and North American green sturgeon.

The San Joaquin River adjacent to the Mitigation Site has been designated as critical habitat for Delta smelt, Central Valley steelhead, and the Southern DPS of North American green sturgeon.

JURISDICTIONAL DETERMINATION

Wetland delineations for the RD 17 Phase 3 Repair Project were conducted at multiple times to address project footprint changes and revisions to ensure the project design meets current USACE standards. The delineations were conduction on November 3, 2009, December 21, 2009, July 1, 2010, and again on February 13, 2014 (AECOM 2009a, 2009b, 2010, and 2014). The USACE issued Preliminary Jurisdictional Determinations for the project on November 10, 2009, April 9, 2010, October 21, 2010, and again on April 7, 2014.

No jurisdictional waters or wetlands were identified within the footprint for Element IVc. A delineation of the ordinary high water mark (OHWM) along the San Joaquin River was completed at Element IVc to address work on the waterside of the levee. The verified OHWM corresponds to approximately 4.7 feet in surface elevation. **Exhibit 8** shows the OHWM within Element IVc.

CULTURAL RESOURCES

There were no cultural resources identified within or adjacent to Element IVc.

REFERENCE SITE

A reference site serves as a template or model for restoration planning. It can be used for development of design characteristics and is used during the monitoring period to provide a yardstick for comparison and also to compare occurrences of variation due to natural events. It is anticipated that the Oxbow Preserve, owned and managed by the Center for Natural Lands Management, will be used as the reference site. The Oxbow Preserve is located on the right bank of the San Joaquin River at RM 55, just south of the Mitigation Site. The Oxbow Preserve was established in 2004 as mitigation for an adjacent development in Lathrop, CA. A baseline description of this site will be included in the Final MMP.

MITIGATION WORK PLAN

MITIGATION DESIGN

The design of the Mitigation Site is based on research, field visits, hydrologic investigations, consultation with the regulatory agencies and local authorities and consideration of the regional biological resources.

SPECIES ACCOUNTS AND DESIGN GUIDELINES

Detailed species accounts and relevant design guidelines for the Mitigation Site for riparian brush rabbit and VELB will be included in the Final MMP.

SCHEDULE AND SEQUENCE

A proposed schedule for the mitigation implementation is provided in **Table 11** below. Project implementation is dependent on receipt of all regulatory approvals and permits. Thus, it is subject to change.

Table 11
Anticipated Mitigation Implementation Schedule for Element IVc Mitigation Site

Date	Activity
Early Spring 2018	Plant Procurement
Early Summer 2018	Grading Contract Mobilization (part of larger levee construction contract) and Site Preparation
Summer 2018	Earthwork: topsoil salvage and storage, grading (with the exception of the levee breach), and topsoil placement, best management practices for erosion control.
Late Summer 2018	Grading Completion
Late Summer 2019	Setback Levee Accreditation[1]
Late Summer/Early Fall 2019	Breach Remnant Levee
Late Summer/Early Fall 2019	Site Soil Preparation and Amendment for Planting
Fall 2019	Planting: container plants, cuttings, seeding and mulching
Fall 2019	Irrigation System Installation
Fall 2019	Planting Completion: remove construction debris; site walk-through and acceptance with the contractor; complete and submit as-built drawings
December 2019 – December 2022	Maintenance Period: weed control, irrigation, caging and fencing maintenance, and re-planting as needed
January 2022	Maintenance Close-out: final as-built submittal
January 2020-December 2024	5-year Monitoring and Reporting Period
Winter/Early Spring 2025	Agency Sign-off and Transfer to Long-term Maintenance

Notes:
[1] The remnant levee cannot be breached until the new setback levee has been accredited. It is anticipated that the new levee will be accredited one year after construction.
Source: Data compiled by GEI Consultants, Inc. in 2016

CONSTRUCTION METHODS

The setback levee would be constructed as part of the larger Phase 3 Repair Project. After construction of the setback levee is completed, RD 17 must complete the levee accreditation process. Once this process is complete, the breach in the remnant levee, and planting would be completed. Earthwork within the Mitigation Site can be conducted concurrently with setback levee construction. Site preparation and planting within the setback area floodplain would be completed concurrently, or just after the levee breach for efficiency.

GRADING AND REMNANT LEVEE BREACH

Grading plans for the Mitigation Site are under development and will be provided in the Final MMP. As described above, grading and shaping of the Mitigation Site within the setback area can be completed concurrently with the setback levee construction and prior to breaching the remnant levee. The remnant levee breach shall be completed during the dry season to minimize the potential for erosion and sedimentation. Best management practices (BMPs) shall be implemented throughout the Mitigation Area during construction, especially downslope of potential construction-generated sediment source materials. Access routes for heavy equipment shall use the existing levee roads as much as possible or where necessary use the least potentially damaging route. Access points will be selected by the contractor in consultation with the restoration ecologist to ensure that sensitive riparian, woodland, and wetland resources are avoided.

DEMOLITION AND DEBRIS REMOVAL

During construction of the breach in the remnant levee, any associated debris will be removed from the Mitigation Site and disposed of properly. Any remaining gravel along the remnant levee crown road will be scraped and hauled off site. There are no other known items within the Mitigation Site boundaries that require demolition or removal. However, if additional items are identified during construction, they will be removed and properly disposed of offsite. Once planting is complete, any associated refuse will be removed by the contractor prior to site acceptance. During maintenance activities, any trash or debris will be removed and disposed of properly.

SOIL PREPARATION AND AMENDMENT

SOIL TESTING

Soil samples will be collected at the Mitigation Site prior to planting to assess soil fertility, texture, and structure. This soil testing will inform the need for soil amendment, preparation methods, and confirm that there are no site specific soil toxicity issues that may result in high plant mortality. To detect potential site variability, soil sample collection will be representative of all soil types and landforms within the Mitigation Site. A minimum of three samples will be collected from each unique location. Soil samples for fertility analysis will be collected using a clean soil probe. At the same locations, soil texture and structure will be assessed in the field using a larger soil pit dug to approximately 18–24 inches in depth. Within the Mitigation Site, it is anticipated that samples will be taken from the basin within the setback area, and from the slope and crown of the remnant levee. Approximately 9–12 samples will be collected and submitted to a qualified soil testing lab for analysis.

Based on fertility testing and field assessment results, soil amendment recommendations will be developed and included in the Final MMP. Recommendations to correct for pH or fertility issues, or to improve permeability will be included, if necessary.

SOIL STORAGE

Where grading is planned within the setback area at the Mitigation Site, the top 6 inches of soil and organic materials will be stripped and salvaged. Areas with heavy infestations of invasive species, as determined by a qualified restoration ecologist, will be avoided. In areas where fill is needed within the Mitigation Site, the interim grade will be set to 6 inches below finish grade. Salvaged topsoil will be incorporated to attain the finish grade. Topsoil will be stockpiled, minimizing handling and compaction to the greatest extent feasible. Topsoil will be stored dry; water application, if necessary for dust control, will be minimized to the extent feasible. If topsoil storage is necessary, it will be stored in narrow rows for up to three months. Storage piles should be protected using appropriate stormwater BMPs to avoid adverse impacts to water quality.

Soil Preparation

Detailed soil preparation methods will be provided in the Final MMP once soil analysis has been conducted at the Mitigation Site.

PLANTING AND SEEDING

Preliminary plant palettes for the Mitigation Site are provided below (**Tables 12a, 12b, 13a, 13b, and 13c**). Seeding application rates, container plant sizes and planting ratios will be provided in the Final MMP. The Final MMP will include detailed guidelines on: plant procurement, including maintaining genetic integrity and appropriate sources for plant materials; seeding and planting techniques, including harvesting and planting willow pole cuttings; and plant protection. The Final MMP will also include a detailed planting plan and irrigation plan. The irrigation plan will identify the water source and point of connection, and provide the irrigation layout for the Mitigation Site.

Plant Palettes

Plant palettes for seeding and container planting have been carefully chosen based on the current knowledge of Mitigation Site conditions, including soils, hydrologic regime, precipitation, proximity to the water table and habitat requirements for the riparian brush rabbit and VELB. As site design evolves, and additional site information is available (including the fertility soil testing results), the plant palettes may be modified for the Final MMP. Seed mixes for the Mitigation Site are presented in **Tables 12a and 12b**, and container plant palettes are presented in **Tables 13a, 13b, and 13c**.

Table 12a
Lower Floodplain Seed Mix

Common	Scientific Name	PLS Pounds / Acre
Annual hairgrass	*Dechampsia danthonioides*	TBD
Creeping wildrye	*Elymus triticoides*	TBD
Western goldenrod	*Euthamia occidentalis*	TBD
Stalked popcorn flower	*Plagiobothrys stipitatus*	TBD
Tomcat clover	*Trifolium willdenovii*	TBD
Total		**TBD**
Source: Data compiled by GEI Consultants, Inc. in 2016		

Table 12b
Upper Floodplain Seed Mix

Common	Scientific Name	PLS Pounds / Acre
Mugwort	*Artemisia douglasiana*	TBD
Creeping wildrye	*Elymus triticoides*	TBD
Tufted lovegrass	*Eragrostis pectinacea*	TBD
Cowbag clover	*Trifolium depauperatum*	TBD
Total		**TBD**
Source: Data compiled by GEI Consultants, Inc. in 2016		

Table 13 Floodplain Swale Planting Palette				
Species		**Container Size**	**Plant Spacing (feet on center)**	**% of Planting Palette**
Common Name	**Scientific Name**			
Herbaceous				
Common spike rush	*Eleocharis macrostachya*	plugs	TBD	TBD
Common bog rush	*Juncus effusus*	plugs	TBD	TBD
Source: Data compiled by GEI Consultants, Inc. in 2016				

Table 13b Great Valley Riparian Scrub Planting Palette				
Species		**Container Size****	**Plant Spacing (feet on center)**	**% of Planting Palette**
Common Name	**Scientific Name**			
Herbaceous				
Mugwort	*Artemisia douglasiana*	TBD	TBD	TBD
Santa Barbara sedge	*Carex barbarae*			
Creeping wildrye	*Elymus triticoides*	TBD	TBD	TBD
Gumplant	*Grindelia camporum*	TBD	TBD	TBD
Shrubs				
Common buttonbush	*Cephalanthus occidentalis*	TBD	TBD	TBD
California wild rose	*Rosa californica*	TBD	TBD	TBD
California blackberry	*Rubus ursinus*	TBD	TBD	TBD
Sandbar willow	*Salix exigua*	TBD	TBD	TBD
Vines				
California wild grape	*Vitus californica*	TBD	TBD	TBD
Trees				
Black willow	*Salix gooddingii*	TBD	TBD	TBD
Arroyo willow	*Salix lasiolepis*	TBD	TBD	TBD
Source: Data compiled by GEI Consultants, Inc. in 2016				

Table 13c Great Valley Valley Oak Riparian Forest – Upland Refugia Planting Palette				
Species		**Container Size***	**Spacing (feet on center)**	**% of Planting Palette**
Common Name	**Scientific Name**			
Herbaceous				
Mugwort	*Artemisia douglasiana*	TBD	TBD	TBD
Santa Barbara sedge	*Carex barbarae*	TBD	TBD	TBD
Creeping wildrye	*Elymus triticoides*	TBD	TBD	TBD
Shrubs				

Table 13c Great Valley Valley Oak Riparian Forest – Upland Refugia Planting Palette				
Coyote brush	*Baccharis pilularis*	TBD	TBD	TBD
Mule fat	*Baccharis salicifolia*	TBD	TBD	TBD
Golden current	*Ribes aureum*	TBD	TBD	TBD
California wild rose	*Rosa californica*	TBD	TBD	TBD
California blackberry	*Rubus ursinus*	TBD	TBD	TBD
Blue elderberry	*Sambuccas mexicana*	TBD	TBD	TBD
Trees				
Box elder		TBD	TBD	TBD
Fremont cottonwood	*Populus fremontii*	TBD	TBD	TBD
Valley oak	*Quercus lobata*	TBD	TBD	TBD
Arroyo willow	*Salix lasiolepis*	TBD	TBD	TBD
Source: Data compiled by GEI Consultants, Inc. in 2016				

OTHER HABITAT FEATURES

PROTECTIVE FENCING

Feral cats are common predators of the riparian brush rabbit. The close proximity of residential neighborhoods to riparian scrub habitat creates a source of potential predators. To reduce potential for feral or residential pet cats to enter the Mitigation Site, an exclusion fence will be installed on the western side of the new setback levee. The fencing location, design, and details will be included in the Final MMP. It is anticipated that the fence will be 6-foot high chain-link with a 2-foot 'floppy' overhang and steel posts. This type of fence has been proven to exclude feral cats effectively during experimental studies (Moseby and Read 2006).

RESOURCE PROTECTION MEASURES

Implementation at the Mitigation Site will follow the same resource protection measures identified in and required by regulatory authorizations for the Phase 3 Repair Project. All permit conditions and California Environmental Quality Act and National Environmental Policy Act mitigation measures related to pre-construction surveys, construction monitoring for protection of biological resources, cultural resources, and water quality will be followed.

IMPLEMENTATION BUDGET AND FUNDING

The Final MMP will include an itemized budget for mitigation implementation. The budget will include estimated costs for the following elements:

- Land acquisition
- Planning and engineering
- Legal fees
- Mobilization
- Construction
- Planting and irrigation
- Monitoring and reporting

MAINTENANCE AND MANAGEMENT

Maintenance during the establishment period of a mitigation site is a critical component for success. Conducting vegetation management at targeted times will reduce planting mortality, and ultimately reduce the cost of attaining required performance standards. The ultimate goal of the maintenance and vegetation management program is to establish a mitigation site that will be self-sustaining in perpetuity. By providing enough initial support to the mitigation plantings, the Mitigation Site can become a vigorous ecosystem that thrives without supplemental intervention.

A detailed maintenance and vegetation management plan for the Mitigation Site will be developed and provided in the Final MMP. RD 17 or RD 17's contractor will be responsible for implementing the maintenance program during the establishment period.

VEGETATION MANAGEMENT

Using an integrated pest management approach, vegetation management on the Mitigation Site will draw from a full spectrum of tools including the use of physical/mechanical, ecological, and/or chemical techniques to support establishment of mitigation plantings and reduction or suppression of non-native and/or invasive species. During Mitigation Site evaluation, a full list of current and potential invasive species will be recorded. The timing and frequency of the maintenance efforts will be based on the biology of the invasive species that require control. The vegetation management plan will account for all requirements in the VELB Guidelines (USFWS 1999), and protection of nesting birds and special-status species.

ADAPTIVE MANAGEMENT AND CONTINGENCY MEASURES

Using an adaptive approach is the cornerstone of an adequate management and monitoring program. Mitigation Site design is based on the best available science and a comprehensive ecological evaluation. However, over time, conditions can change, new information may become available, unanticipated factors may influence site conditions, a stochastic environmental event (e.g., fire) may occur, or the site may be vandalized. If this occurs, it is likely the Mitigation Site will fail to meet performance standards (as defined in the "Performance Standards, Monitoring and Reporting" section of this MMP). If this occurs, it would trigger evaluation and analysis of the problem, and assessment of the Mitigation Site design and/or management plan to develop corrective measures. If large-scale changes occur on the Mitigation Site that require unanticipated actions (e.g., site grading, large scale replanting, managing large-scale pest infestations, etc.), RD 17 will develop a recommended course of action and consult with USFWS and the other regulatory agencies prior to implementing those measures.

If performance standards are not met due to routine plant mortality or small-scale weed or pest infestations, RD 17 or its representative will analyze the cause(s) of failure, and implement remedial actions to correct the performance deficiency. RD 17 will summarize the analysis and the specific remedial actions taken to correct the identified deficiency in the annual monitoring report submitted to USFWS and the other regulatory agencies. If the Mitigation Site does not meet a final performance standard, RD 17's maintenance and monitoring obligations will continue until USFWS confirms in writing that RD 17 has met the required conditions.

PERFORMANCE STANDARDS, MONITORING, AND REPORTING

After the mitigation implementation effort is completed, the Mitigation Site will be monitored as defined below, or until the final performance standards are met.

ECOLOGICAL PERFORMANCE STANDARDS

The Final MMP will establish ecological performance standards for the Mitigation Site once the site design has been finalized. Performance standards will be established for canopy cover and plant survival. The final performance standards must be reached without remedial intervention (e.g., irrigation, greater than 20% replacement planting) for a minimum of 2 sequential years. Monitoring must continue until 2 sequential years of independence have been achieved.

MONITORING METHODS AND SCHEDULE

The Final MMP will provide detailed monitoring methods and a monitoring schedule for the Mitigation Site. It is anticipated that the monitoring period for the entire setback area will be a minimum of 5 years. Both quantitative and qualitative monitoring will be conducted at the Mitigation Site.

Qualitative monitoring will be conducted during each quantitative monitoring visit. Qualitative monitoring will provide an opportunity to document general plant health, overall plant community composition, hydrologic conditions, site damage, infestation of weeds, signs of excessive herbivory, erosion problems, and signs of human disturbance and vandalism. These criteria will be assessed and noted for use in adaptive management of the Mitigation Site. A list of all wildlife species observed will be compiled for the Mitigation Site during each monitoring visit.

Annual photo-documentation from fixed photo points will also be conducted. Selection of the photo points will provide appropriate views and orientation for a comprehensive assessment of the progress of the Mitigation Site.

It is anticipated that canopy cover within the Mitigation Site will be estimated using the line transect method. Permanent transects will be established using aerial photography. Approximately 10 transects, 150 feet in length, will be sampled. The height and width of the trees and shrubs along each transect will be recorded to provide supplemental information on site performance and species health.

Monitoring for the VELB elderberry seedlings and associate plantings will follow the VELB Conservation Guidelines (USFWS 1999). It is understood that the VELB Guidelines are currently under revision. If the revised guidelines become available during the monitoring period, monitoring methods for the remainder of the monitoring period will be adapted in accordance with these revisions to the extent feasible. However, the length of the monitoring period would not be extended.

MONITORING REPORTS

CONSTRUCTION COMPLETION REPORT AND AS-BUILTS

Within 60 days of completing mitigation implementation of the Mitigation Site, RD 17 will submit to USFWS and the other regulatory agencies a memo documenting major mitigation implementation milestone completion dates and as-built plans. If there were any substantial deviations from the original designs, a clear description of the modifications that were made and the rationale behind the changes will be provided.

If mitigation habitats are created in excess of that needed to mitigate for the Phase 3 Repair Project impacts, the acreage of these habitats will be recorded with the as-built drawings. Extra acreage will provide a contingency in the event of Phase 3 Repair Project changes that require additional mitigation acreage, or if portions of the mitigation components do not fulfill the performance standards.

ANNUAL MONITORING REPORTS

During the establishment and monitoring period, RD 17 will prepare an annual mitigation monitoring report that will be submitted to USFWS by March 30 following the monitoring year until the final performance standards have been met. The report will assess the attainment of or progress toward meeting the performance standards for the Mitigation Site.

The report will include the following relevant information:

- a list of individuals who conducted monitoring activities and prepared the monitoring report for that year, including titles and affiliations;
- maps of the Mitigation Site including: a vicinity map and a map that depicts established habitat types, photo-point locations, and monitoring transect locations;
- a summary and analysis of the monitoring data collected, including a qualitative assessment of site characteristics, functions, and services;
- a comparison of the monitoring results with performance standards;
- results of habitat monitoring for VELB in accordance with the VELB Guidelines (USFWS 1999);
- a list of target native plant and invasive weed species growing within the Mitigation Site;
- a description of actions for which regulatory agency notification or approval was not needed, but that were carried out during the year;
- discussion of and rationale for any substantial modifications made to monitoring methods;
- a description of actions for additional or modified adaptive management practices, as needed, for the next calendar year, that includes timing, and methods necessary to meet the performance standards within the establishment period; and
- a photo appendix documenting the conditions of the Mitigation Site; the photo appendix will include the location, date, and direction photo was taken.

Copies of all field data sheets will be available for regulatory agency review upon request.

COMPLETION OF MITIGATION RESPONSIBILITIES

RD 17 will notify USFWS and the other regulatory agencies through the annual monitoring report when the performance standards are met and the establishment period specified in the monitoring program is complete. It is recognized that USFWS and the other regulatory agencies may require visits to the Mitigation Site. With prior notification, USFWS may visit the Mitigation Site at any time to verify that project mitigation requirements have been completed. After verification, USFWS will provide RD 17 with written confirmation that they have met the required mitigation obligations and responsibilities.

LONG-TERM MANAGEMENT AND FUNDING

RD 17 is in the process of negotiating purchase of the Mitigation Site property. It is anticipated that RD 17 will own and manage the property in perpetuity. It is anticipated that the site will be protected as habitat in perpetuity using deed restrictions, a conservation easement, or similar preservation mechanism acceptable to USFWS. The Final MMP will identify the specific mechanism with which the site will be protected. A copy of the long-term preservation mechanism will be provided to USFWS and the other regulatory agencies.

LONG-TERM MANAGEMENT PLAN

A Long-term Management Plan (LTMP) will be developed for the Mitigation Site and submitted to USFWS and the other regulatory agencies prior to the start of construction. The LTMP will identify long-term management needs and other activities necessary to maintain the functions and values of the Mitigation Site. The LTMP will cover: general inspections and monitoring; signage; site maintenance including: fencing maintenance, vegetation management, managing trespass, trash removal, fire hazard reduction, and erosion control; and reporting. The LTMP will also address adaptive management measures that may be needed due to future changes as described under the "Adaptive Management and Contingency Measures" section above. Annual costs required to implement the long-term management and maintenance will be estimated and documented in the LTMP. The LTMP will take effect once the Mitigation Site has met required performance standards and mitigation responsibilities have been deemed as completed in accordance with USFWS and the other regulatory agencies.

FUNDING AND FINANCIAL ASSURANCES

RD 17 will be responsible for funding and implementing mitigation implementation and long-term management and monitoring. RD 17 will work with USFWS and the other regulatory agencies to identify an acceptable mechanism to fund long-term management and maintenance. The Final MMP will identify the funding mechanisms that will be put in place to provide adequate funds to manage and maintain the Mitigation Site in perpetuity.

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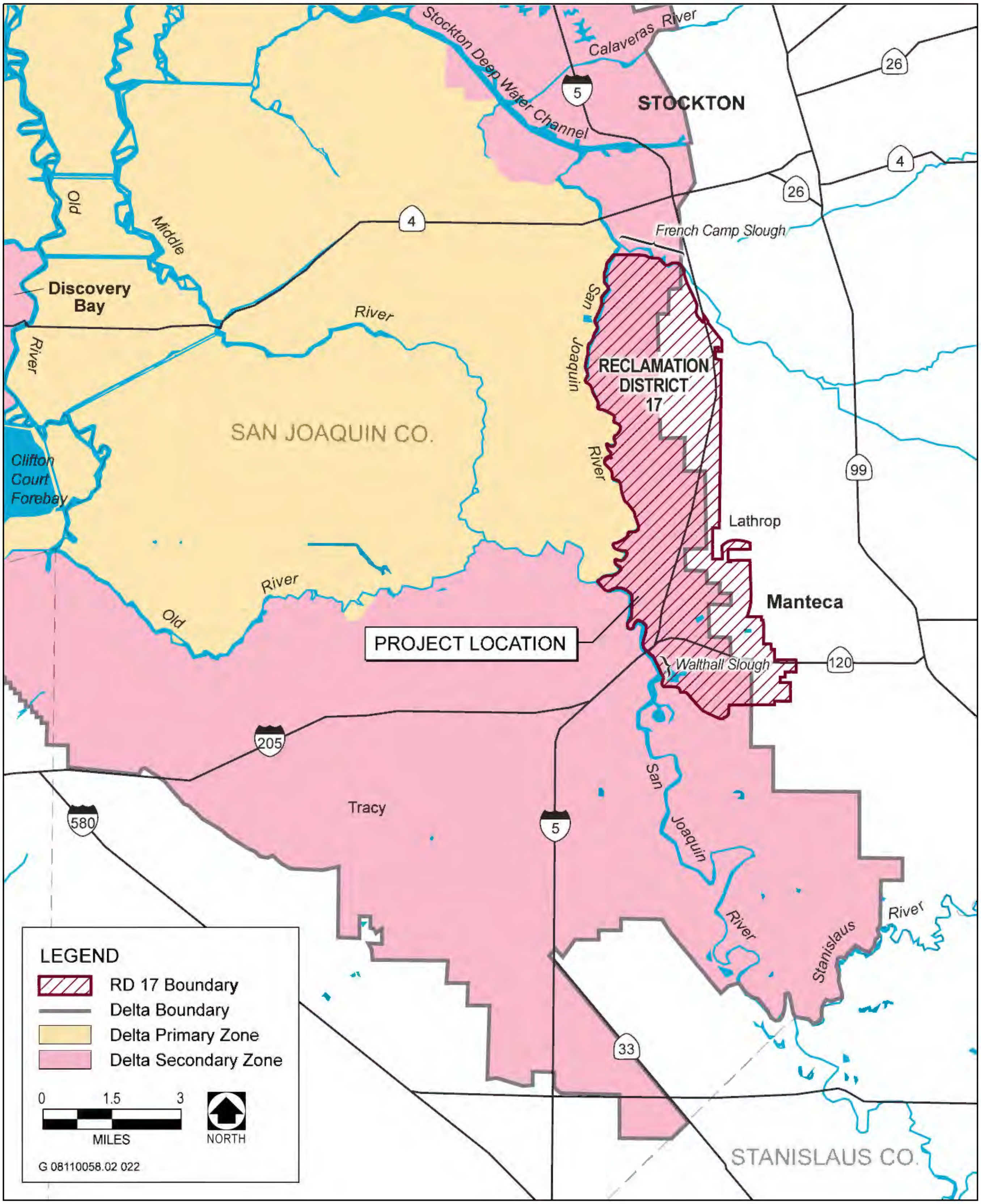
APPENDIX A

Exhibits



Source: DWR 1995, adapted by AECOM in 2010

Exhibit 1 **Project Vicinity and Boundaries of Reclamation District No. 17**

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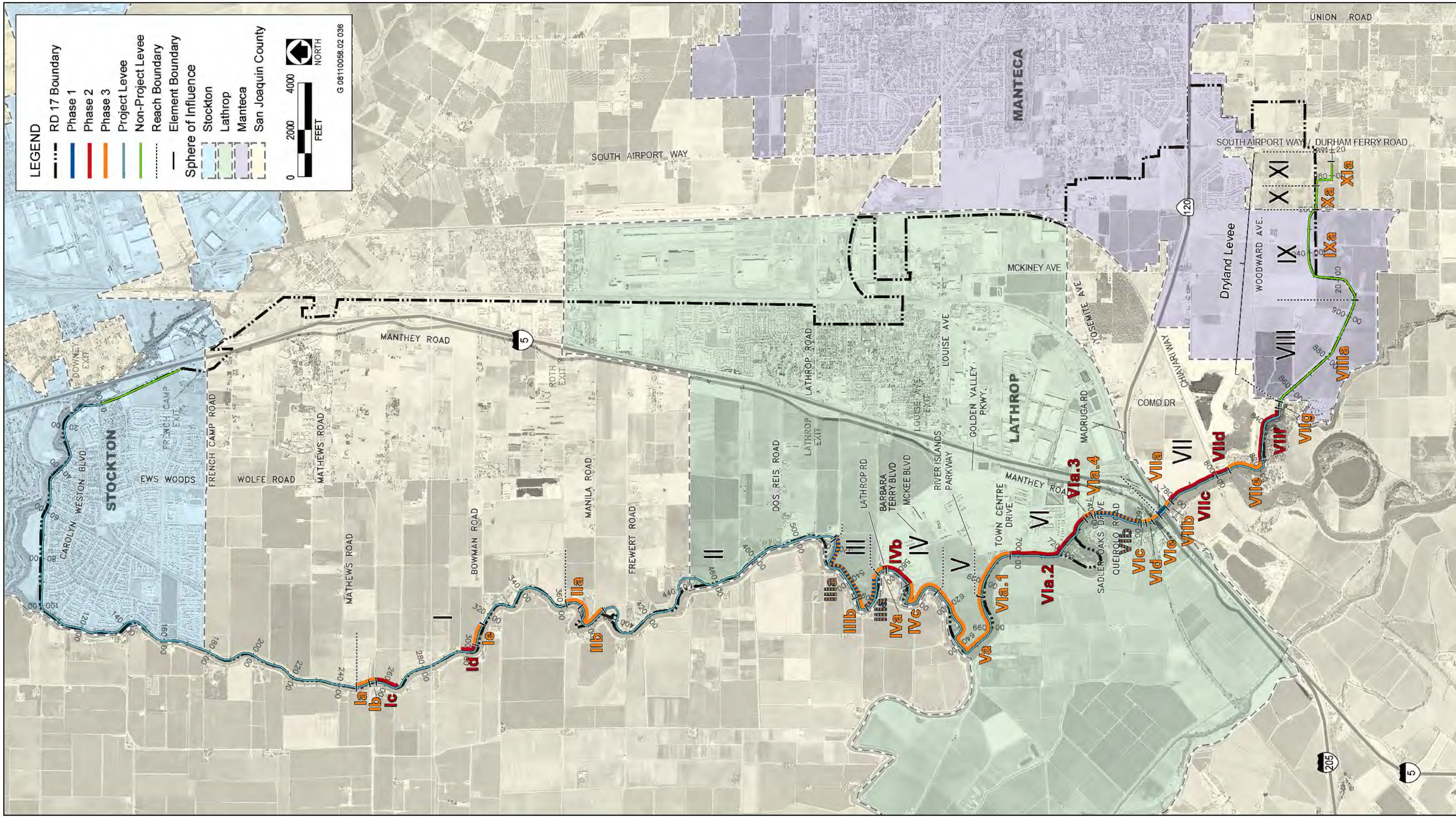
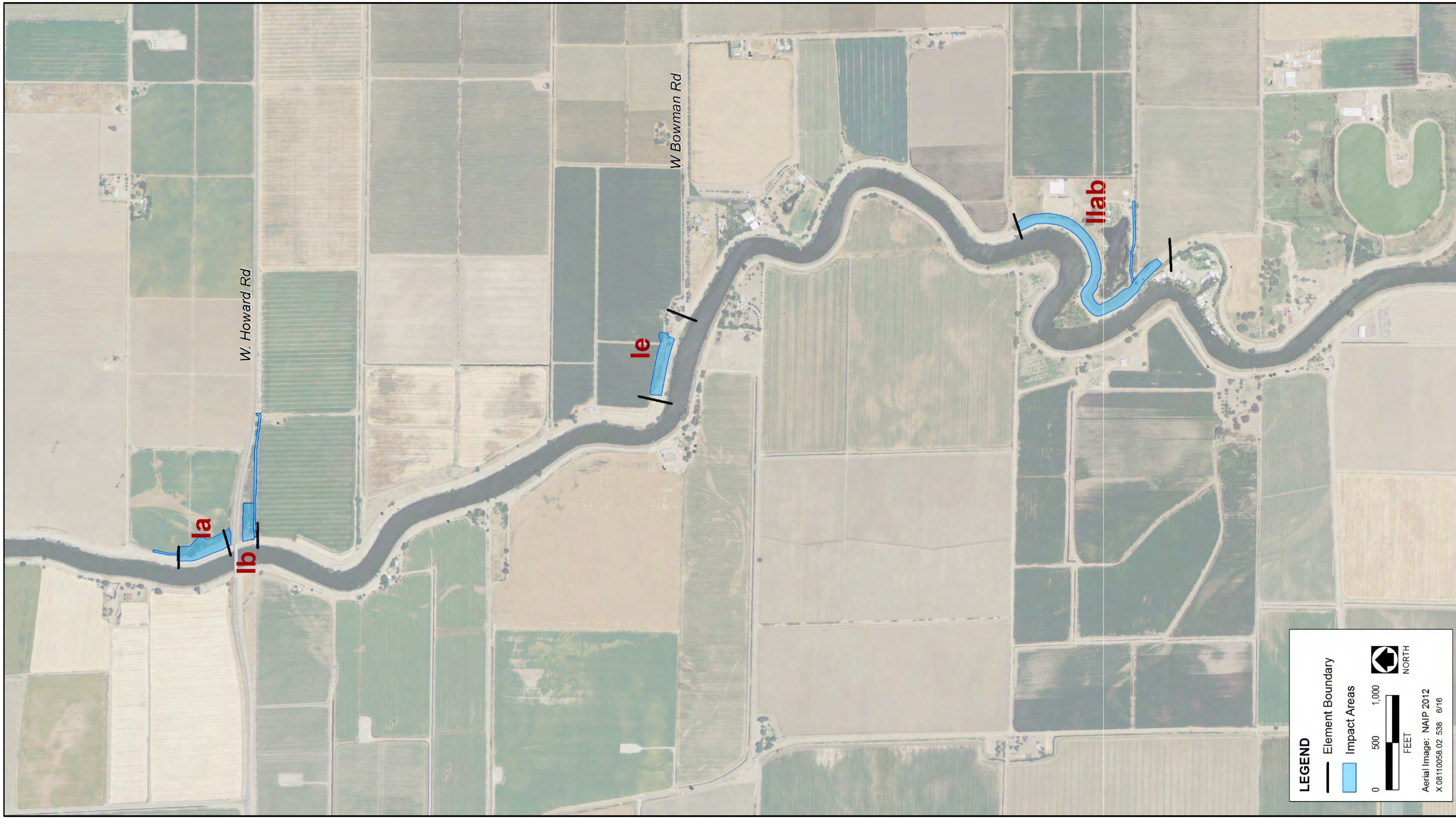


Sources: Data provided by Kjeldsen Sinnock Neudeck, ENGEO, and MacKay & Somps in 2010; adapted by AECOM in 2010

Exhibit 2

D 17 Levee System and Levee Seepage Repair Project Phases

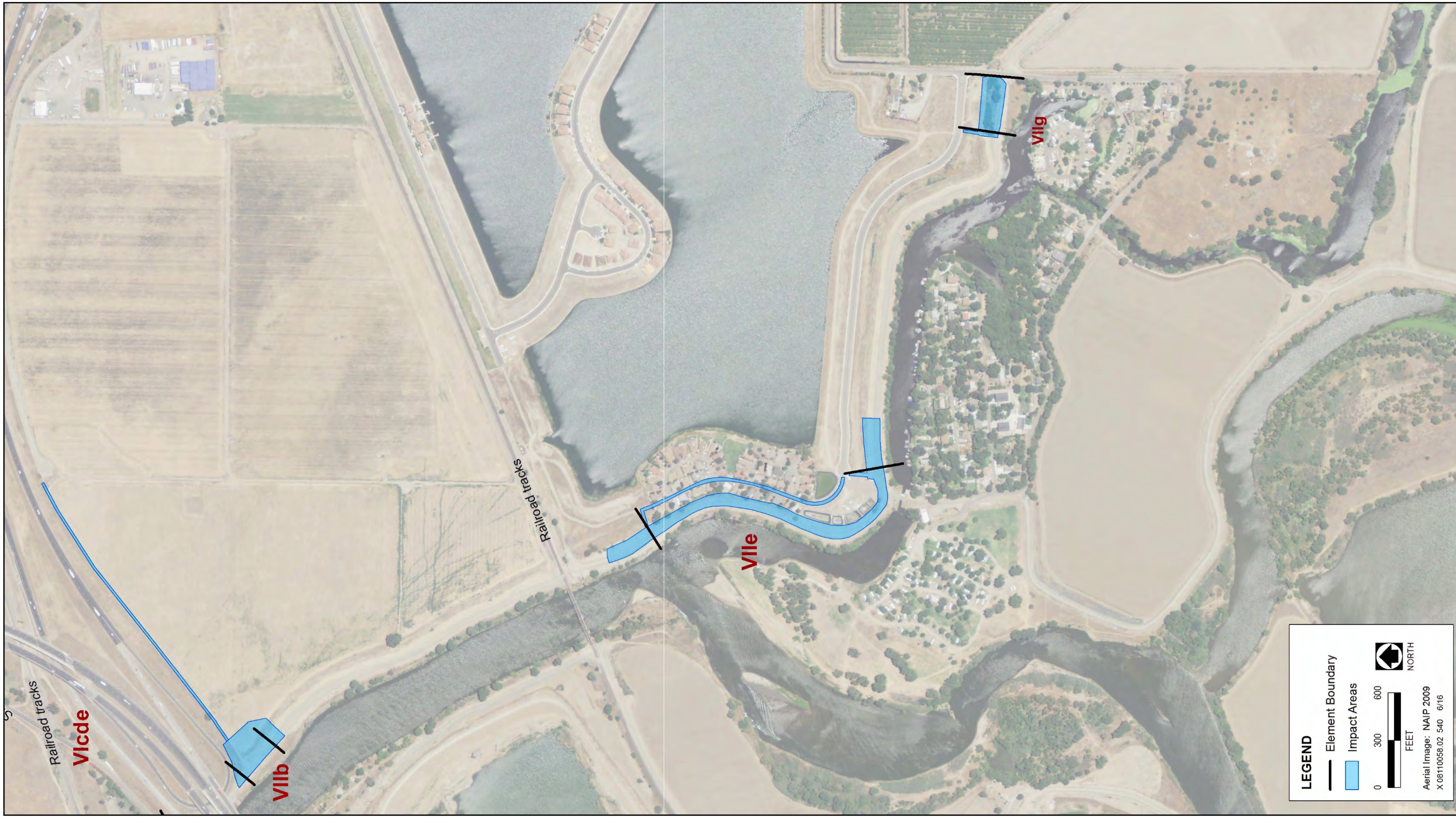


Sources: McKay and Somps 2014, AECOM 2014

Exhibit 3a **Overview of Phase 3 Repair Project**

Sources: McKay and Somps 2014, adapted by AECOM 2014

Exhibit 3b **Overview of Phase 3 Repair Project**



Sources: McKay and Somps 2014, adapted by AECOM 2014

Exhibit 3c **Overview of Phase 3 Repair Project**

Sources: McKay and Somps 2014, adapted by AECOM 2014

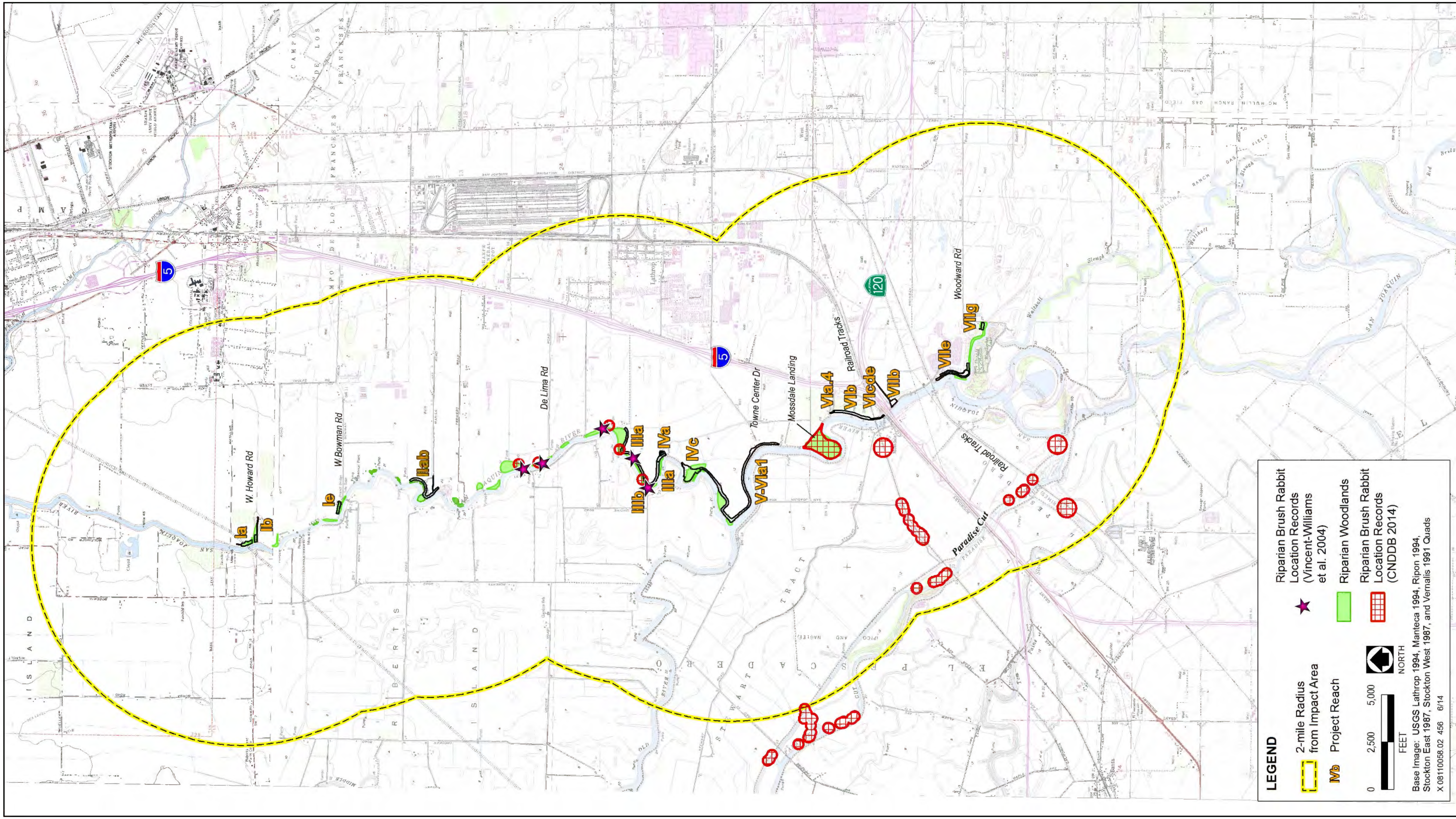
Exhibit 4a **Overview of Phase 3 Repair Project Land Cover Types**

Sources: McKay and Somps 2014, adapted by AECOM in 2014

Exhibit 4b **Overview of Phase 3 Repair Project Land Cover Types**

Sources: McKay and Somps 2014, adapted by AECOM in 2014

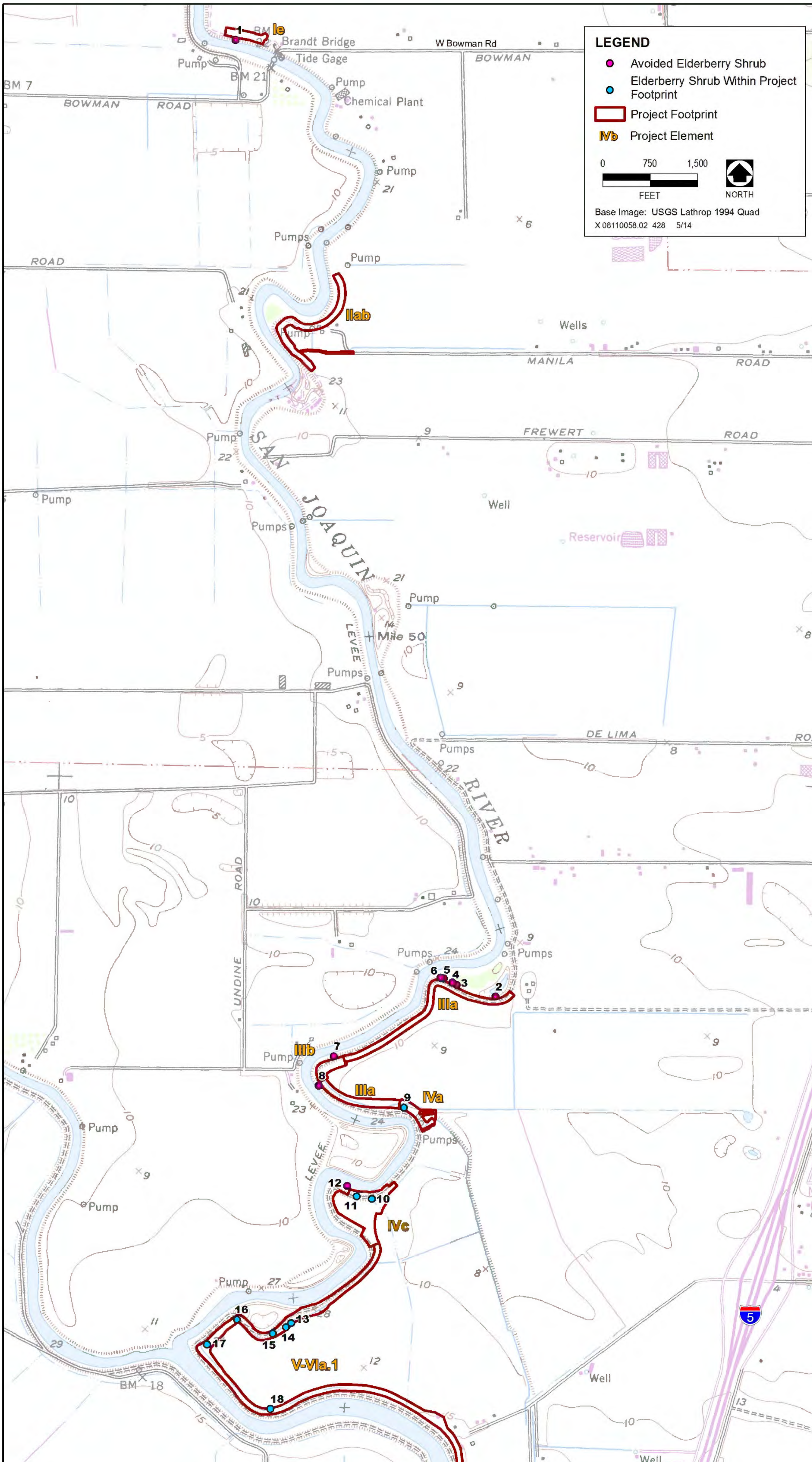
Exhibit 4c **Overview of Phase 3 Repair Project Land Cover Types**



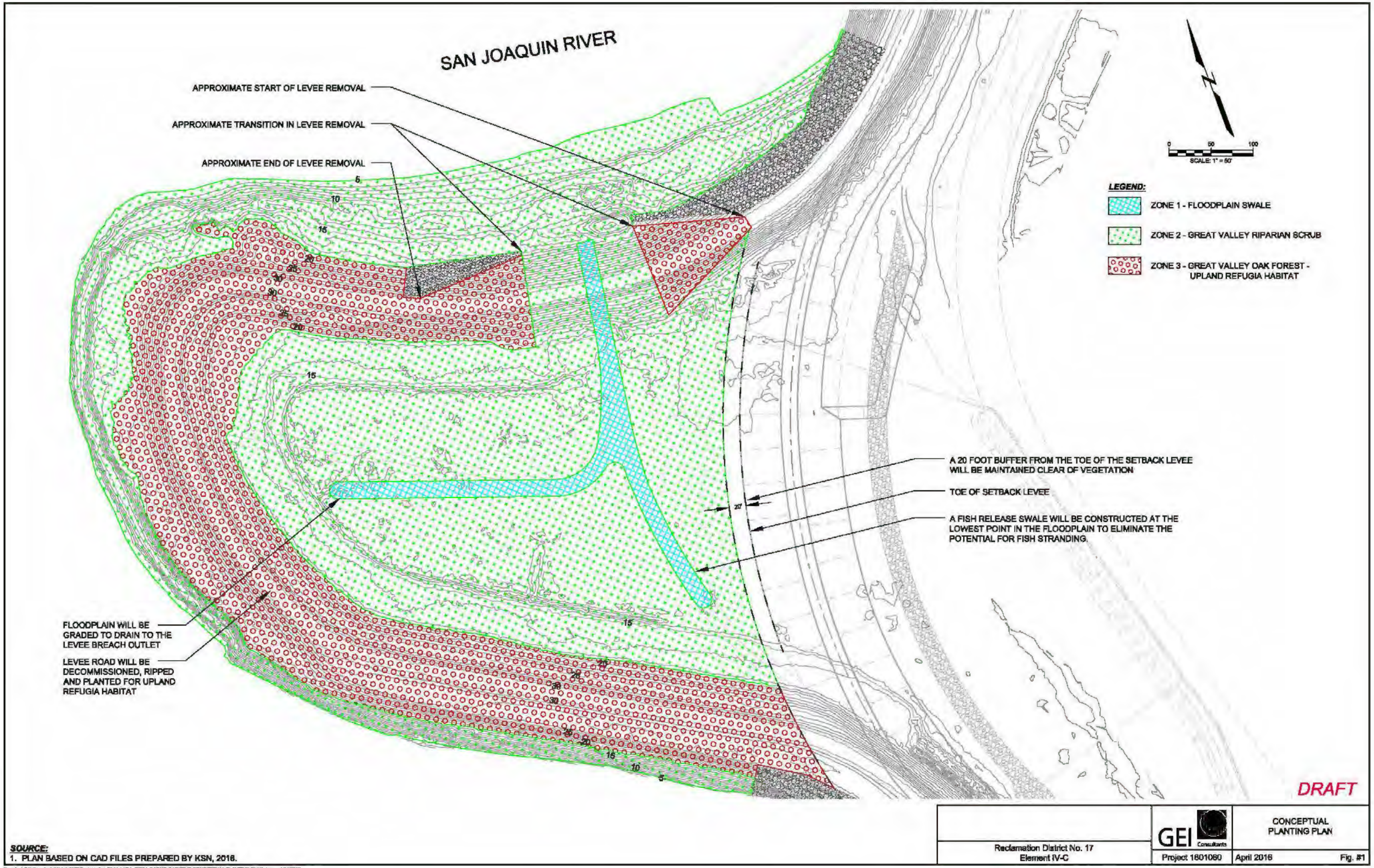
Sources: CNDDB 2014; MacKay and Somps 2014; adapted by AECOM in 2014

Exhibit 5 **Occurrence Records and Potentially Suitable Habitat of Riparian Brush Rabbit in the Vicinity of the Proposed Project**

Exhibit 6 Locations of Elderberry Shrubs in the Vicinity of the Proposed Project



Sources: CNDDB 2014; MacKay and Somps 2014; adapted by AECOM in 2014



Sources: Main Stone 2010, MacKay & Somps 2014, adapted by AECOM in 2014

Exhibit 7 **Conceptual Habitat Restoration in Levee Setback Area at Element**

Source: AECOM 2014

Exhibit 8 **San Joaquin River Ordinary High Water Mark in Element IVc**

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APPENDIX B

MBK Engineers: Site Specific Inundation Frequency and Duration

RD 17 Levee Setback IV-c
Evaluation of Frequency of Project Area Inundation

Mike Archer, MBK Engineers
2/23/16

An evaluation of the frequency of flooding of the RD 17 IV-c levee setback offset area was made in August 2015 for the original project plan with an invert elevation for the breach connecting the San Joaquin River to the offset area of 14 feet (NAVD88). An additional request has been made for the frequency of inundation with breach inverts of 10 feet (NAVD88) and 8 feet (NAVD88).

Based on the hydraulic model analysis, the estimated flow at the location of the San Joaquin River near Vernalis USGS stream gage (Vernalis gage), about 17.5 miles upstream of the project area, at which water would enter the setback area through the remnant levee breach for the three breach invert elevations is shown in Table 1. An estimate of the return interval of the Vernalis flow, from a HEC-SSP Bulletin 17b analysis of the Vernalis gage record, is included in Table 1. Also included for information is the corresponding computed flow in the San Joaquin River at the project location.

Table 1. Estimated Flows Above Which the Project Area Would Flood

Breach Invert Elevation (feet, NAVD88)	Flow in San Joaquin River near Vernalis above which project breach flow occurs (cubic feet per second)	Estimated Return Interval	Flow in San Joaquin River at breach location (cubic feet per second)
8	9,500	2 year	4,200
10	13,200	3 to 4 year	5,700
14	24,000	6 year	8,800

To evaluate how often and how long the project area would expect to be inundated, a review was made of the historical San Vernalis gage daily flow records since the completion of New Melones Dam in 1979 (this represents a period where the San Joaquin River basin operating regime has been relatively unchanged). The evaluation used the mean daily flows for the period 10/1/1978 through 9/30/2015, or Water Years 1979 through 2015. The total number of days in the evaluation period is 13,514. Table 2 summarized the estimated number and percent of days in the evaluation study period in which the Project area would flood.

Table 2. Estimated Total Duration of Project Area Flooding for Evaluation Period of Record

Breach Invert Elevation (feet, NAVD88)	Flow in San Joaquin River near Vernalis above which project breach flow occurs (cubic feet per second)	Number of days flow equaled or exceeded since 10/1/78	Percent of days flow equaled or exceeded since 10/1/78
8	9,500	1,619	12.0%
10	13,200	1,126	8.3%
14	24,000	423	3.1%

Table 3 summarizes the estimated number of days in each water year that the Project area would flood for each of the three breach invert elevations, along with estimates of average and maximum depths of flooding in each water year. The depths were computed relative to the breach invert elevation. Estimating the depth in the offset area was done with a two-step process:

1. Development of a regression correlation between the mean daily flow gage record at Vernalis and the mean daily stage at the DWR San Joaquin River below Old River near Lathrop gage. This relationship was used to estimate a mean daily stage at the Lathrop gage based on mean daily flow at Vernalis. This was necessary because the Lathrop gage record starts in 2002.

2. Development of regression correlation between the stage at the Lathrop gage and the stage at the remnant levee breach. This relationship was derived from hydraulic model computed data. It was used to translate the estimated stage at the Lathrop gage from step 1 to the remnant levee breach location.

A chronological plot of the Vernalis mean daily flow for the evaluation period of record is provided in Figures 1 and 2. Also indicated on these figures are the Project area flooding thresholds for each of the breach invert elevations.

Table 3. Estimated Annual Duration of Project Area Flooding for Evaluation Period of Record

Water Year	Breach Invert at 8 ft. NAVD88			Breach Invert at 10 ft. NAVD88			Breach Invert at 14 ft. NAVD88		
	Number of days flooded	Depth (above invert), feet		Number of days flooded	Depth (above invert), feet		Number of days flooded	Depth (above invert), feet	
		Avg.	Max.		Avg.	Max.		Avg.	Max.
1979	15	1.4	2.5	1	0.5	0.5	0		
1980	118	3.8	9.0	70	3.8	7.0	28	1.8	3.0
1981	0			0			0		
1982	92	3.7	8.0	53	3.7	6.0	20	1.2	2.0
1983	276	6.3	10.4	231	5.3	8.4	154	2.7	4.4
1984	141	3.5	8.8	82	2.9	6.8	20	1.9	2.8
1985	0			0			0		
1986	84	4.7	9.5	66	3.7	7.5	24	2.0	3.5
1987	0			0			0		
1988	0			0			0		
1989	0			0			0		
1990	0			0			0		
1991	0			0			0		
1992	0			0			0		
1993	1	0.5	0.5	0			0		
1994	0			0			0		
1995	123	4.5	7.0	103	3.1	5.0	8	0.7	1.0
1996	68	2.3	4.1	34	1.3	2.1			
1997	93	6.9	10.5	87	5.3	8.5	63	2.5	4.5
1998	183	4.7	9.2	166	3.0	7.2	32	2.1	3.2
1999	25	2.2	3.5	14	0.9	1.5	0		
2000	33	2.6	3.8	22	1.0	1.8	0		
2001	0			0			0		
2002	0			0			0		
2003	0			0			0		
2004	0			0			0		
2005	48	2.1	3.2	27	0.8	1.2	0		
2006	144	4.6	9.1	109	3.6	7.1	50	1.7	3.1
2007	0			0			0		
2008	0			0			0		
2009	0			0			0		
2010	0			0			0		
2011	175	2.7	8.3	61	3.4	6.3	24	1.7	2.3
2012	0			0			0		
2013	0			0			0		
2014	0			0			0		
2015	0			0			0		

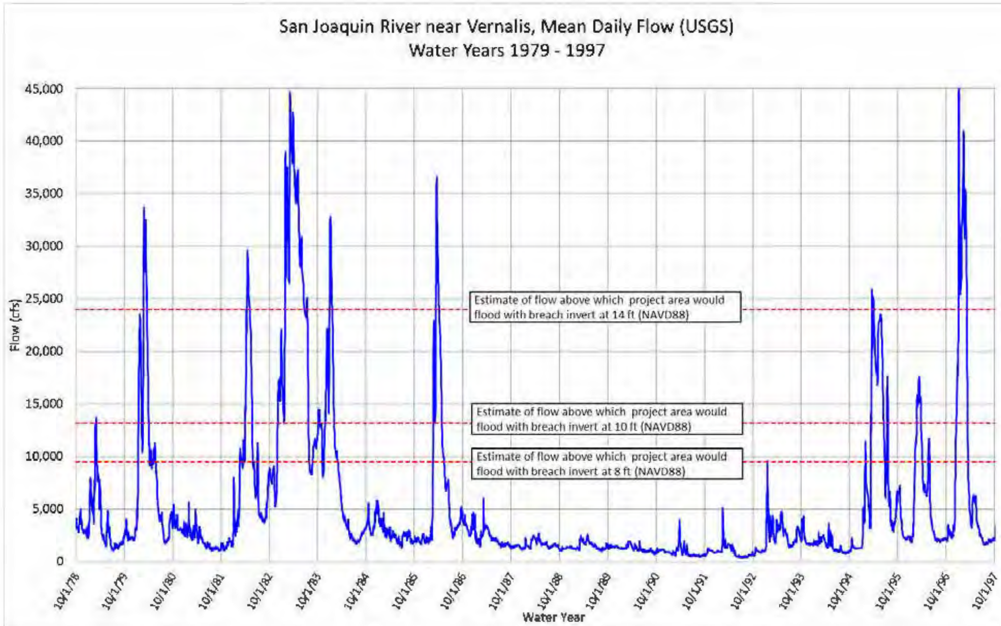


Figure 1.

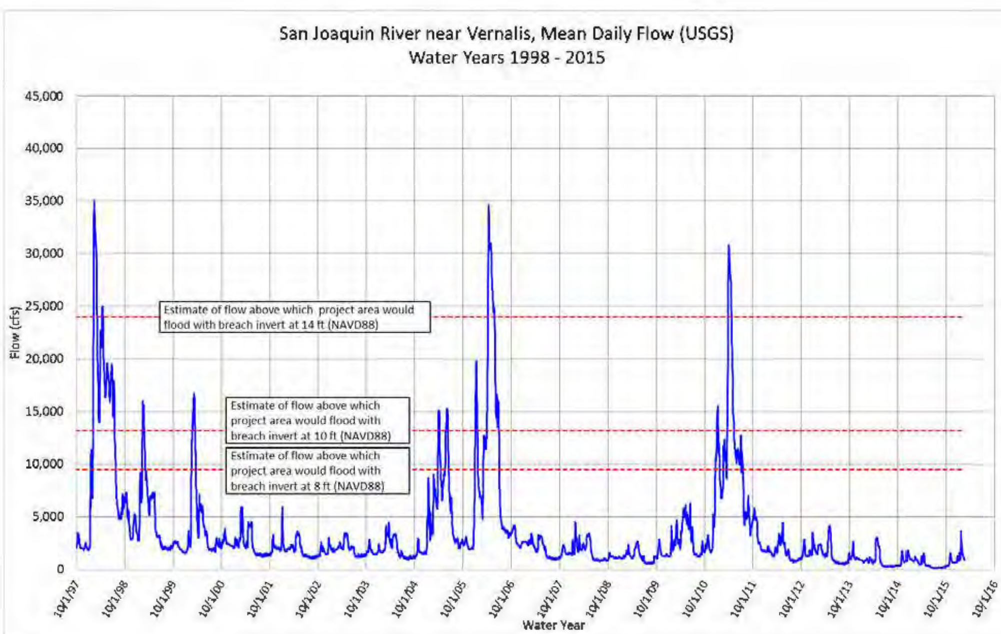


Figure 2.

R:\3901-1 RD 17\EIP levee setback HIA\Setback area inundation frequency 2016-02-23.docx 4

7. **Letter to NMFS, Responding to Request for Additional Information. October 7, 2016.**

Response to NMFS's July 2015 Request for Additional Information

October 7, 2016

RESPONSE TO NATIONAL MARINE FISHERIES SERVICE'S JULY 2015 REQUEST FOR ADDITIONAL INFORMATION ON BIOLOGICAL ASSESSMENT

This is in response to the National Marine Fisheries Service (NMFS) July 7, 2015, letter requesting additional information to support the request for initiation of informal consultation with the U.S. Army Corps of Engineers (USACE) on the Reclamation District 17 (RD 17) Phase 3 Levee Seepage Repair Project (Project) in San Joaquin County, California. To respond to the request, we have bracketed the NMFS July 7, 2015, letter and have organized our responses accordingly.

Response to Comment 1a

The following information has been incorporated into the "Setback Levee with Seepage Berm and Underlying Cutoff Wall" subsection of the "Description of the Proposed Phase 3 Repair Project" section on pages 22-25 of the BA.

Of direct benefit to fish resources is the inclusion of project Element IVc, which includes construction of a 1,240-foot-long setback levee with cutoff wall and seepage berm, on a major oxbow of the San Joaquin River (see Table 2 of the biological assessment [BA]). A Conceptual Mitigation and Monitoring Plan for Riparian Brush Rabbit [for the] Phase 3 – RD 17 Levee Seepage Repair Project (Conceptual MMP) (RD 17 2016) has been prepared to describe the expansion and restoration of riparian habitat in Element IVc; this document has been added as an attachment to the BA (Appendix E).

Setback Description. The cutoff wall would involve degrading the top one-third to one-half of the existing levee crown where it would intersect the new setback levee and would begin with a 1:1 cut at the waterside crown. Approximately 0.64 acres (110 linear feet) of riprap would be installed on the waterside of the existing levee (above the high tide line) where it would intersect the setback levee. After the setback levee is completed, 400 linear feet of the existing levee above the high tide line on the downstream side of the oxbow would be degraded, reconnecting approximately 8 acres of floodplain to the river. That floodplain area would be graded to allow complete drainage of the floodplain to the river through the downstream opening in the remnant levee, as river flows recede.

i. The elevations of the newly "exposed" floodplains in the area of the setback levee. The Conceptual MMP evaluates three breach invert elevations (8 feet [NAVD88], 10 feet [NAVD88] and 14 feet [NAVD88]) for the proposed levee breach on the downstream end of the oxbow. Hydraulic modeling, based on San Joaquin River flows as reported at the Vernalis USGS stream gage (Vernalis gage), about 17.5 miles upstream of the project area, was used to estimate the flow in the San Joaquin River at which water would enter the setback area through the remnant levee breach for these three breach invert elevations. The results are shown in Table 1.

Table 1
Estimated Flows for Inundation of the Element IVc Mitigation Site

Breach Invert Elevation (feet, NAVD88)	Flow in San Joaquin River near Vernalis above which Mitigation Site Breach Flow Occurs (cfs)	Estimated Return Interval	Flow in San Joaquin River at Breach Location (cfs)
8	9,500	2 year	4,200
10	13,200	3 to 4 year	5,700
14	24,000	6 year	8,800

Note: cfs = cubic feet per second Source: MBK Engineers 2016

ii. The expected frequency of inundation during high water events.

and

iii. The expected durations of inundation under different high water stages.

To evaluate how often and how long the setback levee area would be expected to inundate, a review was made of the historical Vernalis gage daily flow records since the completion of New Melones Dam in 1979 (this represents a period where the San Joaquin River basin operating regime has been relatively unchanged). The evaluation used the mean daily flows for the period October 1, 1978 through September 30, 2015, or Water Years 1979 through 2015. The total number of days in the evaluation period is 13,514. Table 2 summarizes the estimated number and percent of days in the evaluation study period in which the levee setback area would flood based on each of the three invert elevations. Based on the historical data, the periods during which water would flow into the project breach at the three invert elevations are displayed in the figures below.

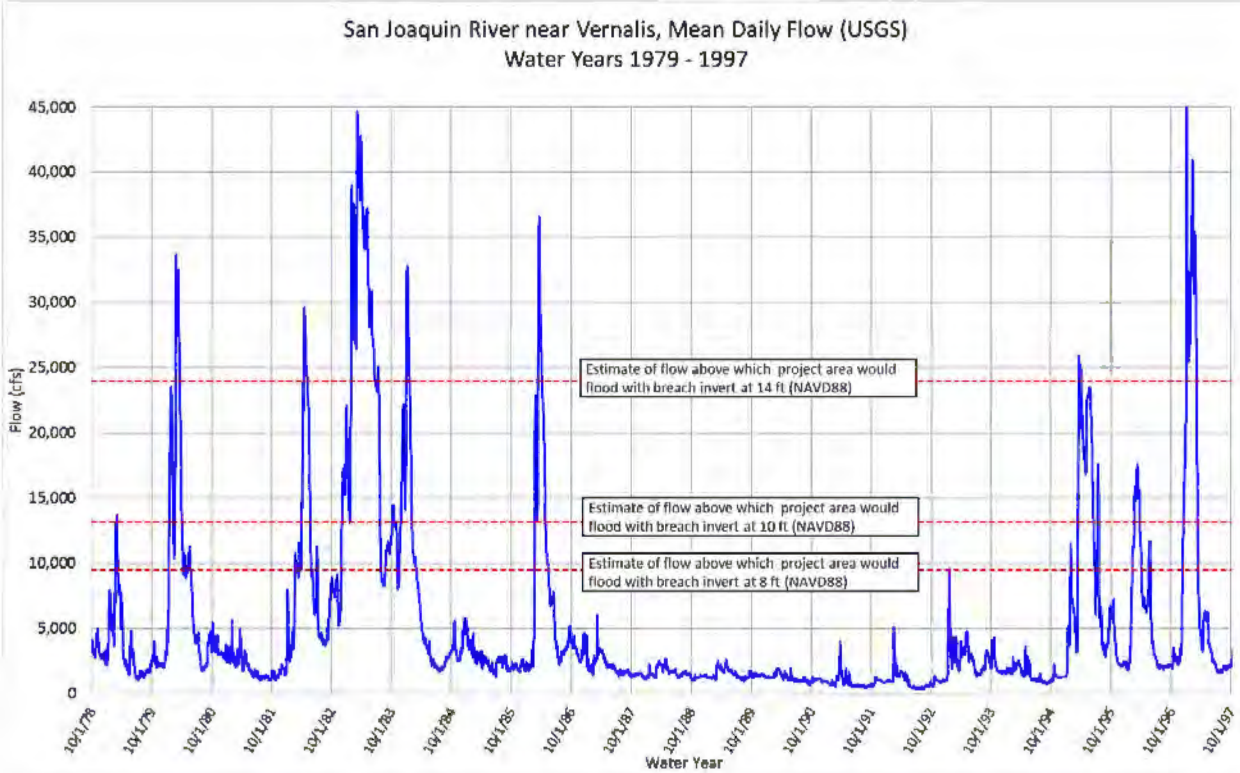
The appropriate breach elevation is under consideration and will be defined in the Final MMP. It is anticipated that the breach elevation would be set at approximately 9 or 10 feet (NAVD88). Approximately 1-2 acres of the floodplain would be set to an elevation of 14 feet (NAVD 88) or below and would inundate approximately every 6 years.

Table 2
Estimated Total Duration of Mitigation Site Flooding for Evaluation Period of Record

Breach Invert Elevation (feet, NAVD88)	San Joaquin River Flow at Vernalis above which Mitigation Site Breach Flow Occurs (cfs)	Number of Days Flow Equaled or Exceeded Since 10/1/1978	Percent of Days Flow Equaled or Exceeded Since 10/1/1978
8	9,500	1,619	12%
10	13,200	1,126	8.3%
14	24,000	423	3.1%

Note: cfs = cubic feet per second
Source: MBK Engineers 2016

i. Potential for stranding in any depressions or perched areas within the levee setback area. The floodplain would be graded to drain to a central swale, approximately 2-feet deep. As flood flows recede, the swale would drain completely through the breach in the remnant levee. This would minimize the possibility of fish stranding. A major benefit to fish resources would be the reactivation of floodplain rearing habitat for juvenile salmonids, in particular, and other native fishes as well. The seasonal nature of inundation, along with complete drainage, precludes establishment in the floodplain of predatory, non-native fishes.


San Joaquin River near Vernalis, Mean Daily Flow (USGS)
Water Years 1979 - 1997
Flow (cfs)
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Estimate of flow above which project area would flood with breach invert at 14 ft (NAVD88)
Estimate of flow above which project area would flood with breach invert at 10 ft (NAVD88)
Estimate of flow above which project area would flood with breach invert at 8 ft (NAVD88)
10/1/78
10/1/79
10/1/80
10/1/81
10/1/82
10/1/83
10/1/84
10/1/85
10/1/86
10/1/87
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10/1/89
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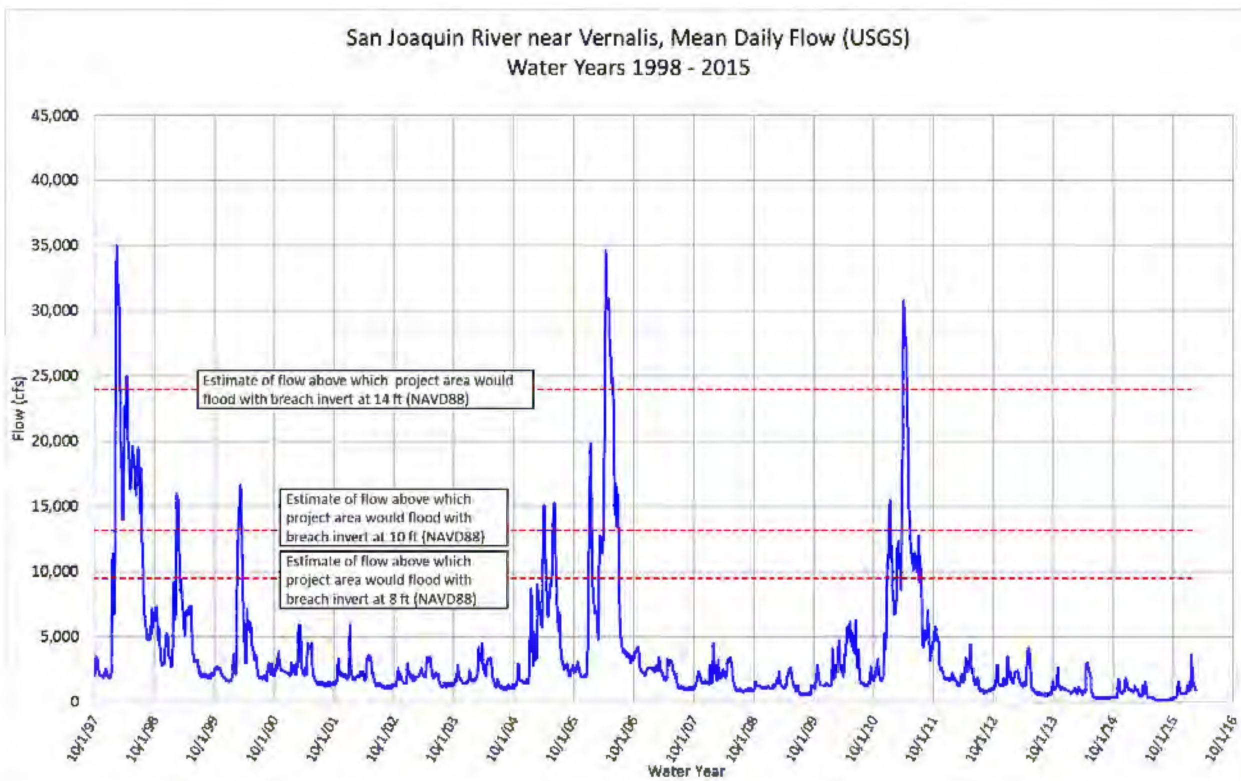
10/1/97
Water Year


San Joaquin River near Vernalis, Mean Daily Flow (USGS)
Water Years 1998 - 2015
Flow (cfs)
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Estimate of flow above which project area would flood with breach invert at 14 ft (NAVD88)
Estimate of flow above which project area would flood with breach invert at 10 ft (NAVD88)
Estimate of flow above which project area would flood with breach invert at 8 ft (NAVD88)
10/1/97
10/1/98
10/1/99
10/1/00
10/1/01
10/1/02
10/1/03
10/1/04
10/1/05
10/1/06
10/1/07
10/1/08
10/1/09
10/1/10
10/1/11
10/1/12
10/1/13
10/1/14
10/1/15
10/1/16
Water Year

Response to Comment 1b

Information about the exclusion of setbacks has been provided in the BA, with information specifically incorporated into the “Setback Levee Considerations” subsection of the “Description of the Proposed Action” Section on page 22 of the BA. The complete hydraulic analyses that evaluated the setback levee alternatives are included as a new appendix to the BA (Appendix F).

Plan formulation, including the rationale for not incorporating additional setback levees into the proposed action, is discussed in greater detail in Section 2.1.4 of the Draft Environmental Impact Statement/Environmental Impact Report (DEIS/EIR; USACE and RD 17 2011). As discussed in the DEIS/DEIR, setback levees were considered but eliminated from further consideration in several project reaches for the reasons listed below.

- Construction of a setback levee along certain stretches of the river were hydraulically constrained and would have greatly increased the project scope to the point of being cost prohibitive (Elements VIa.4 and VIb).
- Because of the proximity to the bifurcation at Old River, the change in hydraulic conditions that would result from constructing a setback levee at Elements Va and VIa.1 would increase flows down the San Joaquin River during flood events, which could lead to increased flooding downstream (Elements Va and VIa.1).
- Construction of a setback levee relative to other levee improvement alternatives and/or land acquisition to accommodate the construction of a setback levee was cost prohibitive (Elements Ie, IIab, IIIb, IVa, VIcde, and VIIb).
- Existing landside development constrained the option of constructing a setback levee (Elements Ia, IIab, VIIe and VIIg).

Response to Comment 1c

As stated in the “San Joaquin Multi-Species Conservation Plan” subsection of the “Species Considered” section on page 13 of the BA, “…because the [San Joaquin Multi-Species Conservation Plan (SJMSCP)] does not cover special-status fish, the conversion of riparian brush rabbit habitat, or impacts on other species on the waterside of the levee, RD 17 and USACE would not rely on the SJMSCP to assess and offset Phase 3 Repair Project effects on federally listed and State-listed species. Rather, through this BA and the associated Section 7 consultations with USFWS and NMFS, RD 17 and USACE would seek take authorization for Phase 3 Repair Project activities.”

Mitigation relative to project construction is directed solely towards terrestrial habitats and species, and not towards aquatic species, including listed anadromous species, because there will be no significant effects to those aquatic species or their habitat (including essential fish habitat [EFH]) resulting from project construction or implementation. All waterside activities will be conducted out of the channel, and best management practices (BMPs) will ensure the stability of sediments on the levee and floodplain. No mitigation is necessary for aquatic species or habitats.

Response to Comment 1d

All waterside work activities are anticipated to be completed inside the work window (i.e., between July 1 and November 1). No work will be conducted within the stream channel and BMPs will ensure the stability of sediments during construction activities that occur on the levee and floodplain. As stated under the “Proposed Schedule and Sequence of Project Construction” subsection under the “Description of the Proposed Phase 3 Repair Project” section on pages 25-28 of the BA,” The general levee construction window is seasonal (July 1–November 1), avoiding the period when high-water levels have the potential to occur within the San Joaquin River system. However, depending on hydrologic conditions, and subject to compliance with special-status species work windows, the CVFPB may grant a variance allowing work to occur outside the July 1 to November 1 work window. The CVFPB may stipulate that RD 17 has to comply with additional conditions and commitments as a component of any work window variance.”

Response to Comment 2

The action area is defined here in accordance with ESA guidelines as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). The action area includes all areas that would be directly or indirectly affected by the components of the Phase 3 Repair Project. Areas downstream of the Phase 3 Repair Project area might also be indirectly affected by the flood risk management component of the project through improved water quality and flood risk management conditions. The extent of this potential effect is difficult to quantify, however, for Element IVc, construction of a setback levee and breaching a small downstream portion of the existing levee would be expected to create a backwater effect and would not result in a substantial widening of the flood plain. An analysis also was conducted to evaluate the hydraulic effects of the setback levee at Element IVc. This hydraulic analysis showed that the proposed action would essentially have no effect on the maximum water surface elevation, with a computed maximum increase in the water surface elevation of 0.0007 feet, and maximum flow rate changes would be negligible during extreme events (100-year flood recurrence interval) (see Appendix F to the revised final BA).

Since far afield project-related hydrologic effects are not likely to occur, the action area is concluded to be designated as the immediate vicinity of the actual project boundaries, and the BA has been updated accordingly to reflect this as the action area.

Response to Comment 3a

Five-year status reviews for the listed Central Valley Chinook salmon, Central Valley steelhead, and southern distinct population segment (DPS) of green sturgeon have been reviewed and pertinent information from those documents has been included, and cited, in the BA. Species accounts for those listed species have been updated in the BA.

Response to Comment 3b

A recovery plan for the evolutionarily significant units (ESUs) of Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon and the DPS of Central Valley steelhead was finalized by NMFS in July 2014 (NMFS 2014a). The plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives. The recovery plan has been reviewed and pertinent information from that document has been included, and cited, in this BA. A recovery plan has not been developed for green sturgeon, however the Federal Recovery Outline for the Southern DPS is available (NMFS 2010). Species accounts for those listed species have been updated in the BA with information from the recovery plans.

Response to Comment 3c

As discussed in the "San Joaquin River" subsection of the "Environmental Baseline" section on pages 36-37 of the BA, one of the goals of the San Joaquin River Restoration Program (SJRRP) is "to restore and maintain fish populations in "good condition" in the mainstem San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish" (Reclamation and DWR 2011). The SJRRP Settlement stipulates reintroduction of spring-run and fall-run Chinook salmon, with a priority given to restoring self-sustaining populations of wild spring-run Chinook salmon. Juvenile spring-run Chinook salmon were released into the system in 2014, 2015, and 2016. Tracking these fish and their return to the system has proven challenging. Additional efforts are underway by the SJRRP partners to identify and implement alternative technologies to improve tracking (NMFS 2014d).

Surveys indicate that populations of remnant, non-sustaining spring-run Chinook salmon may be found in Cottonwood, Battle, Antelope, and Big Chico Creeks (DWR 1997); more sizable, consistent runs of naturally produced fish are found only in Mill, Deer, and Butte creeks (Williams et al. 2014). All these creeks are tributaries in the Sacramento River basin. The Feather River Fish Hatchery sustains the spring-run population on the Feather River, but the genetic integrity of that run is questionable (DWR 1997). Although all of these populations are found in the Sacramento river basin, the ESU boundary of Central Valley spring-run Chinook salmon includes populations spawning in the Sacramento River and San Joaquin River basins, as reflected in the current 5-Year status review (Williams et al. 2014; NMFS 2011). The status of Central Valley spring-run Chinook salmon ESU has likely not improved since 2005 status review (Williams et al. 2014). Improvement of spring-run Chinook salmon ESU is dependent upon improving habitat conditions in spawning and rearing areas (Williams et al. 2011). Fish passage projects are also of primary importance in improving the status of this ESU (NMFS 2014a). Current and future efforts to restore production in the San Joaquin River are either being planned or are just beginning, and no results as to their current efficacy are available.

Like winter-run Chinook salmon, adult spring-run Chinook salmon other than occasional strays generally have not been documented in the San Joaquin River basin, and therefore, unlikely to occur in the action area at this time. The same is true for juvenile spring-run Chinook salmon.

Response to Comment 3d

Amendment 18 to the Pacific Coast Salmon Fishery Management Plan revises the description and identification of EFH for Pacific salmon (in this case, Chinook salmon), designates habitat areas of particular concern (HAPC), modifies the current information on fishing activities and potential measures to minimize their effects on EFH, and updates the list of fishing and non-fishing related activities that may adversely affect EFH and potential conservation and enhancement measures to minimize those effects (NMFS 2014c). EFH for Chinook salmon in the Lower San Joaquin River includes the San Joaquin River, its eastern tributaries, and the lower reaches of the western tributaries that could provide juvenile rearing habitat or refugia from high flows during floods as salmon migrate along the mainstem in this area.

This information does not essentially change the analysis of potential effects to EFH relative to the Phase 3 Repair Project, included in response to comment 7 (see below). Construction of Element IVc would improve EFH by providing the type of refuge habitat for juvenile Chinook salmon during high flows as described in Amendment 18 for the lower San Joaquin River tributaries (NMFS 2014b).

Response to Comment 4a

Relative to the construction-related effects to fish in the action area, fish population levels and survival have been compared to various levels of turbidity and siltation in waterways. The following information is incorporated into the "Temporary Construction-Related Effects" subsection, which is in the "Direct and Indirect Effects on Species in the Action Area" Section under "Federally Listed Fish Species" on page 55 of the BA. Prolonged exposure to high levels of suspended sediment could create a loss of visual capability in fish, leading to a reduction in feeding and growth rates, and to a thickening of the gill epithelia, which may cause the loss of respiratory function; clogging and abrasion of gill filaments; and increases in stress levels, reducing the tolerance of fish to disease and toxicants (Waters 1995). Also, high levels of suspended sediments could cause the movement and redistribution of fish populations or other aquatic organisms, and could affect physical habitat (Waters 1995). Sediment loading could interfere with photosynthesis of aquatic flora and displace aquatic fauna. Many fish and other aquatic species are sight feeders, and turbid waters reduce the ability of these fish to locate and feed on prey. Some fish, particularly juveniles, could become disoriented and leave areas where their main food sources were located, ultimately reducing their growth rates. Increased turbidity and sedimentation cause fish to avoid an area, thus reducing available habitat. Fish will not occupy areas unsuitable for survival unless they have no other option. Therefore, construction-related erosion could result in elevated river turbidity in critical species-specific and life stage-specific habitats, potentially precluding a species from occupying that habitat.

Through the implementation of water quality BMPs, including a storm water pollution prevention plan, the proposed conservation measures (see the "Avoidance and Minimization Measures" section in the BA) would avoid direct and indirect take of fish during construction. The impact would not be expected to have an effect on the overall existence and survival of these species.

Response to Comment 4b

The following information is incorporated into the "Temporary Construction-Related Effects" subsection, which is in the "Direct and Indirect Effects on Species in the Action Area" section under "Federally Listed Fish Species" on page 55 of the BA. The potential would exist for contaminants such as bentonite slurry, fuels, oils, and other products used in construction to be introduced into the waterway directly or through surface runoff. Contaminants might be toxic to fish, or might alter oxygen diffusion rates and cause acute and chronic toxicity to aquatic organisms, thereby reducing growth and survival.

Through the implementation of water quality BMPs, including a storm water pollution prevention plan, and BMPs for slurry management and a slurry spill contingency plan, the proposed conservation measures (see the "Avoidance and Minimization Measures" section in the BA) would avoid direct and indirect take of fish during construction. The impact would not be expected to have an effect on the overall continued existence and survival of these species.

Response to Comment 4c

The following information is incorporated into the "Benefits of Project Actions to Rearing Salmonids" subsection, which is in the "Direct and Indirect Effects on Species in the Action Area" section under "Federally Listed Fish Species" on pages 56-58 of the BA.

i. Changes in growth rate for fish rearing on the floodplain. Sommer et al. (2001) provided evidence that the Yolo Bypass, the primary floodplain of the lower Sacramento River, provides better rearing and migration habitat for juvenile Chinook salmon than adjacent river channels. During 1998 and 1999, salmon increased in size substantially faster in the seasonally inundated agricultural floodplain than in the river, suggesting better growth rates. Similarly, coded-wire-tagged juveniles released in the floodplain were significantly larger at recapture and had higher apparent growth rates than those concurrently released in the river.

   Improved growth rates in the floodplain were in part a result of significantly higher prey consumption, reflecting greater availability of drift invertebrates. Bioenergetic modeling suggested that feeding success was greater in the floodplain than in the river, despite increased metabolic costs of rearing in the significantly warmer floodplain. Growth, survival, feeding success, and prey availability were higher in 1998 than in 1999, a year in which flow was more moderate, indicating that hydrology affects the quality of floodplain rearing habitat. These findings support the predictions of the flood pulse concept and provide new insight into the importance of the floodplain for salmon.

   Work by Jeffres et al. (2008) and Sommer et al. (2001) indicate that off-channel floodplain habitats provide significantly improved rearing habitat, supporting higher growth rates, than the intertidal river channel. However, their work shows that providing habitat complexity for juvenile salmon in floodplains is of utmost importance, so fish can find optimal places for rearing under varying flow conditions. It is well documented that survivorship to adulthood is increased when young salmonids leave freshwater at a larger size (Unwin 1997; Galat and Zweimuller 2001). Studies by Jeffres et al. (2008), Sommer et al. (2001), and others show that floodplain habitat restoration in Central California has major benefits to Chinook salmon populations, especially relative to growth and production.

   These studies indicate bioenergetic improvement to salmonids rearing in a flooded terrestrial floodplain because of the abundance of zooplankton (primary production), rather than having to rely on less dense prey items in the riverine channels, such as larval fish and benthic macroinvertebrates, and expending more energy for their capture. Therefore, construction of Element IVc would likely result in bioenergetic improvement for all listed species.

ii. Risk of predation from predators on the floodplain. The full 8 acres of floodplain would be graded to allow flood flows to drain out through the downstream breach in the remnant levee. This would minimize the possibility of fish stranding. The seasonal nature of inundation, along with complete drainage, precludes establishment in the floodplain of predatory, non-native fishes.

iii. Risk of stranding during the high water recession phase. The full 8 acres of floodplain would be graded to allow flood flows to drain out through the downstream breach in the remnant levee. This would minimize the possibility of fish stranding. The major benefit to fish resources would be the creation of approximately 8 acre of floodplain rearing habitat for juvenile salmonids, in particular, and other native fishes, in general.

iv. How frequently the floodplain becomes available to emigrating fish and for how long at different water elevations. Please see our response to Comment 1a.

v. Using the above information, an integration and synthesis of the variable effects of the setback levee should be performed which determines the net benefits to listed fish and fall-run Chinook salmon. Floodplain and other off-channel habitat restoration is important for improving production of juvenile salmonids in California's Central Valley. Juvenile salmonid emigration is generally passive during high flow events (Healey 1980; Kjelson et al. 1981); they are essentially entrained in the water column until they encounter slower water velocities where active swimming becomes possible. The San Joaquin River, like most rivers in the Central Valley, is incised and lacks channel complexity.

With the exception of the Yolo Bypass for the Sacramento River (Sommer et al. 2001), juvenile salmonids are frequently displaced downstream to the intertidal delta where growth is diminished during high flows in systems that lack access to floodplains. However, protected floodplain habitat, as would be created at Element IVc, would provide protection for juvenile salmonids being swept downstream during high flow events.

High San Joaquin River outflows generally occur during winter and early spring months. Juvenile fall/late fall-run Chinook salmon and Steelhead outmigration occurs at least partially during this period, while Central Valley spring-run Chinook salmon and green sturgeon outmigration occurs later.

- Central Valley fall-/late fall-run Chinook salmon outmigration may begin as early as November and extends through June,
- Central Valley spring-run Chinook salmon juvenile outmigration generally occurs from April through June,
- Central Valley Steelhead juvenile outmigration generally occurs from December through March in the San Joaquin River, and continues through June in the Delta.
- North American Green Sturgeon outmigration of older juveniles generally occurs from June through September,

The presence of the protected floodplain would likely benefit juvenile fall/late fall-run Chinook salmon and steelhead during high flow events. The configuration of the floodplain being protected during high flows facilitates protection of juvenile salmonids as they are directed into the floodplain through backflow currents and are not displaced any further downstream. Additional benefits to out-migrating juvenile spring-run Chinook salmon and green sturgeon would likely be negligible since outmigration occurs after high flow events. However, all listed species would benefit from increased floodplain.

Floodplain and other off-channel habitat restoration is important for improving production of juvenile salmonids in California's Central Valley. Juvenile salmonid emigration is generally passive during high flow events (Healey 1980; Kjelson et al. 1981); they are essentially entrained in the water column until they encounter slower water velocities where active swimming becomes possible. The San Joaquin River, like most rivers in the Central Valley, is incised and lacks channel complexity.

> With the exception of the Yolo Bypass for the Sacramento River (Sommer et al. 2001), juvenile salmonids are frequently displaced downstream to the intertidal delta where growth is diminished during high flows in systems that lack access to floodplains.

Response to Comment 4d

Levee improvements by themselves would not result in growth. Future growth is subject to existing and future specific plans and associated analysis, documentation, regulatory permits, and decisions that will incorporate all permitting requirements. The "Cumulative Effects" section on pages 59-62 of the BA presents a summary of indirect effects related to planned growth.

Response to Comment 4e

Development projects (i.e., residential, commercial, industrial), infrastructure projects, and flood facilities improvement projects include or would include grading and other earthmoving activities that could result in temporary and short-term localized soil erosion that could affect hydrology. However, these site-specific impacts are not expected to combine with the effects of other activities, because compliance with the National Pollutant Discharge Elimination System regulations, including construction site BMPs, would help control erosion at each construction site. Because impacts from development projects, infrastructure projects, and flood facilities improvement projects would be temporary and short-term, and soil erosion would be localized, implementation of these projects would not result in a cumulatively considerable incremental contribution related to hydrology, groundwater recharge, water surface elevations, or water quality. The BA has been updated to include this additional information under the "Cumulative Effects" " section on pages 59-62.

Response to Comment 5

A hard copy of the DEIS/EIR was submitted to Howard Brown of NMFS on April 21, 2010. A hard copy of the Final EIR was provided to Mike Hendrick of NMFS on June 3, 2016. When the NEPA document is finalized, a hard copy of the Final EIS will be provided to NMFS, and an electronic copy will be available on the Sacramento District website.

Response to Comment 6

See above sections for inclusion of information and citation of relevant studies and reports, including species viability assessments for listed Central Valley fish species.

Response to Comment 7

Available literature indicates that limited Chinook salmon spawning typically occurs well upstream of the Project area. EFH in the San Joaquin River in the vicinity of the Project area consists of 1) adult and juvenile (smolt) Chinook salmon passage between upstream spawning grounds and the Pacific Ocean, and 2) limited in-channel rearing habitat for Chinook salmon juveniles: limited because it is situated in a reach of the San Joaquin River that is bound on both banks by levees, resulting in channel incision, and disconnected from its currently non-functioning floodplain. The river extends onto its floodplain only during high flood flows, and if fish are swept onto the disconnected floodplain during high flow conditions, they would likely become stranded due to the absence of secondary channels for returning flood flows to the river. The Project will result in improvement of EFH as functioning floodplain rearing habitat and improvement to existing EFH in the San Joaquin River channel, by reducing and reversing the effects of current channel incision in the immediate vicinity of Element IVc. Further, approximately 2.5 acres of SRA habitat will be created through re-vegetation and other restoration actions in Element IVc.

Levee degradation and floodplain grading activities in Element IVc will improve connectivity to the historic floodplain and improve habitat conditions in the floodplain. Although both actions will be constructed in dry conditions (above the high tide line), a potential short-term indirect effect of construction may be a temporary increase in sediment in the San Joaquin River, especially during the first storm or flooding event after construction. The erosion control and revegetation measures described in the "Avoidance and Minimization Measures" section in the BA are designed to reduce or capture any mobilized sediment resulting from the year's first rain or flooding event.

Any minor, temporary increase in fine sediment load as a result of this project would be un- measurable and overall negligible, especially when compared to the existing sediment load of the San Joaquin River. No adverse effects on EFH are expected, other than short-term and temporary effects to a comparatively small amount of edgewater habitat that is above the high tide line and characterized by ruderal vegetation. However, given the proposed avoidance and minimization measures, and specifically, BMPs that will be included as part of construction of the project, significant loss of EFH is not anticipated as a result of implementation of the Project. When completed, the project area will increase the amount and quality of EFH in the San Joaquin River floodplain for juvenile Chinook salmon rearing.

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8. **Letter to USFWS, responding to request for additional information. October 7, 2016.**

October 7, 2016

RESPONSE TO U.S. FISH AND WILDLIFE SERVICE'S OCTOBER 2015 REQUEST FOR ADDITIONAL INFORMATION ON BIOLOGICAL ASSESSMENT

This is in response to U.S. Fish and Wildlife Service (USFWS) October 2, 2015, letter requesting additional information to support the request for initiation of formal consultation with the U.S. Army Corps of Engineers (USACE) on the Reclamation District 17 (RD 17) Phase 3 Levee Seepage Repair Project (Phase 3 Repair Project) in San Joaquin County, California. USACE had requested the initiation of Section 7 consultation in its February 27, 2015, letter; a copy of the Project's biological assessment (BA), dated February 2015, accompanied the USACE request. To respond to the USFWS request for additional information, we have bracketed the October 2, 2015, letter and have organized our responses accordingly.

Response to Comment 1

This memorandum provides a response to the USFWS' comments and addresses the information requests. The BA has also been revised, as appropriate, to address USFWS' information request.

Response to Comment 2

The BA (see "Compliance with USACE Vegetation Management Standards" [pages 19 – 20] and "Additional Project Components" [pages 27 – 28] subsections in the "Description of the Proposed Action" section) has been updated to reflect more specificity in RD 17's existing operations and maintenance (O&M) and vegetation management practices. As a result of construction of the Phase 3 Repair Project, landside vegetation would be removed; this was previously evaluated in the September 2011 Draft Environmental Impact Statement/Environmental Impact Report (DEIS/DEIR) (USACE and RD 17 2011) and is described in the "Direct and Indirect Effects on Listed Species in the Action Area" section of the BA. Long-term vegetation management practices, (post construction) for both landside and waterside vegetation, would be conducted in accordance with RD 17's existing practices, as described under the "Additional Project Components" subsection [pages 27 – 28] in the "Description of the Proposed Action" section of the BA, and are evaluated in the "Direct and Indirect Effects to Listed Species in the Action Area" section of the BA. These existing management practices associated with vegetation encroachments on the levees include trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up to 5 feet above the ground (or 12 feet above the crown road). See also Response to Comment 3.

Response to Comment 3

Information about Phase 3 Repair Project compliance with USACE's standards for vegetation management has been revised since the 2011 Draft EIS/EIR on the Phase 3 Repair Project. The BA (see "Compliance with USACE Vegetation Management Standards" [pages 19 – 20] subsection in the "Description of the Proposed Action" section) has been updated with the most current information contained within the forthcoming Final EIS which states the following in the section concerning "Waterside Vegetation Removal:"

> "With issuance of Engineering Technical Letter (ETL) 1110-2-571 in 2009, USACE updated its vegetation management standards for levees, requiring the removal of all vegetation, with the exception of perennial grasses, on levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2009a). In September 2011, USACE issued a Draft Environmental Impact Statement/Draft Environmental Impact Report (DEIS/DEIR) for the Phase 3 Repair Project (USACE and RD 17 2011). The September 2011 DEIS/DEIR considered two options for complying with ETL 1110-2-571, as follows:

- Full Implementation of USACE ETL 1110-2-571: All vegetation, other than perennial grasses, would be removed from the levee slopes and out 15 feet from the waterside and landside levee toes, or

- Acquisition of a Variance from Full Compliance with USACE ETL 1110-2-571: Permission would be obtained from USACE to retain all vegetation on the lower two-thirds of the waterside levee slope and out 15 feet from the waterside levee toe; all other levee vegetation still would be removed in accordance with USACE policy.

The USACE policy for Section 408 permission requires any proposed alteration must meet current USACE designs and construction standards. However a requester is not required to bring those portions or features of the existing USACE project that are not impacted by the alteration up to current USACE design standards. The requester has submitted construction methods where the waterside of the levee would not be affected by installation of the proposed alteration, so compliance with the ETL is not required for the approval of the Section 408 permission. RD17 is no longer considering full compliance with the ETL as an alternative.

RD 17 will continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which includes trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up to 5 feet above the ground (or 12 feet above the crown road). In the Phase 3 Repair Project area, landside vegetation would be removed as previously evaluated in the September 2011 DEIS/DEIR (USACE and RD 17 2011) and as described under the "Additional Project Components" and "Effects" sections of this BA. Long-term vegetation management practices, for both landside and waterside vegetation, would be managed in accordance with the USACE O&M Manual which includes RD 17's existing practices, as described under the "Additional Project Components" section of this BA, and are evaluated in the "Effects" section of this BA."

The "Compliance with USACE Vegetation Management Standards" subsection [pages 19-20] in the "Description of the Proposed Action" section of the BA has been updated to reflect this change. Therefore, RD 17's existing vegetation management practices along the waterside of its levees will continue. These practices, which are also outlined in the BA's revised "Additional Project Components" subsection [pages 27-28] in the "Description of the Proposed Action" section, entail managing vegetation encroachments on the landside and waterside of the levee, through trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up 5 feet above the ground or 12 feet above the crown road. Some landside vegetation would be removed during construction of the Phase 3 Repair project. See also Response to Comment 2.

Response to Comment 4

See also Response to Comments 2 and 3. This Section 7 consultation is intended to cover both construction of the Phase 3 Repair Project and vegetation management along the levees post-construction. The BA (see "Compliance with USACE Vegetation Management Standards" and "Additional Project Components" sections) has been updated to reflect more specificity in RD 17's existing O&M and vegetation management practices. The "Direct and Indirect Effects to Listed Species in the Action Area" section in the BA has been updated as appropriate to account for ongoing and future vegetation management practices.

Following completion of construction, woody vegetation would not be allowed to establish on the new levee or within 15 feet of the toe of the levee. RD17 will continue to maintain the levees utilizing both mowing and herbicide application within the allowable work window. Rodent control will continue with baited rodenticide traps, and routine grouting will be used to manage burrows.

As stated in your October 2015 letter, the USFWS has not begun consultation on the Project yet, pending receipt of additional information (see Response to Comment 14); therefore, re-initiation is not necessary at this point.

Response to Comment 5

As reported in Table 8-2, no waterside woodlands would be directly affected (i.e., removed) during construction of the Phase 3 Repair Project. Per Response to Comment 3, after construction is completed, waterside vegetation would be managed in accordance with RD 17's existing practices, which are limited to trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up 5 feet above the ground or 12 feet above the crown road. Trees are only trimmed, not removed under existing O&M practices. Therefore, there is no change in the amount of waterside habitat that would be directly affected as a result of construction of the Phase 3 Repair Project or future vegetation management activities.

The amount of waterside woodlands outside the project footprint but located along the waterside of the levee to 15 feet out from the waterside levee toe of the project levee reaches is approximately 6.87 acres; none of this vegetation would be removed as a result of construction or future vegetation management practices. The amount of landside woodlands outside the project footprint but located along the landside of the levee to 15 feet out from the landside levee toe is approximately 5.92 acres; some of this would be removed as a result of project construction (3.28 acres; see Table 8-2 in the BA) but none would be removed as a result of future vegetation management activities.

Response to Comment 6

The "Compensation Measures" subsection under the "Description of the Proposed Action" section on pages 332-33 of the BA has been updated to include new information about the Mitigation and Monitoring Plan. A Conceptual Mitigation and Monitoring Plan for Riparian Brush Rabbit [for the] Phase 3 – RD 17 Levee Seepage Repair Project (Conceptual MMP) (RD 17 2016) has been prepared to describe the expansion and restoration of riparian habitat in Element IVc; this document is included as Appendix E to the BA.

This Conceptual MMP describes the proposed restoration of at least 10 acres of riparian scrub and Great Valley oak woodland habitat, located between the river and the waterside toe of the new setback levee in Element IVc. The "Direct and Indirect Effects to Listed Species in the Action Area" section of the BA has been updated to account for new detail in the habitat restoration proposal, and the analysis demonstrates that additional compensation sites would no longer be necessary to offset effects to species described in the BA.

Response to Comment 7

See Response to Comment 6. The "Riparian Brush Rabbit" subsection under the "Direct and Indirect Effects to Listed Species in the Action Area" section on pages 53-54 of the BA has been updated to account for new detail in the Conceptual MMP, and the analysis demonstrates that additional compensation sites would no longer be necessary to offset effects to species described in the BA.

Response to Comment 8

Effects to woody vegetation were evaluated through GIS analysis. Habitat layers were mapped into polygons. Where woodland clusters were within 20 feet of each other, the clusters were consolidated into one polygon. This clustering allowed for more than adequate buffer around woody vegetation, considering that the riparian brush rabbit forages along the edges of shrub cover and in small clearings in the vegetation cover rather than in large openings and that it seldom ventures more than 1 meter (3.3. feet) from cover (Sandoval et al. 2006; USFWS 1998).

See Response to Comment 6 and the "Riparian Brush Rabbit" subsection under the "Direct and Indirect Effects to Listed Species in the Action Area" section on pages 53-54 of the BA." The Conceptual MMP describes the proposed restoration of at least 10 acres of riparian scrub and Great Valley oak woodland habitat, located between the river and the waterside toe of the new setback levee in Element IVc. Using GIS and CAD analysis to guide habitat design, the acreage within the Element IVc levee setback area that can be planted with riparian vegetation was calculated. The calculation assumes the density of vegetation in the restored riparian habitat would be similar to the density of existing riparian vegetation on the northern side of Element Va.

Response to Comment 9

See Response to Comment 6. A Conceptual MMP (RD 17 2016) has been prepared to describe the expansion and restoration of riparian habitat in Element IVc; this document is now included as Appendix E to the BA. The Conceptual MMP outlines the proposed planting design, measurable objectives, monitoring, and management elements for the habitat restoration area.

Response to Comment 10

The "Compensation Measures" subsection under the "Description of the Proposed Action" section on pages 32-33 of the BA has been updated to state that elderberry shrubs that cannot be avoided would be transplanted to the levee setback area in Element IVc, in accordance with the USFWS's Conservation Guidelines for the valley elderberry longhorn beetle, and that the restoration design would include elderberry seedlings and associated species plantings to compensate for the effects to valley elderberry longhorn beetle habitat within the Phase 3 Repair Project site. The Conceptual MMP (RD 17 2016; Appendix E to the BA) describes the expansion and restoration of riparian habitat in Element IVc and outlines the proposed planting design, measurable objectives, monitoring, and management elements for the habitat restoration area.

Response to Comment 11

The Phase 3 Repair Project, and the associated USACE Section 404 and Section 408 actions, are limited to the construction of the Phase 3 levee repairs and ongoing vegetation management along the waterside and landside of the levees. The removal of landside vegetation, to accommodate construction of the Phase 3 Repair Project levee repairs, is discussed in the "Direct and Indirect Effects to Listed Species in the Action Area" section of the BA. Ongoing vegetation management is limited to vegetation trimming; no vegetation would be removed outside of construction. See also Response to Comments 2 and 3. RD 17 and USACE conduct ongoing monitoring to evaluate the maintenance of levee integrity.

Response to Comment 12

Additional future projects or actions may be necessary to achieve a 200-year level of protection. Levee repairs and improvements are subject to USACE Section 408 Permission and would require that USACE conduct Section 7 consultation with USFWS and NMFS. Thus, in the case that additional projects or actions are proposed, the USACE would be required to consult with USFWS to evaluate whether these could result in effects to federally listed species. The effects of projects that require a federal action are not considered in the cumulative effects evaluation during Section 7 consultation evaluation because they are subject to separate consultation (USFWS and NMFS 1998).

Response to Comment 13

The information about the exclusion of setbacks has been provided in the BA, with information specifically incorporated into the "Setback Levee Considerations" subsection of the "Description of the Proposed Action" section on page 22 of the BA. The complete hydraulic analyses that evaluated the setback levee alternatives are included as a new appendix to the BA (Appendix F).

As stated in the "Setback Levee with Seepage Berm and Underlying Cutoff Wall" section of the BA, and as described in greater detail under Section 2.1.4 in the Draft EIS/EIR (USACE and RD 17 2011), and in Appendix F to the BA, setback levees were considered but eliminated from further consideration in several project reaches for the following reasons.

- Construction of a setback levee along certain stretches of the river were hydraulically constrained and would have greatly increased the project scope to the point of being cost prohibitive (Elements VIa.4 and VIb).
- Because of the proximity to the bifurcation at Old River, the change in hydraulic conditions that would result from constructing a setback levee at Elements Va and VIa.1 at this location would increase flows down the San Joaquin River during flood events, which could lead to increased flooding downstream (Elements Va and VIa.1).
- Construction of a setback levee relative to other levee improvement alternatives and/or land acquisition to accommodate the construction of a setback levee was cost prohibitive (Elements Ie, IIIb, IVa, VIcde, and VIIb).
- Existing landside development constrained the option of constructing a setback levee (Elements Ia, IIab, VIIe, and VIIg).

Response to Comment 14

Acknowledged. This memorandum provides the additional information requested. The BA has also been revised, as appropriate, to incorporate this information.

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U.S. Army Corps of Engineers (USACE). 2014 (April 30). *Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures*. Technical Letter No. 1110-2-583. Washington, DC.

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9. February 2017 Biological Assessment.

Final Biological Assessment

Phase 3–RD 17 Levee Seepage Repair Project

Prepared for:

Reclamation District (RD) No. 17

For submittal to:

U.S. Army Corps of Engineers

US Army Corps of Engineers ®
Sacramento District

Prepared by:

GEI Consultants

in association with

AECOM

As modified by USACE

February 2017

Final Biological Assessment

Phase 3–RD 17 Levee Seepage Repair Project

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As Modified by USACE

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ACRONYMS AND OTHER ABBREVIATIONS

BA	Biological Assessment
Bay-Delta	San Francisco Bay/Sacramento–San Joaquin Delta
BMP	Best Management Practice
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CVFPB	Central Valley Flood Protection Board
CVP	Central Valley Project
DEIS/DEIR	Draft Environmental Impact Statement/Draft Environmental Impact Report
Delta	Sacramento–San Joaquin Delta
DPS	distinct population segment
DWR	California Department of Water Resources
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	evolutionary significant unit
ETL	Engineering Technical Letter
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FR	Federal Register
HTL	high tide line
LSRP	Levee Seepage Repair Project
MAF	million acre-feet
MMP	Mitigation and Monitoring Plan for the Riparian Brush Rabbit
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
PAL	provisional accredited levee
Phase 3 Repair Project	Phase 3 of the Reclamation District No. 17 Levee Seepage Repair Project
PL	Public Law
RD 17	Reclamation District No. 17
RWQCB	Regional Water Quality Control Board
Section 404	Section 404 of the Clean Water Act (33 USC 1344)
Section 408	Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408)
Settlement	Stipulation of Settlement in *NRDC et al. v. Kirk Rodgers et al*.
SJMSCP	San Joaquin Multi-Species Habitat Conservation and Open Space Plan
SJRRP	San Joaquin River Restoration Program
SRA	shaded riverine aquatic
SWP	State Water Project
SWPPP	storm water pollution prevention plan
SWRCB	State Water Resources Control Board
TMDL	total maximum daily load
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
VELB	valley elderberry longhorn beetle
VELB Guidelines	Conservation Guidelines for the Valley Elderberry Longhorn Beetle

INTRODUCTION

The purpose of this Biological Assessment (BA) is to review Phase 3 of the Reclamation District No. 17 (RD 17) Levee Seepage Repair Project (LSRP) (Phase 3 Repair Project) in sufficient detail to determine the extent to which the proposed action may affect any of the federally listed species described below under “Species Considered.” (See “Project Background and History” below for a brief summary of Phase 1 and Phase 2.)

RD 17, which is located in south-central San Joaquin County, California (**Exhibit 1**; see **Appendix A** for all exhibits), is responsible for maintaining 19 miles of levees along Walthall Slough, the San Joaquin River, and French Camp Slough, as well as the dryland levee along the southern boundary of Manteca. For discussion purposes, the RD 17 levees have been divided into 11 distinct “reaches,” identified by Roman numerals (i.e., I, II, III…, XI), and subdivided further into 28 “elements,” identified by the reach number followed by a lowercase letter and, where needed to further distinguish elements, an Arabic numeral (e.g., Ia, IIa, IIb, …, Va, VIa.1, VIa.2, VIa.4, …, VIe, VIIa, VIIb, …, VIIg…,XIa) (**Exhibit 2**).

This BA does not address the dryland levee (Reaches VIII – XI) because it is not a USACE flood risk management project, and therefore is not subject to Section 408 authorization. The dryland levee is an overland earthen berm, north and east of the San Joaquin River. Under almost all conditions, water does not come in contact with the dryland levee. It only functions as a flood risk management feature if water from the San Joaquin River or Walthall Slough leaves the banks of these waterways and inundates lands north and east, toward Manteca. The dryland levee then acts as an elevated earthen feature that prevents these flood waters from moving farther north. Suitable habitat for federally listed species does not occur along the dryland levee.

This BA has been prepared in accordance with requirements set forth under Section 7 of the federal Endangered Species Act (ESA) (16 United States Code [USC] 1536[c]). It supports formal consultation with the U.S. Fish and Wildlife Service (USFWS) and informal consultation with the National Marine Fisheries Service (NMFS) on the effects of the Phase 3 Repair Project on federally listed species and designated critical habitat. This BA also supports consultation with NMFS for project effects on Pacific Coast Salmon (*Oncorhynchus* spp.) essential fish habitat (EFH) , as required by the Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 USC 1801). (See the “Essential Fish Habitat Assessment” section below.)

Section 7(a)(2) of the ESA directs federal agencies to ensure that their activities are not likely to jeopardize the continued existence of any listed species, or to result in the destruction or adverse modification of critical habitat. This section of the ESA also requires agencies with regulatory authority over listed species to issue biological opinions evaluating the direct and indirect effects of federal actions, and actions that are interrelated or interdependent with the federal action. The biological opinions must determine whether the actions being evaluated may appreciably reduce the listed species’ likelihood of surviving or recovering in the wild by reducing their productivity, numbers, or distribution.

To implement the Phase 3 Repair Project, RD 17 is requesting permission from the U.S. Army Corps of Engineers (USACE) for:

- alteration of federal project levees, pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408, referred to in this BA as “Section 408”); and
- placement of fill in jurisdictional waters of the United States, pursuant to Section 404 of the Clean Water Act (33 USC 1344, referred to in this BA as “Section 404”).

All Phase 3 Repair Project work occurring on the water side of the levee would be above the high tide line (HTL). Therefore, no additional authorizations under Section 10 of the Rivers and Harbors Act of 1899 are required.

These activities are described in more detail under “Description of the Proposed Action.” This BA analyzes direct, indirect, interrelated/interdependent, and cumulative effects of the proposed action on federally listed species.

SPECIES CONSIDERED

This document considers species that have been termed “threatened” or “endangered” under the jurisdiction of USFWS and NMFS. On February 27, 2014, biologists consulted the online database maintained by USFWS’s Sacramento Office to conduct a query of the Lathrop (462D) and West Sacramento (462A) 7.5-minute quadrangles (USFWS 2014) (**Appendix B**). Another query of the USFWS database was conducted on April 18, 2016 (USFWS 2016) (**Appendix B**), and the information in this BA was updated, based on those results. Using the California Department of Fish and Wildlife’s (CDFW’s) California Natural Diversity Database (CNDDB) (CDFW 2014) and the California Native Plant Society’s database of rare and endangered plant species (CNPS 2014), biologists also conducted a query of the topographic quadrangles in which the action area occurs (Lathrop and Stockton West) and the surrounding quadrangles; these database queries were conducted on February 27, 2014, and March 3, 2014, respectively (**Appendix B**). This query identified all listed species in the area surrounding the action area, which is defined here in accordance with ESA guidelines as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action” (50 Code of Federal Regulations [CFR] 402.02).

Based on these database queries and the biologists’ familiarity with local flora and fauna, 21 plant and wildlife species that are federally listed as endangered or threatened, or are federally proposed for listing were considered as part of this BA (**Table 1**).

The following federally proposed and federally listed species are known to occur or have the potential to occur in the Phase 3 Repair Project area (USFWS 2014, 2016):

- valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*),
- riparian brush rabbit (*Sylvilagus bachmani riparius*),
- delta smelt (*Hypomesus transpacificus*),
- Central Valley steelhead distinct population segment (DPS) (*Oncorhynchus mykiss*),
- longfin smelt (*Spirinchus thaleichthys*),
- Sacramento River winter-run Chinook salmon evolutionarily significant unit (ESU) (*O. tshawytscha*),
- Central Valley spring-run Chinook salmon ESU (*O. tshawytscha*), and
- the Southern DPS of North American green sturgeon (*Acipenser medirostris*).

The other federally listed species shown in Table 1 were eliminated from further consideration; they are not likely to occur in the Phase 3 Repair Project area because of a lack of suitable habitat, local range restrictions, regional extirpations, or lack of connectivity between areas of suitable or occupied habitat, or because the action area is located outside the extant range of the species (see “Action Area” section below). The USFWS and NMFS-regulated species with the potential to occur on-site are discussed in more detail in this BA.

Table 1
Fish and Wildlife Species, Federally Listed or Proposed for Listing, Considered in Evaluation of the Phase 3 Repair Project

Species	Status	Habitat	Potential to Occur in the Lower San Joaquin River[1]
Plants			
Large-flowered fiddleneck *Amsinckia grandiflora*	Endangered[2] SJMSCP-covered[4]	Annual herb with bright orange, trumpet-shaped flowers that bloom in late spring. Historically found on north-facing slopes in the upper elevations of grasslands near the blue oak belt in Contra Costa, Alameda, and San Joaquin counties.	No potential to occur. No suitable habitat is present in the action area.[3]
Palmate-bracted bird's-beak *Cordylanthus palmatus*	Endangered[2]	Annual herb that blooms from late spring through summer. Grows on seasonally flooded, saline-alkali soils in lowland plains and basins at elevations of less than 500 feet. Known from scattered locations in Sacramento and San Joaquin valleys; however, unlikely to occur in San Joaquin County because of lack of alkali habitat.	No potential to occur. No suitable habitat is present in the action area.[3]
Invertebrates			
Conservancy fairy shrimp *Branchinecta conservatio*	Endangered SJMSCP-covered[4]	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present in the action area.[3]
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	Threatened SJMSCP-covered[4]	Inhabits elderberry shrubs, primarily in riparian woodland and scrub habitat.	Could occur; elderberry shrubs present occasionally along the San Joaquin River on the waterside and landside of the Phase 3 Repair Project levee; however, no evidence of beetle exit holes was observed in these shrubs.
Vernal pool fairy shrimp *Branchinecta lynchii*	Threatened SJMSCP-covered[4]	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present in the action area.[3]
Vernal pool tadpole shrimp *Lepidurus packardi*	Endangered SJMSCP-covered[4]	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present in the action area.[3]
Fish			
Central Valley steelhead *Oncorhynchus mykiss*	Threatened	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.	Likely to occur. Occurs in the Sacramento and San Joaquin rivers, tributaries, and the Delta. Occurs seasonally in the San Joaquin River in the action area[3]; no spawning habitat is in the action area. Designated critical habitat is in the action area.
Central Valley fall/ late fall–run Chinook salmon *Oncorhynchus tshawytscha*	Species of Concern[2]	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.	Likely to occur. Occurs in the Sacramento and San Joaquin rivers, tributaries, and the Delta. Occurs seasonally in the San Joaquin River in the action area[3]; no spawning habitat is in the action area. Essential fish habitat for this species is in the Phase 3 Repair Project area.

Table 1
Fish and Wildlife Species, Federally Listed or Proposed for Listing, Considered in Evaluation of the Phase 3 Repair Project

Species	Status	Habitat	Potential to Occur in the Lower San Joaquin River[1]
Delta smelt *Hypomesus transpacificus*	Threatened[2] SJMSCP-covered[4, 5]	Spawns in tidally influenced freshwater wetlands and seasonally submerged uplands; rears seasonally in inundated floodplains, tidal marsh, and the Delta.	Could occur. Occurs in tidally influenced segments of the Sacramento and San Joaquin rivers, tributaries, and Delta. Although no spawning habitat is in the action area, delta smelt has potential to occur in the San Joaquin River in the action area.[3] Designated critical habitat is in the action area.
Longfin smelt *Spirinchus thaleichthys*	Candidate/ Proposed Threatened[2] SJMSCP-covered[4, 5]	Pelagic estuarine. Ranges from the Delta in California northward to the Cook Inlet in Alaska.	Could occur. Occurs in tidally influenced segments of the Sacramento and San Joaquin rivers, tributaries, and the Delta. Although no spawning habitat is in the action area, longfin smelt has potential to occur in the San Joaquin River in the action area.[3]
Sacramento River winter-run Chinook salmon *Oncorhynchus tshawytscha*	Endangered[2]	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.[5]	Could occur, but unlikely. Occurs in the Sacramento River, tributaries, and the Delta. No spawning habitat is in the action area. Unlikely to occur in the San Joaquin River in the action area[3]; however, occasional adult and/or juvenile strays may be present.
Central Valley spring-run Chinook salmon *Oncorhynchus tshawytscha*	Threatened[2]	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta	Could occur, but unlikely. Occurs in the Sacramento River, tributaries, and the Delta. Currently unlikely to occur in the San Joaquin River in the action area[3]; no spawning habitat is in the action area. However, occasional adult and/or juvenile strays may be present. The SJRPP[6] includes the reintroduction of this species (an experimental population) to the San Joaquin River.
Green sturgeon *Acipenser medirostris*	Threatened SJMSCP-covered[4, 5]	Requires seasonally inundated floodplains, rivers, tributaries, and the Delta.[5]	Could occur. Occurs in the Sacramento and San Joaquin rivers, tributaries, and the Delta. Has potential to occur in the San Joaquin River in the action area.[3] Designated critical habitat is in the action area.
Amphibians and Reptiles			
California red-legged frog *Rana draytonii (=R. aurora draytonii)*	Threatened SJMSCP-covered[4]	Prefers semi-permanent and permanent stream pools, ponds, and creeks with emergent riparian vegetation and typically without predatory fish. Requires adequate hibernacula, such as small-mammal burrows and moist leaf litter.	No potential to occur. Potential aquatic habitat in the Phase 3 Repair Project area is limited to one constructed pond, likely with predatory fish, but the action area is outside the species' extant range.

Table 1 Fish and Wildlife Species, Federally Listed or Proposed for Listing, Considered in Evaluation of the Phase 3 Repair Project			
Species	**Status**	**Habitat**	**Potential to Occur in the Lower San Joaquin River[1]**
California tiger salamander *Ambystoma californiense*	Threatened[2] SJMSCP-covered[4]	In winter, breeds in vernal pools and stock ponds that are fish-free and inundated for a minimum of 12 weeks. In summer, aestivates in rodent borrows in grassland habitat.	Unlikely to occur. Potential aquatic habitat in the Phase 3 Repair Project area is limited to one constructed pond, likely with predatory fish; a small area of freshwater marsh in element Ib[7]; and agricultural ditches. Much of the action area consists of urban and agricultural land that is not suitable as potential upland habitat. A 1996 CNDDB record documents California tiger salamander adjacent to State Route 120 in roadside seasonal wetland; however, it is approximately 2 miles east of the San Joaquin River and geographically isolated.
Giant garter snake *Thamnophis gigas*	Threatened[2] SJMSCP-covered[4]	Streams, sloughs, ponds, and irrigation/drainage ditches; also requires upland refugia not subject to flooding during the snake's inactive season.	Unlikely to occur. Although potential habitat for this species is present in the Phase 3 Repair Project area, none of it is suitable. The only documented occurrences of giant garter snake are separated from the Phase 3 Repair Project area by extensive urbanized development (City of Stockton) and large rivers that do not provide suitable habitat and are a greater distance than the species is known to disperse. For additional information that summarizes the rationale that supports the "unlikely to occur" determination for this species in the Phase 3 Repair Project area, refer to **Appendix C** in this document.
Birds			
Least Bell's vireo *Vireo bellii pusillus*	Endangered[2]	Nests in riparian habitat adjacent to riverine and freshwater marsh.	Unlikely to occur. Although suitable habitat is present, the last recorded observation of this species in the action area was in 1878, with no extant occurrences.
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	Threatened SJMSCP-covered[4]	Insect-feeder that forages in dense riparian oak forest canopy along major rivers. Species is considered extirpated from San Joaquin County.	No potential to occur. Although potential dispersal and foraging habitat is in the Phase 3 Repair Project area, the action area is outside the species' extant range.
Mammals			
San Joaquin kit fox *Vulpes macrotis mutica*	Endangered SJMSCP-covered[4]	Annual grassland or grassy open stages with scattered shrubby vegetation; needs loose-textured sandy soils for burrowing, and suitable prey base.	No potential to occur. Although potential dispersal and foraging habitat is in the Phase 3 Repair Project area, the action area is outside the species' extant range.
Riparian brush rabbit *Sylvilagus bachmani riparius*	Endangered[2] SJMSCP-covered[4, 5]	Inhabits riparian oak forest with dense understory of wild roses, grapes, and blackberries; small home ranges, seldom moving more than a few feet from cover, avoiding large openings in shrub cover and frequenting small clearings.	Known to occur. Occupied riparian habitat is present on the waterside of elements IIIa and IIIb, and suitable habitat is present immediately adjacent to the project area in several elements; the species also is known to occur on an oxbow between elements VIa.1 and VIa.4[7] and in waterside habitat between elements IIab and IIIa.

Table 1 Fish and Wildlife Species, Federally Listed or Proposed for Listing, Considered in Evaluation of the Phase 3 Repair Project			
Species	**Status**	**Habitat**	**Potential to Occur in the Lower San Joaquin River[1]**
Riparian (=San Joaquin Valley) woodrat *Neotoma fuscipes riparia*	Endangered SJMSCP-covered[4]	Requires healthy riparian forests, where it nests in cavities in trees, snags, or logs, spaces in talus, or lodges built of downed woody materials. Known to exist in and immediately adjacent to Caswell Memorial State Park, along the Stanislaus River in San Joaquin County.	No potential to occur. The action area is outside the species' extant range.

Notes: CNDDB = California Natural Diversity Database; Delta = Sacramento–San Joaquin Delta; Phase 3 Repair Project = Phase 3 of the proposed Reclamation District No. 17 Levee Seepage Repair Project; SJMSCP = San Joaquin Multi-Species Habitat Conservation and Open Space Plan; SJRRP = San Joaquin River Restoration Program

[1] **Potential for Occurrence Definitions:**

No potential to occur; Suitable habitat is not present in the Phase 3 Repair Project area and/or the Phase 3 Repair Project area is not within the historical or current range of the species.

Unlikely to occur: Potential habitat present, but species unlikely to be present in the Phase 3 Repair Project area because of current status of the species, a very restricted distribution, and/or essential habitat components are not present.

Could occur: Suitable habitat is available in the Phase 3 Repair Project area; however, few or no other indicators show that the species may be present.

Likely to occur: Habitat conditions, behavior of the species, known occurrences in the Phase 3 Repair Project area, or other factors indicate a relatively high likelihood that the species would occur in the Phase 3 Repair Project area.

Known to occur: The species, or evidence of its presence, was observed in the Phase 3 Repair Project area during reconnaissance-level surveys or was reported by others.

[2] These species have a similar status listing under the California Endangered Species Act, except for delta smelt and western yellow-billed cuckoo, which are both State-listed as endangered, and longfin smelt and San Joaquin kit fox, which are both State-listed as threatened.

[3] Action Area: The action area is defined here in accordance with ESA guidelines as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). The action area includes all areas that would be directly or indirectly affected by the components of the Phase 3 Repair Project. Areas downstream from the Phase 3 Repair Project area may also be indirectly affected by the flood risk management component of the project through improved water quality and flood risk management conditions.

[4] SJMSCP-covered: These species are covered under the SJMSCP (San Joaquin County 2000).

[5] SJMSCP-covered with limitations: The SJMSCP does not cover the conversion of occupied riparian brush rabbit habitat, limits the amount of delta smelt habitat, and does not authorize take of green sturgeon.

[6] See "San Joaquin River" subsection under "Environmental Baseline" section below, for more information.

[7] Elements: The RD 17 levees have been divided into seven distinct "reaches" identified by Roman numerals (i.e., I, II, III), and subdivided further into 19 "elements," identified by the reach number followed by a lowercase letter and, in some cases, an Arabic numeral (e.g., Ia, IIa, Va, VIa.1…); see **Exhibit 2**.

Sources: CDFW 2014; CNPS 2014; USFWS 2014, 2016; data compiled by AECOM in 2014 and updated by GEI Consultants in 2016

SPECIES HABITAT AND POTENTIAL FOR OCCURRENCE IN THE AREA

The following is a summary of relevant habitat conditions in the action area for species that could occur, are likely to occur, or are known to occur in the Phase 3 Repair Project area. Full species accounts for federally listed species addressed in this BA are presented in the section titled "Species Accounts."

- **Valley elderberry longhorn beetle:** Elderberry shrubs provide habitat for VELB. Elderberry shrubs are known to occur along the San Joaquin River, on both the waterside and landside of levees in the Phase 3 Repair Project area. Focused surveys for elderberry shrubs were conducted along all levee reaches on March 8, 2011; the area was resurveyed on January 29, 2014. A total of 18 elderberry shrubs were observed within 100 feet of the Phase 3 Repair Project area: nine shrubs on the waterside of the levee and nine shrubs on the landside. None of the shrubs had evidence of beetle exit holes. One of the landside shrubs does not have stems greater than 1 inch in diameter at ground level; therefore, it is not considered suitable VELB habitat.

- **Riparian brush rabbit:** Trapping conducted in February 2003 and February 2004 detected occurrences of riparian brush rabbit near the Phase 3 Repair Project area in waterside riparian habitat adjacent to elements IIIa and IIIb, between elements IIab and IIIa, and between elements VIa.1 and VIa.4 (CDFW 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004). The waterside habitat along elements IIIa and IIIb is dominated by willow within interspersed California blackberry and grasses. The trapping locations between elements IIab and IIIa are dominated by willows, cottonwoods, valley oaks, wild rose, and California and Himalayan blackberry. The trapping locations between elements VIa.1 and VIa.4 are on an oxbow with dense riparian vegetation. Similar riparian habitat is present adjacent to the waterside of elements IIab, IVc, and Va. North of element IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, or isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species.

- **Delta smelt:** Delta smelt are found from Suisun Bay upstream through the Sacramento–San Joaquin Delta (Delta). Delta smelt disperse widely into freshwater in late fall and winter as the spawning period approaches, and may move as far upstream as Mossdale on the San Joaquin River (Bennett 2005). Therefore, this species has the potential to occur in the Phase 3 Repair Project area.

- **Longfin smelt:** Longfin smelt occur in the Delta and tidally influenced segments of the Sacramento and San Joaquin rivers. The occurrence of longfin smelt in the San Joaquin River is rare, but it does occur on occasion when river salinity extends farther upstream, either because of Delta pumping or because of drought. Therefore, this species has the potential to occur in the Phase 3 Repair Project area.

- **Anadromous salmonids:** The action area (see "Action Area" section below) does not provide suitable spawning habitat for salmonids because it lacks the cold freshwater and gravel substrate characteristic of salmonid spawning areas in upper river basins. However, adult and juvenile Central Valley fall-run Chinook salmon and Central Valley steelhead could occur in the action area during migrations along the San Joaquin River and its tributaries. Winter-run and spring-run Chinook salmon are known to occur only in the Sacramento River and its tributaries (Moyle 2002). Because the action area is along the San Joaquin River, several miles upstream from its confluence with the Sacramento River, adult migrants along the Sacramento River are not expected to move into the action area. However, with implementation of the San Joaquin River Restoration Project (SJRRP) (see "San Joaquin River" subsection under "Environmental Baseline" below), an experimental population of spring-run Chinook salmon are being reintroduced to the San Joaquin River, initiated in 2014, to achieve one of the goals of the SJRRP, which is "to restore and maintain fish populations in 'good condition' in the mainstem San Joaquin River…including naturally reproducing and self-sustaining populations of salmon and other fish" (NMFS 2013).

- **Green sturgeon:** Green sturgeon is known to occur in the San Joaquin River and Delta, and therefore, has the potential to occur in the lower San Joaquin River in the Phase 3 Repair Project area (Moyle 2002). Currently, green sturgeon spawning in the San Joaquin River is not documented.

CRITICAL HABITAT

"Critical habitat" is defined in Section 3(5)A of the ESA as the specific areas in the geographical area occupied by the species where physical or biological features are found that are essential to the conservation of the species and that may require special management considerations or protection. Specific areas outside the geographical area occupied by the species also may be included in critical-habitat designations, based on a determination that such areas are essential for conservation of the species.

The proposed action addressed in this BA would fall within designated critical habitat for delta smelt, which was designated on December 19, 1994 (59 Federal Register [FR] 65256). Critical habitat is designated to include most tidally influenced areas of the Delta.

The proposed action addressed in this BA would fall within designated critical habitat for the Central Valley steelhead DPS. Critical habitat for the Central Valley steelhead DPS was designated on August 12, 2005; a final designation was published on September 2, 2005 (70 FR 52604), with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include select waters in the Sacramento and San Joaquin river basins, including the segment of the San Joaquin River in the action area (see “Action Area” section below).

The proposed action addressed in this BA would fall within designated critical habitat for the Southern DPS of North American green sturgeon. Critical habitat for green sturgeon was designated on October 9, 2009 (74 FR 52300). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins, including the segment of the San Joaquin River in the action area.

The action area is not within designated critical habitat for the remaining species listed in **Table 1,** for which such a designation has been made: large-flowered fiddleneck, Conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, VELB, Sacramento River winter-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU, California red-legged frog, California tiger salamander, and least Bell’s vireo. Critical habitat has not been designated for palmate-bracted bird’s-beak, longfin smelt, Central Valley fall/late fall–run Chinook salmon ESU, giant garter snake, western yellow-billed cuckoo, San Joaquin kit fox, riparian brush rabbit, or riparian woodrat.

SAN JOAQUIN MULTI-SPECIES CONSERVATION PLAN

All of the above species, except the anadromous salmonid fish species, are covered on some level under the San Joaquin Multi-Species Habitat Conservation and Open Space Plan (SJMSCP) (San Joaquin County 2000). The SJMSCP was developed to avoid, minimize, and mitigate impacts on plant and wildlife habitat projected to occur in San Joaquin County between 2001 and 2051, resulting from the anticipated conversion of open space land to non–open space uses. Ninety-seven species are covered by the SJMSCP. The plan is intended to provide comprehensive mitigation, in accordance with local, State, and federal regulations, for impacts of SJMSCP-permitted activities on these species. USFWS and CDFW participated in development of the SJMSCP, approved the mitigation, and agreed to issue incidental take permits for species and activities covered by the SJMSCP.

The geographic area covered in the SJMSCP extends up to the landside levee crown of the San Joaquin River levee and includes the Phase 3 Repair Project area. However, the SJMSCP does not cover federal flood risk management projects or activities that involve tidally jurisdictional wetlands or other waters of the United States, and thus the Phase 3 Repair Project would not be a covered activity under the SJMSCP. The SJMSCP outlines a mechanism by which a federal flood risk management project, such as the Phase 3 Repair Project, could obtain take coverage under the SJMSCP (see Section 8.2.3 of the SJMSCP). However, because the SJMSCP does not cover special-status fish, the conversion of riparian brush rabbit habitat, or impacts on other species on the waterside of the levee, RD 17 and USACE would not rely on the SJMSCP to assess and offset Phase 3 Repair Project effects on federally listed and State-listed species. Rather, through this BA and the associated Section 7 consultations with USFWS and NMFS, RD 17 and USACE would seek take authorization for Phase 3 Repair Project activities. Species listed under the California Endangered Species Act that also are covered species under the SJMSCP would be evaluated through coordination with CDFW.

CONSULTATION TO DATE

The list below summarizes correspondence, meetings, and discussions between regulatory agencies, RD 17, and consultants that relate to potential effects of the Phase 3 Repair Project on species addressed in this document. The most recent consultation is listed first.

4/18/2016 Letter from USFWS to GEI Consultants regarding the Species List for Phase 3–RD 17 Levee Seepage Repair Project (**Appendix B**)

10/2/2015 Letter from USFWS to USACE requesting additional information on the RD 17 Phase 3 Repair Project BA (**Appendix D-5**). A letter response to comments was completed by GEI Consultants and AECOM, on behalf of RD 17 (**Appendix D-6**).

7/7/2015 Letter from NMFS to USACE requesting additional information on the RD 17 Phase 3 Repair Project BA (**Appendix D-3**). A letter response to comments was completed by GEI Consultants and AECOM, on behalf of RD 17 (**Appendix D-4**).

2/27/15 Letter from USACE to NMFS transmitting the BA and requesting informal consultation.

2/27/15 Letter from USACE to USFWS transmitting the BA and requesting to initiate formal Section 7 consultation.

2/27/14 Letter from USFWS to AECOM regarding the Species List for RD 17 100-Year Levee Seepage Area Project[1] (**Appendix B**)

3/1/11 Tour of proposed action area with representatives from AECOM, USACE, USFWS, NMFS, and CDFW.

1/24/11 Meeting with representatives of USFWS and AECOM to discuss project permitting coordination, potential effects of the project on federally listed species, and development of a conservation strategy.

12/9/10 Meeting with representatives of CDFW and AECOM to discuss project permitting coordination, the potential effects of the project on State-listed species, use of the SJMSCP, and development of a conservation strategy.

8/24/10 Meeting with representatives of USACE, USFWS, NMFS, and AECOM to discuss the potential effects of the project on listed species and development of a conservation strategy.

6/11/10 Letter from NMFS to AECOM, responding to May 14, 2010, letter requesting technical assistance (**Appendix D-2**).

5/14/10 Letter from AECOM, prepared on behalf of RD 17, to USFWS and NMFS requesting informal technical assistance in evaluating the potential effects on listed species that could result from implementing USACE vegetation management standards, and in developing a conservation strategy to adequately offset the potential loss of habitat. Copies of the wetland delineation report and maps were provided with the letter (**Appendix D-1**).

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1 "RD 17 100-Year Levee Seepage Area Project" is a reference to the RD 17 Levee Seepage Repair Project. This former name was used in documents published before preparation of the Final Environmental Impact Statement for Phase 3 of the RD 17 Levee Seepage Repair Project.

DESCRIPTION OF THE PROPOSED ACTION

U.S. ARMY CORPS OF ENGINEERS ACTION

RD 17, in cooperation with the California Department of Water Resources (DWR) and the Central Valley Flood Protection Board (CVFPB), is the local project sponsor for the Phase 3 Repair Project. RD 17 has requested permission from the CVFPB and USACE to alter segments of the San Joaquin River Levee System, which is a federal project levee. The proposed action for USACE is to make a permit decision on Phase 3 of the LSRP under the authority of Clean Water Act Section 404 and a permission decision under Section 408 of Title 33 USC. Under Section 408, USACE may allow the permanent use or occupancy of a USACE flood risk management project with approval by the Secretary of the Army on recommendation of the Chief of Engineers, provided that such use or occupancy would not be injurious to the public interest. USACE has determined that a Section 408 decision would be required for repair of seepage deficiencies to federal project levees. The activities requiring Section 408 and/or 404 authorizations, described in more detail below, include proposed alterations/repairs to USACE flood risk management facilities and fill of jurisdictional waters during earth-moving activities for levee construction. Activities for the Phase 3 Repair Project would be processed through an encroachment permit with the CVFPB. USACE would conduct a technical engineering review as part of the evaluation of the CVFPB's request to modify the Federal flood risk management project, in accordance with USACE regulations under 33 CFR 408.

PROJECT LOCATION

RD 17 is located in south-central San Joaquin County, California, in the center of the California Central Valley, at the north end of the San Joaquin River Basin, and within the far southeast limit of the Delta (see **Exhibit 1**). The boundaries of RD 17 are marked by French Camp Slough on the north, approximately 3 miles southwest of the central business district of the city of Stockton; the San Joaquin River on the west; Walthall Slough on the south (just below State Route 120); and Airport Way/McKinley Avenue on the east, just outside the city of Manteca. RD 17 is responsible for maintaining the levees along the east bank of the San Joaquin River from just south of Mathews Road to Walthall Slough, the levees along the north bank of Walthall Slough, and the dryland levee out to approximately South Airport Way (see **Exhibit 2**).

The proposed action is located along specific reaches of the RD 17 levees, as depicted in **Exhibit 2**. The Phase 3 Repair Project's landside levee improvements would include a combination of construction of seepage berms, installation of chimney drains and both shallow and deep cutoff walls, the raising of landside grade, and construction of a setback levee with seepage berm and an underlying cutoff wall along 19 elements of the RD 17 levee system.

PROJECT BACKGROUND AND PURPOSE

PROJECT BACKGROUND AND HISTORY

The RD 17 system for reducing the risk of flood damage, like other flood protection systems in the San Joaquin Valley, initially was designed to facilitate agricultural development on the extensive valley floodplains and to support river navigation. Levees set closely along the rivers were designed to contain flows generated by common floods, and bypasses were constructed to carry overflows generated by large floods. The close-set levees ensured that water velocities would help scour the river bottom and move sediment through the system, reducing dredging costs for sustaining navigation. Starting in about 1863, RD 17 undertook the maintenance and reconstruction of the levee system.

Some of the levees in the Delta are considered "federal project levees." These levees were constructed or reconstructed (e.g., existing or damaged farm levees were improved) by USACE and are intended to meet federal standards. Construction of the federal levee system that encompasses the current RD 17 levees along Walthall

Slough, the San Joaquin River, and French Camp Slough began in 1944 and was completed in 1963. The levee system has since been upgraded substantially to meet Federal Emergency Management Agency (FEMA) requirements for flood protection during a 100-year flood event (flood with a 1 percent chance of occurring in any given year, or 0.01 annual exceedance probability) [AEP]). In 1990, after extensive analysis, the RD 17 levees were accredited by FEMA as meeting the 100-year requirements for urban development.

During a high-water event on the San Joaquin River in January 1997, seepage and boils occurred at several locations along the RD 17 levees. USACE, DWR, and RD 17 successfully contained the seepage and boils, and the levees did not break. After the 1997 event, USACE, the CVFPB, and RD 17 funded a project, the Reconstruction of the California Central Valley Levees San Joaquin Basin #4, Reclamation District #17 Project, to repair the seepage and boil areas. The project was designed and constructed by USACE, and work was completed in 2003.

After reviewing the data supporting the 1990 accreditation and subsequent information, FEMA notified RD 17 of its intention to confirm full accreditation of the RD 17 levees as meeting FEMA's requirements for 100-year flood protection. On June 19, 2007, DWR wrote a letter to the City of Lathrop, with a copy to FEMA, stating that it could not support recertification of the RD 17 levees or the granting of provisional accreditation because of concerns about seepage exit gradients.[2] The basis of DWR's concern was analysis showing seepage exit gradients greater than 0.5, which indicated a higher likelihood of seepage or boils occurring during a high-water event Because of DWR's concern, FEMA then denied full accreditation and instead granted provisional accredited levee (PAL) status to the RD 17 levees. A PAL is a levee that FEMA has previously credited with providing a 100-year flood event level of flood risk reduction (i.e., flood with a 1 percent chance of occurring in any given year, or 0.01 annual exceedance probability). In fall 2007, in response to the PAL status, RD 17 initiated a levee seepage repair program and requested funding through DWR's Early Implementation Program.

RD 17 subsequently implemented Phases 1 and 2 of the LSRP. After completion of the Phase 1 and 2 levee repairs, RD 17 submitted a recertification application to FEMA. In September 2010, RD 17 received a response letter declaring that FEMA had accredited the area protected by the RD 17 levee system, including the dryland levee, thereby removing the PAL status.

The Phase 1 Project included construction of two seepage berms, located in elements III and VI of the LSRP (**Exhibit 2**). The project reconstructed and extended the landside levee toe berms with earth and gravel fill, both landward and along the levee toe, to reduce seepage exit gradients. Work areas were designed to avoid any environmental resources of possible significance, including sensitive habitats and listed species. The project was determined to be categorically exempt from the California Environmental Quality Act (CEQA), and no federal authorizations or funding was required for the Phase 1 work; therefore, no National Environmental Policy Act (NEPA) analysis was triggered. The Phase 1 Project work was completed in January 2009.

The Phase 2 Project addressed work needed at nine levee reaches in the LSRP area. At eight of the nine reaches, the project involved constructing drained seepage berms along the landside levee toe. At one site that did not include seepage berm construction, RD 17 acquired an easement on land along the levee toe and performed various maintenance and site cleanup activities. A CEQA initial study/mitigated negative declaration that was completed for the Phase 2 Project concluded that no significant effects would occur on environmental resources after mitigation measures were implemented (RD 17 2009). Potential impacts on biological resources that resulted from Phase 2 Project implementation were mitigated through participation in the SJMSCP. No federal

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2 "Seepage exit gradient" is an expression in numeric form of the potential for under seepage to exit on the landside of a levee as seepage or a boil. The lower the number used to express seepage exit gradient, the more resistant the system is to seepage or boils; the higher the number, the more likely seepage or boils may occur during a high water event. In formulas for seepage exit gradients, the numerator (top number in a fraction) typically addresses forces that cause or enhance seepage (e.g., water pressure), and the denominator typically addresses forces that resist seepage (e.g., soil resistance to water pressure, depth and weight of soil over the potential seepage area, distance from the levee toe). A lower seepage exit gradient (i.e., more resistance to seepage) is achieved when the numerator (positive seepage forces) is reduced and/or the denominator (resistance to seepage) is increased.

authorizations or funding was required for the Phase 2 work; therefore, no NEPA analysis was triggered. All Phase 2 Project work was completed in summer 2010.

PROJECT PURPOSE AND OBJECTIVES

The overall purpose of the Phase 3 Repair Project is to implement landside and isolated waterside levee improvements in 19 LSRP elements affecting 5.3 miles of the approximately 19-mile RD 17 levee system, to reduce the risk of flooding in the RD 17 service area during a 100-year flood event. Levee improvements would address under seepage, through seepage, and levee geometry repair and remediation. USACE and RD 17 each view the project purpose from the purview of their respective responsibilities, defined as follows:

USACE's objectives for the Phase 3 Repair Project are to:

- decide whether or not to grant permission for the RD 17 Phase 3 Repair Project to alter the federal project levees within its levee system under Section 408, and
- decide whether or not to issue permits under Section 404.

RD 17's objectives for the proposed Phase 3 Repair Project are to:

- repair seepage deficiencies where needed to meet current USACE seepage criteria standards,
- increase the levee's resistance to under seepage and/or through seepage,
- provide under seepage exit gradients equal to or less than 0.5 at the landside levee toe, and equal to or less than 0.8 at the landside drainage seepage berm at the water surface elevation associated with the design water surface, and
- meet levee geometry requirements of the permitting agencies in the specific areas of repair work.

All Phase 3 Repair Project work would occur on the landside of the existing levee system or above the HTL, on the water side of the levee, therefore, authorization under Section 10 of the Rivers and Harbors Act of 1899 would not be required. Authorization under Section 404 of the Clean Water Act also would not be required on the landside work or on the water side of the levee because work would occur above the HTL. Section 404 authorization would be required on the land side of the levee. USACE verified a wetland delineation that was submitted for Phase 3 of the RD 17 LSRP on November 3, 2009 (a preliminary jurisdictional determination form was issued by USACE on November 10, 2009; USACE 2009b), and three supplemental wetland delineations were prepared. The first supplemental delineation was submitted on January 22, 2010 (a preliminary jurisdictional determination form was issued by USACE on April 9, 2010; USACE 2010a). The second supplemental wetland delineation was submitted on September 16, 2010 (a preliminary jurisdictional determination form was issued by USACE on October 7, 2010; USACE 2010b). The third supplemental wetland delineation was submitted on April 4, 2014 (a preliminary jurisdictional determination form was issued by USACE on April 7, 2014; USACE 2014a).

COMPLIANCE WITH USACE VEGETATION MANAGEMENT STANDARDS

With issuance of Engineering Technical Letter (ETL) 1110-2-571 in 2009,[3] USACE updated its vegetation management standards for levees, requiring the removal of all vegetation, with the exception of perennial grasses, on levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2009a). In September 2011, USACE issued a Draft Environmental Impact Statement/Draft Environmental Impact Report (DEIS/DEIR) for the

3 USACE ETL 1110-2-571 subsequently was replaced by ETL 1110-2-583 on April 30, 2014 (USACE 2014b).

Phase 3 Repair Project (USACE and RD 17 2011). The September 2011 DEIS/DEIR considered two options for complying with ETL 1110-2-571, as follows:

- Full Implementation of USACE ETL 1110-2-571: All vegetation, other than perennial grasses, would be removed from the levee slopes and out 15 feet from the waterside and landside levee toes, or

- Acquisition of a Variance from Full Compliance with USACE ETL 1110-2-571: Permission would be obtained from USACE to retain all vegetation on the lower two-thirds of the waterside levee slope and out 15 feet from the waterside levee toe; all other levee vegetation still would be removed in accordance with USACE policy.

The USACE policy for Section 408 permission requires any proposed alteration must meet current USACE designs and construction standards. However a requester is not required to bring those portions or features of the existing USACE project that are not impacted by the alteration up to current USACE design standards. The requester has submitted construction methods where the waterside of the levee would not be affected by installation of the proposed alteration, so compliance with the ETL is not required for the approval of the Section 408 permission. RD17 is no longer considering full compliance with the ETL as an alternative.

RD 17 will continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which includes trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up to 5 feet above the ground (or 12 feet above the crown road). In the Phase 3 Repair Project area, landside vegetation would be removed as previously evaluated in the September 2011 DEIS/DEIR (USACE and RD 17 2011) and as described under the "Additional Project Components" and "Effects" sections of this BA. Long-term vegetation management practices, for both landside and waterside vegetation, would be managed in accordance with the USACE O&M Manual which includes RD 17's existing practices, as described under the "Additional Project Components" section of this BA, and are evaluated in the "Effects" section of this BA.

DESCRIPTION OF THE PROPOSED PHASE 3 REPAIR PROJECT

This section generally describes the elements of RD 17's proposed project. The section titled "Proposed Schedule and Sequence of Project Construction" describes construction, as well as the proposed construction schedule and sequencing. The Phase 3 Repair Project would address the under seepage and/or through seepage concerns raised by DWR and repair and/or remediate levee geometry to USACE design standards along approximately 5.2 miles of the RD 17 levee system, including portions of the San Joaquin River east levee and portions of the levee along the northerly bank of Walthall Slough. Under seepage occurs below the aboveground levee prism and is caused by the buildup of water pressure in the subsurface foundation soils when high-river stages are present on the waterside of the levees. This pressure head causes water to flow through the earthen foundation layers under the levee and exit onto the ground surface on the landside of the levee prism (**Exhibit 3**). Such seepage is not uncommon and does not inherently imply that the levee is failing; however, excessive and uncontrolled under seepage can carry fine-grained material with the water flow that can undermine the levee and lead to levee failure. Through seepage is the movement of water through the levee prism when high-river stage conditions exist on the waterside of the levee (**Exhibit 3**). Depending on the duration of high water and the permeability of the levee embankment soil, seepage may exit onto the landside slope of the levee, thereby negatively affecting the stability of the landside levee slope.

Levee improvements along the USACE project levees would consist primarily of in-place repair/remediation, but would include a single setback levee at element IVc. As summarized in **Table 2** and shown in **Exhibits 4a** through **4c**, the Phase 3 Repair Project's landside levee improvements would include a combination of construction of seepage berms, installation of chimney drains and both shallow and deep cutoff walls, the raising of landside grade, and construction of a setback levee with seepage berm and an underlying cutoff wall along 19 elements of the RD 17 levee system. These levee repair components, as well as additional project components (such as levee geometry corrections and stormwater management), are described in more detail following **Table 2**. The proposed action does not include any work that would raise the existing levee. Limited work would be performed along the waterside of the levee above the HTL in element IVc, where the setback levee would be constructed.

LEVEE REPAIR ACTIVITIES

The Phase 3 Repair Project would include seepage berms, chimney drains, cutoff walls, a setback levee, and a raised landside grade. **Table 2** summarizes the activities proposed for each project element.

Table 2
Summary of Major Activities Proposed for Each Element of the Phase 3 Repair Project

Element	Type of Remediation	Proposed Activities
Ia	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width, and install a 590-foot-long seepage berm (minimum 65 feet wide) with chimney drain to meet required exit gradients.
Ib	under seepage and through seepage	Fill existing depression to 300 feet from toe of existing levee; place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width; and install a 125-foot-long seepage berm (minimum 60 feet wide) with chimney drain on top of fill to meet required exit gradients.
Ie, IIIb, IVa, and VIIb	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and construct seepage berms with lengths of 655 feet (Ie), 720 feet (IIIb), 525 feet (IVa), and 385 feet (VIIb), and chimney drains to meet required exit gradients. Minimum seepage berm widths would vary (65–105 feet) depending on the element. For element Ie, construct v-ditch from seepage berm to existing swale.
IIab	under seepage and through seepage	Install cutoff wall with a length of 2,550 feet to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.
IVc	under seepage and through seepage	Construct 1,240-foot-long setback levee with seepage berm and cutoff wall to meet required exit gradients. Depth of the cutoff wall will be 60 feet. Cutoff wall will involve degrading the top 1/3 to 1/2 of the levee crown and will begin with a 1:1 cut at the waterside crown. Seepage berm would be a minimum of 65 feet wide. Install riprap on waterside of existing levee above the high tide line where it would intersect setback levee. After setback levee is completed, remove 400 linear feet of the existing levee above the high tide line on the downstream side of oxbow. Grade approximately 8 acres of setback area, to drain to the river through the downstream opening in the remnant levee, and restore at least 9.9 acres, and up to 11.5 acres, of riparian scrub and Great Valley oak woodland in the area between the landside toe of the setback levee and the river. For more information about habitat restoration in element IVc, see the Conceptual Mitigation and Monitoring Plan for the Riparian Brush Rabbit in **Appendix E** of this document.
Va and VIa.1	under seepage and through seepage	Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and install cutoff walls with a length of 9,520 feet to meet required exit gradients. Depth of cutoff walls would vary from 60–85 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls.
IIIa	through seepage	Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths and install chimney drain in existing 4,680-feet-long seepage berm to meet required exit gradients.

Table 2 Summary of Major Activities Proposed for Each Element of the Phase 3 Repair Project		
Element	**Type of Remediation**	**Proposed Activities**
VIa.4	under seepage and through seepage	Install cutoff wall with length of 70 feet to meet required exit gradients. Depth of cutoff wall would vary from 90–100 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.
VIb and VIcde	under seepage and through seepage	Install cutoff wall with length of 3,720 feet (VIb and VIcde) to meet required exit gradients. Depth of cutoff wall would vary from 70–80 feet. Cutoff wall in levee prism would involve both deep slurry mix construction as well as degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown.
VIIe	under seepage and through seepage	Install cutoff wall with a length of 1,900 feet to meet required exit gradients. Depth of cutoff wall would vary from 60–120 feet. Deep slurry mixing method would be used. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Repair Project.
VIIg	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width, and construct seepage berm with chimney drain with length 395 feet to meet required exit gradients. Minimum seepage berm width would be 65 feet.
Source: Data provided by Kjeldsen, Sinnock & Neudeck, Inc. in 2014		

The respective levee improvement components are described next in more detail.

SEEPAGE BERMS

Reducing the risk of levee failure caused by under seepage and through seepage may be achieved by constructing a drained seepage berm. A drained seepage berm collects and conveys seepage, thereby reducing the flood risk associated with a high-water event. A drained seepage berm is built on the landside of a levee, and consists of layers of sand filter material, drain rock, geosynthetic filter fabric, and a seepage berm soil fill (**Exhibit 5**).

The drained seepage berm reduces flood risk during sustained high-river events by collecting seepage that otherwise would flow onto the landside ground surface at and beyond the levee's landside toe of slope, and then by conveying the seepage away from the levee. The layer of sand filter material placed on the natural ground surface serves to reduce the transmission of fine-grained soils into the drain rock, thereby maintaining the drain rock's ability to be a conductive soil unit that conveys collected seepage. Similarly, the filter fabric that separates the drain rock from the seepage berm fill soil prevents finer soils from migrating into the drain rock unit. The weight of the berm acts as ballast, reducing the potential for detrimental boils and piping.

The design width and height of a seepage berm are dependent on the relative permeability of the underlying soil layers and the amount of pressure head that push water under the levee and through these soils during sustained high-river events. The higher the water pressure head and the more dissimilar the porosity of the underlying soil layers, the wider and/or taller the seepage berm must be to prevent boils and reduce flood risk.

For the Phase 3 Repair Project, drained seepage berm widths of 65–120 feet are expected to be adequate to meet the design criteria in most cases (**Exhibit 5**). However, these types of berms may extend up to 300–400 feet inland from the landside toe of the levee. Seepage berms typically are constructed using select materials excavated from borrow sites or obtained from commercial sources. For the Phase 3 Repair Project, soil material for seepage berms would be purchased from commercial sources. A compacted-surface patrol road would be constructed near the outside edge of the seepage berm (see “Additional Project Components” below).

In urban areas, some seepage berms also would include a toe drain system (element VIIg) or a V-ditch (element Ie) to safely collect and discharge the seepage water into an urban storm drainage system. A toe drain pipe is a below-grade, perforated pipe surrounded by a layer of sand and drain rock (**Exhibit 6**). The toe drain pipe is a mechanism to safely collect and convey seepage water away from the levee and seepage berm. If the toe drain pipe is unable to convey the seepage water, the water exits the drained seepage berm through the drain rock at the face of the berm, similar to a nonurban berm.

CHIMNEY DRAINS

A chimney drain is a drainage system that collects seepage waters that are flowing through the aboveground portion of the levee structure. This type of drain is used to collect and convey through seepage. A chimney drain consists of a 1 to 3-foot-thick layer of sand and drain rock. Filter fabric is placed between the soil and rock layer to avoid migration of the soil into the rock, which can clog the rock layer and reduce its ability to carry seepage flows. The chimney drain is placed directly on the landside slope of the levee and tied into an existing or new drained seepage berm at the landside base of the levee (**Exhibit 7**). The chimney drain conveys the through seepage flows to a drained seepage berm, which is located at the landside base of the levee.

Installing a chimney drain in an existing drained seepage berm would include adding the through seepage material on top of the existing seepage berm and tying this material into the existing seepage berm material by removing the seepage berm fill material and physically tying the two drainage rock layers together. When the remediation includes construction of a new drained seepage berm with a chimney drain, the chimney drain would be installed during construction of the drained seepage berm.

CUTOFF WALLS

In selected locations of the Phase 3 Repair Project, cutoff walls would be placed through the levee prism (parallel to the river). Cutoff walls use specialized earthen materials (often bentonite clay, which has low permeability, or a mixture of bentonite and cement). Cutoff walls would be constructed vertically through the levee prism, extending into or through deeper foundational soils that have low-permeability (a layer through which seepage does not flow readily). Thus, cutoff walls would substantially reduce the potential for under and through seepage flow during high-river events. Two methods for installing cutoff walls would be used along portions of the RD 17 levees: the conventional open-trench method and the deep soil mixing method.

The conventional open-trench method would be used to install shallow cutoff walls to a maximum depth of approximately 80 feet. This method involves excavating material in an open trench (the trench is filled with a bentonite slurry to maintain the side slopes of the excavation) and then replacing it with the select materials, typically a bentonite or cement-bentonite slurry (**Exhibit 8**). In this case, the top one-third to one-half of the levee height is “degraded,” meaning that it is excavated so that any weakness in the narrow upper portion of the levee does not result in failure of the levee during construction.

For the deep slurry mixing method, specialized equipment (such as augers) is used to excavate deep into the subsurface, allowing the cutoff walls to reach depths up to 120 feet (**Exhibit 9**). The deep slurry mixing method involves mixing the soil in place with cement and / or bentonite, thereby reducing the risk of failure during construction. This method does not require levee crown degradation.

For the Phase 3 Repair Project, the cutoff walls would be extended approximately 300 feet beyond the element boundary to provide the required overlap when drained seepage berms have been or are being installed along the landside of adjacent levee elements. Levee slopes (where cutoff walls would be installed) also would be modified as needed to achieve the required 20-feet width and landside 3:1 slope.

Setback Levee with Seepage Berm and Underlying Cutoff Wall

General Description of Setback Levees

A setback levee is a levee constructed some distance behind an existing levee. The setback is tied into the existing levee at the upstream and downstream ends of the setback area. After certification of the setback levee, all or a portion of the existing levee between these two points typically is removed to allow high-water events to inundate the newly expanded floodway. Soil from the old levee may be used as a source of fill for other levee improvement projects, depending on the quality and quantity of material generated from demolition of the old levee. In some cases, it may be necessary to continue maintaining the existing levee after a setback levee is constructed (e.g., to protect existing development in the setback area) and to use the newly constructed levee as a backup levee.

General Description of Proposed Setback Levee and Associated Floodplain Restoration

Project Element IVc involves construction of a 1,240-foot-long setback levee with an underlying cutoff wall and a seepage berm, on a major oxbow of the San Joaquin River (see Table 2). A *Conceptual Mitigation and Monitoring Plan for Riparian Brush Rabbit [for the] Phase 3 – RD 17 Levee Seepage Repair Project* (Conceptual MMP) (RD 17 2016) has been prepared to describe the expansion and restoration of riparian habitat in Element IVc; this document is included as an attachment to this BA (Appendix E).

In the Phase 3 Repair Project area, soil materials beneath a setback levee are anticipated to have properties similar to those of materials below the existing levees. Therefore, a setback levee would have no seepage-related benefit in the RD 17 area relative to other seepage control methods; like the existing levees, a setback levee would require either a cutoff wall or drained seepage berm to sufficiently reduce the potential adverse effects associated with under seepage flows (**Exhibits 10** and **11**). Nevertheless, implementation of a setback levee could provide some additional capacity in the river for floodwaters and also would have the potential to provide habitat in the area between the new and old levee locations. In the Phase 3 Repair Project area, any newly expanded floodway created by a proposed setback levee would be designed to drain surface water after a high-water event, to prevent fish stranding.

Setback Levee Considerations

As described in greater detail under Section 2.1.4 in the DEIS/DEIR (USACE and RD 17 2011), and consistent with Section 2.5.1 of the forthcoming Final Environmental Impact Statement (FEIS) (USACE *in prep.)* for the proposed project, setback levees were considered but eliminated from further consideration in several project reaches for the following reasons:

- Construction of a setback levee along certain stretches of the river would be hydraulically constrained and would greatly increase the project scope to the point of being cost prohibitive (elements VIa.4 and VIb).
- Because of the proximity to the bifurcation at Old River, the change in hydraulic conditions that would result from constructing a setback levee at these locations would increase flows down the San Joaquin River during flood events, which could lead to increased flooding downstream (elements Va and VIa.1).
- Construction of a setback levee relative to other levee improvement alternatives and/or land acquisition to accommodate construction of a setback levee would be cost prohibitive (elements Ia, Ie, IIIb, IVa, VIcde, and VIIb).
- Existing landside development would constrain the option of constructing a setback levee (elements IIab, VIIe, and VIIg).

The complete hydraulic analyses that evaluated the setback levee alternatives are included as **Appendix F**.

Tie-in to Existing Levee

Where the new setback levee would intersect the existing levee, the top one-third to one-half of the crown of the existing levee would be degraded beginning with a 1:1 cut at the existing waterside crown to facilitate tying the cutoff wall and setback levee into the existing levee.

Riprap

Approximately 0.64 acres (740 linear feet) of riprap would be installed only on the waterside of the existing levee and above the HTL in element IVc where it would intersect the setback levee. No trees/shrubs would be removed to place the riprap and any riprap around trees/shrubs would be hand-placed. The riprap would not be installed to act as launchable rock.

Remnant Levee Breach

After the setback levee is completed, 400 linear feet of the existing levee above the HTL on the downstream side of the oxbow would be degraded, reconnecting approximately 8 acres of floodplain to the river.

Floodplain Offset Area

The reconnected floodplain area would be graded to allow complete drainage of the floodplain to the river. The floodplain would be graded to drain to a central swale, approximately 2-feet deep. As flood flows recede, the swale would drain completely through the breach in the remnant levee. This would minimize the possibility of fish stranding. The periodic reactivation of floodplain rearing habitat for juvenile salmonids, in particular, and other native fishes as well would be a benefit to fish resources. The seasonal nature of inundation, along with complete drainage, would preclude establishment in the floodplain of predatory, non-native fishes.

The Conceptual MMP evaluates three breach invert elevations (8 feet [NAVD88], 10 feet [NAVD88] and 14 feet [NAVD88]) for the proposed levee breach on the downstream end of the oxbow. Hydraulic modeling, based on San Joaquin River flows as reported at the Vernalis USGS stream gage (Vernalis gage), about 17.5 miles upstream of the project area, was used to estimate the flow in the San Joaquin River at which water would enter the setback area through the remnant levee breach for the three breach invert elevations. The results are shown in Table 3.

To evaluate how often and how long the levee setback area would be expected to inundate, a review was made of the historical Vernalis gage daily flow records since the completion of New Melones Dam in 1979 (this represents a period where the San Joaquin River basin operating regime has been relatively unchanged). The evaluation used the mean daily flows for the period October 1, 1978 through September 30, 2015, or Water Years 1979 through 2015. The total number of days in the evaluation period is 13,514. Table 4 summarizes the estimated number and percent of days in the evaluation study period in which the levee setback area would flood based on the three invert elevations. Based on the historical data, the periods during which water would flow into the project breach at the three invert elevations are displayed in the figures below.

The appropriate breach elevation is under consideration and will be defined in the Final MMP. It is anticipated that the breach elevation would be set at approximately 9 or 10 feet (NAVD88). Approximately 1-2 acres of the floodplain would be set to an elevation of 14 feet (NAVD 88) or below and would inundate approximately every 6 years.

RAISED LANDSIDE GRADE

Directly adjacent to the landside toe of the levee in element Ib, an approximately 5-foot-deep depression was used as a borrow site to facilitate construction of the Howard Road Bridge. RD 17 would place fill within this depression to raise the landside grade.

Table 3 Estimated Flows for Inundation of the Element IVc Mitigation Site			
Breach Invert Elevation (feet, NAVD88)	Flow in San Joaquin River near Vernalis above which Mitigation Site Breach Flow Occurs (cfs)	Estimated Return Interval	Flow in San Joaquin River at Breach Location (cfs)
8	9,500	2 year	4,200
10	13,200	3 to 4 year	5,700
14	24,000	6 year	8,800
Note: cfs = cubic feet per second Source: MBK Engineers 2016			

Table 4 Estimated Total Duration of Mitigation Site Flooding for Evaluation Period of Record			
Breach Invert Elevation (feet, NAVD88)	San Joaquin River Flow at Vernalis above which Mitigation Site Breach Flow Occurs (cfs)	Number of Days Flow Equaled or Exceeded Since 10/1/1978	Percent of Days Flow Equaled or Exceeded Since 10/1/1978
8	9,500	1,619	12%
10	13,200	1,126	8.3%
14	24,000	423	3.1%
Note: cfs = cubic feet per second Source: MBK Engineers 2016			

ADDITIONAL PROJECT COMPONENTS

The following additional activities would occur as part of the Phase 3 Repair Project:

- **Levee geometry corrections:** Phase 3 Repair Project elements currently do not meet requirements for levee geometry (i.e., slopes, crown width). To correct levee geometry, levee fill material would be placed along the landside of existing levee slopes where needed to provide the minimum 3:1 slope and a minimum 20-foot-wide levee crown. All elements would undergo some level of levee geometry corrections.

- **Operations and Maintenance (O&M) access and utility corridors:** A 20-foot-wide permanent O&M access corridor[4] would be established adjacent to the landside toe of seepage berms and levees (if not already present for levees). Any relocated power poles and other utility infrastructure would be located outside this easement.

- **Temporary construction easements:** Where needed, a 20-foot-wide temporary construction easement and construction turnaround area (up to 80 feet in diameter) would be included adjacent to the inland side of the permanent O&M access corridor, to provide access to the site during construction. These features would be removed and the site(s) would be returned to pre-project conditions following completion of construction.

- **Stormwater /irrigation controls:** Drainage/irrigation swales would be constructed around the outside boundaries of levee repairs, where needed, and other stormwater best management practices (BMPs) would be implemented to manage stormwater runoff and/or irrigation during and after construction. These swales would be located so that they would not drain to/from wetlands or other waters of the U.S.

4 The CVFPB would require that a 20-foot-wide access corridor be established. However, on a case-by-case basis, effects on woody vegetation within this corridor may be avoided in place. However, for the purposes of the analysis in this FEIS, it was assumed that any vegetation within the 20-foot-wide corridor would be removed.

- **Right-of-way acquisition:** Lands within the Phase 3 Repair Project footprint would be acquired as needed, to accommodate levee repairs (e.g., seepage berms, setback levees) and establish the minimum 20-foot-wide O&M access corridor at the landside toes of all the improved levees, to prevent encroachment. Privately owned lands would be acquired in fee preferably, but may be taken as easements if needed. Where the project footprint overlies land owned and managed by other agencies (i.e., the City of Lathrop, San Joaquin County, Union Pacific Railroad [UPRR]), either the land would have to be acquired in fee or easements would have to be obtained and secured. Real property acquisition and any relocation services, if needed (although no relocations are anticipated), would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 USC 4601 et seq.) and implementing regulation, Title 49 of CFR Part 24, and California Government Code Section 7267 et seq.
- **Haul roads:** An estimated 700,000 cubic yards of imported material (i.e., soil, aggregate, and cement) would be required to construct these levee improvements. These materials would be hauled to the work sites from commercial sources up to 11 miles away. Personnel, equipment, and imported materials would be transported to the Phase 3 Repair Project area using various surface roads that connect with Interstate 5 or State Route 120. The primary corridors where construction activity would take place would be public roadways, on and within 300 feet of the levees, existing unpaved roads used for access to work areas, and levee patrol roads atop the levee crown.
- **Landside vegetation removal:** Landside vegetation within the footprint of the proposed levee work, including maintenance roadway corridors and temporary access easements, would be cleared to prepare for levee repair work. The proposed action would involve performing limited work on the waterside of the levee above the HTL (e.g., installing riprap and degrading a portion of the levee in element IVc); however, no waterside woody or riparian vegetation would be removed; the areas where riprap would be placed and the levee degraded are characterized by ruderal land cover.
- **Encroachment management:** Several features, including power poles, vegetation, and a variety of agricultural-related facilities (e.g., irrigation infrastructure, fences), are within the Phase 3 Repair Project footprint. Utility infrastructure would be relocated as needed to accommodate the levee repairs, and any pipelines or other underground utility crossings would be replaced as needed. Other encroachments in the Phase 3 Repair Project area would be removed or relocated as required to meet the criteria of USACE, the CVFPB, and FEMA. No waterside woody or riparian vegetation would be removed; the areas where riprap would be placed and the levee degraded are characterized by ruderal land cover.
- **Long-Term Vegetation Management:** Vegetation on the levees and within the access easements would be managed in accordance with current O&M practices to maintain access and visibility. These practices include: mechanical trimming of existing trees and removal of large dead and downed trees annually, as described under “Compliance with USACE Vegetation Management Standards”; regular summer and winter application of herbicides for weed control; and summer application of herbicides to control woody plants and berries.

PROPOSED SCHEDULE AND SEQUENCE OF PROJECT CONSTRUCTION

Construction of the Phase 3 Repair Project is scheduled to begin in 2017, and is expected to be completed by December 2018, assuming receipt of all required environmental clearances, permits, and approvals for implementation. Some related activities, such as relocating power poles, may be conducted before levee work is begun, and site restoration and demobilization could extend through spring 2019. The general levee construction window is seasonal (July 1–November 1), avoiding the period when high-water levels have the potential to occur within the San Joaquin River system. However, depending on hydrologic conditions and subject to compliance with species work windows, a work window variance that allows an extension outside the July 1–November 1 work period may be granted by the CVFPB. The CVFPB may stipulate that RD 17 has to comply with additional conditions and commitments as a component of any work window variance.

The proposed construction sequence, which would include concurrent work in several different elements to meet the project schedule, is as follows:

- **Relocation of power poles:** Power poles currently situated on the landside of the levee toe of some elements would need to be relocated to accommodate proposed drained seepage berms. To the extent feasible, power poles would be relocated beyond the toe of the new berm, outside the maintenance access easement. If placing poles on top of the seepage berms is required, either raised foundations or steel-reinforced concrete piers would be constructed to prevent the poles from affecting the seepage berms. RD 17 would oversee relocation of the power poles, in coordination with the appropriate utility and construction companies.

- **Site preparation at existing levee sites and in levee setback area:** Site preparation (i.e., clearing, grubbing, and stripping) of the levee elements would begin by clearing structures (see discussion in next bullet) and woody vegetation from the footprint of the proposed levee work and the permanent O&M access and utility corridors. Vegetation would be retained in areas adjacent to but outside the project footprint. This operation would require removal of some trees and relocation or removal of some elderberry shrubs. Large trees would be felled approximately 3 feet above ground level, with stumps temporarily left in place. Where feasible, small trees and elderberry shrubs would be relocated. Elderberry shrubs would be relocated, in accordance with the avoidance and minimization measures outlined (see "Avoidance and Minimization Measures – Valley Elderberry Longhorn Beetle" section of this BA). A minimal amount of belowground disturbance would occur. The clearing operation would be followed by grubbing operations to remove stumps, root balls, and any below-ground infrastructure. The area then would be disked to chop surface vegetation and mix it with near-surface organic soils. The disking operation would be followed by stripping the top 12 inches of earthen material from the landside slope of the existing levee and the footprint of the proposed seepage berms. Excess earthen materials (i.e., organic soils, and excavated material that does not meet levee embankment criteria) would be temporarily stockpiled and then would be re-spread on the surface of the new levee slopes and seepage berms, provided this material is not contaminated with vegetation. Any stripped material contaminated with vegetation and other debris generated during the clearing and grubbing operations would be hauled off-site to a suitable landfill.

- **Removal or modification of landside structures and other facilities:** In a few levee elements, agricultural facilities (e.g., fences, drainage infrastructure) or parking lots are located within the footprint of the proposed levee work. These facilities would be removed from or relocated outside the project footprint before levee construction begins in those areas. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. Demolished concrete could be sent to a concrete recycling facility. If any wells or septic systems would be affected, they would be abandoned in accordance with the applicable State and County requirements.

- **Construction of the setback levee with drained seepage berm and underlying cutoff wall:** Construction of the setback levee embankment in element IVc would begin as soon as sufficient lengths of levee foundation are prepared and weather conditions are suitable. Foundation preparation would include constructing a levee keyway that would be excavated 3–5 feet deep across the entire footprint of the proposed setback levee. A smaller but deeper excavated inspection trench, centered beneath the new waterside hinge point of the setback levee, then would be constructed beneath a small portion of the keyway to meet DWR standards. After the foundation layers are backfilled with engineered soil, a geotechnical geogrid fabric would be installed at ground level across the entire setback levee footprint. A second layer of geogrid fabric would be placed at mid-height of the new levee fill section to further reduce the potential for post-construction settlement of the new levee. The embankment would be constructed of engineered fill, with the fill placed in 3-foot-maximum lifts by motor graders. Each lift would be moisture-conditioned using water trucks and would be compacted to the specified density using a suitable compactor, such as a sheep's foot, tamping foot, or rubber-tired roller. Next, quarry stone riprap would be applied in three segments, to armor the newly completed setback levee's waterside slope and protect against erosion. Riprap would be placed on the waterside levee above the HTL in areas that are characterized by ruderal land cover (**Exhibit 12**). All waterside woodland would be avoided; all waterside trees would be avoided as well as any tree canopy that

overlaps riprap. Riprap placement would be done either by barge or by long-arm excavator from the top of the levee crown. Riprap dimensions for the three segments are: 340 feet long by 50 feet wide (0.39 acre), 140 feet long by 30 feet wide (0.096 acre), and 230 feet long by 50 feet wide (0.26 acre). A drained seepage berm then would be constructed on the landside of the setback levee. Fill material for setback levee and drained seepage berm construction would be obtained from commercial sources and would be delivered to levee construction sites using haul trucks.

- **Setback levee site restoration and demobilization:** After completion of construction, the previously stripped topsoil material would be placed on top of the completed setback levee and associated seepage berms in element IVc, and levee slopes and the tops of the seepage berms would be hydroseeded. An aggregate-base patrol road would be constructed at the landside edge of the seepage berm and setback levees and on the new setback levee crown. The existing levee would be fully restored at the tie-in points to the new setback levee. The existing levee crown patrol road would be redressed with aggregate base, to restore it to preconstruction levels. Any disturbed riprap also would be supplemented to provide a uniform layer across the connection point with the new setback levee. Immediately after final construction, the setback levee’s fill slopes would be covered with erosion control material until application of the hydroseed. Any construction debris would be hauled to an appropriate off-site waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to pre-project conditions. Demobilization would be likely to occur in various locations as construction proceeds along various elements.

- **Removal of existing levee at setback levee elements, site restoration, and demobilization:** After certification of the new setback levee and seepage berm in element IVc, a 400-linear-foot-long section of the existing outboard levee (which is approximately 2,400 linear feet long in element IVc) on the downstream side of the existing oxbow would be partially degraded. The area where the levee would be degraded is characterized by ruderal land cover (**Exhibit 13b**); some landside vegetation would be removed (as accounted in the “Effects – Direct and Indirect Effects on Species in the Action Area” section of this BA, but all waterside trees and overlapping tree canopy would be avoided. At least 9.9 acres (and up to 11.5 acres) of riparian vegetation would be established in the area between the new setback levee and the river (**Exhibit 12**) (see the “Compensation Measures” section below for additional information). This acreage would be made up of approximately 0.5 acre of floodplain swale and approximately 4.5 acres of restored riparian scrub habitat between the landside toe of the existing levee and the waterside toe of the new setback levee; approximately 2.5 acres of enhanced riparian scrub habitat between the river and the waterside toe of the existing levee; and approximately 4 acres of restored Great Valley oak woodland/upland refugia habitat along the existing levee. These acreages would include approximately 1.6 acres of contingency, with the goal of restoring a minimum of 9.9 acres of riparian habitat. This work would be completed after flood season (from July 1 through November 1) and above the HTL, primarily using scrapers, excavators, and bulldozers to remove the levee section and all present levee encroachments.

- **Construction of drained seepage berms, drained seepage berms with chimney drains, and chimney drains within existing drained seepage berms:** Fill material for levee improvements would be obtained from commercial sources and delivered to the levee construction sites by haul trucks. The material then would be spread by motor graders and compacted by sheep’s foot rollers to build new seepage berms and seepage berms with chimney drains. A water truck would be used to properly moisture-condition the soils for compaction. Installing the chimney drains in existing drained seepage berms also would require use of an excavator or scraper to remove the existing drained seepage berm fill material so that the chimney drain fill material can be tied into the drainage rock layer of the existing drained seepage berm.

- **Construction of cutoff walls:** Cutoff wall construction is anticipated to occur 24 hours a day, 7 days a week, with occasional shutdowns for equipment maintenance, when necessary. Lights and possibly power generators would be used during nighttime construction hours. Additional equipment would include slurry batch plants to prepare bentonite or bentonite cement mix, pumps, and support vehicles. Four to five batch plants or slurry ponds would be required for the project; these would be located near the site of cutoff wall construction. Each batch plant or slurry pond with associated pumps and support equipment would occupy an area of approximately 100 square feet that would be restored to pre-project conditions following completion of cutoff wall construction. Cutoff walls may be installed concurrently in two or more different directions within an element. RD 17 proposes to use the deep slurry mix method for installing deep cutoff walls, which would avoid the need to degrade the top of the levee, and conventional slurry trench walls (open-cut method) for shallow cutoff walls. RD 17 also would consider driving sheet piles, using a drop impact hammer or other pile-driving technology in lieu of cutoff wall installation at element VIIe. The number of cutoff wall rig setups would depend on the project schedule and contractor preference. Each deep slurry mix cutoff wall rig would move continuously along the proposed alignment, to attain an uninterrupted cutoff wall and reduce prolonged disturbance to residences near some cutoff wall segments. Each cutoff wall rig could move 50 to 100 feet horizontally during a 12-hour work shift, while each conventional slurry trench rig could move 75 to 200 feet horizontally during a 12-hour work shift. Disturbances to nearby residences are expected to be minor because of the limited number of residences near the cutoff wall installation areas. However, where lights, noise, and/or vibration would exceed allowable nighttime standards for the applicable local jurisdiction, work hours would be restricted to daytime work hours.

- **Traffic control during construction:** Traffic control and detours could be required in the immediate vicinity of some levee improvements. Traffic control measures would include flaggers for one-way traffic control, advance construction signs and other public notices to alert drivers to activity in the area, and “positive guidance” detour signage on alternate access roads to reduce inconvenience to the driving public. Detours for through traffic are not likely to be required.

- **Site restoration and demobilization:** On completion of construction, previously stripped topsoil material not contaminated with vegetation would be placed on top of the completed seepage berms and any disturbed levee slopes. Any previously nonagricultural, vegetated areas disturbed during construction would be hydroseeded with a standard erosion control mix. An aggregate-base patrol road would be constructed at the landside edge of any seepage berms. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to pre-project conditions. Demobilization likely would occur in various locations as construction proceeds along various elements.

AVOIDANCE AND MINIMIZATION MEASURES

GENERAL

A qualified biologist, retained by RD 17, will be on-site to ensure compliance with the avoidance and minimization measures described below, particularly where construction activities occur adjacent to sensitive habitats to be avoided.

A worker awareness training program will be conducted for construction crews before the start of construction. The program will include a brief overview of special-status species and sensitive resources (including riparian habitats) in the Phase 3 Repair Project area, measures to avoid and minimize effects on those resources, and conditions of relevant regulatory permits.

Furthermore, traffic speeds on unpaved roads will be limited to 15 miles per hour, to reduce dust emissions and minimize potential effects on listed species, such as the riparian brush rabbit.

VALLEY ELDERBERRY LONGHORN BEETLE

For elderberry shrubs that are located in the Phase 3 Repair Project area, RD 17 will implement the following avoidance and minimization measures that are described in the Conservation Guidelines for the Valley Elderberry Longhorn Beetle (VELB Guidelines; USFWS 1999), to avoid and minimize effects on VELB:

- All elderberry shrubs that are located adjacent to construction areas but can be avoided will be protected by establishing a fenced avoidance area. The fencing will be placed at least 20 feet from the dripline of the shrubs. All elderberry shrubs to be protected during construction will be identified and marked by a qualified biologist. Orange construction barrier fencing will be placed at the edge of the respective buffer areas, and no construction activities will be permitted within the buffer zone other than those activities necessary to erect the fencing. In cases where the elderberry dripline is less than 20 feet from the work area, k-rails will be placed at the shrub's dripline to provide additional protection to the shrubs from construction equipment and activities. Temporary fences around the elderberry shrubs and, where appropriate, k-rails at shrub drip lines will be installed as the first order of work. Buffer area fences around elderberry shrubs will be inspected weekly by a qualified biologist during ground-disturbing activities, until adjacent project construction is complete or the fences are removed on approval by a qualified biologist and the resident engineer.

- No insecticides, herbicides, or other chemicals that may harm the beetle or its host plant will be used within 100 feet of elderberry shrubs.

- Elderberry shrubs that require removal will be transplanted to a USFWS-approved site during the dormant period for elderberry shrubs (i.e., November 1 to February 15) and in accordance with the VELB Guidelines (USFWS 1999).

- Each elderberry stem measuring 1 inch or greater in diameter at ground level that may be adversely affected (i.e., transplanted) will be replaced with elderberry seedlings and seedlings of associated species, in accordance with the VELB Guidelines (USFWS 1999).

Regarding provision for off-site compensatory mitigation for habitat losses, see the "Compensation Measures" section below.

RIPARIAN BRUSH RABBIT

The following measures will be implemented to avoid and minimize potential adverse effects on riparian brush rabbit in potential habitat within and adjacent to the Phase 3 Repair Project footprint (i.e., Great Valley cottonwood and Great Valley oak riparian forest communities):

- Potential riparian brush rabbit habitat will be identified and avoided wherever possible. The primary engineering and construction contractors will ensure, through coordination with a qualified biologist who is pre-approved by USFWS and retained by RD 17, that construction will be implemented in a manner that minimizes disturbance of such areas to the extent feasible.

- Temporary fencing will be used during construction to prevent disturbance of potential habitat adjacent to construction areas. Construction personnel, vehicles, and equipment will remain within the identified construction area. In addition, a silt fence or other suitable temporary barrier will be installed around the construction area where it borders suitable habitat for brush rabbits, to exclude brush rabbits from the construction site; this silt fence or temporary barrier either will be incorporated into the temporary fencing or will be installed as a separate fence. Temporary signage will be placed along the rabbit exclusion fence at 150-foot intervals, warning contractors to stay within the construction area. The temporary rabbit exclusion fence and associated signage will be inspected by a qualified biologist and the construction contractor each morning before the beginning of construction activities, and will be repaired and maintained as necessary. A biological monitor will inspect the fence at least once a week. The temporary rabbit exclusion fence and signage will be removed after construction activities are no longer occurring adjacent to the exclusion area.

- Where suitable habitat for riparian brush rabbit has to be removed, vegetation will be removed by hand 2 weeks before the start of construction so that no riparian brush rabbits are present in the construction area at the time of construction. A qualified biologist, retained by RD 17, will be on-site during vegetation removal.

Areas of temporary habitat disturbance in the Phase 3 Repair Project area will be revegetated with native plant species and restored to pre-project conditions.

Regarding provision for on-site compensatory mitigation for habitat losses, see the "Compensation Measures" section below.

FEDERALLY LISTED FISH—DELTA SMELT, LONGFIN SMELT, ANADROMOUS SALMONIDS, AND GREEN STURGEON (WATER QUALITY)

The following measures will be implemented to avoid and minimize potential adverse effects on water quality:

- Any work within the existing floodway (i.e., placing riprap on the waterside levee above the HTL at element IVc) of the San Joaquin River will not take place during the designated flood season (i.e., November 1 to July 1) and will not begin until evaluation of upstream conditions (e.g., reservoir storage and snowpack) indicate that inundation of these areas will be unlikely to occur during construction.
- RD 17 will comply with all local, State, and federal regulations and environmental requirements regarding turbidity-reduction measures, including the following:
    - obtaining and complying with relevant agency permits (e.g., CDFW streambed alteration agreement, Central Valley Regional Water Quality Control Board [RWQCB] Clean Water Act Section 401 certification, and Section 404 permit);
    - developing and implementing a storm water pollution prevention plan (SWPPP) that identifies specific BMPs to avoid and minimize effects on water quality during construction activities; and
    - complying with the conditions of the National Pollutant Discharge Elimination System (NPDES) general stormwater permit for construction activity.
- RD 17 will file a notice of intent with the Central Valley RWQCB to discharge stormwater associated with construction activity. Final design and construction specifications will require implementation of standard erosion, siltation, and good housekeeping BMPs. Construction contractors will be required to prepare and implement a SWPPP and comply with the conditions of the NPDES general stormwater permit for construction activity (Order No. 2009-0009-DWQ or the current permit in place at the time of construction). The SWPPP will describe the construction activities to be conducted, BMPs that will be implemented to prevent discharges of contaminated stormwater into waterways, and inspection and monitoring activities that will be conducted.

  At a minimum, the following specific BMPs will be implemented:

    - All work will be conducted according to site-specific construction plans that identify areas for clearing, grading, and revegetation so that ground disturbance is minimized.
    - Silt fences and/or straw wattles will be installed near riparian areas or existing drainages to control erosion and trap sediment and reseed cleared areas with native vegetation.
    - Maintenance will be conducted on a regular basis to ensure proper installation and function of BMPs, and during storm events, maintenance will be conducted daily.
    - BMPs that have failed (within 48 hours of an event) will be repaired and replaced immediately with sufficient devices and materials (e.g., silt fence, coir rolls, and erosion blankets), provided throughout project construction to enable immediate corrective action for failed BMPs.

- Stockpiling of construction materials (e.g., portable equipment, vehicles, and supplies, including chemicals) will be restricted to designated construction staging areas, exclusive of any riparian, wetland, or other areas supporting waters.
- Disturbed soils at construction areas will be stabilized before the onset of rainfall.
- Stockpiles will be stabilized and protected from exposure to rain and potential erosion.

The SWPPP also will specify appropriate hazardous materials handling, storage, and spill response practices to reduce the possibility of effects from use or accidental spills or releases of contaminants. Specific measures applicable to the project will include the following:

- Compliance will be required by RD 17 contractors with all applicable State Water Resources Control Board (SWRCB) and Central Valley RWQCB standards and other applicable water quality standards.
- Strict on-site handling rules will be developed and implemented, to keep potentially contaminating construction and maintenance materials out of drainages and other waterways.
- When refueling and servicing equipment, absorbent material or drip pans will be used underneath such equipment to contain spilled fuel, oil, and other fluids; and any fluid drained from machinery will be collected in leak-proof containers and deliver to an appropriate disposal or recycling facility.
- Controlled construction staging and fueling areas will be maintained at least 100 feet away from channels or wetlands, to minimize accidental spills and runoff of contaminants in stormwater.
- Substances that can be hazardous to aquatic life will be prevented from contaminating the soil or entering watercourses.
- Spill cleanup equipment will be maintained in proper working condition. All spills will be cleaned up immediately according to the spill prevention and response plan, which will be prepared by RD 17 or its contractor or representative and will be approved by the RWQCB before the start of project ground-breaking.
- NMFS, USFWS, CDFW, and the Central Valley RWQCB will be notified immediately (within 24 hours) of any reportable spills and cleanup occurrences. All such spills, and the success of the efforts to clean them, will be recorded in post-construction compliance reports.
- A slurry spill contingency plan will be developed, which will be prepared by RD 17 or its contractor or representative before the start of project groundbreaking, to respond to a potential for bentonite slurry spill and prevent slurry from entering watercourses.
- Construction materials handled by RD 17 or its contractors will be stored and transported in a manner that minimizes potential water quality effects. Storage areas will be located away from drainages and waterways, outside the floodplain, and away from sensitive resources, and containment facilities will be used.

BMPs will be applied to meet the “maximum extent practicable” and “best conventional technology/best available technology” requirements and address compliance with water quality standards. RD 17 will implement a monitoring program during and after construction so that the Phase 3 Repair Project complies with all applicable standards and BMPs implementation is effective.

COMPENSATION MEASURES

VALLEY ELDERBERRY LONGHORN BEETLE

As described above under "Avoidance and Minimization Measures—Valley Elderberry Longhorn Beetle," compensation for effects on VELB will be provided in accordance with the VELB Guidelines (USFWS 1999). Elderberry shrubs that cannot be avoided will be transplanted to the levee setback area in element IVc (**Exhibit 12**). The restoration design, as outlined in the Conceptual Mitigation and Monitoring Plan for the Riparian Brush Rabbit (Conceptual MMP; **Appendix E**), will include elderberry seedlings and associated species plantings to compensate for the effects on VELB habitat in the Phase 3 Repair Project site. Transplanting unavoidable elderberry shrubs and planting elderberry seedlings and associated species (in an amount determined through compliance with the VELB Guidelines) will fully compensate for the loss of VELB habitat resulting from construction activities associated with the Phase 3 Repair Project.

RIPARIAN BRUSH RABBIT

Compensation for effects on riparian brush rabbit habitat will consist of restoring natural habitats in the Phase 3 Repair Project area.

As described in more detail in the Conceptual MMP (**Appendix E)**, on-site compensation for adverse effects on riparian brush rabbit habitat will include restoration of at least 9.9 acres of riparian habitat in the proposed levee setback area in element IVc. This acreage will be made up of approximately 0.5 acre of floodplain swale and approximately 4.5 acres of restored riparian scrub habitat between the landside toe of the existing levee and the waterside toe of the new setback levee; approximately 2.5 acres of enhanced riparian scrub habitat between the river and the waterside toe of the existing levee; and approximately 4 acres of restored Great Valley oak woodland/upland refugia habitat along the existing levee. The total of amount of potential compensatory mitigation acreage is approximately 11.5 acres, which will allow approximately 1.6 acres of contingency to achieve the compensation for riparian brush rabbit habitat.

After the new setback levee is constructed and certified in element IVc, a small 400-foot section of the existing levee will be partially degraded. Native riparian scrub vegetation will be established within the entire setback area floodplain. Species in the plant palette will be those preferred by the riparian brush rabbit for providing cover, including: California blackberry (*Rubus ursinus*), California wild rose (*Rosa californica*), sandbar willow (*Salix exigua*), coyote brush (*Baccharis pilularis*), and golden currant (*Ribes aureum*), among others. Understory vegetation will include herbaceous species that have been identified as preferred forage by the riparian brush rabbit, such as mugwort (*Artemisia douglasiana*) and gumplant (*Grindelia camporum*). To provide refugia during flood events, the old levee footprint also will be vegetated with riparian scrub and riparian woodland tree species. The upland refugia will include elderberry seedlings and associated species plantings to compensate the effects on VELB habitat in the Phase 3 Repair Project area. In addition to plantings within the setback area, waterside riparian vegetation will be enhanced with plantings in open areas.

Between 25 feet from the landside toe of the existing levee and 25 feet from the waterside toe of the new setback levee are approximately 4.5 acres of ruderal grassland that can be restored as riparian scrub habitat (**Exhibit 12**). Approximately 2.5 additional acres of riparian scrub habitat will be restored and/or enhanced between the waterside toe of the existing levee and the river. The restored riparian scrub habitat will consist of willows, cottonwoods, valley oaks, wild rose, California blackberry, and grasses, which is comparable to the composition of habitats where riparian brush rabbit is documented to occur along the RD 17 levees. Apart from a 400-foot section along the north side, the existing levee will remain in place and approximately 4 acres of Great Valley oak woodland will be established on it, thus providing upland refugia for the riparian brush rabbit during high-water events.

Approximately a 3:1 restoration to impact mitigation ratio (for effects on potential riparian brush rabbit habitat) will be accomplished in the restoration area, with approximately 9.9 acres (and up to 11.5 acres) of riparian brush rabbit habitat restored. The expansion and restoration of riparian habitat in element IVc will augment the waterside riparian corridor along the San Joaquin River and will provide additional riparian habitat for the riparian brush rabbit between two known occurrences of this species (i.e., between elements IIIa/IIIb and elements VIa.1/VIa.4 [CDFW 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004]). The restoration area will be contiguous with existing waterside riparian habitat along element IVc; this waterside riparian habitat along element IVc extends northward through elements IVa, IIIa, and IIIb, and southward through elements Va and VIa.1. Documented occurrences exist of riparian brush rabbit in the waterside riparian habitat in elements IIIa and IIIb, and north of element IIIa and south of element VIa.1; therefore, reestablishing and protecting riparian habitat in element IVc will provide expanded and connected habitat for this species. This habitat creation and enhancement will fully compensate for the loss of habitat for riparian brush rabbit resulting from construction activities associated with the Phase 3 Repair Project.

MITIGATION AND MONITORING PLAN

A Conceptual MMP has been prepared to describe the expansion and restoration of riparian habitat in element IVc (**Appendix E**). Specifically, this plan:

- describes specifications for the restoration of habitat components, including details about the restoration of riparian habitats, with a list of the plant species and drawings/designs to show the location of the plant species and planting density;
- establishes specific success criteria for the habitat components, including:
  - performance standards to determine whether the habitat improvement was trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in design or maintenance revisions);
  - monitoring and maintenance protocols; and
  - measureable goals to ensure vegetation survival to provide and replace riparian habitats;
- specifies remedial measures to be undertaken if success criteria are not met (e.g., adaptive management, physical adjustments, additional monitoring); and
- describes short and long-term management and maintenance of the habitat lands.

The Conceptual MMP is intended to be developed into a Final MMP, in coordination with USFWS, NMFS, and USACE, and would be reviewed and approved by USFWS and NMFS before ground-breaking in the portions of the Phase 3 Repair Project area that could affect the species addressed in this BA. RD 17 would provide conservation of the restored riparian habitat in the levee setback area in element IVc. The compensation habitat ultimately would be transferred to a suitable land management organization, for long-term management and monitoring. This habitat creation and enhancement would fully compensate for the loss of habitat for VELB and riparian brush rabbit resulting from construction activities associated with the Phase 3 Repair Project.

ACTION AREA

The action area is defined in accordance with ESA guidelines as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). The action area includes all areas that would be directly or indirectly affected by the components of the Phase 3 Repair Project.

Areas downstream from the Phase 3 Repair Project area also may be indirectly affected by the flood risk management component of the project, through improved water quality and flood risk management conditions. The extent of this potential effect is difficult to quantify, however, for element IVc; construction of a setback levee and breaching a small downstream portion of the existing levee would be expected to create a backwater effect and would not result in a substantial widening of the flood plain. An analysis also was conducted to evaluate the hydraulic effects of the setback levee at element IVc. This hydraulic analysis showed that the proposed action would essentially have no effect on the maximum water surface elevation, with a computed maximum increase in the water surface elevation of 0.0007 feet, and maximum flow rate changes would be negligible during extreme events (100-year flood recurrence interval). Because far afield project-related hydrologic effects are not likely to occur, the action area is concluded to be in the immediate vicinity of the actual project boundaries.

ENVIRONMENTAL BASELINE

HYDROLOGY

SACRAMENTO–SAN JOAQUIN DELTA

The Delta extends inland from the confluence of the Sacramento and San Joaquin rivers west of Antioch to Sacramento on the Sacramento River and to near Mossdale on the San Joaquin River. The Phase 3 Repair Project area is in the southeastern portion of the Delta, within the legal boundary of the Delta as defined by Section 12220 of the California Water Code.

The legal Delta encompasses an area of approximately 851,000 acres (of which approximately 135,000 acres consist of waterway, marshland, or other water surfaces). The Delta is divided into a Primary Zone and a Secondary Zone, as defined by the Delta Protection Act of 1992. Land uses in the Primary Zone are regulated to protect the area for agriculture, wildlife habitat, and recreational uses. The Secondary Zone is the area outside the Primary Zone and within the legal Delta. Where urban development activities occur in the Secondary Zone, efforts should be taken to ensure that these activities do not adversely affect Delta waters, Primary Zone habitat, or recreational uses. The San Joaquin River delineates the boundary between the Primary Zone to the west and the Secondary Zone to the east. The Phase 3 Repair Project is located in the Secondary Zone.

The Sacramento River contributes roughly 75 to 80 percent of the Delta inflow in most years, and the San Joaquin River contributes about 10 to 15 percent; the Mokelumne, Cosumnes, and Calaveras rivers, which flow into the eastern side of the Delta, contribute the remainder. The rivers flow through the Delta and into Suisun Bay, San Pablo Bay, San Francisco Bay, and the Pacific Ocean. Historical annual Delta inflow averaged approximately 23 million acre-feet (MAF) between 1945 and 1995, with a minimum inflow of approximately 6 MAF in 1977 and a maximum of approximately 70 MAF in 1983. Water flowing into the Delta is used for urban and agricultural use, recreation, navigation, and wildlife and fisheries. The Delta provides drinking water for about 23 million Californians.

Freshwater inflows to the Delta vary greatly, depending on precipitation, snowmelt, and Central Valley Project (CVP) and State Water Project (SWP) water operations. During the summer months, most inflow to the Delta comes from regulated releases from SWP and CVP reservoirs. Both projects also withdraw large volumes of water from the Delta for agricultural and urban use. Precipitation in the project region occurs primarily from November through March, with the average annual precipitation ranging from about 8 inches near Tracy to approximately 17 inches near Lodi. Near Lathrop, the annual precipitation is approximately 12 inches.

Water movement in the Delta responds to four primary forcing mechanisms:

- freshwater inflows to the ocean;
- Delta exports and upstream diversions;
- operation of water control facilities such as dams, export pumps, and flow barriers; and
- the regular tidal movement of seawater into and out of the Delta.

In addition, winds and salinity behavior in the Delta can generate secondary currents that, despite being of low velocity, can be of considerable significance with respect to transporting contaminants and mixing different sources of water. Changes in flow patterns in the Delta, whether caused by export pumping, winds, atmospheric pressure, flow barriers, tidal variations, inflows, or local diversions, can influence water quality at drinking water intakes.

The Delta is a hydrologically complex region of interlacing channels, marshland, and islands. The Delta has been reclaimed into more than 60 islands and tracts, interlaced with about 700 miles of waterways. Some channels are edged with aquatic and riparian vegetation, but most are bordered by steep banks of earth or riprapped levees. Vegetation generally is removed from channel margins to increase flood flow capacity and facilitate levee maintenance. About 520,000 acres are devoted to farming. An approximately 1,100-mile network of levees protects the reclaimed land, most of which lies near or below sea level, from flooding. Some of the island interiors are as much as 25 feet below sea level.

Nearly 16.5 miles of the 19 miles of levees protecting RD 17 are considered federal project levees; the 2.6-mile dryland levee is not a federal levee. Federal project levees either were constructed by the federal government (typically through USACE) or were built by others and later brought under federal jurisdiction.

San Joaquin River

The San Joaquin River originates in the Sierra Nevada and enters the San Joaquin Valley at Friant Dam. Most of the flow in the lower San Joaquin River is derived from inflow from the Merced, Tuolumne, and Stanislaus rivers (Northeastern San Joaquin County Groundwater Banking Authority 2004). The 330-mile-long San Joaquin River, which drains a watershed area of 13,540 square miles from the Sierra Nevada to the Delta, contributes approximately 15 percent of the inflow to the Delta (Delta Protection Commission 2000). Flowing through portions of Fresno, Madera, Merced, Stanislaus, San Joaquin, Sacramento, and Contra Costa counties, the river has flows ranging from 1,500 cfs in dry years to more than 40,000 cfs in wet years (Friant Water Users Authority and Natural Resources Defense Council 2002).

Hydrologic conditions in the San Joaquin River basin are dominated by snowmelt from the Sierra Nevada. Before major water storage projects were completed on the San Joaquin River and its major tributaries, lower San Joaquin River flows generally peaked in late spring/early summer and dropped to low levels in the fall. Since completion of Friant Dam (1944), McClure Reservoir (1967 on the Merced River), Don Pedro Reservoir (1971 on the Tuolumne River), and New Melones Reservoir (1979 on the Stanislaus River), the lower San Joaquin River's seasonal flow pattern has changed substantially. Before 1944, based on 1923–1944 records, flow in the lower San Joaquin River tended to peak in May and June, with an average monthly flow of almost 11,000 cfs, and declined rapidly to an average monthly flow of approximately 1,200–1,300 cfs in August and September. Since 1979, the average monthly flow has peaked in March at just over 10,000 cfs, with a more gradual decline to approximately 2,400 cfs in August. In addition, the San Joaquin River is tidally influenced by the Delta and the San Francisco Bay. Tidal fluctuation in the San Joaquin River has been modeled to approximately the Vernalis tide gauge and the Airport Way crossing of the San Joaquin River, which is approximately 13 river miles upstream from the project site.

The SJRRP was established in late 2006, to implement the Stipulation of Settlement in *NRDC et al. v. Kirk Rodgers et al*. (Settlement). Authorization for implementing the Settlement is provided in the San Joaquin River Restoration Settlement Act, included in PL 111-11. The goal of the SJRRP is to re-operate and increase the release of water from Friant Dam in accordance with the Settlement, and in a manner consistent with federal, State, and local laws, and future agreements with downstream agencies, entities, and landowners (Reclamation and DWR 2011). The Settlement establishes two primary goals:

- *Restoration Goal*—To restore and maintain fish populations in "good condition" in the mainstem San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish. To achieve the Restoration Goal, the Settlement calls for releases of water from Friant Dam to the confluence of the Merced River (referred to as Interim and Restoration Flows), a combination of channel and structural modifications along the San Joaquin River below Friant Dam, and reintroduction of Chinook salmon.

- *Water Management Goal*—To reduce or avoid adverse water supply impacts on all of the Friant Division long-term contractors that may result from the Interim and Restoration Flows provided for in the Settlement. To achieve the Water Management Goal, the Settlement calls for recirculation, recapture, reuse, exchange, or transfer of the Interim and Restoration Flows to reduce or avoid impacts on water deliveries to all of the Friant Division long-term contractors caused by the Interim and Restoration Flows.

The SJRRP is to release Interim and Restoration Flows to the San Joaquin River from Friant Dam in accordance with the flow schedule presented in Exhibit B of the Settlement. The Settlement establishes the Recovered Water Account and recovered-water program, which make water available to all Friant Division long-term contractors who provide water to meet Interim or Restoration Flows so that the impacts of Interim and Restoration Flows on such contractors can be reduced or avoided.

LOCAL DRAINAGE

Stormwater runoff in the RD 17 area commonly is collected in agricultural ditches, channels, municipal stormwater sewers, or human-made ponds before being pumped to the San Joaquin River. Runoff from the area east of the San Joaquin River, along levee elements Ie and VIIb, is directed west through agricultural swales and ditches, and then is pumped into the river by means of private agricultural pumps. Runoff from developed lands adjacent to elements IVa, IVc, and VIa.4 is directed to the City of Lathrop's storm drainage system, held in detention basins, and ultimately pumped into the San Joaquin River through a municipal stormwater outfall. Runoff in the area around element VIIe, which encompasses the Oakwood Lake development, first flows into the artificial lake in the center of the development, and then is pumped into the river if lake levels become too high.

WATER QUALITY

Water quality in the Delta and portions of the San Joaquin River are heavily influenced by CVP and SWP operations. Generally, Delta water quality is best during the winter and spring months and poorer during the irrigation season and early fall. Water quality in the San Joaquin River is influenced by factors such as rain and snowmelt runoff, reservoir operations, and irrigation return flows in the San Joaquin river basin. Agricultural return flows commonly discharge elevated salt loads into the San Joaquin River. The SWRCB has set flow and water quality objectives at Vernalis, located just upstream from the Phase 3 Repair Project area. To meet the Vernalis objective, the U.S. Bureau of Reclamation supplements flows on the San Joaquin River with releases from New Melones Reservoir on the Stanislaus River (Northeastern San Joaquin County Groundwater Banking Authority 2004).

The latest version of the Section 303(d) list for California issued by the SWRCB (approved October 26, 2006) identifies an impaired status for waterways in the eastern Delta, including the lower San Joaquin River. Potential sources of pollution for all of the listed constituents in the basin include agriculture, urban runoff/storm sewers, resource extraction, and unknown sources. The eastern Delta, including the lower San Joaquin River, is on the Section 303(d) list for impairment from boron, chlorpyrifos, diazinon, dichlorodiphenyltrichloroethane, electrical conductivity, unknown toxicity, Group A pesticides, exotic species, and mercury. Downstream from the Phase 3 Repair Project area, the Stockton Deep Water Ship Channel is being addressed by a total maximum daily load (TMDL) plan for dissolved oxygen and is no longer on the Section 303(d) list. TMDLs have been initiated for organophosphorus pesticides (i.e., diazinon and chlorpyrifos), salinity and boron, and selenium in the lower San Joaquin River watershed and for total dissolved solids and mercury in Delta channels. TMDLs for the other listed pollutants are scheduled to be developed at various times over the next 10 years, in accordance with the priorities contained in the Section 303(d) list.

Major monitoring programs for the San Joaquin River include DWR's Municipal Water Quality Investigations Program and Water Rights Decision 1485 Water Quality Monitoring Program. The City of Stockton also monitors ambient water quality to assess potential effects of discharges from the Stockton Regional Wastewater Control Facility. Data are collected at five water quality monitoring sites along the San Joaquin River near the Phase 3

Repair Project area. The Mossdale Bridge sampling site at the Interstate 5 crossing over the San Joaquin River is near elements VIcde and VIIb. The Vernalis sampling site is located near the town of Vernalis, just upstream from the Phase 3 Repair Project area. Some of the broad categories that are monitored are discussed briefly below.

HABITAT

Dense riparian forests once flanked the San Joaquin River in this area. In contrast, the habitat today consists of linear areas and occasional remnant patches of riparian forests and related riparian scrub that grow on or adjacent to the levee, primarily on the waterside. A few larger areas of these riparian forests are present where the river turns away from the levee and creates a point bar and an upland floodplain area. Riprap or large boulders cover the lower half of most of the waterside of the San Joaquin River east levee in the Phase 3 Repair Project area, and ruderal vegetation grows in open areas, especially upslope from the riprap and on large open areas on the landside of the levee. Other areas of levee on the waterside are barren and/or covered with stumps and dead vegetation, likely because of levee maintenance that has included cutting scrub and low vegetation, burning, and applying herbicide. Some of the lands on the waterside of the levee are privately held and are affected by grazing and other landowner activities.

The landside reaches of the Phase 3 Repair Project area levees primarily are barren or covered with ruderal vegetation. Beyond the base of the levees, riparian vegetation is rare but occasionally is present in small, isolated patches. Other trees include occasional single or isolated stands of native oaks and nonnative trees that have been planted around farms, agricultural fields, and residential or other types of development. Habitat and land cover types present in the Phase 3 Repair Project area include riparian forests, nonnative woodlands, agricultural lands, ruderal and developed areas, and aquatic features (including marsh, wetlands, and ponds) (**Exhibits 13a** through **13c**).

VEGETATION AND LAND COVER

As described below, terrestrial vegetation and land cover types in the Phase 3 Repair Project area and vicinity include Great Valley cottonwood riparian forest (remnant), Great Valley oak riparian forest (remnant), nonnative woodland, agricultural (row crops, orchards, dirt roads, and irrigation ditches), and ruderal and developed (residential housing, parks, boat launch facilities, and roads).

- **Great Valley cottonwood riparian forest:** Remnant patches of Great Valley cottonwood riparian forest in the Phase 3 Repair Project area are dominated by large Fremont cottonwood (*Populus fremontii*) trees and Goodding's willow (*Salix gooddingii*). Most of the otherwise linear or smaller patchy areas of this community lack Fremont cottonwood and are represented by Goodding's willow, red willow (*S. laevigata*), arroyo willow (*S. lasiolepis*), narrow leaved-willow (*S. exigua*), scattered valley oak (*Quercus lobata*), Oregon ash (*Fraxinus* latifolia), and buttonbush (*Cephalanthus occidentalis*). Native ground cover species, found mainly in the larger remnant patches of riparian forest, include California blackberry (*Rubus ursinus*) and wild rose (*Rosa californica*). Common nonnative understory species found in most elements include Himalayan blackberry (*Rubus discolor*) and tree tobacco (*Nicotina glauca*). Most of the Great Valley cottonwood riparian forest community also could be characterized as Great Valley riparian scrub, which does not include Fremont cottonwood and is characterized by a shorter canopy and more uniform structure. This habitat, however, is part of the Great Valley cottonwood riparian forest that was extensive and connected along this entire reach of the San Joaquin River. Therefore, this BA describes all riparian habitat as such. The largest stands of Fremont cottonwood trees in the Phase 3 Repair Project area are present in elements IIIb, IVc, Va, and VIa.1.
- **Great Valley oak riparian forest:** Great Valley oak riparian forest is located in the Phase 3 Repair Project area, occurring only on the landside of the levees. This is a medium to tall (rarely to 100 feet), broadleaved, winter deciduous, closed-canopy riparian forest dominated by valley oak. Understories include scattered Northern California black walnut (*Juglans nigra*) and western sycamore (*Platanus racemosa*) as well as young valley oaks. Understory plants include California rose (*Rosa californica*), blackberry (*Rubus* spp.), and

western poison oak (*Toxicodendron diversilobum*) (Hickman 1993; Holland 1986). Two substantial oak groves of very large, healthy valley oak trees are present on the landside of elements IIIb and IVa and account for most of the Great Valley oak riparian forest. Several groups of smaller valley oak trees and individual valley oaks, scattered along the landside of other Phase 3 Repair Project elements, also contribute to this community.

- **Nonnative woodland:** Along the landside of elements Ie, VIa.1, VIde, and VIIg, nonnative trees have been planted around farms, agricultural fields, and residential or other types of development. These woodlands lack understory vegetation, other than grasses and ruderal vegetation.

- **Agricultural cropland:** Cropland in the Phase 3 Repair Project area is dominated by alfalfa fields, orchards, and row crops, such as tomatoes. Ruderal species grow along the edges of fields and irrigation ditches, some of which contain water and associated aquatic plants. The largest areas of agricultural lands are present in elements Va, VIa.1, and VIcde.

- **Ruderal vegetation:** Ruderal vegetation is characterized by nonnative weedy and sometimes invasive vegetation and nonnative annual grasses. Common weed species include yellow star-thistle (*Centaurea solstitialis*), black mustard (*Brassica nigra*), shortpod mustard (*Hirschfeldia incana*), Italian thistle (*Carduus pycnocephalus*), milk thistle (*Silybum marianum*), and Himalayan blackberry. Common grass species include ripgut brome (*Bromus diandrus*), foxtail barley (*Hordeum murinum* ssp. *leporinum*), Bermuda grass (*Cynodon dactylon*), and Johnsongrass (*Sorghum halepense*). The levee slopes are dominated by ruderal vegetation. Large open areas in elements IIIa and IVc also are composed primarily of ruderal vegetation, as are smaller open areas in elements VIcde and VIIe that border roads, parking lots, and agricultural land.

- **Developed areas:** Developed areas in the Phase 3 Repair Project area consist of residential areas bordering elements IVa, IVc, Va and VIa.1, and VIIe; parks located in elements IVc and VIa.2, the latter of which is also a boat launching facility; and ranch houses and related facilities located in or adjacent to elements Ie, IIab, Va, VIa.1, and dryland levee element XI. Vegetation in residential areas and parks consists of turf grasses, landscape trees, and occasional valley oak trees. Ranch lands often contain English walnut trees (*Juglans regia*), a variety of landscaped trees, and occasional native valley oak trees.

AQUATIC HABITATS

The principal surface water bodies associated with the Phase 3 Repair Project area are the San Joaquin River and Walthall Slough. Project elements Ia through IVc are located downstream from the confluence of the San Joaquin River and Old River. Reach V is located directly adjacent to this confluence. Elements VIa.1 through VIIe are upstream from the confluence of the San Joaquin River and Old River. Small portions of elements VIIe and VIIg are located along Walthall Slough. An approximately 3.5-acre constructed pond is located adjacent to elements IIab, but outside the project footprint (**Exhibit 13a**).

In the Phase 3 Repair Project area, the San Joaquin River is characterized as a wide channel (approximately 300 feet) with little riparian canopy or overhead vegetation and minimal bank cover. Aquatic habitat in the San Joaquin River is characterized primarily by slow-moving glides and pools, is depositional in nature, and has limited water clarity and habitat diversity. Altered flow regimes, flood risk management, and bank protection efforts along much of the San Joaquin River have reduced riparian vegetation and associated shaded riverine aquatic (SRA) habitat, sediment transport, channel migration and avulsion, and large woody debris recruitment, and have isolated the channel from its floodplain. This has resulted in a decline in habitat quality for fish species using the San Joaquin River near the Phase 3 Repair Project area. However, fish use this segment of the river, even if only as a migratory pathway to and from upstream spawning and rearing areas.

Wetland vegetation in the Phase 3 Repair Project area is limited to coastal and valley freshwater marshes, several agricultural ditches, and the edges of one constructed pond. Freshwater marsh is isolated in a depression on the landside of the levee in element Ib between Howard Road to the north and a dirt farm road on the south. A limited

amount of freshwater marsh also is present around the edges of a constructed pond, located on a large private estate and equestrian center, east of the Phase 3 Repair Project area levee in element IIab. A second area of freshwater marsh is located just outside the Phase 3 Repair Project area in element Va, and in an area of backwater on the San Joaquin River. Agricultural ditches are located along the edges of fields and orchards.

FISH POPULATIONS

The lower San Joaquin River and Delta serve as a migration corridor and/or provide other types of habitat (e.g., rearing, spawning) for steelhead, delta smelt, white sturgeon (*Acipenser transmontanus*), and green sturgeon. Numerous other resident native and nonnative species also are found in the San Joaquin River. Among the native species present in the river are blackfish (*Orthodon microlepidotus*), threespine stickleback (*Gasterosteus aculeatus*), and San Joaquin roach (*Lavinia symmetricus* sp.); while nonnative species include striped bass (*Morone saxatilis*), white catfish (*Ameiurus catus*), and bluegill (*Lepomis macrochirus*). In late 2014, experimental populations of spring-run Chinook salmon began to be reintroduced to the San Joaquin River, as a component of the SJRRP (see "San Joaquin River" subsection above).

The small, unnamed pond in elements IIab (**Exhibit 13a**) may contain fish and other aquatic species. Because of its isolated nature and size, this pond likely supports only nonnative warm-water fish that probably have been introduced. Typical fish that are found in similar ponds include bluegill, western mosquitofish (*Gambusia affinis*), and catfish (*Ameiurus* or *Ictalurus* spp.), among other nonnative warm-water species.

WILDLIFE

Common wildlife species expected in the Phase 3 Repair Project area are those typically associated with agriculture (e.g., alfalfa, row crops, and orchards) and ruderal habitat, which account for 57 percent of the Phase 3 Repair Project area's footprint. Species include California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), western harvest mouse (*Reithrodontomys megalotis*), and California meadow vole (*Microtus californicus*). These small mammals are prey for a variety of raptor species known to occur in the area, including Swainson's hawk (*Buteo swainsoni*). Riparian habitats in the Phase 3 Repair Project area provide nesting habitat for a wide variety of bird species.

SPECIES ACCOUNTS

This section presents species accounts for the federally listed species considered in this BA, including relevant life history and habitat use, as well as the species' potential for occurrence in the action area. The action area (see the "Action Area" section above) encompasses the entire area that may be affected by the Phase 3 Repair Project, including more distant locations where indirect effects may occur. However, the species accounts below focus on the habitat present in the Phase 3 Repair Project area itself and describe the potential for federally listed species to occur in the general vicinity. Only when the habitat quality or species distribution is specifically known for the action area is it described.

VALLEY ELDERBERRY LONGHORN BEETLE

VELB has four life stages: egg, larva, pupa, and adult. This species, which is federally listed as threatened, is nearly always found on or close to its host plant, the elderberry (*Sambucus* sp.). Females lay their eggs on the bark, and larvae hatch and burrow into the stems. The larval stage can last 2 years, after which the larvae enter the pupal stage and transform into adults. Adults are active (feeding and mating) from March to June (USFWS 2006). It appears that to function as VELB habitat, host elderberry shrubs must have stems that are 1.0 inch or greater in diameter at ground level. Use of the plants by the beetle rarely is apparent. Frequently, the only exterior evidence of the shrub's use by the beetle is an oval exit hole, created by the larva just before the pupal stage. Field studies conducted along the Cosumnes River and in the Folsom Lake area suggest that larval galleries can be found in elderberry stems with no evidence of exit holes, because the larvae either succumb before constructing an exit hole or are not far enough along in the developmental process to construct an exit hole (USFWS 1996a).

VELB is patchily distributed throughout the remaining riparian forests of the Central Valley, from Redding to Bakersfield, and appears to be only locally common (i.e., found in population clusters that are not evenly distributed across the Central Valley). Extensive loss of Central Valley riparian forests has occurred since 1900, with riparian forests declining by 80 to 96 percent, depending on the region (USFWS 2006). Although it is wide-ranging, VELB is thought to have suffered a long-term decline because of human activities that have caused widespread alteration and fragmentation of riparian habitats and, to a lesser extent, upland habitats that support the beetle. Low density and limited dispersal capability may cause the beetle to be particularly vulnerable to population isolation because of habitat fragmentation. Insecticide and herbicide use in agricultural areas and along road rights-of-way may be factors limiting the beetle's distribution. The age and quality of individual elderberry shrubs/trees and stands as a food plant for beetle may be a factor in its limited distribution.

Elderberry shrubs are known to occur along the San Joaquin River, on both the waterside and landside of levees in the Phase 3 Repair Project area. Focused surveys for elderberry shrubs were conducted along all levee reaches on March 8, 2011; the area was resurveyed on January 29, 2014. A total of 18 elderberry shrubs were observed within 100 feet of the Phase 3 Repair Project area: nine shrubs on the waterside of the levee and nine shrubs on the landside. None of the shrubs had evidence of beetle exit holes. One of the landside shrubs does not have stems greater than 1 inch in diameter at ground level; therefore, it is not considered suitable VELB habitat. See **Exhibit 14** for locations of the elderberry shrubs that were observed within 100 feet of the Phase 3 Repair Project area during field surveys in 2014.

CRITICAL HABITAT

Critical habitat for VELB was designated at the time of listing. Two areas along the American River in the Sacramento metropolitan area were designated as critical habitat for this species. The Phase 3 Repair Project area is not located within designated critical habitat for VELB.

RECOVERY PLAN FOR VALLEY ELDERBERRY LONGHORN BEETLE

The Recovery Plan for Valley Elderberry Longhorn Beetle (USFWS 1984) lacks specific goals and does not include objective, measurable recovery criteria (USFWS 2006). The recovery plan identified additional essential habitat for this species in an area along Putah Creek, Solano County, and an area along the American River Parkway, Sacramento County. USFWS released a 5-year status review for VELB on October 2, 2006 (USFWS 2006). This review reported an increase in known beetle locations, from 10 at the time of listing in 1980 to 190 in 2006. Because of the presumed increase in the estimated population and the concurrent protection and restoration of several thousand acres of riparian habitat suitable for VELB, USFWS's status review determined that this species is no longer in danger of extinction and recommended that the species no longer be listed under the ESA. On October 2, 2012, the USFWS issued a proposed rule to delist VELB (78 FR 66058); however, on September 17, 2014, the USFWS withdrew this proposal, stating that the scientific information and analysis reflected in the October 2012 proposal was not strong enough to support a decision to delist the species (79 FR 55874).

RIPARIAN BRUSH RABBIT

Riparian brush rabbit, which is federally listed as endangered, inhabits riparian communities in the northern San Joaquin Valley that are dominated by thickets of willows and large clumps of shrubs and vines, such as wild rose, blackberries, coyote bush, and wild grape. Historically, riparian brush rabbit inhabited dense, brushy areas of valley riparian forests, marked by extensive thickets of wild rose, blackberries, and willows (Sandoval et al. 2006).

Suitable habitat for riparian brush rabbit is characterized by an abundance of woody ground litter, mats of low-growing vines and shrubs, and areas of higher ground not subject to regular or heavy flooding (Sandoval et al. 2006). On a seasonal basis, it also may use dense, tall stands of herbaceous plants adjacent to patches of riparian shrubs (Williams and Hamilton 2002). It tends to avoid large openings in the understory cover, frequenting only small clearings in the vegetation while foraging (USFWS 1998). An essential component of habitat for riparian brush rabbit is high-ground refugia from flooding, which provides protection from predators and dry habitat during prolonged rainstorms (USFWS 1998).

The only known populations of riparian brush rabbit are confined to Caswell Memorial State Park on the Stanislaus River in Stanislaus County, approximately 10 miles southeast of the Phase 3 Repair Project area, and in the South Delta along the San Joaquin River and overflow channels (Williams and Hamilton 2002; Williams et al. 2002; Lloyd and Williams 2003; Vincent-Williams et al. 2004; CDFW 2014) (**Exhibit 15**). The population in the South Delta is found in Paradise Cut along the rights-of-way of the two railroads that cross Paradise Cut and Tom Paine Slough, and in an oxbow on the San Joaquin River near Mossdale Landing (CDFW 2014). Riparian brush rabbits also have been found along the San Joaquin River north of the oxbow population, in waterside riparian habitat near the Phase 3 Repair Project area adjacent to elements IIIa and IIIb, between elements IIab and IIIa, and between elements VIa.1, and VIa.4 (CDFW 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004) (**Exhibit 15**). Other historical habitats along the San Joaquin River and tributaries are believed to no longer be suitable for riparian brush rabbits because of irrigated agriculture, livestock grazing, and impoundment and channelization of streams. High-ground refugia also may be lacking in these areas (Williams and Hamilton 2002).

In Paradise Cut, existing habitat for riparian brush rabbits is confined to levee bases, the channel banks of Paradise Cut, and pockets of low ground along the bottom of Paradise Cut. Generally, areas of suitable habitat in these locations are very narrow (15 to 100 feet wide). Most of the channels in Paradise Cut are in effect dead-end sloughs fed by Old River, with large portions containing water year-round, which results in the isolation of some upland areas (i.e., islands). The existing habitat for rabbits is covered in water on average once every 4 years, when flood flows in the San Joaquin River are sufficient to overtop Paradise Weir. Brush rabbits probably use the UPRR right-of-way as high-ground refugia during flooding events (Williams and Hamilton 2002).

Occupied habitat for riparian brush rabbit is documented adjacent to the Phase 3 Repair Project area along the waterside levee in elements IIIa and IIIb, between elements IIab and IIIa, and between elements VIa.1, and VIa.4. The waterside habitat along elements IIIa and IIIb is dominated by willow within interspersed California blackberry and grasses. The waterside habitat between elements IIab and IIIa is dominated by willows, cottonwoods, valley oaks, wild rose, and California and Himalayan blackberry. The waterside habitat between elements VIa.1 and VIa.4 is on an oxbow with dense riparian vegetation. Other patches of riparian vegetation along the San Joaquin River and adjacent to Phase 3 Repair Project area levees, such as the Great Valley cottonwood forest and Great Valley oak riparian forest communities shown in **Exhibits 13a** through **13c**, provide potentially suitable habitat for riparian brush rabbit, including the small areas of riparian habitat that are present on the waterside of Phase 3 Repair Project area elements IIab, IVc, and Va.

Riparian brush rabbit forages along the edges of shrub cover and in small clearings in the vegetation cover rather than in large openings. It feeds on herbaceous vegetation, such as grasses, sedges, clover, forbs, and buds, bark, and leaves of woody plants (Sandoval et al. 2006; USFWS 1998). This species has a small home range and mainly remains hidden under protective shrub cover, seldom venturing more than 1 meter (3.3 feet) from cover (Sandoval et al. 2006). North of elements IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the UPRR tracks (i.e., elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species.

CRITICAL HABITAT

Critical habitat has not been designated for riparian brush rabbit.

RECOVERY PLAN FOR RIPARIAN BRUSH RABBIT

The Recovery Plan for Upland Species of the San Joaquin Valley, California addresses the riparian brush rabbit (USFWS 1998). At the time the recovery plan was prepared, only the Caswell Memorial State Park population was known to exist. One of the most important conservation actions identified in the plan was establishment of other viable populations within the park’s range. The recovery plan recommended the following actions (USFWS 1998):

- Initiate a reintroduction program that includes researching genetic diversity among remaining individuals.
- Implement a captive breeding program to translocate individuals to new populations.
- Establish at least three additional wild populations in the San Joaquin Valley in restored and expanded suitable habitat within the rabbit’s historical range.

In 1999, the Endangered Species Recovery Program began implementing the Controlled Propagation and Reintroduction Plan for the Riparian Brush Rabbit (Williams et al. 2002), which was recommended in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998). The primary goal of the program is to prevent extinction by providing animals for reintroduction to establish new populations or augment existing populations. In July 2002, captive-bred rabbits were released at the San Luis National Wildlife Refuge, near Los Banos in the central San Joaquin Valley, and in 2005, a population of captive-bred rabbits was introduced to a private ranch along the San Joaquin River in Stanislaus County, adjacent to the San Joaquin River National Wildlife Refuge (USFWS 2007). This effort is ongoing.

DELTA SMELT

Delta smelt was formally listed as threatened under the ESA on March 5, 1993 (59 FR 440). On December 19, 1994 (59 FR 65256), USWFS designated critical habitat. Delta smelt is found only from Suisun Bay upstream through the Sacramento–San Joaquin estuary in Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties.

Delta smelt is endemic to the upper Sacramento–San Joaquin River estuary and occurs primarily in open surface waters of Suisun Bay, in the Sacramento River downstream from Isleton, and in the San Joaquin River downstream from Mossdale (Bennett 2005), including the project area. Its historic range is thought to have extended from Suisun Bay upstream to at least the city of Sacramento on the Sacramento River and Mossdale on the San Joaquin River. Delta smelt historically was one of the most common pelagic fish (fish living in open water away from the bottom) in the upper Sacramento–San Joaquin estuary (USFWS 2004). The delta smelt population generally is concentrated in the estuary west of the confluence of the Sacramento and San Joaquin rivers in high-outflow years and in the north Delta in low-outflow years (Sweetnam 1997, 1998; Bennett 2005). Delta outflow determines the location of the salinity gradient and may strongly influence delta smelt distribution. USFWS data indicate that delta smelt is found in the San Francisco Bay/Sacramento–San Joaquin Delta (Bay-Delta) estuary where salinity generally is less than two parts per thousand. Except when spawning in freshwater, delta smelt most frequently is caught in or is slightly upstream from the entrapment zone (Bennett 2005). In the CDFW Delta-wide 20mm delta smelt survey, delta smelt larvae were observed only occasionally and in very low abundance in the vicinity of the project area (less than four larvae in 10,000 cubic meters as sampled on April 4, 2014). The species was not observed in the project vicinity in 2015 or 2016, during the delta smelt monitoring program that occurs from January through March.

CRITICAL HABITAT

Although the Phase 3 Repair Project area is near the upper limit of the known distribution of delta smelt, it is included in the area designated as critical habitat for the species (Critical Habitat Determination for the Delta Smelt, 59 FR 65256, December 19, 1994). In the critical-habitat designation, USFWS identified the following primary constituent elements essential to conservation of delta smelt: physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration (59 FR 65256). The primary constituent elements are organized by habitat conditions required for each life stage. USFWS has identified specific areas in the Delta for spawning habitat, larval and juvenile transport, and adult migration for delta smelt. The Phase 3 Repair Project area and larger action area include places identified for larval and juvenile transport and adult migration, but do not include specific areas important for delta smelt spawning habitat (59 FR 65256).

RECOVERY PLAN FOR DELTA SMELT

The Sacramento–San Joaquin Delta Native Fishes Recovery Plan includes restoration of abundance and distribution of delta smelt (USFWS 1996b). Action items in the recovery plan for delta smelt refer to four zones in the Delta. Sampling stations within these zones were chosen to measure restoration because they have a record of delta smelt catches and are sampled consistently. These zones do not include any portion of the Phase 3 Repair Project area or action area.

LONGFIN SMELT

On April 2, 2012, the USFWS issued its finding that the longfin smelt warranted protection under the ESA, and added it as a candidate species for protection under the ESA (77 FR 19755). Longfin smelt is found in bay, estuarine, and nearshore coastal environments from San Francisco Bay north to Lake Earl near the Oregon border. The southernmost detection of the species was a single fish from Monterey Bay (Eschmeyer et al. 1983), although

spawning has not been documented south of San Francisco Bay. The San Francisco estuary and the Delta support the largest longfin smelt population in California. Longfin smelt is more broadly distributed throughout the Bay-Delta estuary and is found in water with higher salinities than delta smelt. Longfin smelt most often is concentrated in Suisun Bay, San Pablo Bay, and northern San Francisco Bay during nonspawning periods (Moyle 2002). No fish surveys have been conducted by RD 17 within the river stretch adjacent to the Phase 3 Repair Project area; however, CDFW's Delta-wide sampling program, including the 20mm delta smelt survey, longfin smelt larva survey, summer tow net survey, and spring Kodiak Trawl sampling, occurs in the vicinity of this area. Longfin smelt has a short life span, generally reaching maturity at 2 years of age, when it spawns and then dies. During the second year of life, adults tend to inhabit the higher salinity western portion of the estuary system; they occasionally have been found in nearshore ocean surveys (Rosenfield and Baxter 2007). Adults spend their lives in bays, estuaries, and nearshore coastal areas, and migrate into low-salinity or freshwater reaches of coastal rivers and tributary streams to spawn. Spawning occurs in the lower portions of the Sacramento and San Joaquin rivers and adjacent sloughs, typically between November and June, with peak spawning occurring from February through April (Baxter 1999; DWR 2009; Moyle 2002; Wang 1986). On the San Joaquin River, spawning occurs downstream from Medford Island, approximately 20 miles downstream from the project site (Moyle 2002). Locations and movements of all life stages of longfin smelt are influenced by a wide range of hydrologic and environmental variables (Rosenfield 2010), all of which show high variation among and within years; accordingly, temporal and spatial distributions of longfin smelt show high variation among and within years.

CRITICAL HABITAT

Because the longfin smelt has not been listed, no critical habitat has been designated.

RECOVERY PLAN FOR LONGFIN SMELT

The Sacramento–San Joaquin Delta Native Fishes Recovery Plan includes restoration of abundance and distribution of longfin smelt (USFWS 1996b). Action items in the recovery plan for longfin smelt refer to five zones in the Delta. Sampling stations within these zones were chosen to measure restoration because they have a record of longfin smelt catches and are sampled consistently. These zones do not include any portion of the Phase 3 Repair Project area or action area.

CENTRAL VALLEY STEELHEAD DISTINCT POPULATION SEGMENT

On March 19, 1998, NMFS listed the Central Valley steelhead DPS as threatened (63 FR 13347). Central Valley steelhead DPS is considered to be winter-run steelhead (McEwan and Jackson 1996). In the most recent 5-year review of the listing of this species, NMFS recommended that the Central Valley steelhead DPS should remain classified as a threatened species (NMFS 2011a). Findings of the next 5-year status review for all federally listed anadromous salmonids in the Central Valley are anticipated to be published in 2016. Like other anadromous salmonid species, this one matures in the ocean before entering freshwater on its spawning migrations. The major factor influencing steelhead populations in the San Joaquin River system is loss of habitat caused by construction of impassable dams on the mainstem and major tributaries.

Historically, Central Valley steelhead was found throughout the Sacramento and San Joaquin drainages, where waterways were accessible to migrating fish. Steelhead historically was present in the upper San Joaquin River basin, upstream from the current location of Friant Dam. Steelhead commonly migrated far up tributaries and into headwater streams where cool, well-oxygenated waters were present year-round.

Currently, in the Central Valley, viable populations of naturally produced steelhead are found only in the Sacramento River and its tributaries. Wild steelhead populations appear to be restricted to tributaries of the Sacramento River below Keswick Dam, such as Antelope, Deer, and Mill Creeks, and to the Yuba River below Englebright Dam (McEwan and Jackson 1996). No significant populations of steelhead remain in the San Joaquin

River basin; however, small persistent runs still occur on the Stanislaus and Tuolumne rivers, and perhaps the Merced River (McEwan and Jackson 1996).

Juvenile steelhead rear throughout the year and may spend 1 to 3 years in freshwater before emigrating to the ocean. Smoltification, the physiological adaptation that juvenile salmonids undergo to tolerate saline waters, occurs in juveniles as they begin their downstream migration. Smolting steelhead (age class 1+ and older) generally emigrate from March to June (Barnhart 1986; Reynolds et al. 1993).

The San Joaquin River near the Phase 3 Repair Project area is used by adult and juvenile steelhead primarily as a migration corridor between the ocean and cold-water habitat in the upstream tributaries. Juvenile steelhead would be likely to use the edges of rivers and sloughs, and floodplain habitats, if available, for rearing as they emigrate (Moyle 2002).

Critical Habitat

Critical habitat for the Central Valley steelhead DPS was designated on August 12, 2005; a final designation was published on September 2, 2005 (70 FR 52604), with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins. The Phase 3 Repair Project area is located within designated critical habitat for the Central Valley steelhead DPS.

Recovery Plan for Central Valley Steelhead Distinct Population Segment

A recovery plan for the ESUs of Sacramento River winter-run Chinook salmon, the Central Valley spring-run Chinook salmon, and the DPS of Central Valley steelhead was prepared by NMFS in July 2014 (NMFS 2014b). The draft plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives. Although habitat conditions for Central Valley steelhead have improved slightly over the past decade, access to historic habitat generally remains blocked, and the quality of the species' remaining habitat generally remains degraded (Lindley et al. 2009; Cummins et al. 2008).

CENTRAL VALLEY FALL/LATE FALL-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

On September 16, 1999 (64 FR 50393), NMFS determined that listing was not warranted for the Central Valley fall/late fall–run Chinook salmon ESU; however, the ESU was designated as a future candidate for listing because of concerns about specific risk factors. On April 14, 2004 (69 FR 19975), the ESU was reclassified as a species of concern. The ESU includes all naturally spawned populations of fall-run Chinook salmon in the Sacramento and San Joaquin River basins and their tributaries, east of the Carquinez Strait. The Central Valley fall/late fall–run Chinook salmon ESU currently is the only run of Chinook salmon in the San Joaquin River system.

Adult Central Valley fall/late fall–run Chinook salmon enter the Sacramento and San Joaquin river systems from September through January and spawn from October through February. In general, San Joaquin River populations tend to mature at an earlier age and spawn later in the year than Sacramento River populations (Baker and Morhardt 2001). These differences may be phenotypic responses to the generally warmer temperature and lower flow conditions found in the San Joaquin River basin, relative to the Sacramento River basin.

Juveniles typically rear in freshwater for 3 to 6 months (fall-run) and up to 12 months (late fall–run) before entering the ocean. Juveniles migrate downstream from January through June. Juvenile Chinook salmon prefer water depths of 0.5 foot to 3.3 feet and velocities of 0.26 foot to 1.64 feet per second (Raleigh et al. 1986). Important winter habitat for juvenile Chinook salmon includes flooded bars, side channels, and overbank areas with relatively low water velocities. Juvenile Chinook salmon have been found to rear successfully in floodplain habitat, which routinely floods but is dry at other times. Growth rates appear to be enhanced by the conditions found in floodplain habitat (Sommer et al. 2001).

Cover structures, space, and food are necessary components for Chinook salmon rearing habitat. Suitable habitat includes areas with instream and overhead cover in the form of undercut banks, downed trees, and large, overhanging tree branches. The organic materials forming fish cover also help provide sources of food, in the form of both aquatic and terrestrial insects.

Fall-run Chinook salmon adults primarily pass through the Phase 3 Repair Project area on their way to spawn in upstream tributaries of the San Joaquin River (Moyle 2002). Juvenile fall-run Chinook salmon emigrate from San Joaquin River tributaries (e.g., the Stanislaus, Merced, and Tuolumne rivers) and other river tributaries through the San Joaquin River during the late winter and spring (February through mid-June) (San Joaquin River Group Authority 2009). Juvenile Chinook salmon use the edges of rivers and sloughs for rearing as they emigrate downstream (Moyle 2002).

CRITICAL HABITAT

No critical habitat has been designated for Central Valley fall/late fall-run Chinook salmon.

ESSENTIAL FISH HABITAT

EFH has been designated for Pacific Salmon. This includes identification of Chinook salmon EFH, which occurs in the project and action areas. Central Valley fall/late fall-run Chinook salmon ESU is in the Phase 3 Repair Project area along the San Joaquin River. EFH includes migration, holding, and rearing habitat and opportunistic/intermittent spawning, holding, and rearing habitat for the San Joaquin River (NMFS 2014a).

Construction of element IVc would improve EFH, by providing the type of refuge habitat for juvenile salmonids during high-water flows as described in Amendment 18 for the lower San Joaquin River tributaries (NMFS 2014c).

RECOVERY PLAN FOR CENTRAL VALLEY FALL/LATE FALL–RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

Although the Central Valley fall/late fall-run Chinook salmon is not listed as threatened or endangered under the ESA, the Sacramento–San Joaquin Delta Native Fishes Recovery Plan outlines conservation measures and restoration objectives and criteria for the species, including the San Joaquin River run, which CDFW recognizes as a distinct stock (USFWS 1996b). Reasons for decline identified by the plan include habitat loss, suitability of habitat, survival of outmigrants, harvest, hatcheries, and water quality. Conservation measures include:

- testing an electrical fish barrier and a physical barrier upstream from the confluence of the Merced River to prevent adult fish from straying,
- constructing and rehabilitating spawning riffles,
- constructing a temporary barrier at Old River to prevent entrainment of outmigrating smolts, and when possible,
- coordinating water releases to provide attraction or outmigration flows.

These efforts have been funded by a wide range of federal, State, and private agencies (USFWS 1996b).

SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

The Sacramento River winter-run Chinook salmon was formally listed as threatened in November 1990 (55 FR 46515), and was reclassified as endangered under the ESA on January 4, 1994 (59 FR 440).

In the Delta, winter-run adults begin to move through the system in early winter (November–December), with the first upstream adult migrants appearing in the upper Sacramento River during late December (Vogel and Marine 1991, cited in NMFS 2003). Adult winter-run presence in the upper Sacramento River system peaks in March. The timing of migration may vary somewhat because of changes in river flows, dam operations, and water year type. Spawning occurs primarily from mid-April to mid-August, with peak activity occurring in May and June in the river reach between Keswick Dam and the Red Bluff Diversion Dam (Vogel and Marine 1991, cited in NMFS 2003).

Juvenile winter-run Chinook salmon occur in the Delta from October through early May, based on data collected from trawls, beach seines, and salvage records at State and federal water projects (DFG 1998). The peak of juvenile arrivals is between January and March. Juveniles tend to rear in the freshwater upper Delta areas for about the first 2 months (Kjelson et al. 1981, 1982). As they mature, winter-run Chinook fry and fingerlings prefer to rear farther downstream, where ambient salinity is up to 1.5 to 2.5 parts per thousand (Healey 1980, 1982; Levings et al. 1986). Fry remain in the estuary until they reach a fork length of about 118 millimeters (i.e., at 5 to 10 months of age). Emigration from the Delta may begin as early as November and continue through May (Fisher 1994; Myers et al. 1998).

With the exception of occasional strays, adult winter-run Chinook salmon generally do not occur in the San Joaquin River or in this portion of the Delta, and therefore, do not occur in the action area. The same is true for juvenile winter-run Chinook salmon.

CRITICAL HABITAT

Critical habitat for the winter-run Chinook salmon ESU was designated by NMFS on June 16, 1993 (58 FR 33212), with an effective date of July 16, 1993. Critical habitat is designated to include the Sacramento River from Keswick Dam (River Mile 302) to Chipps Island (River Mile 0) and all waters westward, including San Francisco Bay north of the Bay Bridge to the Golden Gate Bridge. The proposed action is not within designated critical habitat.

ESSENTIAL FISH HABITAT

EFH for Chinook salmon, which includes Sacramento River winter-run Chinook salmon ESU (NMFS 2014a), has been identified in the project and action areas.   See the section on Central Valley fall/late fall-run Chinook salmon, Essential Fish Habitat.

RECOVERY PLAN FOR SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

A recovery plan for the ESUs of Sacramento River winter-run Chinook salmon, the Central Valley spring-run Chinook salmon, and the DPS of Central Valley steelhead was prepared by NMFS in July 2014 (NMFS 2014b). The draft plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives. In essence, improvement in the status of winter-run Chinook salmon ESU depends on re-establishment of an alternate population in a historically used area (e.g., Battle Creek) (Williams et al. 2011). Improvement of spring-run Chinook salmon ESU is dependent on improving habitat conditions in spawning and rearing areas (Williams et al. 2011). Fish passage projects also are of primary importance in improving the status of this ESU (NMFS 2014b).

Recovery goals and restoration actions for Sacramento River winter-run Chinook salmon ESU are described by Williams et al. (2011) for the Sacramento River basin, including re-establishment of a population in a historically used area (e.g., Battle Creek) and fish passage improvement projects. Recovery goals do not, however, apply to the action area, because reintroduction of winter-run Chinook salmon is not planned for the San Joaquin River Basin.

CENTRAL VALLEY SPRING-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

NMFS listed Central Valley spring-run Chinook salmon as threatened on September 16, 1999 (50 FR 50394).

Central Valley spring-run Chinook salmon historically was the most abundant run of Central Valley Chinook salmon (Fisher 1994). It occupied the headwaters of all major river systems in the Central Valley, where no natural barriers existed. Adults returning to spawn ascended the tributaries to the upper Sacramento River, including the Pit, McCloud, and Little Sacramento rivers. They also occupied Cottonwood, Battle, Antelope, Mill, Deer, Stony, Big Chico, and Butte creeks and the Feather, Yuba, American, Mokelumne, Stanislaus, Tuolumne, Merced, San Joaquin, and Kings rivers. Spring-run Chinook salmon migrated farther into headwater streams, where cool, well-oxygenated water was available year-round.

Surveys indicate that populations of remnant, non-sustaining spring-run Chinook salmon may be found in Cottonwood, Battle, Antelope, and Big Chico creeks (DWR 1997); more sizable, consistent runs of naturally produced fish are found only in Mill, Deer, and Butte creeks (Williams et al. 2011). All these creeks are tributaries in the Sacramento River basin. The Feather River Fish Hatchery sustains the spring-run population on the Feather River, but the genetic integrity of that run is questionable (DWR 1997). Although all of these populations are found in the Sacramento River basin, the ESU boundary of Central Valley spring-run Chinook salmon includes populations spawning in the Sacramento River and San Joaquin River basins, as reflected in the current 5-year status review (Williams et al. 2011; NMFS 2011b). The status of Central Valley spring-run Chinook salmon ESU likely has not improved since the 2005 status review (Williams et al. 2011). Improvement of spring-run Chinook salmon ESU is dependent on improving habitat conditions in spawning and rearing areas (Williams et al. 2011). Fish passage projects also are of primary importance in improving the status of this ESU (NMFS 2014a). Current and future efforts to restore production in the San Joaquin River are either being planned or are just beginning, and no results about their current efficacy are available.

Like winter-run Chinook salmon, adult spring-run Chinook salmon (other than occasional strays) generally have not occurred in the San Joaquin River basin, and therefore, do not occur in the action area. The same is true for juvenile spring-run Chinook salmon.

CRITICAL HABITAT

Critical habitat for the Central Valley spring-run Chinook salmon was designated on August 12, 2005; a final designation was published on September 2, 2005, with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include selected waters in the Sacramento River basin from approximately Redding (River Mile 302) to approximately Chipps Island (River Mile 0) at the westward margin of the Delta and includes the Sacramento River. The Phase 3 Repair Project area is located outside the species' designated critical habitat.

ESSENTIAL FISH HABITAT

EFH for Chinook salmon, which includes Central Valley spring-run Chinook salmon ESU (NMFS 2014a), has been identified in the project and action areas. See the section on Central Valley fall/late fall-run Chinook salmon, Essential Fish Habitat.

RECOVERY PLAN FOR CENTRAL VALLEY SPRING-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

A recovery plan for the ESUs of Sacramento River winter-run Chinook salmon, the Central Valley spring-run Chinook salmon, and the DPS of Central Valley steelhead was prepared by NMFS in July 2014 (NMFS 2014b). The draft plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives. Recovery goals and restoration actions are outlined for the Sacramento River basin and do not apply to the action area.

As discussed above in the "San Joaquin River" subsection of the "Environmental Baseline" section, one of the goals of the SJRRP is "to restore and maintain fish populations in 'good condition' in the mainstem San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish" (Reclamation and DWR 2011). The Settlement stipulates reintroduction of spring-run and fall-run Chinook salmon, with a priority given to restoring self-sustaining populations of wild spring-run Chinook salmon.

NORTH AMERICAN GREEN STURGEON DISTINCT POPULATION SEGMENT

On April 7, 2006, NMFS listed the Southern DPS of the North American green sturgeon as threatened under the ESA. In North America, green sturgeon is found from Ensenada, Mexico to southeast Alaska. The Southern DPS includes individual reproductive populations south of the Eel River. The populations north of the Eel River, grouped as the Northern DPS, currently do not warrant listing.

Green sturgeon is found in the lower reaches of large rivers, including the Sacramento–San Joaquin River basin, and in the Eel, Mad, Klamath, and Smith rivers. Green sturgeon adults and juveniles are found throughout the upper Sacramento River, as indicated by observations incidental to winter-run Chinook monitoring at Red Bluff Diversion Dam in Tehama County (Poytress et al. 2013; NMFS 2005). Green sturgeon spawns predominantly in the upper Sacramento River and is found primarily in the mainstem Sacramento River.

The green sturgeon is a primitive, bottom-dwelling fish, characterized by its large size (up to 7 feet long and 350 pounds), with a long, round body and "scutes" or plates along its dorsal and lateral sides. It is known to migrate up to 600 miles between freshwater and salt water environments and commercially is caught in the Columbia River and coastal Washington (PFMC 2003). Like all sturgeon species, it is anadromous, but it also is the most marine-oriented of the sturgeon species (NMFS 2005). It spends most of its life in salt water and returns to spawn in freshwater. Individuals congregate in the bays of these systems in summer, while some may travel upstream to spawn in spring and summer. Adult Southern DPS green sturgeon enter San Francisco Bay in late winter through early spring and spawn from April through early July, depending on water flow and temperature (Heublein et al. 2009).

The Southern DPS of the North American green sturgeon is slow growing and late maturing, reaching sexual maturity at about 15 years, at a length of about 5 feet, and typically spawning every 3 to 4 years (NMFS 2015). Green sturgeon spawning has been documented only in the Klamath, Sacramento, and Rogue rivers during recent times (NMFS 2005), although a spawning event was documented in 2011 in the lower Feather River at the Thermalito Afterbay Outlet (Seesholtz et al. 2014). Green sturgeon spawning in the San Joaquin River is not documented, as reported in the 5-year species status review for the Southern DPS of the North American green sturgeon (NMFS 2015).

Green sturgeon populations in the Southern DPS have relatively small population sizes, potentially have lethal temperature limits, face entrainment by water projects and influences of toxic material and exotic species, and may be susceptible to catastrophic events. Impassable barriers to spawning grounds are an additional threat. Preliminary Southern DPS population size estimates are being provided from Dual Frequency Identification Sonar surveys of aggregating sites in the upper Sacramento River; surveys conducted between 2010 and 2014 indicated an annual range of 164 to 526 spawning adults (personal communication with Ethan Mora, UC Davis, March 30, 2015, reported in NMFS 2015). Based on an estimate of mean spawning periodicity, as many as 1,348 ± 524 adults are estimated in the Southern DPS (personal communication with Ethan Mora, UC Davis, May 6, 2015, reported in NMFS 2015).

Green sturgeon may occur in the San Joaquin River between Stockton and the Highway 140 bridge (IEP 2013), including in the Phase 3 Repair Project area, although no evidence exists of historical use of the San Joaquin River by green sturgeon (BRT 2005; Beamesderfer et al. 2007). No documentation is known for green sturgeon spawning in the San Joaquin River, but spawning may have occurred before construction of large-scale hydropower and irrigation development (Mora et al. 2009). White sturgeon persist in the San Joaquin River at population levels of 10 percent of Sacramento River population levels. Young green sturgeon have been taken occasionally in the Santa Clara Shoal area in the Delta, but these fish likely originated in the Sacramento River (NMFS 2005).

CRITICAL HABITAT

Critical habitat for Southern DPS of North American green sturgeon was designated on October 9, 2009 (74 FR 52300). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins, including the segment of the San Joaquin River in the action area.

RECOVERY PLAN FOR NORTH AMERICAN GREEN STURGEON DISTINCT POPULATION SEGMENT

A recovery plan has not been developed for green sturgeon, but the Federal Recovery Outline for the Southern DPS of the North American green sturgeon is available (NMFS 2010).

DIRECT AND INDIRECT EFFECTS ON SPECIES IN THE ACTION AREA

Under the ESA, direct effects are those that are caused by the project and occur at the same time as the action (e.g., construction-related effects). Indirect effects are those that are caused by the proposed action and are later in time but are reasonably certain to occur and there is a causal relationship with the action (e.g., operational effects). In other words, there is a logical, unbroken, traceable, explainable, predictable, chain of effects that result in, or "cause" a given effect on listed species. Avoidance and minimization measures for both direct and indirect effects are presented in the "Avoidance and Minimization Measures" section above.

VALLEY ELDERBERRY LONGHORN BEETLE

No known documented occurrences exist of VELB in the Phase 3 Repair Project area, but the species could use elderberry shrubs in the action area. Elderberry shrubs that could support beetles are sparsely scattered throughout the action area, along both the waterside and landside of the San Joaquin River levee.

Eighteen elderberry shrubs are present in or adjacent to the footprint of the Phase 3 Repair Project. The nine elderberry shrubs located along the waterside of the Phase 3 Repair Project levees would be avoided and protected during construction (see "Avoidance and Minimization Measures—Valley Elderberry Longhorn Beetle"). The nine elderberry shrubs located along the landside of the levee would require removal to accommodate construction of the Phase 3 Repair Project's seepage berms, cutoff walls, and setback levee (**Table 5**; **Exhibit 14**). However, one of these landside shrubs does not have stems greater than 1 inch in diameter at ground level; therefore, it is not considered suitable VELB habitat.

Table 5
Survey Results for Landside Elderberry Shrubs to be Removed from the Phase 3 Repair Project Area

Shrub Number	Number of Stems per Diameter Category (inches)			Beetle Exit Holes Present?	Riparian?
	≥ 1 and ≤ 3	≥ 3 and ≤ 5	≥ 5		
9	0	0	0	No	No
10	73	6	0	No	No
11	25	17	8	No	No
13	12	4	4	No	No
14	5	4	2	No	No
15	32	11	2	No	No
16	13	4	1	No	No
17	25	4	5	No	No
18	6	5	0	No	No
Total	**191**	**55**	**22**		

Notes:
Riparian = waterside of levee; Nonriparian = landside of levee
Source: Data compiled by AECOM in 2014

The eight elderberry shrubs on the landside have a total of 268 stems that are greater than 1 inch in diameter at ground level. These shrubs would require removal during construction of the Phase 3 Repair Project, resulting in direct effects on VELB. If the stems are occupied by beetles, any early-stage individuals are likely to be killed when the shrub is removed. Complete loss of the shrubs to be removed should be avoided by transplanting during the shrubs' dormant season; however, transplanted elderberry shrubs can experience stress or health problems because of changes in soil, hydrology, microclimate, or associated vegetation, and mortality of transplanted shrubs would preclude their future use by the beetle. Removing shrubs in which larvae are present could result in larvae mortality if the health of the shrubs is adversely affected; alternately, adverse effects on elderberry shrubs could have an overall effect on the beetle, even if larvae are absent at the time of impact, if the shrubs are relied on for reproduction. In addition, it takes 5 or more years for replacement elderberry plantings to reach a size conducive to use as VELB habitat. Therefore, a temporary loss of habitat available to the beetle would occur. The Phase 3 Repair Project would comply with avoidance and minimization measures described for VELB and would compensate for removal of these stems, in accordance with the VELB Guidelines (USFWS 1999). A net reduction in the number of elderberry shrubs would be avoided by requiring establishment of 367 elderberry seedlings and 367 associated native plantings.

Elderberry shrubs that cannot be avoided would be transplanted to the levee setback area in element IVc (**Exhibit 12**). The restoration design, as outlined in the Conceptual MMP (**Appendix E**), would include 367 elderberry seedlings and 367 associated species plantings to compensate for the effects to VELB habitat in the Phase 3 Repair Project area.

After construction of the Phase 3 Repair Project, RD 17 would continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which would include trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up to 5 feet above the ground (or 12 feet above the crown road). Trees only would be trimmed, not removed, under these practices. Therefore, no change would occur in the number of elderberry shrubs along the RD 17 levees.

RIPARIAN BRUSH RABBIT

As shown in **Table 6**, the Phase 3 Repair Project levee improvements would result in the removal of 3.28 acres of landside riparian habitat—specifically Great Valley cottonwood riparian forest and Great Valley oak riparian forest—that is suitable for riparian brush rabbit. This riparian habitat is located on the landside of the levee, where levee improvements (e.g., chimney drains, seepage berms) would be constructed. In general, most of the landside riparian vegetation is sparse and lacks understory vegetation other than grasses and ruderal vegetation, which would act as cover for riparian brush rabbit and would not be suitable for this species (Hansen, pers. comm., 2011). However, potential exists for some of these landside woody habitats to support suitable habitat for riparian brush rabbit, particularly because they are located adjacent to waterside riparian habitats that either are known to be occupied by this species or are highly suitable habitat. All landside riparian habitat is considered to be suitable where it is adjacent to waterside riparian habitat that is known to be occupied or highly suitable for riparian brush rabbit (i.e., elements IIab through element VIe). North of elements IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the UPRR tracks (i.e., elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species. No waterside woody or riparian habitat would be removed because of levee improvement activities.

Nearly 54 acres of ruderal annual grassland also would be affected by Phase 3 Repair Project implementation. All effects on ruderal annual grassland that would result from levee improvements are assumed to be temporary because annual grassland would be reestablished in these areas after project completion. Although riparian brush rabbit may use annual grassland as a source for foraging habitat, the key component of habitat suitability for this species in the Phase 3 Repair Project area is based on the presence of riparian woody vegetation and not the surrounding grasslands. Riparian brush rabbit forages along the edges of shrub cover and in small clearings in the vegetation cover, rather than in large openings, feeding on herbaceous vegetation, such as grasses, sedges, clover, forbs, buds, bark, and leaves of woody plants (Sandoval et al. 2006; USFWS 1998). Furthermore, because this species is known to have a small home range and seldom ventures more than 1 meter (3.3 feet) from cover

(Sandoval et al. 2006), the riparian brush rabbit likely uses only a small component of the grassland, and its use of such habitat is concentrated along the edges of the riparian areas.

Table 6
Effects of Implementing the Phase 3 Repair Project on Suitable Riparian Brush Rabbit Habitats

	Acres of Directly Affected Suitable Habitat
Waterside woodlands[1]	0.00
Landside woodlands[1,2]	3.28
Total	**3.28**

Notes:
[1] Suitable riparian brush rabbit habitats are characterized as Great Valley cottonwood riparian forest and Great Valley oak riparian forest.
[2] Most of the landside riparian vegetation is sparse and lacks understory and is not suitable for this species (Hansen, pers. comm., 2011). However, any landside riparian habitat is considered to be suitable where it is adjacent to waterside riparian habitat that is known to be occupied by or highly suitable for riparian brush rabbit (i.e., elements IIab through elements Vie). North of elements IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the Union Pacific Railroad tracks (i.e., elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species.
Source: Data compiled by AECOM in 2014

RD 17's ongoing practice for vegetation encroachment management is limited to trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up 5 feet above the ground or 12 feet above the crown road. Thus, trees and shrubs are only trimmed, not removed, because of this maintenance practice. Thus, RD 17's long-term management of vegetation encroachments on the landside and waterside of the levee is not expected to result in reduction or change to existing riparian habitat. The amount of waterside woodlands outside the project footprint but located along the waterside of the levee to 15 feet out from the waterside levee toe of the project levee reaches is approximately 6.87 acres; none of this vegetation would be removed because of Phase 3 Repair Project construction or future vegetation management practices. The amount of landside woodlands outside the project footprint but located along the landside of the levee to 15 feet out from the landside levee toe is approximately 5.92 acres; some of this would be removed because of Phase 3 Repair Project construction (3.28 acres; see **Table 6**), but none would be removed because of future vegetation management activities.

The loss of potential riparian brush rabbit habitat in the Phase 3 Repair Project area could restrict the range of this species because the RD 17 area currently contains the northernmost known extent of the population on the San Joaquin River. It also could isolate other populations residing in residual habitats in the project vicinity. However, the proposed conservation measures (see the "Avoidance and Minimization Measures" and "Compensation Measures" sections above) would minimize direct loss of riparian habitat in conjunction with compensation for adverse effects. Implementing such measures is anticipated to avoid a net reduction in the number of riparian brush rabbit and its associated habitat. The Phase 3 Repair Project would include restoration of at least 9.9 acres of riparian scrub habitat and upland refugia in the setback area at element IVc (**Exhibit 12**). The expansion and restoration of riparian habitat in element IVc would augment the waterside riparian corridor along the San Joaquin River and would provide additional riparian habitat opportunities for the riparian brush rabbit between two known occurrences of this species (i.e., between elements IIIa/IIIb and elements VIa.1/VIa.4 [CDFW 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004]). The restored riparian scrub habitat (up to 7.5 acres) would consist of willows, cottonwoods, valley oaks, wild rose, California blackberry, and grasses, comparable to the composition of habitats where riparian brush rabbit is documented to occur along the RD 17 levees. Apart from a 400-foot section along the north side, the existing levee would remain in place, and up to 4 acres of Great Valley oak woodland would be established on it, thus providing upland refugia for the riparian brush rabbit during high-water events. The restoration of approximately 9.9 acres (and up to 11.5 acres) of suitable habitat for riparian brush rabbit would achieve a 3:1 restoration to impact mitigation ratio (for effect on potential riparian brush rabbit habitat).

FEDERALLY LISTED FISH SPECIES

Fish species/ESUs addressed in this BA would likely use similar habitat in the action area. Therefore, the direct and indirect effects on delta smelt, longfin smelt, Central Valley fall/late fall–run Chinook salmon, Central Valley steelhead, and green sturgeon are discussed together. Effects on Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon, which are unlikely to occur in the action area but may occasionally occur as strays, would be similar.

TEMPORARY CONSTRUCTION-RELATED EFFECTS

The Phase 3 Repair Project would include constructing several cutoff walls, which would entail degrading the top one-third to one-half of the levee, beginning with a 1:1 cut at the waterside crown. Implementing cutoff walls as part of the Phase 3 Repair Project would disturb soils along the top of the levee, which could enter the San Joaquin River through wind and water erosion. Soil disturbed during construction of seepage berms and other features on the landside of the levee could enter drainage ditches and ultimately could be pumped into the San Joaquin River. Therefore, erosion could temporarily increase turbidity and sedimentation in nearby waterways if soils are transported in river flows or stormwater runoff. Waters (1995) evaluated the effects of turbidity and siltation in waterways at various exposure levels. Prolonged exposure to high levels of suspended sediment could create a loss of visual capability in fish, leading to a reduction in feeding and growth rates, and to a thickening of the gill epithelia, which may cause the loss of respiratory function; clogging and abrasion of gill filaments; and increases in stress levels, reducing the tolerance of fish to disease and toxicants (Waters 1995). Also, high levels of suspended sediments could cause the movement and redistribution of fish populations or other aquatic organisms, and could affect physical habitat (Waters 1995). Sediment loading could interfere with photosynthesis of aquatic flora and displace aquatic fauna. Many fish and other aquatic species are sight feeders, and turbid waters would reduce the ability of these fish to locate and feed on prey. Some fish, particularly juveniles, could become disoriented and leave areas where their main food sources are located, ultimately reducing their growth rates. Increased turbidity and sedimentation cause fish to avoid an area, thus reducing available habitat. Fish will not occupy areas unsuitable for survival unless they have no other option. Therefore, construction-related erosion could result in elevated river turbidity in critical species-specific and life stage-specific habitats, potentially precluding a species from occupying that habitat. In addition, the potential would exist for contaminants (such as bentonite slurry, fuels, oils, and other products used in construction) to be introduced into the waterway directly or through surface runoff. Contaminants may be toxic to fish, or may alter oxygen diffusion rates and cause acute and chronic toxicity to aquatic organisms, thereby reducing growth and survival.

Through implementation of the water quality BMPs, including a SWPPP, and BMPs for slurry management and a slurry spill contingency plan, the proposed conservation measures (see the "Avoidance and Minimization Measures" section in this BA) would avoid direct and indirect take of fish during construction. The Phase 3 Repair Project would not be expected to have an effect on the overall continued existence and survival of these species.

PERMANENT CONSTRUCTION-RELATED EFFECTS

Most waterside woodlands in the Phase 3 Repair Project area are assumed to provide SRA habitat functions. Apart from the placement of 0.64 acre of riprap above the HTL along the waterside levee along 740 linear feet at element IVc, the Phase 3 Repair Project would not include performing any work on the waterside of the levee, and no waterside woodlands or SRA habitat would be removed. Therefore, construction-related effects on the habitats of federally listed fish species would be limited to minor disturbance of the waterside levee at three locations that are above the HTL and characterized by ruderal vegetation.

RD 17 would continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which would include trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up to 5 feet above the ground (or 12 feet above the crown road). Because vegetation management would be limited to trimming trees, no trees would be removed; thus, no change would occur in the amount of waterside habitat that would be directly affected and removed because of future vegetation management activities.

The amount of waterside woodlands outside the project footprint but located along the waterside of the levee to 15 feet out from the waterside levee toe of the project levee reaches is approximately 6.87 acres; none of this vegetation would be removed because of construction or future vegetation management practices. The amount of landside woodlands outside the project footprint but located along the landside of the levee to 15 feet out from the landside levee toe is approximately 5.92 acres; some of this would be removed because of Phase 3 Repair Project construction (3.28 acres; see **Table 6**) but none would be removed because of future vegetation management activities.

Because all Phase 3 Repair Project construction activities would occur above the HTL and no SRA habitat would be removed during Phase 3 Repair Project construction or future vegetation management activities, the Phase 3 Repair Project would not result in adverse effects on Central Valley steelhead, Delta smelt, longfin smelt, Sacramento River winter-run and Central Valley fall- and spring-run Chinook salmon, or green sturgeon.

BENEFITS OF PROJECT ACTIONS TO REARING SALMONIDS

Construction of a 1,240-foot-long setback levee with cutoff wall and seepage berm on a major oxbow of the San Joaquin River (see **Table 2**) would directly benefit fish resources. A Conceptual MMP has been prepared to describe the planned expansion and restoration of riparian habitat that would occur in element IVc (**Appendix E**).

Approximately 0.64 acres (740 linear feet) of riprap would be installed on the waterside of the existing levee (above the HTL), where it would intersect the setback levee. After the setback levee is completed, 400 linear feet of the existing levee above the HTL on the downstream side of the oxbow would be degraded, reconnecting approximately 5 acres of floodplain to the river. That floodplain area would be graded to allow complete drainage of the floodplain to the river through the downstream opening in the remnant levee, as river flows recede. This would minimize the possibility of fish stranding. The other major benefit to fish resources would be the creation of approximately 5 acres of floodplain rearing habitat for juvenile salmonids, in particular, but also to other native fishes. The seasonal nature of inundation, along with complete drainage, would preclude establishment in the floodplain of predatory, non-native fishes.

The specific elevation of the levee breach invert elevation is under consideration. The primary purpose of the setback levee would be to provide habitat for the riparian brush rabbit. The invert elevation and the floodplain elevation would be based on site constraints, habitat requirements, and balancing the needs of riparian brush rabbit to provide protection to any individuals during high-water events while providing a level of disturbance that would support riparian scrub habitat in a sustainable way. The levee breach invert is expected to be set at an elevation to inundate approximately every 3 to 4 years, and the lower floodplain would inundate approximately every 6 years. A detailed hydraulic analysis of the surface water hydrology anticipated within the levee setback area, based on three possible levee breach invert elevations, is provided in the Conceptual MMP (**Appendix E,** see "Mitigation Site Baseline, Hydrology," and **Appendix B**). The floodplain habitat would not be permanently inundated and would not be connected to the San Joaquin River during the dry season.

Jeffries et al. (2008) reared juvenile Chinook salmon in enclosures for two consecutive flood seasons within various habitats of the Cosumnes River and its floodplain, to compare fish growth in river channel and floodplain habitats. Significant differences in growth rates were found; salmon reared in seasonally inundated habitats with annual terrestrial vegetation experienced higher growth rates than those reared in a perennial pond on the floodplain. Furthermore, riverine fish growth upstream from the floodplain varied with flow in the river; with little growth and high mortality during high-water events. When stream flows were low and clear, fish growth was rapid. Growth rates were poor in tidally influenced riverine habitat below the floodplain, where juveniles commonly were displaced during high-water events because of a lack of in-channel complexity. Overall, ephemeral floodplain habitats supported higher growth rates for juvenile Chinook salmon than more permanent habitats in either the floodplain or river. Variable responses in both growth and mortality, however, indicate the importance of providing habitat complexity for juvenile salmon in floodplain reaches of streams, so fish can find optimal places for rearing under different flow conditions. Habitat complexity allows juvenile salmon to find cover, thereby reducing the risk of predation from avian and piscine predators. Floodplain and other off-channel habitat restoration are important for improving production of juvenile salmonids in California's Central Valley. Juvenile salmonid emigration generally is passive during high-water events (Healey 1980; Kjelson et al. 1981); they essentially are entrained in the water column until they encounter slower water velocities, where active swimming becomes possible. The San Joaquin River, like most rivers in the Central Valley, is incised and lacks channel complexity. With the exception of the Yolo Bypass for the Sacramento River (Sommer et al. 2001), juvenile salmonids frequently are displaced downstream to the intertidal Delta, where growth is diminished during high-water events in systems that lack access to floodplains. However, protected floodplain habitat provides protection for juvenile salmonids being swept downstream during high-water events.

High San Joaquin River outflows generally occur during winter and early spring months. Juvenile fall/late fall-run Chinook salmon and steelhead outmigration occurs at least partially during this period, while spring-run Chinook salmon and green sturgeon outmigration occurs later.

- Central Valley fall/late fall-run Chinook salmon juvenile outmigration may begin as early as November and extends through June.
- Central Valley spring-run Chinook salmon juvenile outmigration generally occurs from April through June.
- Central Valley steelhead juvenile outmigration generally occurs from December through March in the San Joaquin River, and continues through June in the Delta.
- North American green sturgeon outmigration of older juveniles generally occurs from June through September.

The presence of the protected floodplain likely would benefit juvenile fall/late fall-run Chinook salmon and steelhead during high-water events. The configuration of the floodplain being protected during high-water events would facilitate protection of juvenile salmonids as they are directed into the floodplain through backflow currents and are not displaced any further downstream.

Sommer et al. (2001) provided evidence that the Yolo Bypass, the primary floodplain of the lower Sacramento River, provides better rearing and migration habitat for juvenile Chinook salmon than adjacent river channels. During 1998 and 1999, salmon increased in size substantially faster in the seasonally inundated agricultural floodplain than in the river, suggesting better growth rates. Similarly, coded-wire-tagged juveniles released in the floodplain were substantially larger at recapture and had higher apparent growth rates than those concurrently released in the river. Improved growth rates in the floodplain were in part because of substantially higher prey consumption, reflecting greater availability of drift invertebrates. Bioenergetic modeling suggested that feeding success was greater in the floodplain than in the river, despite increased metabolic costs of rearing in the substantially warmer floodplain. Growth, survival, feeding success, and prey availability were higher in 1998 than in 1999, a year in which flow was more moderate, indicating that hydrology affects the quality of floodplain rearing habitat. These findings support the predictions of the flood pulse concept and provide new insight into the importance of the floodplain for salmon.

Work by Jeffries et al. (2008) and Sommer et al. (2001) indicate that off-channel floodplain habitats provide substantially improved rearing habitat, supporting higher growth rates than the intertidal river channel. However, their work shows that providing habitat complexity for juvenile salmon in floodplains is of utmost importance, so fish can find optimal places for rearing under varying flow conditions. It is well documented that survivorship to adulthood is increased when young salmonids leave freshwater at a larger size (Unwin 1997; Galat and Zweimuller 2001). Studies by Jeffries et al. (2008), Sommer et al. (2001), and others show that floodplain habitat restoration in Central California has major benefits to Chinook salmon populations, especially relative to growth and production. These studies indicate bioenergetic improvement to salmonids rearing in a flooded terrestrial floodplain because of the abundance of zooplankton (primary production), rather than having to rely on less dense prey items in the riverine channels, such as larval fish and benthic macroinvertebrates, and expending more energy for their capture. Therefore, construction of element IVc would be likely to result in bioenergetic improvement for all listed species.

CUMULATIVE EFFECTS

Cumulative effects include the effects of present, pending, and future State, tribal, local, or private actions that are reasonably certain to occur in the action area under consideration. The effects of projects that require a federal action are not considered in the cumulative effects evaluation during Section 7 consultation evaluation because they are subject to separate consultation (USFWS and NMFS 1998). For example, the Central Lathrop Specific Plan (Phase 1) addresses the development of 1,521 acres of land immediately east of the RD 17 levee elements IIIa and IIIb, south of Dos Reis and north of the housing development adjacent to element IVa. The USFWS issued a Biological Opinion for this project (USFWS File No. 1-1-06-F-0114), which analyzed the effects of the project on riparian brush rabbit and VELB. Therefore, this development is not considered cumulative to the proposed project. Also, the nonfederal action must be located in the action area, or project site, that is evaluated in the Section 7 consultation process (USFWS and NMFS 1998). Several present, pending, and future projects that are located in or near the action area under consideration in this consultation could result in effects similar to those of the proposed action.

SUMMARY OF PRESENT, PENDING, AND FUTURE PROJECTS IN THE PHASE 3 REPAIR PROJECT AREA

FLOOD DAMAGE REDUCTION SYSTEM IMPROVEMENTS

Two other proposed projects related to improvements to flood damage reduction systems are located near RD 17: the Lower San Joaquin River Feasibility Study, which would determine needed improvements for future flood protection systems in an effort to reach or exceed the future 200-year level of flood protection; and the Smith Canal Closure Structure, which would install a flood control gate in the Delta in Stockton, north of the Deep Water Ship Channel, to prevent flood flows from entering the Smith Canal in the event of an imminent or existing levee breach and during 100-year flood events.

These projects may affect federally listed species and require a federal action, and therefore would be subject to Section 7 consultation. Where adverse effects would occur on the landside of the levees, the project proponents may need incidental take authorization, pursuant to incidental take permits used under the SJMSCP. Planning efforts in San Joaquin County have addressed the cumulative effects of development in the county, through preparation and adoption of the SJMSCP. The effects of these projects are not considered cumulative to the Phase 3 Repair Project because they would undergo federal review and permitting as necessary—either through a Section 7 consultation or through SJMSCP compliance. This would ensure that adverse effects would be fully mitigated.

DEVELOPMENT PROJECTS

Development projects within the RD 17 boundaries include projects in the cities of Manteca, Stockton, and Lathrop, and in unincorporated areas of San Joaquin County. These projects have been described and analyzed in their respective environmental documents, including the following:

- River Islands Project;
- San Joaquin County General Plan 2010, adopted in 1992 and as amended;
- City of Stockton General Plan, adopted in 1990 and as amended through November 3, 1998;
- City of Lathrop General Plan, adopted in 1991 and as amended through January 2003;
- Central Lathrop Specific Plan, adopted in November 2004;

- West Lathrop Specific Plan, adopted in 1995;
- Manteca General Plan, adopted in 1988 and as amended through December 20, 1993;
- City of Lathrop Water, Wastewater, and Recycled Water Master Plan, adopted in 2001 and as amended through November 9, 2004;
- City of Manteca Wastewater Treatment Plant expansion; and
- 2001 Regional Transportation Plan, San Joaquin Council of Governments, 2001.

San Joaquin County covers approximately 909,000 acres, with approximately 809,000 acres (or nearly 90 percent of the county) used or available for agriculture (i.e., row and field crops, orchards, vineyards, and grazing lands). The remaining lands are dominated by various types of development (approximately 59,000 acres), natural habitats (e.g., woodlands, riparian), and open water (e.g., lakes, rivers, Delta waterways). Most county residents and development are located in incorporated cities (i.e., Escalon, Lathrop, Lodi, Manteca, Ripon, Stockton, and Tracy). The SJMSCP anticipated that 147,000 acres of various categories of open space lands (including agriculture, range lands, and natural) in the county would be converted to non–open space uses between 2001 and 2051, based on full buildout of each of the general plans in the county and construction of all anticipated utility, transportation, and other public projects. In addition, approximately 59,000 acres of infill of urban lands were presumed to occur in this 50-year time frame.

Many development projects near the Phase 3 Repair Project area, including those described above, have been implemented recently or are in various stages of planning and entitlement, including the River Islands project. These current, pending, and potential future projects may affect federally listed species and require a federal action, and therefore would be subject to Section 7 consultation. Or, for those occurring within the SJMSCP permit area within San Joaquin County, the project applicants are expected to seek incidental take authorization, pursuant to incidental take permits used under the SJMSCP. Planning efforts in San Joaquin County have addressed the cumulative effects of development in the county, through preparation and adoption of the SJMSCP. The effects of these projects are not considered cumulative to the Phase 3 Repair Project because they would undergo federal review and permitting as necessary—either through Section 7 consultation or SJMSCP compliance.

ANALYSIS OF CUMULATIVE EFFECTS

GROWTH INDUCEMENT

Direct growth inducement would result if a project would include construction of new housing. Indirect growth inducement would occur, for instance, if implementing a project were to result in any of the following:

- substantial new permanent employment opportunities (e.g., commercial, industrial, or governmental enterprises);
- substantial short-term employment opportunities (e.g., construction employment) that indirectly would stimulate the need for additional housing and services to support the new temporary employment demand; and/or
- removal of an obstacle to additional growth and development, such as removing a constraint on a required public utility or service (e.g., construction of a major sewer line with excess capacity through an undeveloped area).

Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Local land use decisions are within the jurisdiction of the cities and county in the Phase 3 Repair Project area: the City of Stockton, the City of Lathrop, the City of Manteca, and San Joaquin County. Each of these entities has adopted a General Plan consistent with State law. These General Plans provide an overall framework for growth and development within the jurisdiction of each agency, including the Phase 3 Repair Project area. Within the RD 17 boundaries, as elsewhere, population growth and urban development also are influenced by national, regional, and local economic conditions.

Because the Phase 3 Repair Project would not include construction of housing, it would not directly induce growth. Construction activities would generate short-term employment, but project-related construction jobs are expected to be filled from the existing local employment pool and not to indirectly induce growth or result in a population increase, nor would implementation of the project indirectly induce growth by creating permanent new jobs.

The Phase 3 Repair Project would accommodate growth currently approved or planned for undeveloped lands within the RD 17boundaries. These lands have been identified as the places most suitable for urban growth in the General Plans and additional planning policy documents of the cities of Lathrop, Manteca, and Stockton, and San Joaquin County. The Phase 3 Repair Project would allow development to proceed when economic and market conditions are favorable.

Development within the RD 17 boundaries is directed by the Central Lathrop Specific Plan and the West Lathrop Specific Plan in the City of Lathrop, the City of Stockton General Plan, the City of Manteca General Plan, and the San Joaquin County General Plan. The cities of Lathrop and Manteca are where the majority of planned or proposed development projects would be located. Environmental documents have been prepared to address the General Plans in these areas.

This information provides substantial evidence that the Phase 3 Repair Project would accommodate anticipated growth in a manner that would be consistent with adopted local growth management plans and with the State Plan of Flood Control. Thus, the Phase 3 Repair Project, despite accommodating buildout of adopted Specific Plans and General Plans in the cities of Lathrop, Manteca, and Stockton, would not be growth inducing itself.

Cumulative Effects on Listed Species

Implementing the plans and projects described above would permanently disturb undeveloped land that currently is or has recently been in agricultural use. These projects would have cumulative effects on agricultural resources (by converting agricultural land to nonagricultural uses) and remnant native habitats (such as woodlands and marshes), which would have the potential to cause permanent adverse cumulative effects on the species, including federally listed species, for which these lands provide habitat.

Large areas of native riparian and wetland vegetation in the Phase 3 Repair Project area and Central Valley region have been lost or degraded over the past 150 years. USFWS estimates that more than 90 percent of wetland and riparian habitat has been lost in the Central Valley, compared to historic levels (USFWS 1989). Most losses have occurred because of CVP and SWP facility construction and alteration of flow patterns below dams, particularly channelization, and then clearing or filling behind levees for the conversion to agriculture and urban land uses. Alterations to the San Joaquin River channel have resulted over time in homogenous, trapezoidal channels with little instream structure; narrow and sparse bands of riparian vegetation that provide only limited SRA habitat functions; limited recruitment of large woody debris; and limited habitat conditions for native fish species and other aquatic organisms. This habitat conversion has affected many plant and wildlife species substantially, resulting in various species being listed as threatened or endangered under the ESA as well as under the California Endangered Species Act.

Present and future conversions of open space lands in San Joaquin County and the region consist primarily of converting agricultural lands to residential and urban development. Several flood risk management projects are

being implemented across the Central Valley, including San Joaquin County, to improve the integrity of levees. However, some of these flood risk management projects would implement compensatory mitigation in the form of habitat creation and preserves, designed to actually increase these habitats and their values related to ecosystem functions and special-status species. Upstream from the Phase 3 Repair Project area, the SJRRP would result in future structural and channel improvements to benefit special-status fish and wildlife species (Reclamation and DWR 2011). Nevertheless, even with these benefits, the overall losses of sensitive habitats in the Phase 3 Repair Project region, the numerous threatened and endangered species that are present, the ongoing declines of other species, and the continuing conversions of habitats and open space lands to various developments are evidence that past, present, and reasonably foreseeable future projects would combine to result in significant cumulative effects on biological resources.

Development projects (i.e., residential, commercial, industrial), infrastructure projects, and flood facilities improvement projects include or would include grading and other earthmoving activities that could result in temporary and short-term localized soil erosion that could affect hydrology and would have the potential to release materials (e.g., runoff of soils or contaminants) into the San Joaquin River. Potential increases in sedimentation, turbidity, and contaminants could expose and adversely affect fish and aquatic habitats. However, these site-specific effects are not expected to combine with the effects of other activities, because compliance with the NPDES regulations, including construction site BMPs, would help control erosion at each construction site. The effects from development projects, infrastructure projects, and flood facilities improvement projects would be temporary and short-term, and soil erosion would be localized.

CONCLUSIONS AND DETERMINATION

In conclusion, based on the biology and ecology of the federally listed species that have the potential to occur in the Phase 3 Repair Project area, the environmental baseline for the action area, and the effects of the proposed action and its cumulative effects, implementing the Phase 3 Repair Project may affect and is likely to adversely affect VELB and riparian brush rabbit, and would result in no adverse effect on delta smelt, Central Valley fall/late fall–run Chinook salmon, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and green sturgeon. Designated critical habitat in the action area has been designated for delta smelt, Central Valley steelhead, and green sturgeon; however, none would be adversely modified or destroyed.

- **Valley elderberry longhorn beetle:** The Phase 3 Repair Project may affect and is likely to adversely affect VELB by transplanting eight elderberry shrubs. Although VELB habitat credits comparable to 367 elderberry seedlings and 367 associated native plantings would be purchased from a USFWS-approved VELB habitat conservation bank to compensate for effects on VELB and effects on 268 elderberry stems (greater than 1 inch in diameter at ground level), an adverse effect on the species could occur. Removal of shrubs in which larvae are present could result in larvae mortality if the health of the shrubs is adversely affected, and a temporary loss of habitat available to the beetle during the establishment of seedlings would occur.

- **Riparian brush rabbit:** The Phase 3 Repair Project may affect and is likely to adversely affect riparian brush rabbit by removing 3.28 acres of landside riparian habitat that is suitable for the species, contributing to the further reduction of available habitat for this species.

However, the Phase 3 Repair Project would include restoring approximately 4.52 acres of compensatory riparian habitat (**Exhibit 12**) to offset project-related habitat losses. After the new setback levee in element IVc is constructed and certified, a small section of the existing levee then would be partially degraded. Between 25 feet from the landside toe of the existing levee and 25 feet from the waterside toe of the new setback levee are approximately 4.52 acres that could be restored as riparian habitat (**Exhibit 12**). The restored riparian habitat would consist of willows, cottonwoods, valley oaks, wild rose, California blackberry, and grasses, which is comparable to the composition of habitats where this species is documented to occur along the RD 17 levees. Apart from a small notch along the north side, the existing levee would remain in place, thus providing upland refugia for the species during high-water events. The 4.52-acre area would be contiguous with existing waterside riparian habitat along element IVc; this waterside riparian habitat along element IVc extends northward through elements IVa, IIIa, and IIIb, and southward through elements Va and VIa.1. Documented occurrences exist of riparian brush rabbit in the waterside riparian habitat in elements IIIa and IIIb, north of element IIIa and south of element VIa.1; therefore, reestablishing and protecting riparian habitat in element IVc would provide expanded and connected habitat for this species.

RD 17 also is evaluating options for providing off-site compensatory habitat to offset Phase 3 Repair Project effects on riparian brush rabbit. Additional off-site compensatory habitats would include preserving existing waterside riparian habitats and/or restoring natural riparian habitats. These options would be evaluated in coordination with USFWS during the Section 7 consultation.

- **Federally listed fish species:** The Phase 3 Repair Project would result in no adverse effects on federally proposed and federally listed fish species considered in this BA. Effects are not expected to occur because of the avoidance and minimization measures to be implemented by the Phase 3 Repair Project. The Phase 3 Repair Project would include several measures that would avoid potential direct environmental effects during project construction. The potential effects of increased sedimentation or turbidity, and/or release of contaminants on fish and other aquatic organisms, would be avoided and minimized through the use of BMPs (e.g., source control, detention basins, revegetation, and spill containment plan) that would maintain surface water quality conditions in receiving waters and minimize disturbance to fish and other aquatic habitats. No waterside riparian or SRA habitat would be removed.

ESSENTIAL FISH HABITAT ASSESSMENT

The Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 USC 1801), requires that EFH be identified and described in federal fishery management plans. Federal agencies must consult with NMFS on any activity that they fund, permit, or carry out that may adversely affect EFH. The EFH regulations require that federal agencies obligated to consult on EFH also provide NMFS with a written assessment of the effects of any action on EFH (50 CFR 600.920). NMFS is required to provide EFH conservation and enhancement recommendations to federal agencies. The statute also requires federal agencies receiving NMFS EFH conservation recommendations to provide a detailed written response to NMFS within 30 days of receipt, detailing how they intend to avoid, mitigate, or offset the impact of activity on EFH (Section 305[b][4][B]).

EFH is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purposes of interpreting the definition of EFH, "waters" includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers all habitat types used by a species throughout its life cycle.

The Pacific Fishery Management Council has identified and described EFH, adverse impacts, and recommended conservation measures for salmon in Amendment 14 to the Pacific Coast Salmon Fishery Management Plan (PFMC 2003). Amendment 18 to the Pacific Coast Salmon Fishery Management Plan revises the description and identification of EFH for Pacific salmon, designates habitat areas of particular concern, modifies the current information on fishing activities and potential measures to minimize their effects on EFH, and updates the list of fishing and non-fishing related activities that may adversely affect EFH and potential conservation and enhancement measures to minimize those effects (NMFS 2014c). Freshwater EFH for Pacific salmon in the Central Valley (i.e., Chinook salmon) includes waters currently or historically accessible to salmon within the Central Valley ecosystem, as described in Myers et al. (1998), and includes the segment of the San Joaquin River in the action area. EFH for Chinook salmon in the Lower San Joaquin River includes the San Joaquin River, its eastern tributaries, and the lower reaches of the western tributaries that could provide juvenile rearing habitat or refugia from high flows during floods as salmon migrate along the mainstem in this area. Although evidence of current or historical Chinook salmon distribution is lacking for the western tributaries (Yoshiyama et al. 2001), the lower reaches of these tributaries could provide juvenile rearing habitat or refugia. Central Valley fall/late fall–run Chinook salmon is a species managed under the Pacific Coast Salmon Plan that occurs in the San Joaquin River.

THE PROPOSED ACTION

The proposed action is described in detail in the "Description of the Proposed Action" section of this BA. The action area, environmental baseline, and species accounts, respectively, are described in the "Action Area," "Environmental Baseline," and "Species Accounts" sections of this BA.

ESSENTIAL FISH HABITAT DESIGNATION IN THE ACTION AREA

EFH has been identified for Chinook salmon, which includes Central Valley fall- and late fall-run Chinook salmon. EFH includes migration, holding, and rearing habitat and opportunistic/intermittent spawning, holding, and rearing habitat for the San Joaquin River (NMFS 2014a). EFH for Chinook salmon in the Lower San Joaquin River includes the San Joaquin River, its eastern tributaries, and the lower reaches of the western tributaries that could provide juvenile rearing habitat or refugia during floods as salmon migrate along the mainstem in this area (NMFS 2014c).

EFFECTS OF THE PROPOSED ACTION

Effects of the proposed action are described below and in the "Effects" and "Cumulative Effects" sections of this BA.

Available literature indicates that limited Chinook salmon spawning typically occurs well upstream from the Phase 3 Repair Project area. EFH in the San Joaquin River in the vicinity of the Phase 3 Repair Project area consists of adult and juvenile (smolt) Chinook salmon passage between upstream spawning grounds and the Pacific Ocean, and limited in-channel rearing habitat for juveniles (limited because it is situated in a reach of the San Joaquin River that is bound on both banks by levees, resulting in channel incision, and is disconnected from its currently non-functioning floodplain). The river extends onto its floodplain only during high-water events, and if fish are swept into the floodplain during high flow conditions, they likely would become stranded because of the absence of a secondary channel for returning flood flows to the river. The Phase 3 Repair Project would result in improvement of EFH as functioning floodplain-rearing habitat and improvement to existing EFH in the San Joaquin River channel, by reducing and reversing the effects of current channel incision in the immediate vicinity of element IVc. Furthermore, approximately 2.5 acres of SRA habitat would be created and/or enhanced through revegetation actions between the river and the waterside toe of the existing levee in element IVc (see **Appendix E**).

Levee degradation and floodplain grading activities in element IVc would restore connectivity to the historic floodplain and improve habitat conditions in the floodplain. Although both actions would be constructed in dry conditions (above HTL), a potential short-term indirect effect of construction may be a temporary increase in sediment in the San Joaquin River, especially during the first storm or flooding event after construction. The measures (erosion control and revegetation) described in the "Avoidance and Minimization Measures" section of this BA are designed to reduce or capture any mobilized sediment resulting from the year's first rain or flooding event. Therefore, any construction-related sediment load would be temporary and negligible, especially when compared to the existing sediment load of the San Joaquin River and the project would not result in adverse effects on EFH.

The project would increase the amount and improve the quality of EFH in the project area. The new setback levee with floodplain in element IVc would improve EFH by providing refuge habitat for juvenile salmonids during high-water events, as described in Amendment 18 (NMFS 2014c). The newly reconnected floodplain would provide habitat for juvenile Chinook salmon rearing. It would also alter the channel dynamics in the immediate vicinity such that the channel incision process is expected to be reversed, thereby improving juvenile and adult migratory passage habitat.

PROPOSED CONSERVATION MEASURES

Proposed conservation measures are presented in the "Description of the Proposed Action" and "Effects" sections of this BA. The measures include avoidance and minimization measures.

CONCLUSIONS

The proposed action would not affect the spawning, rearing, or migratory EFH functions of Chinook salmon currently or previously managed under the Magnuson-Stevens Fishery Conservation and Management Act in the San Joaquin River.

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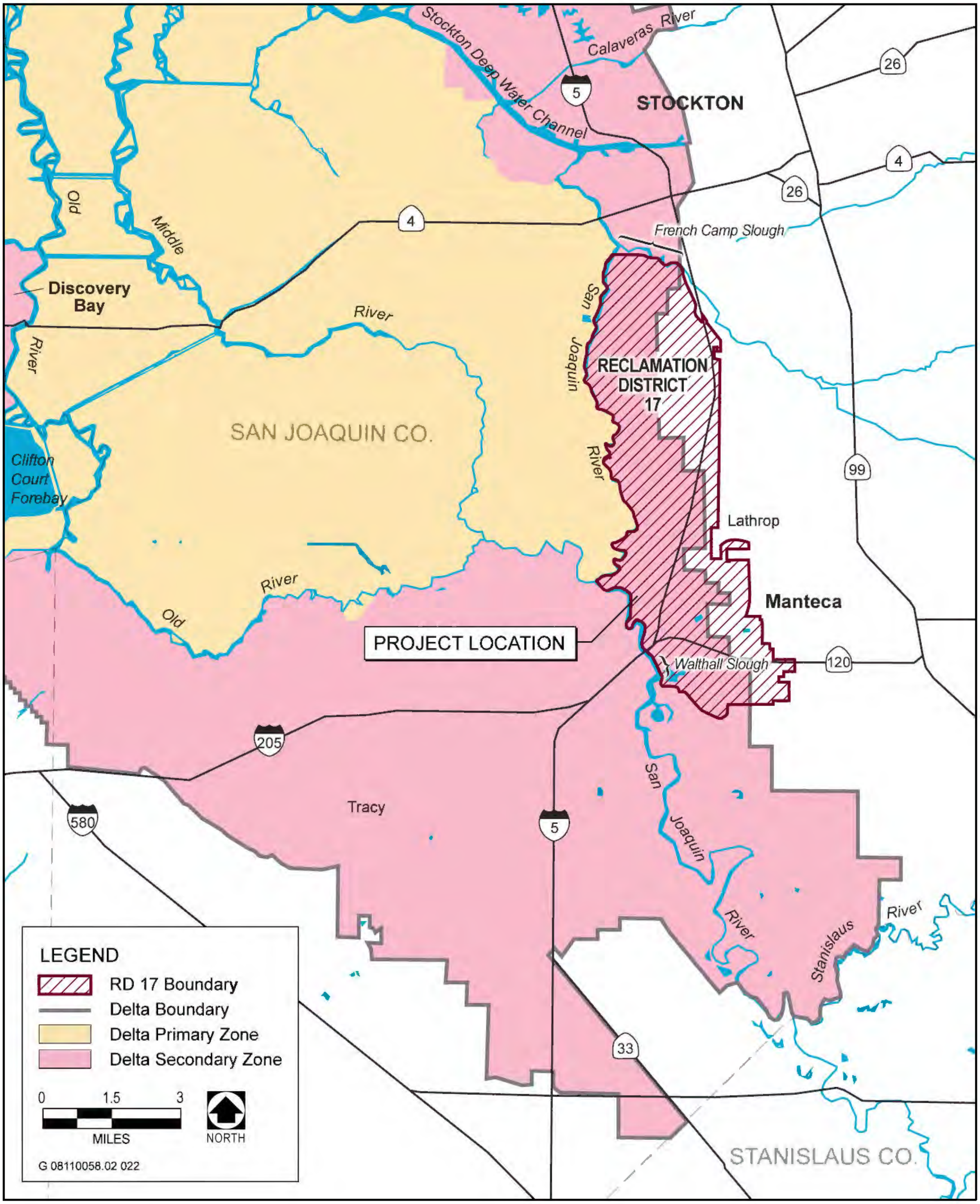
APPENDIX A

Exhibits



Source: DWR 1995, adapted by AECOM in 2010

Exhibit 1 **Project Vicinity and Boundaries of Reclamation District No. 17**

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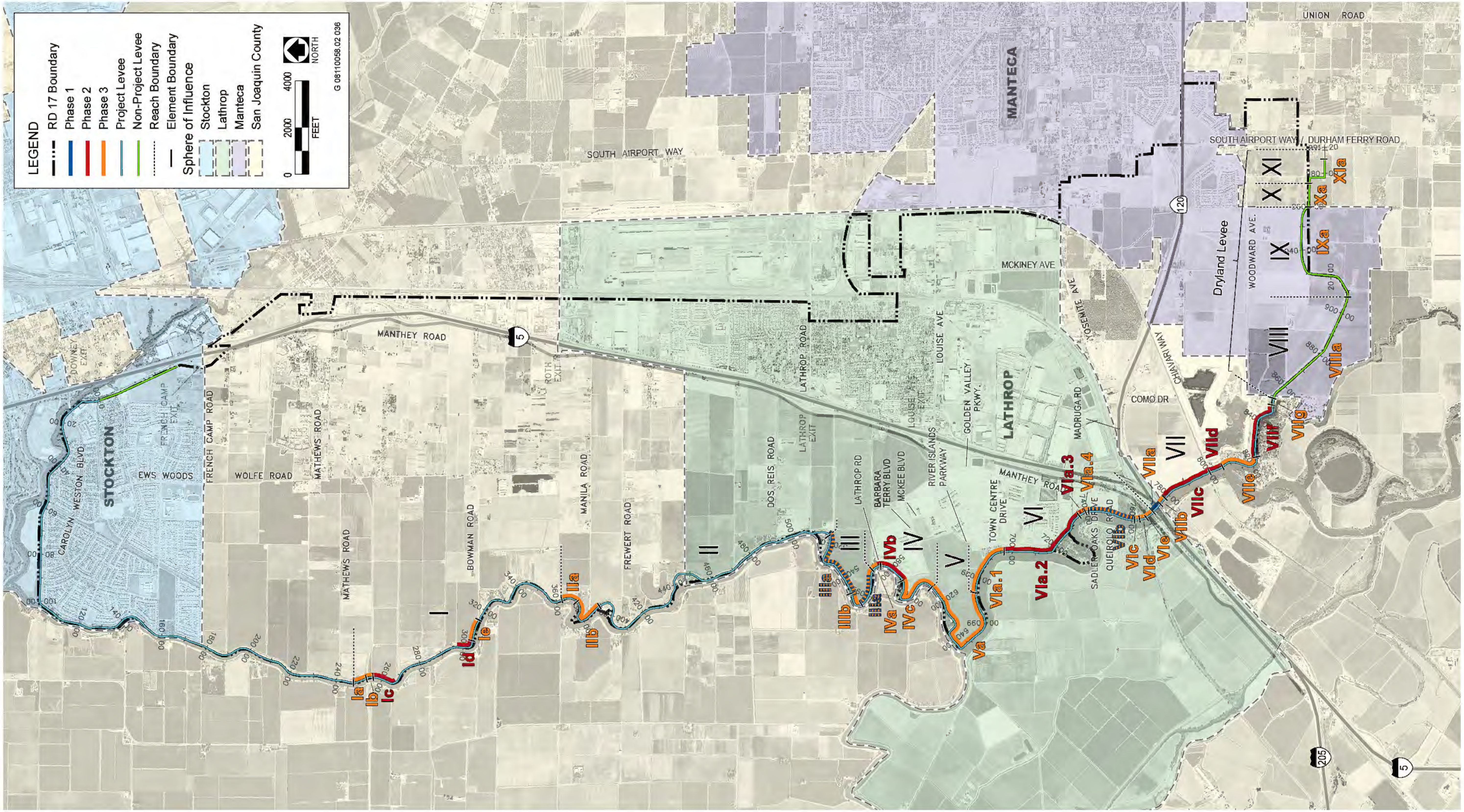

Sources: Data provided by Kjeldsen Sinnock Neudeck, ENGEO, and MacKay & Somps in 2010; adapted by AECOM in 2010 and updated by GEI Consultants, Inc. 2016

Exhibit 2 **RD 17 Levee System and Levee Seepage Repair Project Phases**

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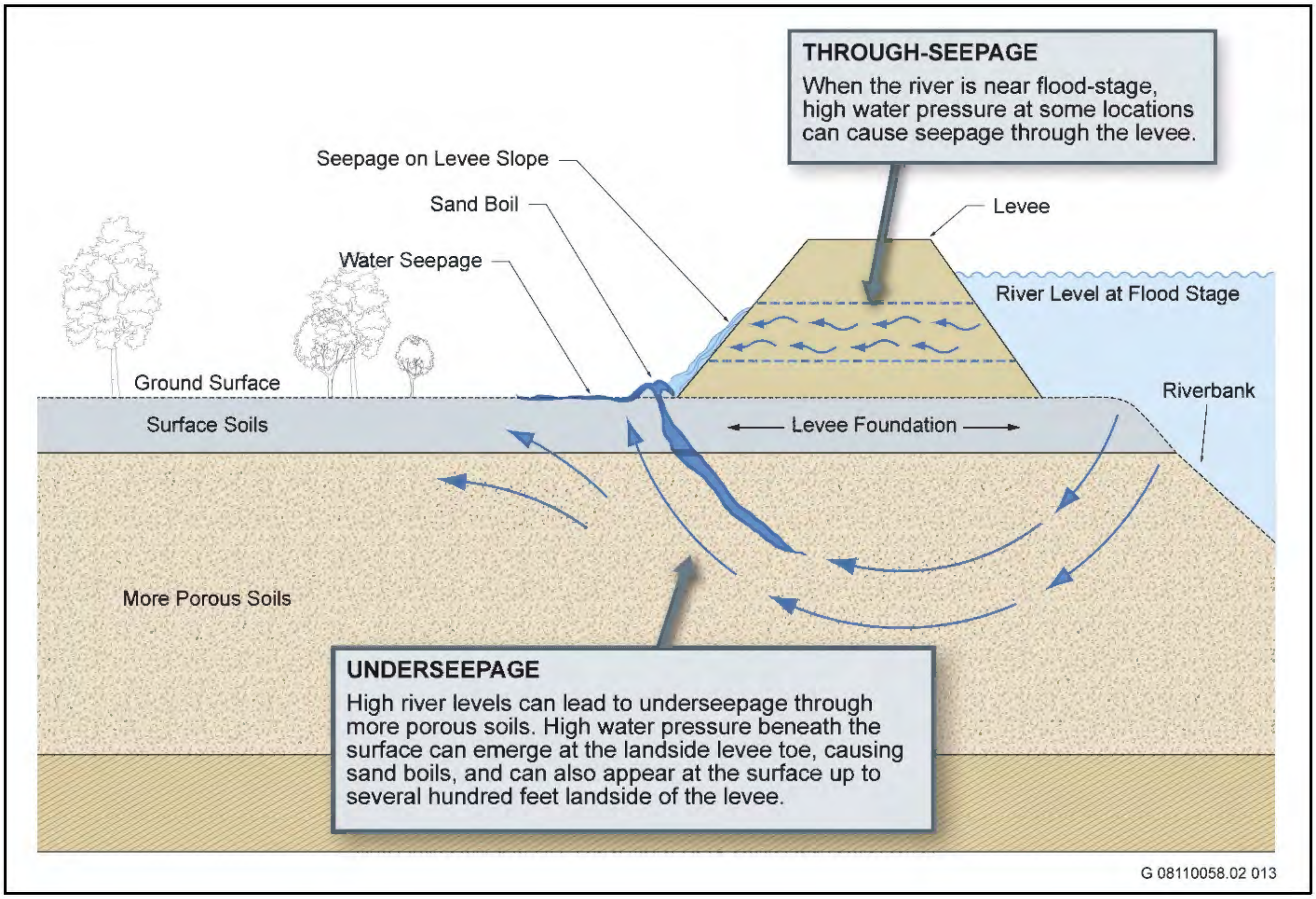

Source: SAFCA 2007; adapted by AECOM in 2010

Exhibit 3 **Levee Seepage Diagram**

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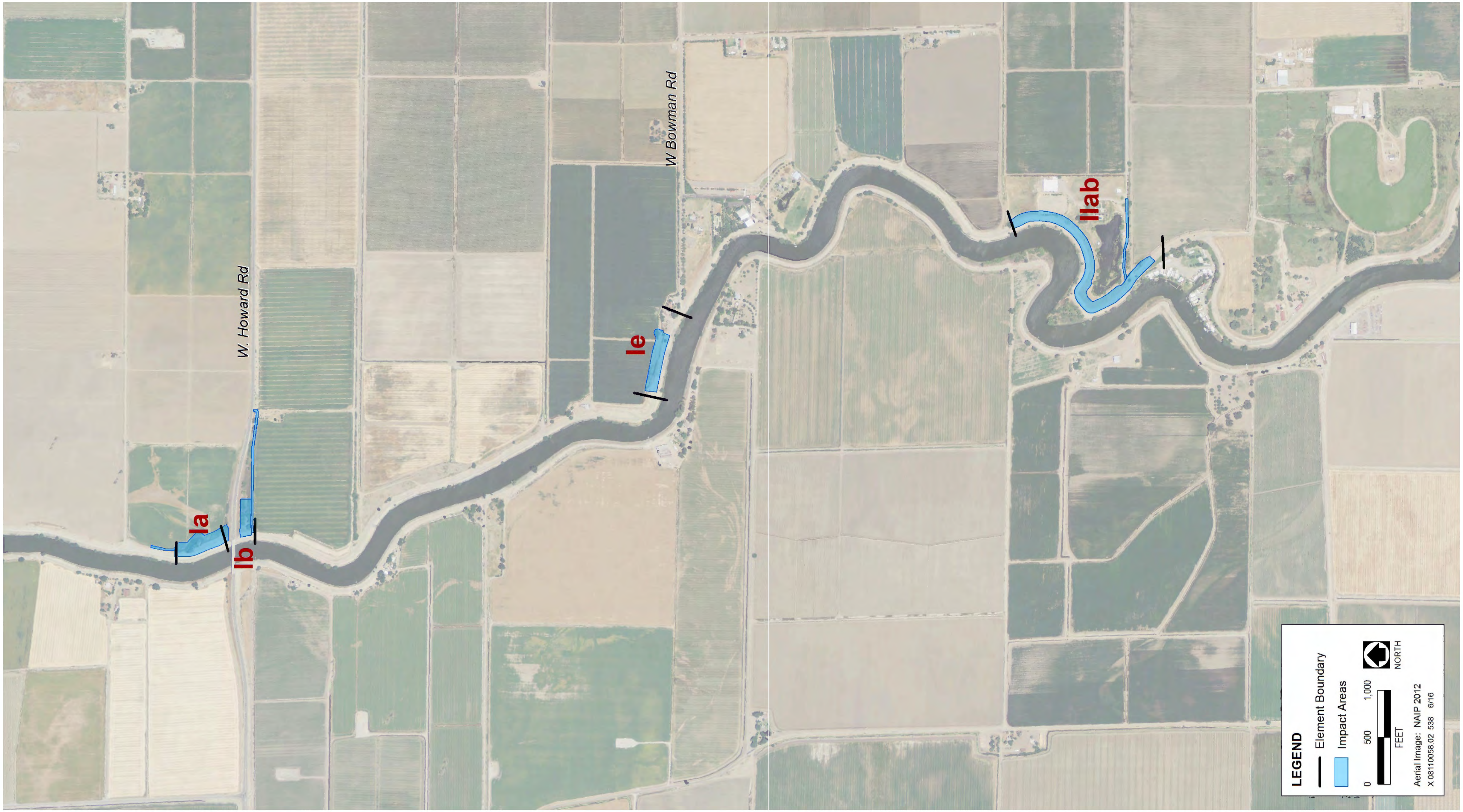

Sources: McKay and Somps 2014, AECOM 2014, and updated by GEI Consultants, Inc. 2016

Exhibit 4a

Overview of Phase 3 Repair Project

Sources: McKay and Somps 2014, adapted by AECOM 2014, and updated by GEI Consultants, Inc. 2016

Exhibit 4b **Overview of Phase 3 Repair Project**

Sources: McKay and Somps 2014, adapted by AECOM 2014, and updated by GEI Consultants, Inc. 2016

Exhibit 4c **Overview of Phase 3 Repair Project**

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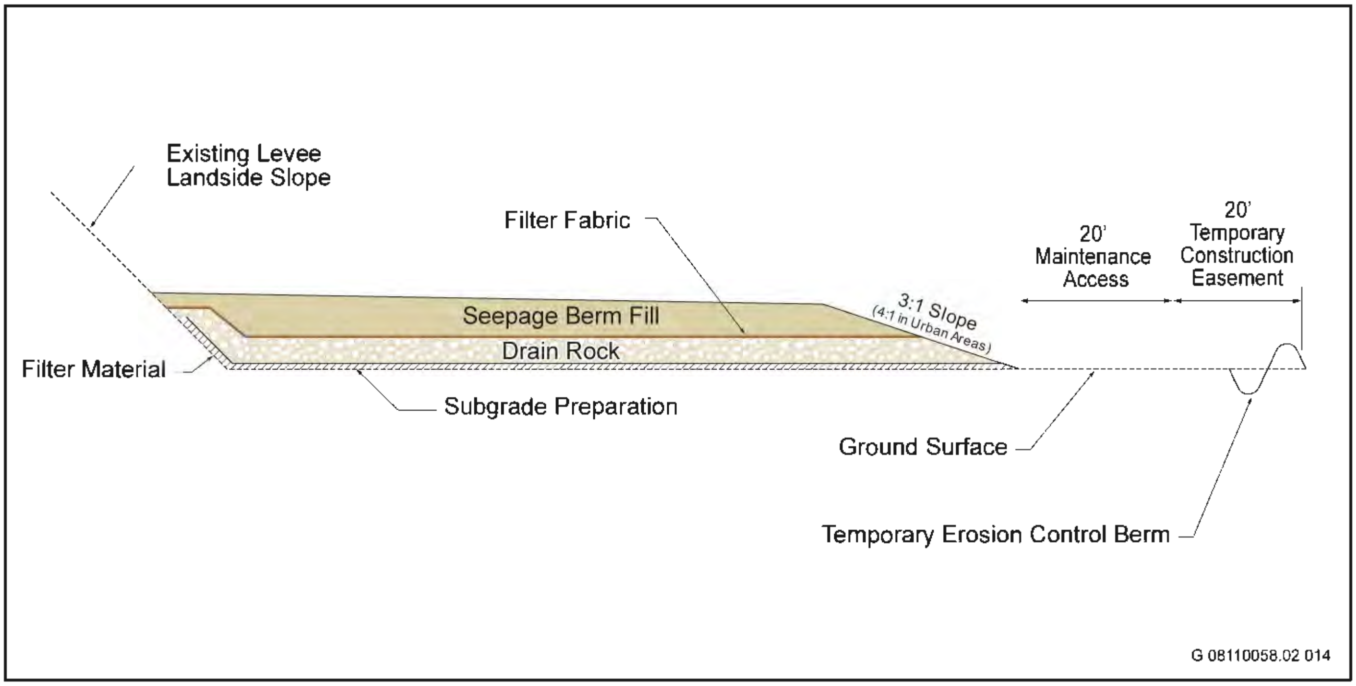
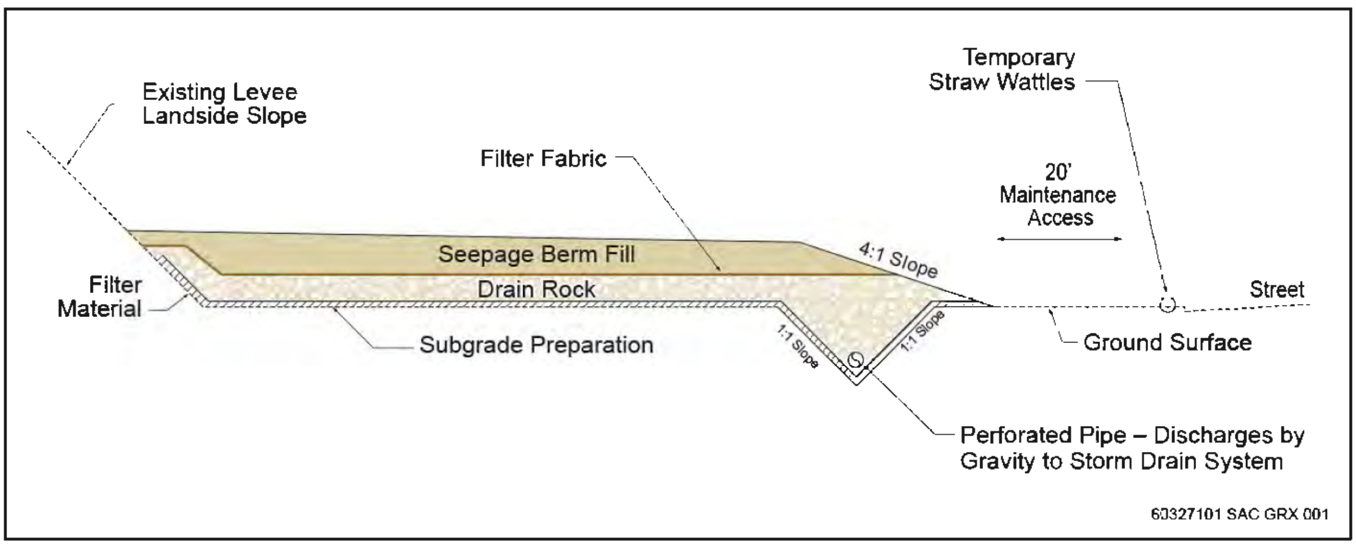


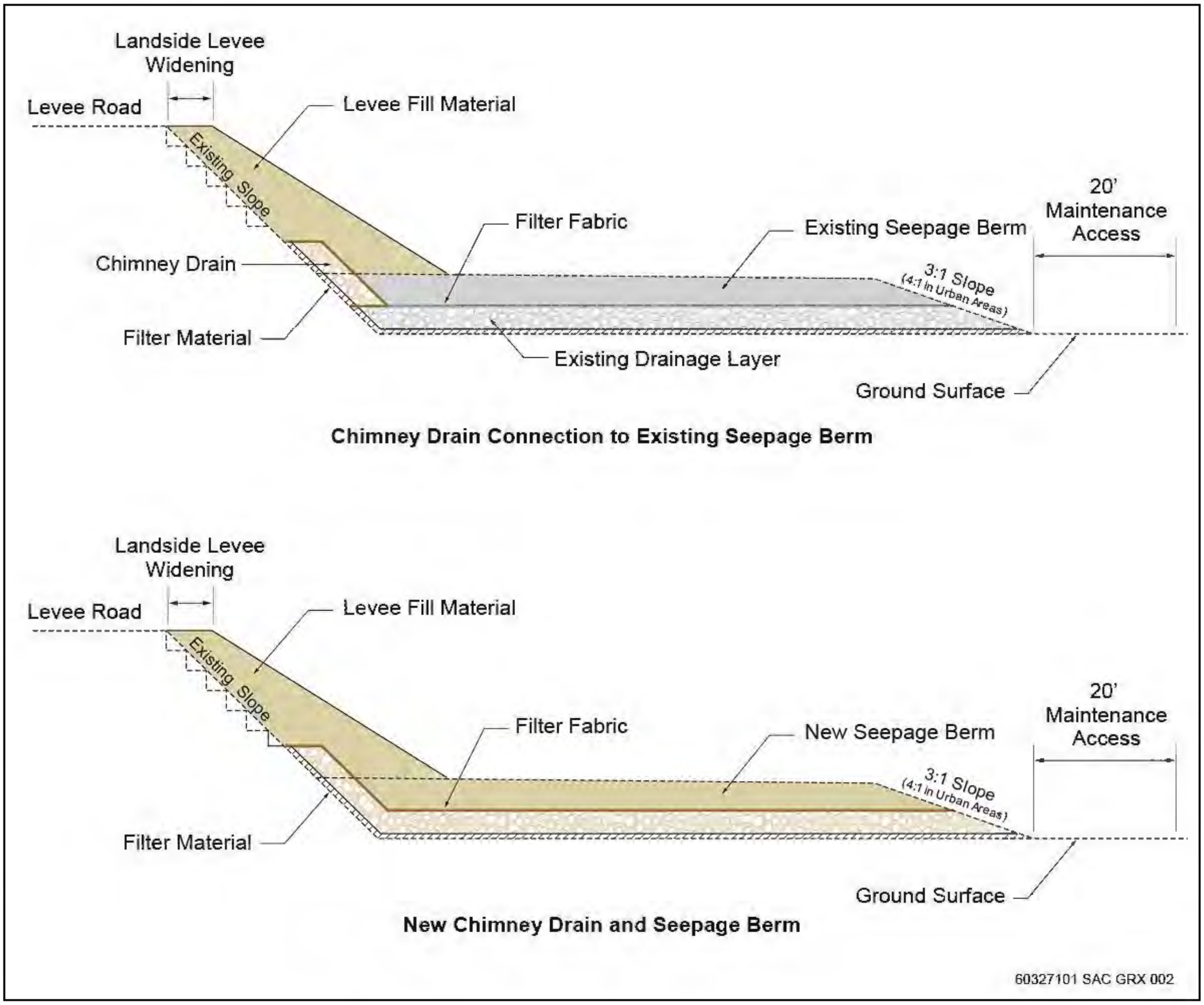
Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010; adapted by AECOM in 2010

Exhibit 5 **Typical Seepage Berm**



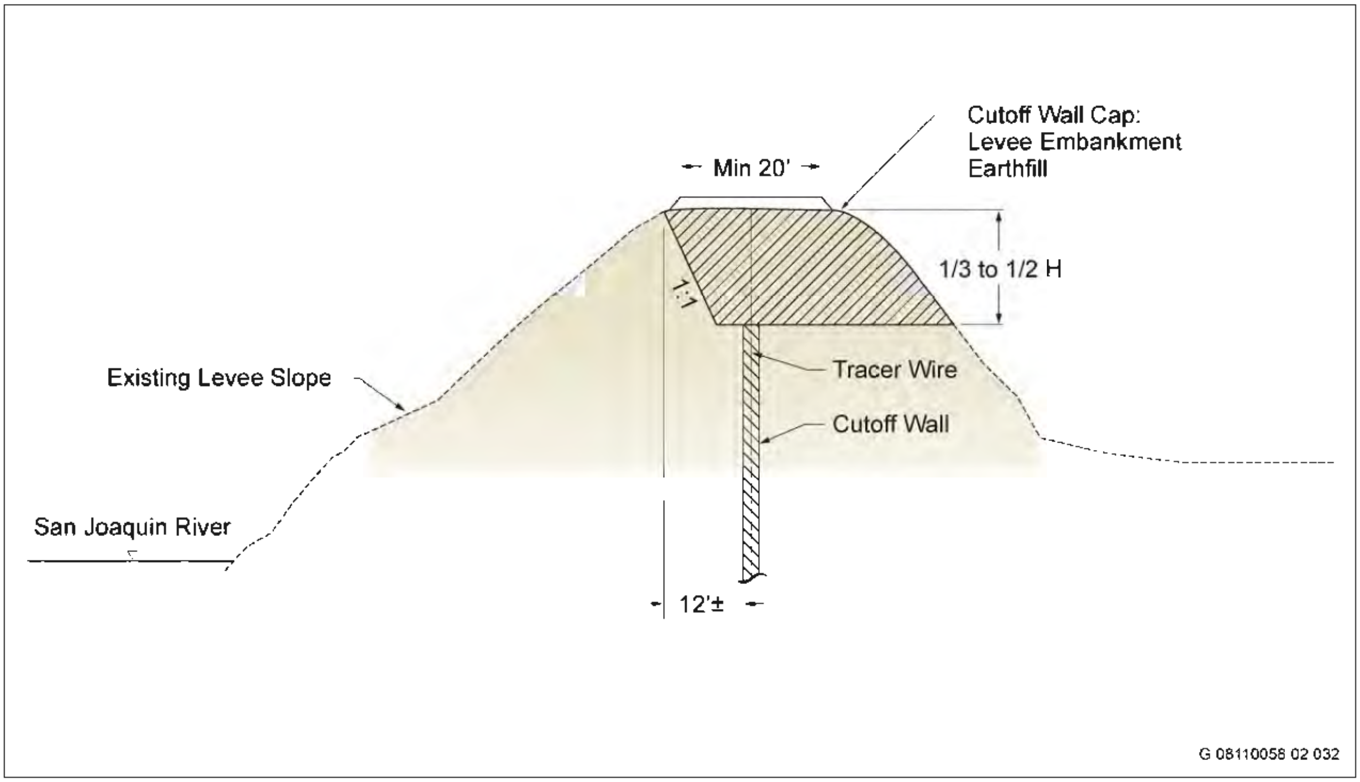
Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010; adapted by AECOM in 2010

Exhibit 6 **Typical Toe Drain**



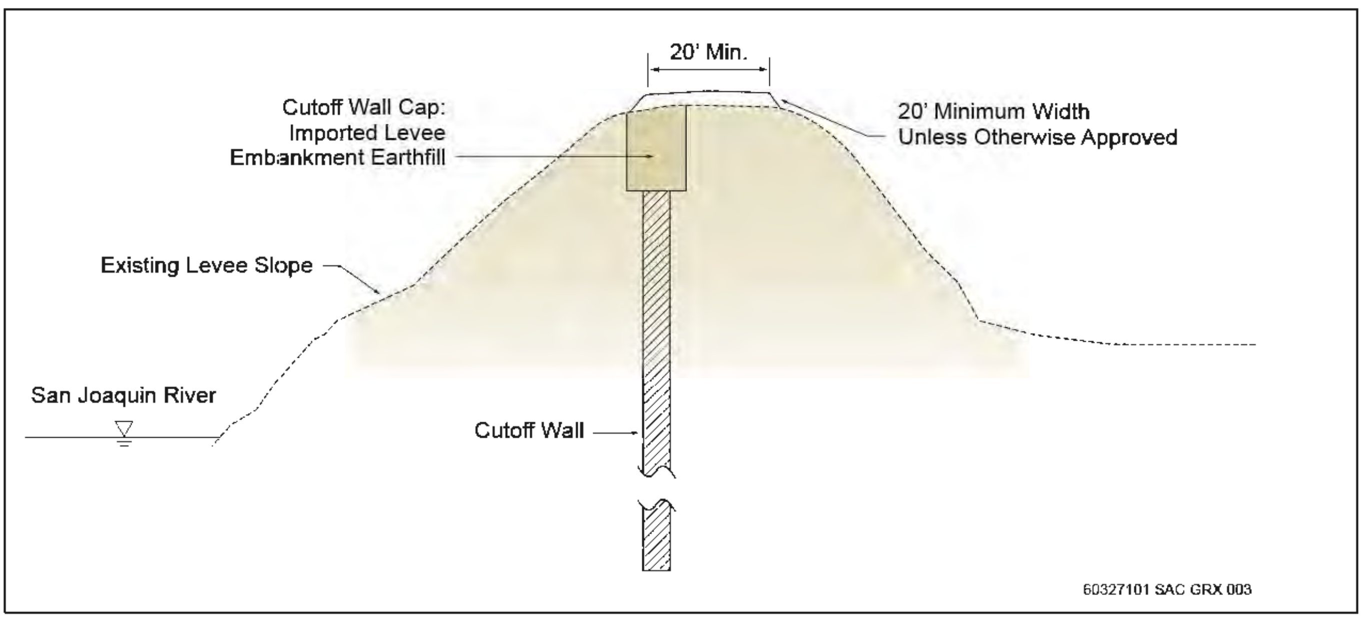
Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010; adapted by AECOM in 2010

Exhibit 7 **Typical Chimney Drain**



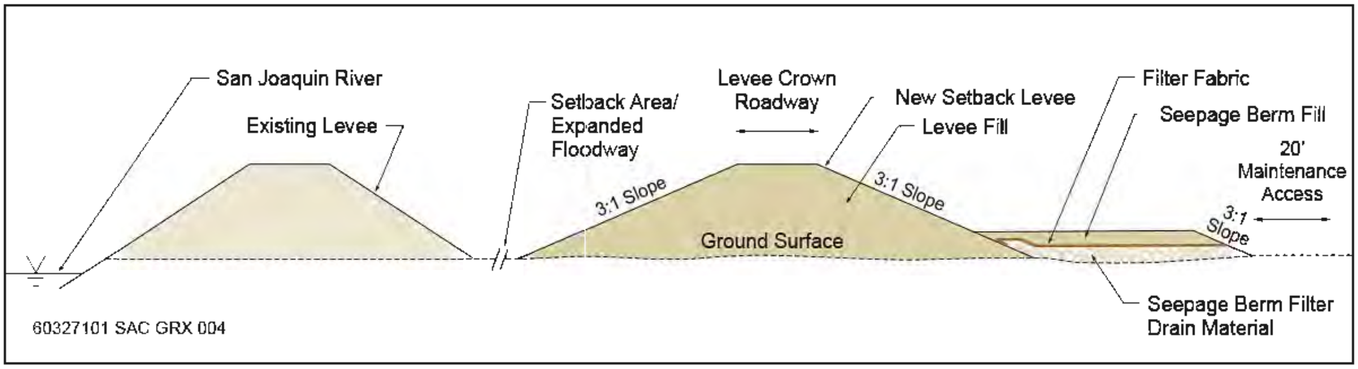
Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010; adapted by AECOM in 2010

Exhibit 8 **Typical Open Cut Method Cutoff Wall**



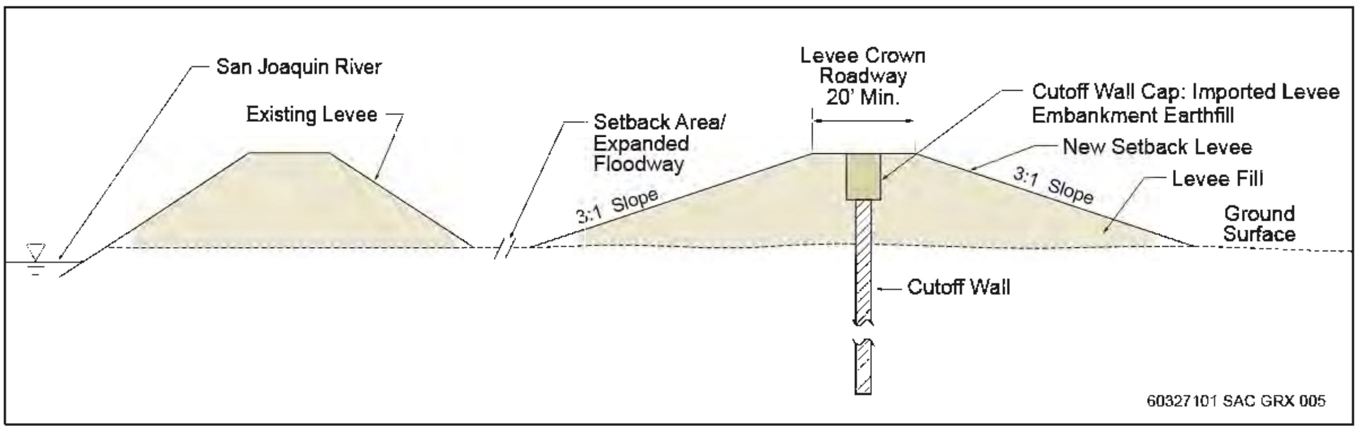
Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010; adapted by AECOM in 2010

Exhibit 9 **Typical Deep Slurry Mix Method Cutoff Wall**



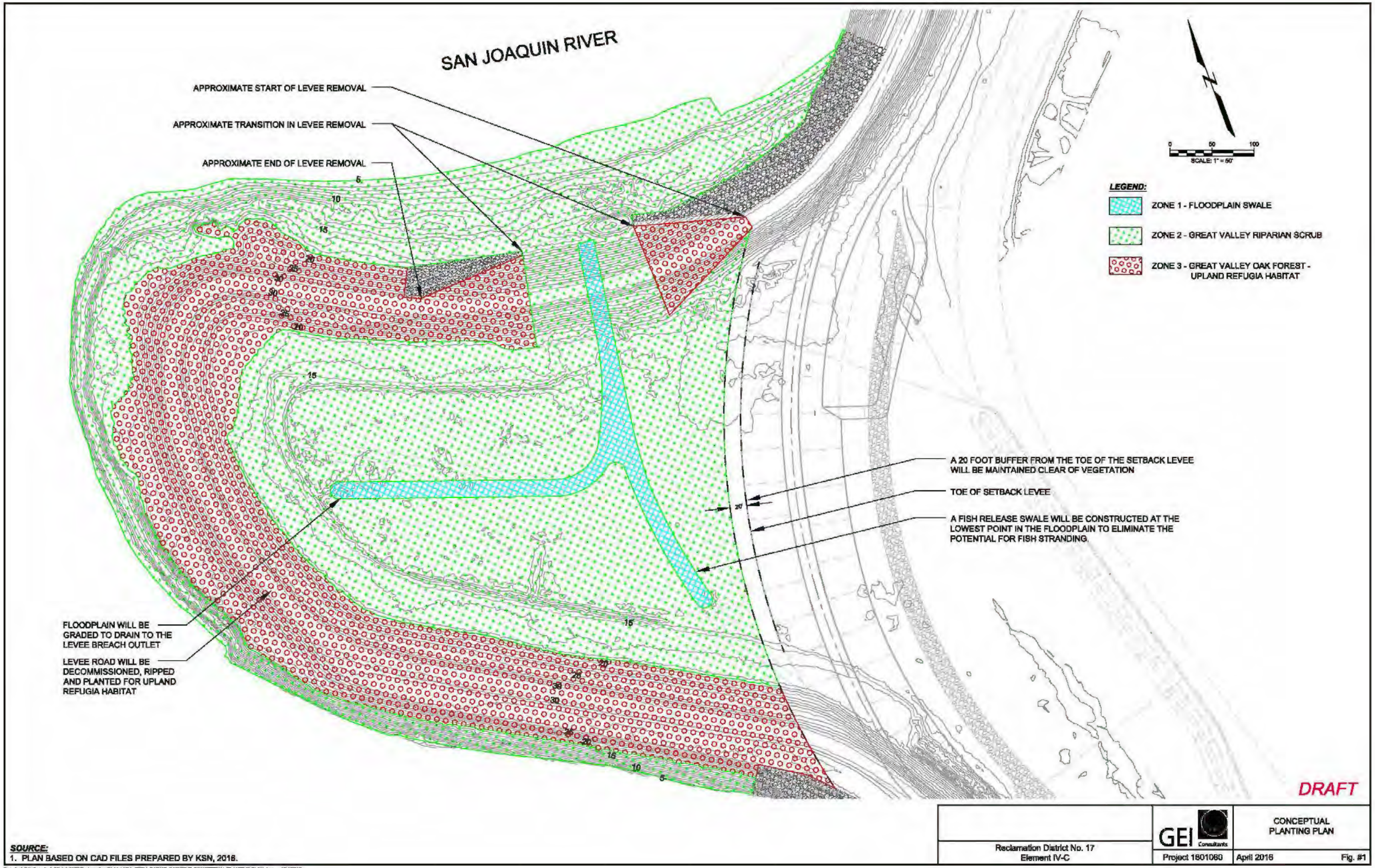
Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010; adapted by AECOM in 2010

Exhibit 10 **Typical Setback Levee**



Sources: Data provided by Kjeldsen, Sinnock & Neudeck, ENGEO, and MacKay & Somps in 2010; adapted by AECOM in 2010

Exhibit 11 **Typical Setback Levee with Cutoff Wall**



Sources: Main Stone 2010, MacKay & Somps 2014, adapted by AECOM in 2014

Exhibit 12 **Conceptual Habitat Restoration in Levee Setback Area at Element IVc**

Sources: McKay and Somps 2014, adapted by AECOM 2014

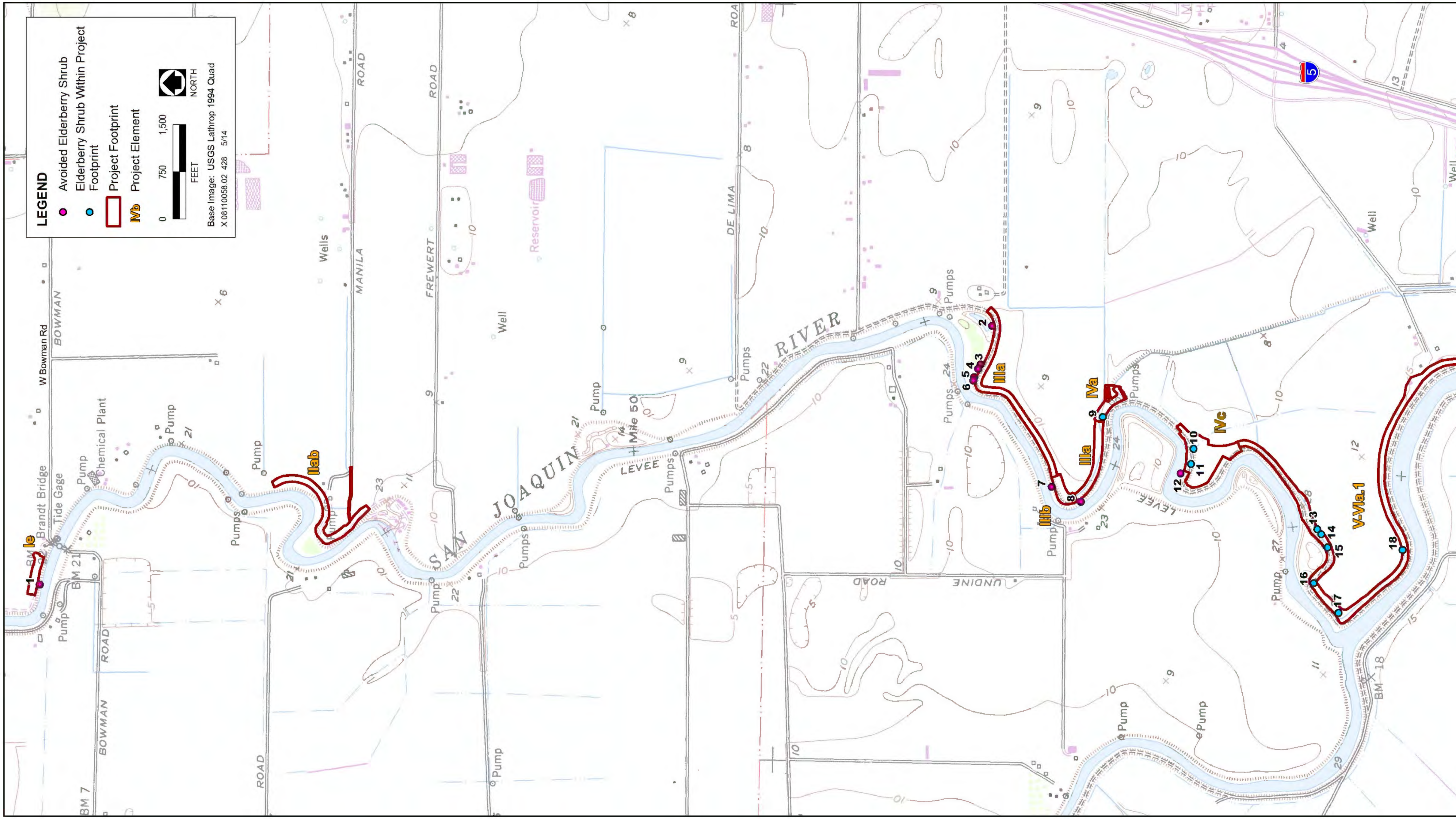
Exhibit 13a **Overview of Phase 3 Repair Project Land Cover Types**

Sources: McKay and Somps 2014, adapted by AECOM in 2014

Exhibit 13b **Overview of Phase 3 Repair Project Land Cover Types**

Sources: McKay and Somps 2014, adapted by AECOM in 2014

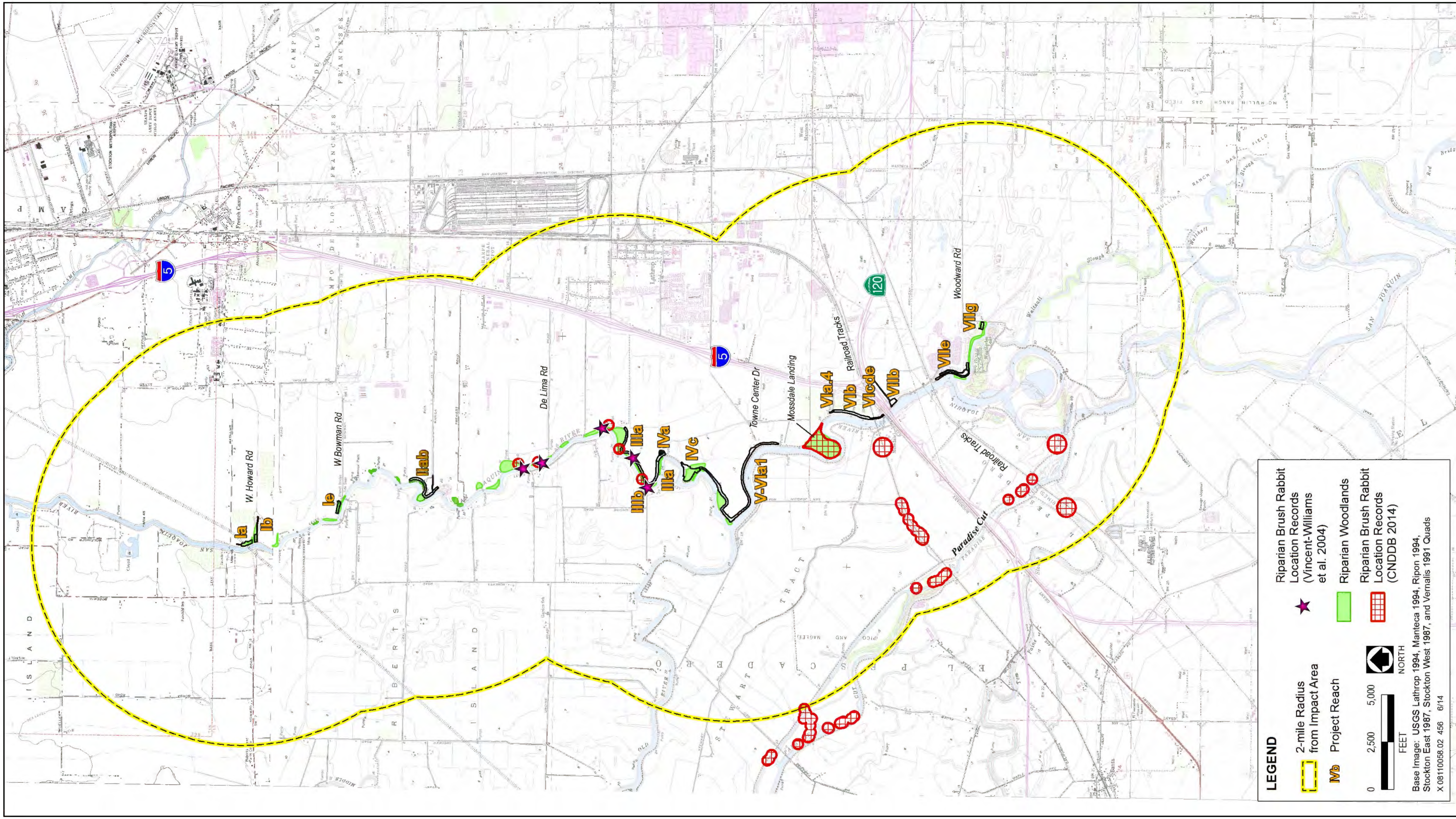
Exhibit 13c **Overview of Phase 3 Repair Project Land Cover Types**



Sources: CNDDB 2014; MacKay and Somps 2014; adapted by AECOM in 2014

Exhibit 14

Locations of Elderberry Shrubs in the Phase 3 Repair Project Vicinity



Sources: CNDDB 2014; MacKay and Somps 2014; adapted by AECOM in 2014

Exhibit 15 **Occurrence Records and Potentially Suitable Habitat for Riparian Brush Rabbit in the Phase 3 Repair Project Vicinity**

APPENDIX B

Species Lists

United States Department of the Interior

FISH AND WILDLIFE SERVICE
San Francisco Bay-Delta Fish and Wildlife
650 CAPITOL MALL, SUITE 8-300
SACRAMENTO, CA 95814
PHONE: (916)930-5603 FAX: (916)930-5654
URL: kim_squires@fws.gov

Consultation Code: 08FBDT00-2016-SLI-0118 April 18, 2016
Event Code: 08FBDT00-2016-E-00075
Project Name: RD 17 Levee Seepage Repair Project - Phase 3

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2) (c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment

Official Species List

Provided by:

San Francisco Bay-Delta Fish and Wildlife
650 CAPITOL MALL
SUITE 8-300
SACRAMENTO, CA 95814
(916) 930-5603_
http://kim_squires@fws.gov

Consultation Code: 08FBDT00-2016-SLI-0118
Event Code: 08FBDT00-2016-E-00075

Project Type: STREAM / WATERBODY / CANALS / LEVEES / DIKES

Project Name: RD 17 Levee Seepage Repair Project - Phase 3
Project Description: The overall purpose of the Phase 3 Project is to implement landside and isolated waterside levee improvements in 19 LSRP elements affecting 5.3 miles of the approximately 19-mile RD 17 levee system to improve the existing levee integrity based on the new USACE standards and continue to provide flood risk reduction within RD 17 and surrounding areas. Levee improvements would address under seepage, through seepage, and levee geometry repair and remediation.

Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

United States Department of Interior
Fish and Wildlife Service

Project name: RD 17 Levee Seepage Repair Project - Phase 3

Project Location Map:

Project Coordinates: The coordinates are too numerous to display here.

Project Counties: San Joaquin, CA

Endangered Species Act Species List

There are a total of 9 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Amphibians	Status	Has Critical Habitat	Condition(s)
California red-legged frog *(Rana draytonii)* Population: Entire	Threatened	Final designated	
California tiger Salamander *(Ambystoma californiense)* Population: U.S.A. (Central CA DPS)	Threatened	Final designated	
Crustaceans			
Vernal Pool fairy shrimp *(Branchinecta lynchi)* Population: Entire	Threatened	Final designated	
Vernal Pool tadpole shrimp *(Lepidurus packardi)* Population: Entire	Endangered	Final designated	
Fishes			
Delta smelt *(Hypomesus transpacificus)* Population: Entire	Threatened	Final designated	
Flowering Plants			

Large-Flowered fiddleneck *(Amsinckia grandiflora)*	Endangered	Final designated	
Insects			
Valley Elderberry Longhorn beetle *(Desmocerus californicus dimorphus)* Population: Entire	Threatened	Final designated	
Mammals			
Riparian Brnsh rabbit *(Sylvilagus bachmani riparius)* Population: Entire	Endangered		
Reptiles			
Giant Garter snake *(Thamnophis gigas)* Population: Entire	Threatened		

Critical habitats that lie within your project area

The following critical habitats lie fully or partially within your project area.

Fishes	Critical Habitat Type
Delta smelt *(Hypomesus transpacificus)* Population: Entire	Final designated

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825

February 27, 2014

Document Number: 140227124042

Kelly Holland
AECOM
2020 L Street Suite 400
Sacramento, CA 95811

Subject: Species List for RD 17 Levee Seepage Area Project

Dear: Ms. Holland

We are sending this official species list in response to your February 27, 2014 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area*. For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be May 28, 2014.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found here.

Endangered Species Division

TAKE PRIDE IN AMERICA

U.S. Fish & Wildlife Service
Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 140227124042

Database Last Updated: September 18, 2011

Quad Lists

Listed Species

Invertebrates

Branchinecta lynchi
- vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus
- valley elderberry longhorn beetle (T)

Lepidurus packardi
- vernal pool tadpole shrimp (E)

Fish

Acipenser medirostris
- green sturgeon (T) (NMFS)

Hypomesus transpacificus
- Critical habitat, delta smelt (X)
- delta smelt (T)

Oncorhynchus mykiss
- Central Valley steelhead (T) (NMFS)
- Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha
- Central Valley spring-run chinook salmon (T) (NMFS)
- winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense
- California tiger salamander, central population (T)

Rana draytonii
- California red-legged frog (T)

Reptiles

Thamnophis gigas
- giant garter snake (T)

Mammals

Sylvilagus bachmani riparius
- riparian brush rabbit (E)

Plants

Cordylanthus palmatus
- palmate-bracted bird's-beak (E)

Print table Show entire table in new window Export entire table to a text file Next 50 Records

Results for quads centered on LATHROP Quad (3712173) - 126 elements selected

Record	QUADNAME	ELMCODE	SCINAME	COMNAME	FE
1	Holt	ABNKC19070	Buteo swainsoni	Swainson's hawk	None
2	Holt	ABNSB10010	Athene cunicularia	burrowing owl	None
3	Holt	ABPBXA3010	Melospiza melodia	song sparrow ("Modesto" population)	None
4	Holt	AFCHA0209K	Oncorhynchus mykiss irideus	steelhead - Central Valley DPS	Threat
5	Holt	AFCHB01040	Hypomesus transpacificus	Delta smelt	Threat
6	Holt	AFCHB03010	Spirinchus thaleichthys	longfin smelt	Candi
7	Holt	ARAAD02030	Emys marmorata	western pond turtle	None
8	Holt	CTT52410CA	Coastal and Valley Freshwater Marsh	Coastal and Valley Freshwater Marsh	None
9	Holt	IICOL48011	Desmocerus californicus dimorphus	valley elderberry longhorn beetle	Threat
10	Holt	PDAPI19030	Lilaeopsis masonii	Mason's lilaeopsis	None
11	Holt	PDASTE8470	Symphyotrichum lentum	Suisun Marsh aster	None
12	Holt	PDFAB250D2	Lathyrus jepsonii var. jepsonii	Delta tule pea	None
13	Holt	PDMAL0H0R3	Hibiscus lasiocarpos var. occidentalis	woolly rose-mallow	None
14	Holt	PDSCR10050	Limosella australis	Delta mudwort	None
15	Holt	PMCYP032Y0	Carex comosa	bristly sedge	None
16	Lathrop	AAAAA01180	Ambystoma californiense	California tiger salamander	Threat
17	Lathrop	ABNKC19070	Buteo swainsoni	Swainson's hawk	None
18	Lathrop	ABNSB10010	Athene cunicularia	burrowing owl	None
19	Lathrop	ABPBXA3010	Melospiza melodia	song sparrow ("Modesto" population)	None
20	Lathrop	ABPBXB0020	Agelaius tricolor	tricolored blackbird	None
21	Lathrop	ABPBXB3010	Xanthocephalus xanthocephalus	yellow-headed blackbird	None
22	Lathrop	AFCHA0209K	Oncorhynchus mykiss irideus	steelhead - Central Valley DPS	Threat
23	Lathrop	AFCHB03010	Spirinchus thaleichthys	longfin smelt	Candi
24	Lathrop	AMAEB01021	Sylvilagus bachmani riparius	riparian brush rabbit	Endan
25	Lathrop	IICOL48011	Desmocerus californicus dimorphus	valley elderberry longhorn beetle	Threat
26	Lathrop	PDAPI0Z0S0	Eryngium racemosum	Delta button-celery	None
27	Lathrop	PDAST2E0U0	Cirsium crassicaule	slough thistle	None
28	Lathrop	PDAST9F031	Trichocoronis wrightii var. wrightii	Wright's trichocoronis	None
29	Manteca	ABNKC19070	Buteo swainsoni	Swainson's hawk	None
30	Manteca	ABPBXB0020	Agelaius tricolor	tricolored blackbird	None
31	Manteca	IICOL4C020	Lytta moesta	moestan blister beetle	None
32	Ripon	AAAAA01180	Ambystoma californiense	California tiger salamander	Threat
33	Ripon	ABNJB05035	Branta hutchinsii leucopareia	cackling (=Aleutian Canada) goose	Delist
34	Ripon	ABNKC19070	Buteo swainsoni	Swainson's hawk	None
35	Ripon	ABNKD06030	Falco columbarius	merlin	None
36	Ripon	ABNRB02022	Coccyzus americanus occidentalis	western yellow-billed cuckoo	Propo
37	Ripon	ABPBXB0020	Agelaius tricolor	tricolored blackbird	None
38	Ripon	AFCHA0209K	Oncorhynchus mykiss irideus	steelhead - Central Valley DPS	Threat
39	Ripon	AFCJB25010	Mylopharodon conocephalus	hardhead	None
40	Ripon	AMAEB01021	Sylvilagus bachmani riparius	riparian brush rabbit	Endan
41	Ripon	AMAFF08081	Neotoma fuscipes riparia	riparian (=San Joaquin Valley) woodrat	Endan
42	Ripon	CTT61410CA	Great Valley Cottonwood Riparian Forest	Great Valley Cottonwood Riparian Forest	None
43	Ripon	CTT61420CA	Great Valley Mixed Riparian Forest	Great Valley Mixed Riparian Forest	None
44	Ripon	CTT61430CA	Great Valley Valley Oak Riparian Forest	Great Valley Valley Oak Riparian Forest	None
45	Ripon	CTT63440CA	Elderberry Savanna	Elderberry Savanna	None

http://imaps.dfg.ca.gov/viewers/CNDDB_QuickViewer/list_9quad_cnddb.asp?theServerN... 2/27/2014

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Results for quads centered on STOCKTON WEST Quad (3712183) - 99 elements selected

Record	QUADNAME	ELMCODE	SCINAME	COMNAME	FEDSTATU
1	Holt	ABNKC19070	Buteo swainsoni	Swainson's hawk	None
2	Holt	ABNSB10010	Athene cunicularia	burrowing owl	None
3	Holt	ABPBXA3010	Melospiza melodia	song sparrow ("Modesto" population)	None
4	Holt	AFCHA0209K	Oncorhynchus mykiss irideus	steelhead - Central Valley DPS	Threatened
5	Holt	AFCHB01040	Hypomesus transpacificus	Delta smelt	Threatened
6	Holt	AFCHB03010	Spirinchus thaleichthys	longfin smelt	Candidate
7	Holt	ARAAD02030	Emys marmorata	western pond turtle	None
8	Holt	CTT52410CA	Coastal and Valley Freshwater Marsh	Coastal and Valley Freshwater Marsh	None
9	Holt	IICOL48011	Desmocerus californicus dimorphus	valley elderberry longhorn beetle	Threatened
10	Holt	PDAPI19030	Lilaeopsis masonii	Mason's lilaeopsis	None
11	Holt	PDASTE8470	Symphyotrichum lentum	Suisun Marsh aster	None
12	Holt	PDFAB250D2	Lathyrus jepsonii var. jepsonii	Delta tule pea	None
13	Holt	PDMAL0H0R3	Hibiscus lasiocarpos var. occidentalis	woolly rose-mallow	None
14	Holt	PDSCR10050	Limosella australis	Delta mudwort	None
15	Holt	PMCYP032Y0	Carex comosa	bristly sedge	None
16	Lathrop	AAAAA01180	Ambystoma californiense	California tiger salamander	Threatened
17	Lathrop	ABNKC19070	Buteo swainsoni	Swainson's hawk	None
18	Lathrop	ABNSB10010	Athene cunicularia	burrowing owl	None
19	Lathrop	ABPBXA3010	Melospiza melodia	song sparrow ("Modesto" population)	None
20	Lathrop	ABPBXB0020	Agelaius tricolor	tricolored blackbird	None
21	Lathrop	ABPBXB3010	Xanthocephalus xanthocephalus	yellow-headed blackbird	None
22	Lathrop	AFCHA0209K	Oncorhynchus mykiss irideus	steelhead - Central Valley DPS	Threatened
23	Lathrop	AFCHB03010	Spirinchus thaleichthys	longfin smelt	Candidate
24	Lathrop	AMAEB01021	Sylvilagus bachmani riparius	riparian brush rabbit	Endangerec
25	Lathrop	IICOL48011	Desmocerus californicus dimorphus	valley elderberry longhorn beetle	Threatened
26	Lathrop	PDAPI0Z0S0	Eryngium racemosum	Delta button-celery	None
27	Lathrop	PDAST2E0U0	Cirsium crassicaule	slough thistle	None
28	Lathrop	PDAST9F031	Trichocoronis wrightii var. wrightii	Wright's trichocoronis	None
29	Lodi South	ABNKC19070	Buteo swainsoni	Swainson's hawk	None
30	Lodi South	ABNSB10010	Athene cunicularia	burrowing owl	None
31	Lodi South	AFCHA0209K	Oncorhynchus mykiss irideus	steelhead - Central Valley DPS	Threatened
32	Lodi South	ARADB36150	Thamnophis gigas	giant garter snake	Threatened
33	Lodi South	CTT71130CA	Valley Oak Woodland	Valley Oak Woodland	None
34	Lodi South	ICBRA10010	Lepidurus packardi	vernal pool tadpole shrimp	Endangerec
35	Lodi South	PDAPI19030	Lilaeopsis masonii	Mason's lilaeopsis	None
36	Lodi South	PDASTE8470	Symphyotrichum lentum	Suisun Marsh aster	None
37	Manteca	ABNKC19070	Buteo swainsoni	Swainson's hawk	None
38	Manteca	ABPBXB0020	Agelaius tricolor	tricolored blackbird	None
39	Manteca	IICOL4C020	Lytta moesta	moestan blister beetle	None
40	Stockton East	ABNKC19070	Buteo swainsoni	Swainson's hawk	None
41	Stockton East	ABNSB10010	Athene cunicularia	burrowing owl	None
42	Stockton East	AFCHA0209K	Oncorhynchus mykiss irideus	steelhead - Central Valley DPS	Threatened
43	Stockton East	ARADB36150	Thamnophis gigas	giant garter snake	Threatened
44	Stockton East	PDRAN0B1J0	Delphinium recurvatum	recurved larkspur	None
45	Stockton West	AAAAA01180	Ambystoma californiense	California tiger salamander	Threatened

CNPS California Native Plant Society Rare and Endangered Plant Inventory

Plant List

2 matches found. *Click on scientific name for details*

Search Criteria

FESA is one of [Endangered, Threatened, Species of Concern], Found in 9 Quads around 37121G3

Scientific Name	Common Name	Family	Lifeform	Rare Plant Rank	State Rank	Global Rank
Amsinckia grandiflora	large-flowered fiddleneck	Boraginaceae	annual herb	1B.1	S1	G1
Chloropyron palmatum	palmate-bracted bird's-beak	Orobanchaceae	annual herb (hemiparasitic)	1B.1	S1	G1

Suggested Citation

California Native Plant Society (CNPS). 2014. Inventory of Rare and Endangered Plants (online edition, v8-02). California Native Plant Society. Sacramento, CA. Accessed on Monday, March 03, 2014.

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Plant List

1 matches found. *Click on scientific name for details*

Search Criteria

FESA is one of [Endangered, Threatened, Species of Concern], Found in 9 Quads around 37121H3

Scientific Name	Common Name	Family	Lifeform	Rare Plant Rank	State Rank	Global Rank
Chloropyron palmatum	palmate-bracted bird's-beak	Orobanchaceae	annual herb (hemiparasitic)	1B.1	S1	G1

Suggested Citation

California Native Plant Society (CNPS). 2014. Inventory of Rare and Endangered Plants (online edition, v8-02). California Native Plant Society. Sacramento, CA. Accessed on Monday, March 03, 2014.

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Appendix C

Evaluation of Potential for Giant Garter Snake Occurrence in the Phase 3 Repair Project Area

EVALUATION OF POTENTIAL FOR GIANT GARTER SNAKE TO OCCUR IN THE PHASE 3 PROJECT AREA

This appendix describes the evaluation process undertaken to determine whether the giant garter snake *(Thamnophis gigas),*which is federally and state-listed as threatened, could occur in the Phase 3 Project area of Reclamation District 17's (RD 17) Levee Seepage Repair Project (Phase 3 Project or proposed project). This evaluation supports the conclusion stated in Table 1 of the Biological Assessment: the giant garter snake is unlikely to occur in the Phase 3 Project area.

Table 1 in the Biological Assessment summarizes an assessment of the potential for species, which have been termed "threatened" or "endangered" under the jurisdiction of U.S. Fish and Wildlife Service and National Marine Fisheries Service, to occur in the Phase 3 Project Area. A number of resources were consulted to generate the list of species that would be evaluated (CNBBD 2014; CNPS 2014; USFWS 2014). Surveys of the proposed project area were also conducted to evaluate habitat conditions and habitat suitability for listed species. The majority of the federally listed species identified in Table 1of the Biological Assessment were eliminated from further consideration because they are not likely to occur in the Phase 3 Project area due to a lack of suitable habitat, local range restrictions, regional extirpations, or lack of connectivity between areas of suitable or occupied habitat, or because the action area is located outside of the extant range of the species.

The giant garter snake was determined to be unlikely to occur in the Phase 3 Project area because of a lack of suitable habitat, lack of connectivity to areas of suitable or occupied habitat, and local range restrictions. Information supporting this conclusion is detailed below.

LACK OF SUITABLE HABITAT

Giant garter snakes are endemic to wetlands in the Sacramento and San Joaquin valleys, where the species inhabits marshes, sloughs, ponds, small lakes, low gradient streams, and other waterways and agricultural wetlands, such as irrigation and drainage canals, rice fields and the adjacent uplands (USFWS 1999). Essential habitat components consist of: (1) wetlands with adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) upland habitat with grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for over-wintering habitat with escape cover (vegetation, burrows) and underground refugia (crevices and small mammal burrows) (Hansen 1988). Snakes are typically absent from larger rivers and other bodies of water that support introduced populations of large, predatory fish, and from wetlands with sand, gravel, or rock substrates (Hansen 1988; Hansen and Brode 1980; Rossman and Stewart 1987). Riparian woodlands do not provide suitable habitat because of excessive shade, lack of basking sites, and absence of prey populations (Hansen 1988). Unlike flood irrigated rice fields, other agricultural cropping systems (i.e., irrigation and drainage canals supporting "dry" row crops) do not hold sufficient water for long enough time periods to create artificial, temporary wetlands and also lack an adequate prey base (USFWS 2012; Wylie and Martin 2005).

According to the USFWS's most recent summary and evaluation report on the giant garter snake (USFWS 2012), the RD 17 project area falls within the Delta Basin "population," which includes portions of Sacramento, Yolo, Solano, Contra Costa, and San Joaquin counties. Although some suitable habitat for the giant garter snake is known to exist in the Delta Basin giant garter snake "population" (USFWS 2012), suitable habitat is not distributed evenly throughout the Lower San Joaquin River portion of the Delta Basin. Specifically, most of the RD 17 area and all of the Phase 3 Project area do not support suitable habitat for giant garter snake, as outlined below. The essential habitat components required by the species are not present in the proposed project area (E. Hansen, pers. comm., 2014). Potential aquatic habitat for the giant garter snake in the Phase 3 Project area is limited to one constructed pond in Element IIab; a small area of freshwater marsh in Element Ib; and a few agricultural ditches. However, these features are not considered suitable for the snake because: (1) these aquatic features are all isolated from one another, separated by overland distances of more than 200 feet, and are disconnected from other areas of potential aquatic habitat for the species and (2) these features capture periodic drainage from surrounding agricultural lands and, thus, are intermittently dry throughout the summer months, having water for limited and non-continuous periods. Wetlands that do not provide water during their active season (April to October) cannot support large populations of the giant garter snake (Wylie *et al*. 1997, 2000, 2002, 2010; USFWS 2012), mainly because these features lack both an adequate prey base and enough emergent vegetation that would provide cover and refuge for the species. Specifically, the aquatic features in the Phase 3 Project area are not suitable habitat for the giant garter snake based on the following reasons:

- Constructed Pond: The pond is a constructed feature that is stocked with predatory fish for recreational fishing. Predatory fish prey on the giant garter snake young as well as the snake's prey, limiting the snake's ability to maintain a population (G. Hansen 1986; CDFG 1992; USFWS 2012). Further, this pond is surrounded by residential landscape, which is not considered suitable upland for this species. Lastly, the pond is an isolated feature, separated from other potentially suitable aquatic habitats (e.g., agricultural ditches) by more than 1,000 feet.

- Freshwater Marsh: The freshwater marsh is fed by adjacent agricultural drainage ditches that are (1) intermittently dry throughout the snake's active season and (2) re-sculpted based on the farming needs each planting season, and therefore, are often filled, relocated, and otherwise subject to a great amount of ground disturbance. Because these ditches are not suitable habitat, the freshwater marsh remains a small, isolated feature surrounded by a landscape that is not suitable habitat for giant garter snake. The small size of this marsh and the high level of isolation render it unsuitable for the species.

- Agricultural Ditches: The agricultural ditches (1) lack emergent vegetation that serves to provide shelter to prey and shelter from predators; (2) are periodically dry throughout the snake's active season as these provide drainage catchment for "dry" agricultural fields (row crops), which are not suitable upland for the snake (Wylie and Martin 2005; USFWS 2012); and (3) are disconnected from each other and other aquatic habitats in the proposed project area and vicinity (Exhibit 1).

No suitable upland habitat is present in the Phase 3 Project area. Uplands consist mainly of urban and developed areas, residential and parks landscaping, and agricultural land, consisting of dry" row crops (e.g., tomatoes, corn), alfalfa, and orchards (RD 17 2009:12–15), which are not suitable as potential giant garter snake upland habitat (USFWS 2012).

Because the proposed project area lacks the essential habitat components required by the species (E. Hansen, pers. comm., 2014), the Phase 3 Project area does not support suitable habitat for giant garter snake.

LACK OF CONNECTIVITY

No occurrences of giant garter snake have been recorded in the RD 17 project area (CNDDB Two CNDDB occurrences of giant garter snake showed up in a California Natural Diversity Database (CNDDB) record search of the nine U.S. Geological Survey quadrangles that surround, and include, the proposed project. Both records are from 1976, including one in the Stockton Diverting Canal at State Route 99 (approximately 8 air miles northwest of the proposed project area; *see* Exhibit 1) and one along Eight Mile Road between Interstate 5 and State Route 99 (approximately 12 air miles north of the proposed project). The distance between these records to the proposed project area is a greater distance than the species is known to disperse across where suitable (and hydrologically connected) habitats are present (Wylie and Martin 2004); however, suitable habitat for the species is absent between these records and proposed project area and the hydrological connection is also not suitable.

The San Joaquin River provides the only hydrological connection between the proposed project site and these two records; as noted above under “Lack of Suitable Habitat,” large rivers, such as the San Joaquin River, are not suitable habitat for giant garter snake because of the absence of emergent vegetation and backwater sloughs, and the presence of predatory fish (Hansen 1988; Hansen and Brode 1980; Rossman and Stewart 1987). Both of the records are separated from the proposed project site by extensive urbanized development (City of Stockton), “dry” upland agricultural crops, and a large river, all of which do not provide suitable habitat for the giant garter snake (USFWS 2012). Although the region surrounding the RD 17 area appears to support abundant wetlands (e.g., west of the San Joaquin River or east of Interstate 5), the waters and wetlands within the RD 17 area are sparse and disconnected from each other and other areas where more extensive wetlands may be located (Exhibit 1). Not only does the RD 17 area not support suitable habitat for the species, this area is disconnected from areas where the species may or is known to occur, making it highly unlikely that the snake would exist, let alone persist, in the Phase 3 Project area (E. Hansen, pers. comm., 2014).

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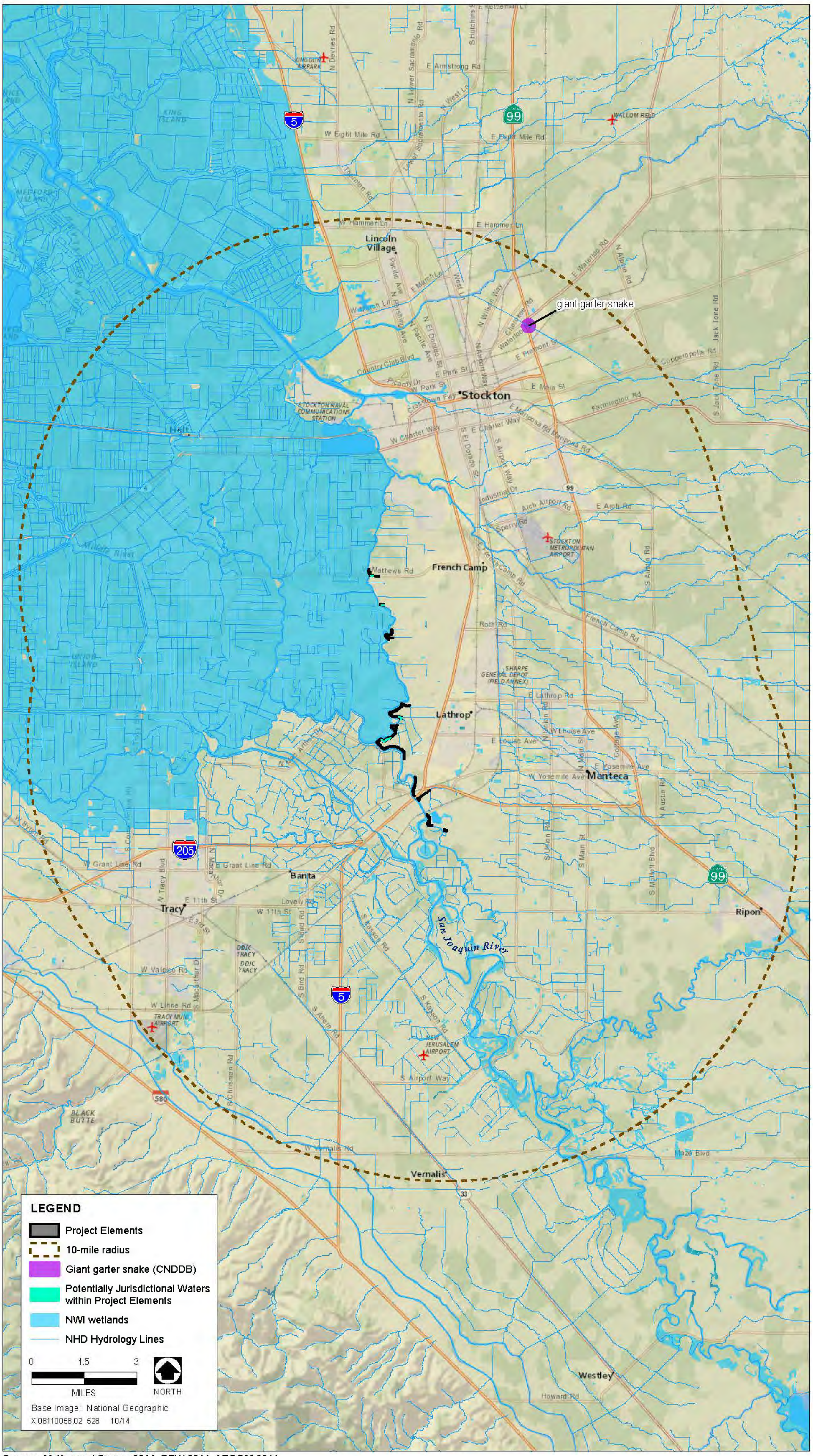

Source: McKay and Somps 2014, DFW 2014, AECOM 2014

Waters with giant garter snake CNDDB Occurrences within a 10-mile Search Radius

LOCAL RANGE RESTRICTIONS

Apart from the two occurrence records referenced above, no other CNDDB records for this species are in the vicinity of the Phase 3 Project area. There are occurrences of the species documented in White Slough and Little Connection Slough, which are 15.5 and 15 miles due north of the proposed project, respectively, and in Volta Wildlife Area, which is over 50 miles south of the proposed project (USFWS 2012; CNDDB 2014). No occurrences of giant garter snakes are known from the northern portion of the San Joaquin Valley north to the eastern fringe of the Sacramento-San Joaquin River Delta, where the floodplain of the San Joaquin River is limited to a relatively narrow trough (Hansen and Brode 1980; 58 FR 54053). Any observations of the species in the Sacramento-San Joaquin River Delta are associated with backwater areas of the adjacent rivers, emergent marshes, and sloughs (E. Hansen, pers. comm., 2014) – all of which are absent from the waterside and landside of the RD 17 levees. The resulting gap of approximately 60 miles separates the southern and northern populations (Hansen and Brode, 1980; CNDDB 2014). The USFWS recognizes that this large gap (65 miles) between these occurrences of the giant garter snake is due to the presence of urbanized developments and “dry” agricultural crop production that do not provide suitable habitat for the species and limit its ability to disperse (USFWS 2012).

CONCLUSION

In summary, CNDDB records of GGS only indicate distribution of the species across the greater landscape; occurrence of the species within this landscape is limited to suitable and connected habitat (E. Hansen, pers. comm., 2014). There is no suitable habitat in the Phase 3 Project area that would support this species. Table 1 of the Biological Assessment summarizes the evaluation of potential for species occurrence in the proposed project area; this evaluation concluded that the giant garter snake is “unlikely to occur” in the Phase 3 Project area. An “unlikely to occur” determination concludes that potential habitat is present, but the species is unlikely to be present in the area because of current status of the species, a very restricted distribution, and/or essential habitat components are not present. Although some features in the proposed project area could be potential habitat for the species (e.g., annual grassland on the levee, freshwater marsh), these habitats are not suitable for the giant garter snake because they do not provide the components that are considered essential to support the species (e.g., a continuous supply of summer water, adequate prey base). Because of the absence of suitable habitat features and the lack of connectivity of the proposed project area to other areas that may be more suitable for the species, the species is unlikely to occur in the Phase 3 Project area (E. Hansen, pers. comm., 2014).

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APPENDIX D

Project Correspondence

APPENDIX D-1

Letter to USFWS and NMFS Requesting Technical Assistance,
May 14, 2010

Refer to **Attachment 1 of Appendix J of this FEIS:**
Letter from AECOM to USFWS and NMFS Requesting Technical Assistance. May 14, 2010. Includes two attachments (2009 preliminary wetland delineation and 2010 updated wetland delineation), on page 955 of this PDF.

APPENDIX D-2

Letter from NMFS to AECOM Responding to Technical Assistance Request, June 11, 2010

Refer to **Attachment 2 of Appendix J of this FEIS:**
Letter Responding to Technical Assistance Request.
June 11, 2010, on page 1067 of this PDF.

APPENDIX D-3

Letter from NMFS to USACE Requesting Additional Information, July 7, 2015

Refer to **Attachment 4 of Appendix J of this FEIS: Letter from NMFS to USACE, Requesting Additional Information. July 7, 2015, on page 1173 of this PDF.**

APPENDIX D-4

Response to NMFS's July 2015 Request for Additional Information

Refer to **Attachment 7 of Appendix J of this FEIS:**
Letter from NMFS, Responding to Request for Additional Information. October 7, 2016, on page 1259 of this PDF.

APPENDIX D-5

Letter from USFWS to USACE Requesting Additional Information,
October 2, 2015

Refer to **Attachment 5 of Appendix J of this FEIS: Letter from USFWS to USACE, Responding to Request for Additional Information. October 2, 2015, on page 1183 of this PDF.**

APPENDIX D-6

Response to USFWS' October 2015 Request for Additional Information

Refer to **Attachment 8 of Appendix J of this FEIS:**
Letter to USFWS, Responding to Request for Additional Information. October 7, 2016, on page 1275 of this PDF.

APPENDIX E

Conceptual Mitigation and Monitoring Plan for Levee Setback Area
June 2016

Refer to **Attachment 6 of Appendix J of this FEIS: Conceptual Mitigation and Monitoring Plan for Levee Setback Area – June 2016, on page 1191 of this PDF.**

APPENDIX F

Hydraulic Analyses of Setback Levee Alternatives

APPENDIX F-1

January 2010 Hydraulic Analysis of Reach IVc and Reaches IIa and IIb Levee Setback Alternatives

***Refer to* Appendix D.1 of this FEIS:**
January 2010 Hydraulic Analysis of Reach IVc and Reaches IIa and IIb Levee Setback Alternatives, dated January 19, 2010, Revised April 14, 2010, on page 679 of this PDF.

APPENDIX F-2

February 2014 Hydraulic Analysis of Reach IVc Levee Setback for Preferred Alternative

Refer to **Appendix D.2 of this FEIS:**
February 2014 Hydraulic Analysis of Reach IVc Levee Setback for Preferred Alternative, on page 743 of this PDF.

APPENDIX F-3

"Setback Levee Alternative" Excerpted from March 2, 2009, Reclamation District 17 Early Implementation Project Funding Application for 100-Year Levee Seepage Area Project – 2009 Project Elements

H. Setback Levee Alternative

The potential for setback levees along the San Joaquin River within RD 17 is limited due to the general ‘straightness’ of the channel and the proximity of developed adjacent land uses. However RD 17 has studied levee setback alternatives where the river alignment and adjacent land uses offer the potential for setback solutions. This setback levee analysis was conducted by ENGEO and considered geomorphic and hydraulic impacts that might result in the implementation of the setback levee alternatives. A copy of the analysis in included in Appendix 9.

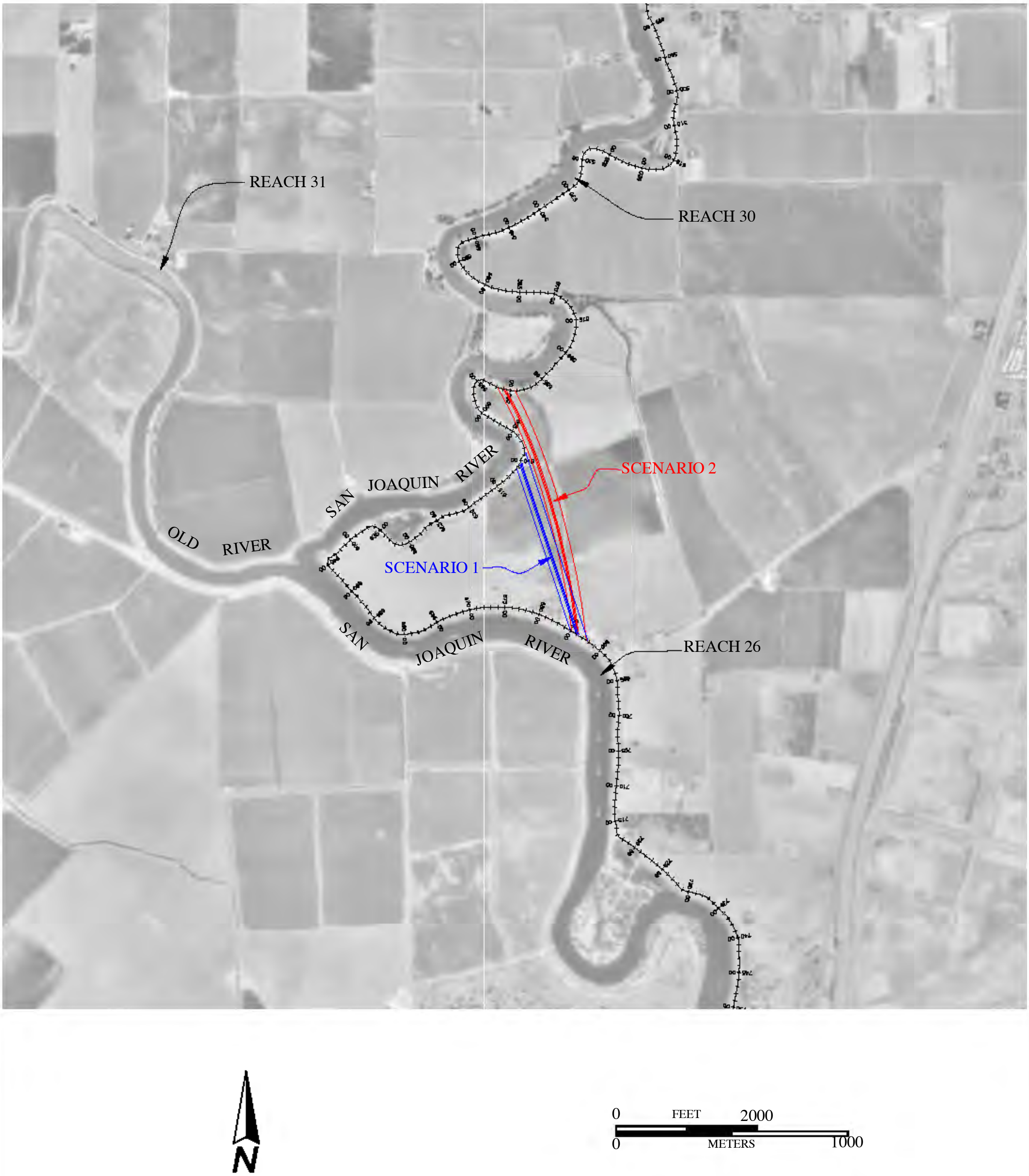
RD17 identified a reach where channel geomorphology and undeveloped adjacent land might allow for the implementation of a setback levee. In the particular reach where the levee set-backs were considered, the San Joaquin River splits into two watercourses, at a prominent river bifurcation, as it flows towards the Delta area (Figure 11). The northern distributary continues as the eastern branch of the San Joaquin River, while the western distributary is referred to as the Old River. The RD 17 levees are constructed on the east (right) bank of the main and east branches of the San Joaquin River. The lands to the north of the San Joaquin River/Old River bifurcation are used for agriculture. In recent years a significant portion of the lands immediately southeast and southwest of the bifurcation have been converted from agricultural use to residential and commercial development.

<u>Setback Scenario 1</u>
Levee Setback Scenario 1 would remove a portion of the RD 17 levee located at a large bend in the river approximately between stations 685+00 and 610+00 and rebuild the levee so that the inboard area would become unprotected from flood flows. The setback levee would thus begin in the reach of the San Joaquin River upstream of the Old River bifurcation, and end downstream thereof.

<u>Setback Scenario 2</u>
Similar to Scenario 1, Scenario 2 would begin approximately at 685+00 but would continue through two river meanders approximately to station 590+00. Similar to Alternative 1, the set setback levee would thus begin in the reach of the San Joaquin River upstream of the Old River bifurcation, and end downstream thereof.

<u>Geomorphic Analysis:</u>
The geomorphic analysis of the setback levee scenarios included a review of surficial mapping by Atwater (1982), a previous study by William Lettis Associates (WLA, 2007), 1915 USGS topographic map for the Lathrop quadrangle and aerial photography flown between 1979 and 2003.

In the study area and to the north, the San Joaquin River splits into several distributary channels as it enters the Sacramento – San Joaquin Delta. Prior to levee construction in the late 1800’s the distributory channels flowed into and



BASE MAP SOURCE: USGS

ENGEO Expect Excellence

APPROXIMATE LOCATION OF SETBACK LEVEE ALTERNATIVES
SAN JOAQUIN LEVEE SETBACK STUDY
LATHROP, CALIFORNIA

PROJECT NO.: 5747.000.000		FIGURE NO. 1
DATE: FEBRUARY 2009		
DRAWN BY: PC	CHECKED BY: JJT	

G:\Drafting\DRAFTING2_Dwg\5747\000\Setback levee study\5747000000-1-LeveeAlternatives-0209.dwg 2-23-09 02:43:37 PM pcrockett

ORIGINAL FIGURE PRINTED IN COLOR

through tidal marshes. According to Atwater (1982) and WLA (2003), the modern San Joaquin River system flows along the western edge of older alluvial fan deposits. The modern river channels and floodplains are underlain by Holocene alluvium consisting of stream channel deposits (sands and silts) and overbank deposits (sands, silts and clays). The distribution of Holocene alluvium and the morphology of the river channels has been influenced over the last several thousand years by rising sea levels and tidal effects from the adjacent Delta

On the 1915 topographic map, the locations of the main channel of the San Joaquin River and the bifurcation to the Old River appear to be essentially the same as the modern condition. The locations of the levees on the 1915 map also appear to be essentially the same as the modern condition, although the original levees were widened and raised in the 1960's. Review of aerial photographs flown between 1979 and 2003 shows that the channel morphology and levee conditions have remained relatively stable over the last three decades. Modifications to the levee system during that time have included local maintenance of rip rap levee toe protection, repairs of local areas of sloughing and construction of seepage berms on the land side of the RD 17 levees at several locations.

Hydraulic Analysis

The purpose of the hydraulic analysis was to estimate the distribution of peak discharges at the Old River/San Joaquin River bifurcation and document changes that would occur to the river hydraulics downstream of the bifurcation if levee setback alternatives were constructed. To conduct the analysis effectively, two programs were used to model the fluvial hydraulics of the system. The first was the Hydrologic Engineering Center – River Analysis System (HEC-RAS) program developed by the Corps, and the second was the finite element analysis program Flo-2D. A 19 day, 100 year input hydrograph with a peak flow of 48,284 cfs at the upstream boundary of the setback alignment was used as the basis for the hydraulic analysis.

Results

Tables 3 and 4 below contain both the measured flow data and the calculated flow data, respectively. The downstream and upstream indicators refer to the reach location of the San Joaquin River relative to the Old River bifurcation.

Table 3: Empirical Peak Flow Rates (100-year recurrence interval hydrograph)

		Measured 100 Year Peak Flow Rates
Corps Data	Reach 26 (San Joaquin upstream)	48,284
	Reach 31 (Old River)	34,850
	Reach 30 (San Joaquin downstream)	12,051

Table 4: Calculated Peak Flow Rates (100-year recurrence interval hydrograph)

		MODELED PEAK FLOWS (cfs)		
		Existing Levee Conditions	Proposed Levee Conditions	
			SCENARIO 1	SCENARIO 2
Flo2D	Reach 26 (San Joaquin - upstream)	48,284	48,284	48,284
	Reach 31 (Old River)	35,208	31,751	31,857
	Reach 30 (San Joaquin - downstream)	12,969	16,546	16,441
HEC-RAS	Reach 26 (San Joaquin - upstream)	48,284	48,284	48,284
	Reach 31 (Old River)	33,047	30,231	31,280
	Reach 30 (San Joaquin downstream)	15,233	18,033	16,988

Conclusion:
Based on the results of the hydraulic modeling, it Scenarios 1 and 2 increase peak flows in the San Joaquin river channel downstream of the Old River bifurcation by approximately 3000 cubic feet per second. The results are summarized in the table below.

Table 5: Change in 100-year peak discharge per Scenario.

		Flow change (cfs) Implementation of Scenario 1	Flow change (cfs) Implementation of Scenario 2
Flo2D	Reach 31 (Old River)	-3,457	-3,351
	Reach 30 (San Joaquin – downstream)	3,577	3,472
HEC-RAS	Reach 31 (Old River)	-2,816	-1,767
	Reach 30 (San Joaquin downstream)	2,800	1,755

These increased peak flows would overwhelm the levee system downstream of the bifurcation therefore the set back levee alternatives studied are not considered feasible for implementation.

I. Economic Feasibility

EIP Guideline Criterion 5 - Economic Feasibility of Section I.1.c., requires the Applicant to demonstrate, with supporting documentation, that their proposed Projects are economically feasible. A Project is considered economically feasible when the present value of its total benefits exceeds the present value of the total costs over the life of the Project. RD 17 conducted an Economic Feasibility analysis of both the 100-Year Levee Seepage Area Project and also the 200-Year Area Plan. Both analyses concluded that the projects are economically feasible. The following is a summary of the analyses. A copy of the detailed analyses can be found in Appendix 11.

Study Area & Methodology
The area studied was RD 17 as described earlier. Within RD 17, development is located in the northern most portion of the study area and along the Interstate 5

10. Letter from USACE to USFWS, requesting initiation of formal consultation. March 3, 2017.

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

Environmental Resources Branch

Ms. Maria Rae, Assistant Regional Administrator
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

Dear Ms. Rae:

I am writing to continue informal consultation under Section 7 of the Endangered Species Act, for a combined Department of Army permit application and a Section 408 permission request for Phase 3 of the Reclamation District 17 (RD 17) Levee Seepage Repair Project. We are also requesting to consult with your agency under the Magnusson-Stevens Fishery Conservation and Management Act (MSA) for Pacific Coast Salmon (*Oncorhynchus* spp.) essential fish habitat (EFH). The project is proposed by RD 17, and is located along the San Joaquin River in RD 17 in San Joaquin County, California. A copy of the February 2017, "Phase 3 – RD 17 Levee Seepage Repair Project, Final Biological Assessment" (BA), prepared by GEI, is enclosed.

The Sacramento District (Corps) originally requested to informally consult in a letter dated March, 27, 2015. The National Marine Fisheries Service (NMFS) responded in a letter, dated July 7, 2015, and requested additional information (Appendix D-3). Our specific responses to each element of the information request are provided in Appendix D-4 of the enclosed biological assessment (BA). This information has also been incorporated into the main body of the BA, as appropriate. The BA also includes an updated description of the proposed action.

Based on the available information, we have determined that the action may affect, but is not likely to adversely affect, Federally listed Central Valley steelhead distinct population segment (DPS) (*Oncorhynchus mykiss*), Central Valley spring-run Chinook salmon ESU (*Oncorhynchus tshawytscha*), Sacramento River winter-run Chinook salmon ESU (*Oncorhynchus tshawytscha*) and the Southern DPS of North American green sturgeon (*Acipenser medirostris*). The proposed action will not result in destruction or adverse modification of designated critical habitat for any of these species and will not adversely affect designated Chinook salmon EFH. We request your written concurrence with our determinations. If new information becomes available indicating that other listed species or critical habitat may be affected, we will follow the procedures under 50 CFR 402.16, Reinitiation of Consultation.

The RD 17 Levee Seepage Repair Project is a program of levee repairs and improvements for 19 miles of levee along the San Joaquin River and Walthall Slough. This program is being implemented in three phases. The overall purpose of the program is to repair levee geometry to meet Federal and State levee standards, and to improve levee performance to better address under- and through-seepage. Most improvements are on, or landward of, the existing levee. The Phase 1 Project was completed in 2009. The Phase 2 Project was completed in summer 2010. The Phase 3 Project is the subject of this consultation.

To implement the Phase 3 Project, RD 17, through the Central Valley Flood Protection Board, is requesting permission from the U.S. Army Corps of Engineers pursuant to Section 14 of the Rivers and Harbors Act of 1899 (title 33 of the United States Code [USC], Section 408 [33 USC 408], referred to as Section 408, for alterations of Federal projects. RD 17 is also seeking a permit under Section 404 of the Clean Water Act (33 USC 1344) for placement of fill into jurisdictional waters of the United States.

The following information is provided to your office to initiate consultation:

A description of the action to be considered: The proposed levee modifications would involve: (1) installing approximately 3.3 miles of soil and bentonite cutoff walls; (2) constructing 0.64 miles of seepage berms; (3) constructing a 1,240 foot-long setback levee to restore at least 4.52 acres of floodplain; and (4) filling 0.77 acres of Waters of the United States, including wetlands, and other associated upland fill. A more detailed description of the proposed action is provided in Table 2 ("Summary of Major Activities Proposed for Each Element; Preferred Alternative") of the Enclosed BA. This work would eliminate or reduce levee deficiencies, including through- and under-seepage, slope stability, erosion and encroachments, within the construction footprint.

Details of RD 17's preferred alternative are provided in the enclosed BA and accompanying CD. The CD contains the 65 percent engineering designs plans for the preferred alternative. RD 17 proposes to construct the project over two construction seasons.

A description of the specific area that may be affected by the action: The work proposed as part of the Phase 3 Project would involve modifying approximately 5.3 miles of the Federal levee on the east bank of the San Joaquin River to reduce the potential for flooding, flood damage, and public risk in RD 17. Exhibit 2 of the enclosed BA shows the location of the proposed Phase 3 work. It also depicts levee work completed as part of the earlier Phase 1 and Phase 2 projects. Site specific details are shown in the enclosed BA in Exhibits 4a through 4c, and 13a through 13c.

A description of any listed species or critical habitat that may be affected by the action: We have determined that the proposed action may affect, but is not likely to adversely affect, Central Valley steelhead DPS, Central Valley spring-run Chinook salmon ESU, and the Southern DPS of North American green sturgeon.

A description of the manner in which the action may affect any listed species or critical habitat and analysis of any cumulative impacts: The Phase 3 Project would involve constructing several cutoff walls, which would entail degrading the top one-third to one-half of the levee. The degrade would begin at the waterside edge of the levee crown and would be accomplished without disturbing the waterside levee face. Exhibit 8 in the enclosed BA shows this measure. Implementing cutoff walls as part of the Phase 3 Project would disturb soils along the top of the levee which, through wind and water erosion, could enter the San Joaquin River. Soil disturbed during construction of seepage berms and other features on the landside of the levee could enter drainage ditches and ultimately be pumped into the San

Joaquin River. Therefore, erosion could temporarily increase turbidity and sedimentation in nearby waterways if soils are transported in river flows or stormwater runoff. Through the implementation of water quality best management practices, including a Stormwater Pollution Prevention Plan, the proposed conservation measures (see pages 30 and 31 of the enclosed BA), would avoid direct and indirect take of fish during construction.

A setback levee would be constructed along one segment and the existing project levee would be modified to allow high water to flow onto the floodplain between the existing levee and the new setback levee. Fish and other aquatic organisms would likely flow onto the floodplain. The offset area would be contoured to drain back into the San Joaquin River as the water recedes in a manner that would avoid trapping fish landward of the existing levee. This is described in greater detail on page 23 of the enclosed BA.

Relevant reports including any environmental impact statement, environmental assessment, or biological assessment prepared: A copy of the February 2017, "Phase 3 – RD 17 Levee Seepage Repair Project, Final Biological Assessment" (BA), prepared by GEI, is enclosed.

Any other relevant available information on the action, the listed species, or critical habitat: See the enclosed BA.

This constitutes the best scientific and commercial data available. If you need additional information, or determine that conditioning the permit and letter of permission or modifying the project would preclude the need for formal consultation, please contact us immediately.

A copy of this letter, with the enclosure, will be furnished to Mr. Howard Brown, National Marine Fisheries Service, 650 Capitol Mall, Suite 5-100, Sacramento, California 95814-4700. Copies of the letter will also be furnished: to Dr. Steve Schoenberg, U.S. Fish and Wildlife Service, 2800 Cottage Way, Suite W-2605, Sacramento, CA 95825-1846; Mr. Dante Nomellini, c/o Nomellini, Grilli & McDaniel, P.O. Box 1416, Stockton, CA 95201; Mr. Henry Long, President, Reclamation District No. 17, P.O. Box 1461, Stockton, CA 95201; and Dr. Andrea Shephard, GEI Consulting, Inc. 2868 Prospect Park Drive, Suite 400, Rancho Cordova, CA 95670.

If you have any questions, please contact Ms. Tanis Toland, Environmental Manager, at (916) 557-6717 or by email at Tanis.J.Toland@usace.army.mil.

Sincerely,

Mark T. Ziminske
Chief, Environmental Resources Branch

Enclosure

11. September 2017 Biological Assessment.

Final Biological Assessment

Phase 3–RD 17 Levee Seepage Repair Project, Including 2017 Emergency Response Construction

Prepared for:

Reclamation District (RD) No. 17

For submittal to:

U.S. Army Corps of Engineers

US Army Corps of Engineers ®
Sacramento District

Prepared by:

GEI Consultants

in association with

AECOM

As modified by USACE

September 2017

Final Biological Assessment

Phase 3–RD 17 Levee Seepage Repair Project,
Including 2017 Emergency Response Construction

Prepared for:

Reclamation District (RD) No. 17
c/o Nomellini, Grilli & McDaniel
235 E. Weber Avenue
Stockton, CA 95202

Attn: Dante John Nomellini, Sr.
Secretary and Counsel for RD 17
209/465-5883

For submittal to:

U.S. Army Corps of Engineers
CESPK-PD
1325 J Street
Sacramento, CA 95814

Attn: Tanis Toland
916/557-6717

Prepared by:

GEI Consultants, Inc.
2868 Prospect Park Drive, Suite 400
Rancho Cordova, CA 95670

Contact:

Kelly A. Fitzgerald-Holland
Senior Wildlife Biologist
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GEI Consultants

in association with

AECOM

As Modified by USACE

September 2017

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Appendix H – July 10, 2017, Construction Monitoring Report for Reclamation District 17's 2017 Emergency Response Construction Project

ACRONYMS AND OTHER ABBREVIATIONS

BA	Biological Assessment
Bay-Delta	San Francisco Bay/Sacramento–San Joaquin Delta
BMP	Best Management Practice
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CVFPB	Central Valley Flood Protection Board
CVP	Central Valley Project
DEIS/DEIR	Draft Environmental Impact Statement/Draft Environmental Impact Report
Delta	Sacramento–San Joaquin Delta
DPS	distinct population segment
DWR	California Department of Water Resources
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	evolutionary significant unit
ETL	Engineering Technical Letter
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FR	Federal Register
HTL	high tide line
LSRP	Levee Seepage Repair Project
MAF	million acre-feet
MMP	Mitigation and Monitoring Plan for the Riparian Brush Rabbit
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
PAL	provisional accredited levee
Phase 3 Repair Project	Phase 3 of the Reclamation District No. 17 Levee Seepage Repair Project
PL	Public Law
RD 17	Reclamation District No. 17
RWQCB	Regional Water Quality Control Board
Section 404	Section 404 of the Clean Water Act (33 USC 1344)
Section 408	Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408)
Settlement	Stipulation of Settlement in *NRDC et al. v. Kirk Rodgers et al*.
SJMSCP	San Joaquin Multi-Species Habitat Conservation and Open Space Plan
SJRRP	San Joaquin River Restoration Program
SRA	shaded riverine aquatic
SWP	State Water Project
SWPPP	storm water pollution prevention plan
SWRCB	State Water Resources Control Board
TMDL	total maximum daily load
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
VELB	valley elderberry longhorn beetle
VELB Guidelines	Conservation Guidelines for the Valley Elderberry Longhorn Beetle

INTRODUCTION

The purpose of this Biological Assessment (BA) is to review Phase 3 of the Reclamation District No. 17 (RD 17) Levee Seepage Repair Project (LSRP) (Phase 3 Repair Project), including the components of the 2017 Emergency Response Construction Project (collectively "the proposed action"), in sufficient detail to determine the extent to which the proposed action may affect any of the federally listed species described below under "Species Considered." (See "Project Background and History" below for a brief summary of Phase 1 and Phase 2.)

RD 17, which is located in south-central San Joaquin County, California (**Exhibit 1**; see **Appendix A** for all exhibits), is responsible for maintaining 19 miles of levees along Walthall Slough, the San Joaquin River, and French Camp Slough, as well as the dryland levee along the southern boundary of Manteca. For discussion purposes, the RD 17 levees have been divided into 11 distinct "reaches," identified by Roman numerals (i.e., I, II, III…, XI), and subdivided further into 28 "elements," identified by the reach number followed by a lowercase letter and, where needed to further distinguish elements, an Arabic numeral (e.g., Ia, IIa, IIb, …, Va, VIa.1, VIa.2, VIa.4, …, VIe, VIIa, VIIb, …, VIIg…,XIa) (**Exhibit 2**).

This BA does not address the dryland levee (Reaches VIII – XI) because it is not a USACE flood risk management project, and therefore is not subject to Section 408 authorization. The dryland levee is an overland earthen berm, north and east of the San Joaquin River. Under almost all conditions, water does not come in contact with the dryland levee. It only functions as a flood risk management feature if water from the San Joaquin River or Walthall Slough leaves the banks of these waterways and inundates lands north and east, toward Manteca. The dryland levee then acts as an elevated earthen feature that prevents these flood waters from moving farther north. Suitable habitat for federally listed species does not occur along the dryland levee.

This BA has been prepared in accordance with requirements set forth under Section 7 of the federal Endangered Species Act (ESA) (16 United States Code [USC] 1536[c]). It supports formal consultation with the U.S. Fish and Wildlife Service (USFWS) and informal consultation with the National Marine Fisheries Service (NMFS) on the effects of the Phase 3 Repair Project on federally listed species and designated critical habitat. This BA also supports consultation with NMFS for project effects on Pacific Coast Salmon (*Oncorhynchus* spp.) essential fish habitat (EFH), as required by the Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 USC 1801). (See the "Essential Fish Habitat Assessment" section below.)

Section 7(a)(2) of the ESA directs federal agencies to ensure that their activities are not likely to jeopardize the continued existence of any listed species, or to result in the destruction or adverse modification of critical habitat. This section of the ESA also requires agencies with regulatory authority over listed species to issue biological opinions evaluating the direct and indirect effects of federal actions, and actions that are interrelated or interdependent with the federal action. The biological opinions must determine whether the actions being evaluated may appreciably reduce the listed species' likelihood of surviving or recovering in the wild by reducing their productivity, numbers, or distribution.

To implement the Phase 3 Repair Project, RD 17 is requesting permission from the U.S. Army Corps of Engineers (USACE) for:

- alteration of federal project levees, pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408, referred to in this BA as "Section 408"); and
- placement of fill in jurisdictional waters of the United States, pursuant to Section 404 of the Clean Water Act (33 USC 1344, referred to in this BA as "Section 404").

All Phase 3 Repair Project work occurring on the water side of the levee would be above the high tide line (HTL). Therefore, no additional authorizations under Section 10 of the Rivers and Harbors Act of 1899 are required.

On April 6, 2017, the USACE authorized (SPK-2009-001466) the discharge of fill into waters of the United States at elements Ib, Ie, and IVa, under Regional General Permit No. 8 (Emergency Actions). The 2017 Emergency Response Construction Project was implemented in elements Ia, Ib, Ie, IIIb, IVa, Va, VIa.1, VIcde, and VIIb in February 2017. The majority of the 2017 Emergency Response Construction Project actions were already planned under the Phase 3 Repair Project; however, one component (i.e., a seepage berm) within elements Va and VIa.1 was not part of the actions planned specifically within these elements.

These 2017 Emergency Response Construction Project and the Phase 3 Repair Project activities are described in more detail under "Description of the Proposed Action." This BA analyzes direct, indirect, interrelated/ interdependent, and cumulative effects of the proposed action on federally listed species.

SPECIES CONSIDERED

This document considers species that have been termed “threatened” or “endangered” under the jurisdiction of USFWS and NMFS. On February 27, 2014, biologists consulted the online database maintained by USFWS’s Sacramento Office to conduct a query of the Lathrop (462D) and West Sacramento (462A) 7.5-minute quadrangles (USFWS 2014) (**Appendix B**). Another query of the USFWS database was conducted on April 18, 2016 (USFWS 2016) (**Appendix B**), and the information in this BA was updated, based on those results. Using the California Department of Fish and Wildlife’s (CDFW’s) California Natural Diversity Database (CNDDB) (CDFW 2014) and the California Native Plant Society’s database of rare and endangered plant species (CNPS 2014), biologists also conducted a query of the topographic quadrangles in which the action area occurs (Lathrop and Stockton West) and the surrounding quadrangles; these database queries were conducted on February 27, 2014, and March 3, 2014, respectively (**Appendix B**). This query identified all listed species in the area surrounding the action area, which is defined here in accordance with ESA guidelines as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action” (50 Code of Federal Regulations [CFR] 402.02).

Based on these database queries and the biologists’ familiarity with local flora and fauna, 21 plant and wildlife species that are federally listed as endangered or threatened, or are federally proposed for listing were considered as part of this BA (**Table 1**).

The following federally proposed and federally listed species are known to occur or have the potential to occur in the Phase 3 Repair Project area (USFWS 2014, 2016):

- valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*),
- riparian brush rabbit (*Sylvilagus bachmani riparius*),
- delta smelt (*Hypomesus transpacificus*),
- Central Valley steelhead distinct population segment (DPS) (*Oncorhynchus mykiss*),
- longfin smelt (*Spirinchus thaleichthys*),
- Sacramento River winter-run Chinook salmon evolutionarily significant unit (ESU) (*O. tshawytscha*),
- Central Valley spring-run Chinook salmon ESU (*O. tshawytscha*), and
- the Southern DPS of North American green sturgeon (*Acipenser medirostris*).

The other federally listed species shown in Table 1 were eliminated from further consideration; they are not likely to occur in the Phase 3 Repair Project area because of a lack of suitable habitat, local range restrictions, regional extirpations, or lack of connectivity between areas of suitable or occupied habitat, or because the action area is located outside the extant range of the species (see “Action Area” section below). The USFWS and NMFS-regulated species with the potential to occur on-site are discussed in more detail in this BA.

Table 1 Fish and Wildlife Species, Federally Listed or Proposed for Listing, Considered in Evaluation of the Phase 3 Repair Project			
Species	**Status**	**Habitat**	**Potential to Occur in the Lower San Joaquin River[1]**
Plants			
Large-flowered fiddleneck *Amsinckia grandiflora*	Endangered[2] SJMSCP-covered[4]	Annual herb with bright orange, trumpet-shaped flowers that bloom in late spring. Historically found on north-facing slopes in the upper elevations of grasslands near the blue oak belt in Contra Costa, Alameda, and San Joaquin counties.	No potential to occur. No suitable habitat is present in the action area.[3]
Palmate-bracted bird's-beak *Cordylanthus palmatus*	Endangered[2]	Annual herb that blooms from late spring through summer. Grows on seasonally flooded, saline-alkali soils in lowland plains and basins at elevations of less than 500 feet. Known from scattered locations in Sacramento and San Joaquin valleys; however, unlikely to occur in San Joaquin County because of lack of alkali habitat.	No potential to occur. No suitable habitat is present in the action area.[3]
Invertebrates			
Conservancy fairy shrimp *Branchinecta conservatio*	Endangered SJMSCP-covered[4]	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present in the action area.[3]
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	Threatened SJMSCP-covered[4]	Inhabits elderberry shrubs, primarily in riparian woodland and scrub habitat.	Could occur; elderberry shrubs present occasionally along the San Joaquin River on the waterside and landside of the Phase 3 Repair Project levee; however, no evidence of beetle exit holes was observed in these shrubs.
Vernal pool fairy shrimp *Branchinecta lynchii*	Threatened SJMSCP-covered[4]	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present in the action area.[3]
Vernal pool tadpole shrimp *Lepidurus packardi*	Endangered SJMSCP-covered[4]	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present in the action area.[3]
Fish			
Central Valley steelhead *Oncorhynchus mykiss*	Threatened	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.	Likely to occur. Occurs in the Sacramento and San Joaquin rivers, tributaries, and the Delta. Occurs seasonally in the San Joaquin River in the action area[3]; no spawning habitat is in the action area. Designated critical habitat is in the action area.
Central Valley fall/late fall–run Chinook salmon *Oncorhynchus tshawytscha*	Species of Concern[2]	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.	Likely to occur. Occurs in the Sacramento and San Joaquin rivers, tributaries, and the Delta. Occurs seasonally in the San Joaquin River in the action area[3]; no spawning habitat is in the action area. Essential fish habitat for this species is in the Phase 3 Repair Project area.

Table 1 Fish and Wildlife Species, Federally Listed or Proposed for Listing, Considered in Evaluation of the Phase 3 Repair Project			
Species	**Status**	**Habitat**	**Potential to Occur in the Lower San Joaquin River[1]**
Delta smelt *Hypomesus transpacificus*	Threatened[2] SJMSCP-covered[4, 5]	Spawns in tidally influenced freshwater wetlands and seasonally submerged uplands; rears seasonally in inundated floodplains, tidal marsh, and the Delta.	Could occur. Occurs in tidally influenced segments of the Sacramento and San Joaquin rivers, tributaries, and Delta. Although no spawning habitat is in the action area, delta smelt has potential to occur in the San Joaquin River in the action area.[3] Designated critical habitat is in the action area.
Longfin smelt *Spirinchus thaleichthys*	Candidate/ Proposed Threatened[2] SJMSCP-covered[4, 5]	Pelagic estuarine. Ranges from the Delta in California northward to the Cook Inlet in Alaska.	Could occur. Occurs in tidally influenced segments of the Sacramento and San Joaquin rivers, tributaries, and the Delta. Although no spawning habitat is in the action area, longfin smelt has potential to occur in the San Joaquin River in the action area.[3]
Sacramento River winter-run Chinook salmon *Oncorhynchus tshawytscha*	Endangered[2]	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.[5]	Could occur, but unlikely. Occurs in the Sacramento River, tributaries, and the Delta. No spawning habitat is in the action area. Unlikely to occur in the San Joaquin River in the action area[3]; however, occasional adult and/or juvenile strays may be present.
Central Valley spring-run Chinook salmon *Oncorhynchus tshawytscha*	Threatened[2]	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.	Could occur, but unlikely. Occurs in the Sacramento River, tributaries, and the Delta. Currently unlikely to occur in the San Joaquin River in the action area[3]; no spawning habitat is in the action area. However, occasional adult and/or juvenile strays may be present. The SJRPP[6] includes the reintroduction of this species (an experimental population) to the San Joaquin River.
Green sturgeon *Acipenser medirostris*	Threatened SJMSCP-covered[4, 5]	Requires seasonally inundated floodplains, rivers, tributaries, and the Delta.[5]	Could occur. Occurs in the Sacramento and San Joaquin rivers, tributaries, and the Delta. Has potential to occur in the San Joaquin River in the action area.[3] Designated critical habitat is in the action area.
Amphibians and Reptiles			
California red-legged frog *Rana draytonii (=R. aurora draytonii)*	Threatened SJMSCP-covered[4]	Prefers semi-permanent and permanent stream pools, ponds, and creeks with emergent riparian vegetation and typically without predatory fish. Requires adequate hibernacula, such as small-mammal burrows and moist leaf litter.	No potential to occur. Potential aquatic habitat in the Phase 3 Repair Project area is limited to one constructed pond, likely with predatory fish, but the action area is outside the species' extant range.

Table 1 Fish and Wildlife Species, Federally Listed or Proposed for Listing, Considered in Evaluation of the Phase 3 Repair Project			
Species	**Status**	**Habitat**	**Potential to Occur in the Lower San Joaquin River[1]**
California tiger salamander *Ambystoma californiense*	Threatened[2] SJMSCP-covered[4]	In winter, breeds in vernal pools and stock ponds that are fish-free and inundated for a minimum of 12 weeks. In summer, aestivates in rodent borrows in grassland habitat.	Unlikely to occur. Potential aquatic habitat in the Phase 3 Repair Project area is limited to one constructed pond, likely with predatory fish; a small area of freshwater marsh in element Ib[7]; and agricultural ditches. Much of the action area consists of urban and agricultural land that is not suitable as potential upland habitat. A 1996 CNDDB record documents California tiger salamander adjacent to State Route 120 in roadside seasonal wetland; however, it is approximately 2 miles east of the San Joaquin River and geographically isolated.
Giant garter snake *Thamnophis gigas*	Threatened[2] SJMSCP-covered[4]	Streams, sloughs, ponds, and irrigation/drainage ditches; also requires upland refugia not subject to flooding during the snake's inactive season.	Unlikely to occur. Although potential habitat for this species is present in the Phase 3 Repair Project area, none of it is suitable. The only documented occurrences of giant garter snake are separated from the Phase 3 Repair Project area by extensive urbanized development (City of Stockton) and large rivers that do not provide suitable habitat and are a greater distance than the species is known to disperse. For additional information that summarizes the rationale that supports the "unlikely to occur" determination for this species in the Phase 3 Repair Project area, refer to **Appendix C** in this document.
Birds			
Least Bell's vireo *Vireo bellii pusillus*	Endangered[2]	Nests in riparian habitat adjacent to riverine and freshwater marsh.	Unlikely to occur. Although suitable habitat is present, the last recorded observation of this species in the action area was in 1878, with no extant occurrences.
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	Threatened SJMSCP-covered[4]	Insect-feeder that forages in dense riparian oak forest canopy along major rivers. Species is considered extirpated from San Joaquin County.	No potential to occur. Although potential dispersal and foraging habitat is in the Phase 3 Repair Project area, the action area is outside the species' extant range.
Mammals			
San Joaquin kit fox *Vulpes macrotis mutica*	Endangered SJMSCP-covered[4]	Annual grassland or grassy open stages with scattered shrubby vegetation; needs loose-textured sandy soils for burrowing, and suitable prey base.	No potential to occur. Although potential dispersal and foraging habitat is in the Phase 3 Repair Project area, the action area is outside the species' extant range.
Riparian brush rabbit *Sylvilagus bachmani riparius*	Endangered[2] SJMSCP-covered[4, 5]	Inhabits riparian oak forest with dense understory of wild roses, grapes, and blackberries; small home ranges, seldom moving more than a few feet from cover, avoiding large openings in shrub cover and frequenting small clearings.	Known to occur. Occupied riparian habitat is present on the waterside of elements IIIa and IIIb, and suitable habitat is present immediately adjacent to the project area in several elements; the species also is known to occur on an oxbow between elements VIa.1 and VIa.4[7] and in waterside habitat between elements IIab and IIIa.

Table 1 Fish and Wildlife Species, Federally Listed or Proposed for Listing, Considered in Evaluation of the Phase 3 Repair Project			
Species	**Status**	**Habitat**	**Potential to Occur in the Lower San Joaquin River**[1]
Riparian (=San Joaquin Valley) woodrat *Neotoma fuscipes riparia*	Endangered SJMSCP-covered[4]	Requires healthy riparian forests, where it nests in cavities in trees, snags, or logs, spaces in talus, or lodges built of downed woody materials. Known to exist in and immediately adjacent to Caswell Memorial State Park, along the Stanislaus River in San Joaquin County.	No potential to occur. The action area is outside the species' extant range.

Notes: CNDDB = California Natural Diversity Database; Delta = Sacramento–San Joaquin Delta; Phase 3 Repair Project = Phase 3 of the proposed Reclamation District No. 17 Levee Seepage Repair Project; SJMSCP = San Joaquin Multi-Species Habitat Conservation and Open Space Plan; SJRRP = San Joaquin River Restoration Program

1 **Potential for Occurrence Definitions:**

No potential to occur; Suitable habitat is not present in the Phase 3 Repair Project area and/or the Phase 3 Repair Project area is not within the historical or current range of the species.

Unlikely to occur: Potential habitat present, but species unlikely to be present in the Phase 3 Repair Project area because of current status of the species, a very restricted distribution, and/or essential habitat components are not present.

Could occur: Suitable habitat is available in the Phase 3 Repair Project area; however, few or no other indicators show that the species may be present.

Likely to occur: Habitat conditions, behavior of the species, known occurrences in the Phase 3 Repair Project area, or other factors indicate a relatively high likelihood that the species would occur in the Phase 3 Repair Project area.

Known to occur: The species, or evidence of its presence, was observed in the Phase 3 Repair Project area during reconnaissance-level surveys or was reported by others.

2 These species have a similar status listing under the California Endangered Species Act, except for delta smelt and western yellow-billed cuckoo, which are both State-listed as endangered, and longfin smelt and San Joaquin kit fox, which are both State-listed as threatened.

3 Action Area: The action area is defined here in accordance with ESA guidelines as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). The action area includes all areas that would be directly or indirectly affected by the components of the Phase 3 Repair Project. Areas downstream from the Phase 3 Repair Project area may also be indirectly affected by the flood risk management component of the project through improved water quality and flood risk management conditions.

4 SJMSCP-covered: These species are covered under the SJMSCP (San Joaquin County 2000).

5 SJMSCP-covered with limitations: The SJMSCP does not cover the conversion of occupied riparian brush rabbit habitat, limits the amount of delta smelt habitat, and does not authorize take of green sturgeon.

6 See "San Joaquin River" subsection under "Environmental Baseline" section below, for more information.

7 Elements: The RD 17 levees have been divided into seven distinct "reaches" identified by Roman numerals (i.e., I, II, III), and subdivided further into 19 "elements," identified by the reach number followed by a lowercase letter and, in some cases, an Arabic numeral (e.g., Ia, IIa, Va, VIa.1…); see **Exhibit 2**.

Sources: CDFW 2014; CNPS 2014; USFWS 2014, 2016; data compiled by AECOM in 2014 and updated by GEI Consultants in 2016

SPECIES HABITAT AND POTENTIAL FOR OCCURRENCE IN THE AREA

The following is a summary of relevant habitat conditions in the action area for species that could occur, are likely to occur, or are known to occur in the Phase 3 Repair Project area. Full species accounts for federally listed species addressed in this BA are presented in the "Species Accounts" section.

- **Valley elderberry longhorn beetle:** Elderberry shrubs provide habitat for VELB. Elderberry shrubs are known to occur along the San Joaquin River, on both the waterside and landside of levees in the Phase 3 Repair Project area. Focused surveys for elderberry shrubs were conducted along all levee reaches on March 8, 2011; the area was resurveyed on January 29, 2014. A total of 18 elderberry shrubs were observed within 100 feet of the Phase 3 Repair Project area: nine shrubs on the waterside of the levee and nine shrubs on the landside. None of the shrubs had evidence of beetle exit holes. One of the landside shrubs does not have stems greater than 1 inch in diameter at ground level; therefore, it is not considered suitable VELB habitat.

- **Riparian brush rabbit:** Trapping conducted in February 2003 and February 2004 detected occurrences of riparian brush rabbit near the Phase 3 Repair Project area in waterside riparian habitat adjacent to elements IIIa and IIIb, between elements IIab and IIIa, and between elements VIa.1 and VIa.4 (CDFW 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004). The waterside habitat along elements IIIa and IIIb is dominated by willow within interspersed California blackberry and grasses. The trapping locations between elements IIab and IIIa are dominated by willows, cottonwoods, valley oaks, wild rose, and California and Himalayan blackberry. The trapping locations between elements VIa.1 and VIa.4 are on an oxbow with dense riparian vegetation. Similar riparian habitat is present adjacent to the waterside of elements IIab, IVc, and Va. North of element IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, or isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species.

- **Delta smelt:** Delta smelt are found from Suisun Bay upstream through the Sacramento–San Joaquin Delta (Delta). Delta smelt disperse widely into freshwater in late fall and winter as the spawning period approaches, and may move as far upstream as Mossdale on the San Joaquin River (Bennett 2005). Therefore, this species has the potential to occur in the Phase 3 Repair Project area.

- **Longfin smelt:** Longfin smelt occur in the Delta and tidally influenced segments of the Sacramento and San Joaquin rivers. The occurrence of longfin smelt in the San Joaquin River is rare, but it does occur on occasion when river salinity extends farther upstream, either because of Delta pumping or because of drought. Therefore, this species has the potential to occur in the Phase 3 Repair Project area.

- **Anadromous salmonids:** The action area (see "Action Area" section below) does not provide suitable spawning habitat for salmonids because it lacks the cold freshwater and gravel substrate characteristic of salmonid spawning areas in upper river basins. However, adult and juvenile Central Valley fall-run Chinook salmon and Central Valley steelhead could occur in the action area during migrations along the San Joaquin River and its tributaries. Winter-run and spring-run Chinook salmon are known to occur only in the Sacramento River and its tributaries (Moyle 2002). Because the action area is along the San Joaquin River, several miles upstream from its confluence with the Sacramento River, adult migrants along the Sacramento River are not expected to move into the action area. However, with implementation of the San Joaquin River Restoration Project (SJRRP) (see "San Joaquin River" subsection under "Environmental Baseline" below), an experimental population of spring-run Chinook salmon are being reintroduced to the San Joaquin River, initiated in 2014, to achieve one of the goals of the SJRRP, which is "to restore and maintain fish populations in 'good condition' in the mainstem San Joaquin River…including naturally reproducing and self-sustaining populations of salmon and other fish" (NMFS 2013).

- **Green sturgeon:** Green sturgeon is known to occur in the San Joaquin River and Delta, and therefore, has the potential to occur in the lower San Joaquin River in the Phase 3 Repair Project area (Moyle 2002). Currently, green sturgeon spawning in the San Joaquin River is not documented.

CRITICAL HABITAT

"Critical habitat" is defined in Section 3(5)A of the ESA as the specific areas in the geographical area occupied by the species where physical or biological features are found that are essential to the conservation of the species and that may require special management considerations or protection. Specific areas outside the geographical area occupied by the species also may be included in critical-habitat designations, based on a determination that such areas are essential for conservation of the species.

The proposed action addressed in this BA would fall within designated critical habitat for delta smelt, which was designated on December 19, 1994 (59 Federal Register [FR] 65256). Critical habitat is designated to include most tidally influenced areas of the Delta.

The proposed action addressed in this BA would fall within designated critical habitat for the Central Valley steelhead DPS. Critical habitat for the Central Valley steelhead DPS was designated on August 12, 2005; a final designation was published on September 2, 2005 (70 FR 52604), with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include select waters in the Sacramento and San Joaquin river basins, including the segment of the San Joaquin River in the action area (see "Action Area" section below).

The proposed action addressed in this BA would fall within designated critical habitat for the Southern DPS of North American green sturgeon. Critical habitat for green sturgeon was designated on October 9, 2009 (74 FR 52300). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins, including the segment of the San Joaquin River in the action area.

The action area is not within designated critical habitat for the remaining species listed in **Table 1,** for which such a designation has been made: large-flowered fiddleneck, Conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, VELB, Sacramento River winter-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU, California red-legged frog, California tiger salamander, and least Bell's vireo. Critical habitat has not been designated for palmate-bracted bird's-beak, longfin smelt, Central Valley fall/late fall–run Chinook salmon ESU, giant garter snake, western yellow-billed cuckoo, San Joaquin kit fox, riparian brush rabbit, or riparian woodrat.

SAN JOAQUIN MULTI-SPECIES CONSERVATION PLAN

All of the above species, except the anadromous salmonid fish species, are covered on some level under the San Joaquin Multi-Species Habitat Conservation and Open Space Plan (SJMSCP) (San Joaquin County 2000). The SJMSCP was developed to avoid, minimize, and mitigate impacts on plant and wildlife habitat projected to occur in San Joaquin County between 2001 and 2051, resulting from the anticipated conversion of open space land to non–open space uses. Ninety-seven species are covered by the SJMSCP. The plan is intended to provide comprehensive mitigation, in accordance with local, State, and federal regulations, for impacts of SJMSCP-permitted activities on these species. USFWS and CDFW participated in development of the SJMSCP, approved the mitigation, and agreed to issue incidental take permits for species and activities covered by the SJMSCP.

The geographic area covered in the SJMSCP extends up to the landside levee crown of the San Joaquin River levee and includes the Phase 3 Repair Project area. However, the SJMSCP does not cover federal flood risk management projects or activities that involve tidally jurisdictional wetlands or other waters of the United States, and thus the Phase 3 Repair Project would not be a covered activity under the SJMSCP. The SJMSCP outlines a mechanism by which a federal flood risk management project, such as the Phase 3 Repair Project, could obtain take coverage under the SJMSCP (see Section 8.2.3 of the SJMSCP). However, because the SJMSCP does not cover special-status fish, the conversion of riparian brush rabbit habitat, or impacts on other species on the waterside of the levee, RD 17 and USACE would not rely on the SJMSCP to assess and offset Phase 3 Repair Project effects on federally listed and State-listed species. Rather, through this BA and the associated Section 7 consultations with USFWS and NMFS, RD 17 and USACE would seek take authorization for Phase 3 Repair Project activities. Species listed under the California Endangered Species Act that also are covered species under the SJMSCP would be evaluated through coordination with CDFW.

CONSULTATION TO DATE

The list below summarizes correspondence, meetings, and discussions between regulatory agencies, RD 17, and consultants that relate to potential effects of the Phase 3 Repair Project on species addressed in this document. The most recent consultation is listed first.

4/6/2017 Authorization from USACE issued to RD 17 for discharge of fill into waters of the United States for the 2017 Emergency Response Construction Project (SPK-2009-001466) under Regional General Permit No. 8 (Emergency Actions).

4/18/2016 Letter from USFWS to GEI Consultants regarding the Species List for Phase 3–RD 17 Levee Seepage Repair Project (**Appendix B**)

10/2/2015 Letter from USFWS to USACE requesting additional information on the RD 17 Phase 3 Repair Project BA (**Appendix D-5**). A letter response to comments was completed by GEI Consultants and AECOM, on behalf of RD 17 (**Appendix D-6**).

7/7/2015 Letter from NMFS to USACE requesting additional information on the RD 17 Phase 3 Repair Project BA (**Appendix D-3**). A letter response to comments was completed by GEI Consultants and AECOM, on behalf of RD 17 (**Appendix D-4**).

2/27/15 Letter from USACE to NMFS transmitting the BA and requesting informal consultation.

2/27/15 Letter from USACE to USFWS transmitting the BA and requesting to initiate formal Section 7 consultation.

2/27/14 Letter from USFWS to AECOM regarding the Species List for RD 17 100-Year Levee Seepage Area Project[1] (**Appendix B**)

3/1/11 Tour of proposed action area with representatives from AECOM, USACE, USFWS, NMFS, and CDFW.

1/24/11 Meeting with representatives of USFWS and AECOM to discuss project permitting coordination, potential effects of the project on federally listed species, and development of a conservation strategy.

12/9/10 Meeting with representatives of CDFW and AECOM to discuss project permitting coordination, the potential effects of the project on State-listed species, use of the SJMSCP, and development of a conservation strategy.

8/24/10 Meeting with representatives of USACE, USFWS, NMFS, and AECOM to discuss the potential effects of the project on listed species and development of a conservation strategy.

6/11/10 Letter from NMFS to AECOM, responding to May 14, 2010, letter requesting technical assistance (**Appendix D-2**).

5/14/10 Letter from AECOM, prepared on behalf of RD 17, to USFWS and NMFS requesting informal technical assistance in evaluating the potential effects on listed species that could result from implementing USACE vegetation management standards, and in developing a conservation strategy to adequately offset the potential loss of habitat. Copies of the wetland delineation report and maps were provided with the letter (**Appendix D-1**).

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1 "RD 17 100-Year Levee Seepage Area Project" is a reference to the RD 17 Levee Seepage Repair Project. This former name was used in documents published before preparation of the Final Environmental Impact Statement for Phase 3 of the RD 17 Levee Seepage Repair Project.

DESCRIPTION OF THE PROPOSED ACTION

U.S. ARMY CORPS OF ENGINEERS ACTION

RD 17, in cooperation with the California Department of Water Resources (DWR) and the Central Valley Flood Protection Board (CVFPB), is the local project sponsor for the Phase 3 Repair Project. RD 17 has requested permission from the CVFPB and USACE to alter segments of the San Joaquin River Levee System, which is a federal project levee. The proposed action for USACE is to make a permit decision on the Phase 3 Repair Project under the authority of Clean Water Act Section 404 and a permission decision under Section 408 of Title 33 USC. Under Section 408, USACE may allow the permanent use or occupancy of a USACE flood risk management project with approval by the Secretary of the Army on recommendation of the Chief of Engineers, provided that such use or occupancy would not be injurious to the public interest. USACE has determined that a Section 408 decision would be required for repair of seepage deficiencies to federal project levees. The activities requiring Section 408 and/or 404 authorizations, described in more detail below, include proposed alterations/repairs to USACE flood risk management facilities and fill of jurisdictional waters during earth-moving activities for levee construction. Activities for the Phase 3 Repair Project would be processed through an encroachment permit with the CVFPB. USACE would conduct a technical engineering review as part of the evaluation of the CVFPB's request to modify the Federal flood risk management project, in accordance with USACE regulations under 33 CFR 408.

PROJECT LOCATION

RD 17 is located in south-central San Joaquin County, California, in the center of the California Central Valley, at the north end of the San Joaquin River Basin, and within the far southeast limit of the Delta (see **Exhibit 1**). The boundaries of RD 17 are marked by French Camp Slough on the north, approximately 3 miles southwest of the central business district of the city of Stockton; the San Joaquin River on the west; Walthall Slough on the south (just below State Route 120); and Airport Way/McKinley Avenue on the east, just outside the city of Manteca. RD 17 is responsible for maintaining the levees along the east bank of the San Joaquin River from just south of Mathews Road to Walthall Slough, the levees along the north bank of Walthall Slough, and the dryland levee out to approximately South Airport Way (see **Exhibit 2**).

The proposed action is located along specific reaches of the RD 17 levees, as depicted in **Exhibit 2**. The Phase 3 Repair Project's landside levee improvements would include a combination of construction of seepage berms, installation of chimney drains and both shallow and deep cutoff walls, the raising of landside grade, and construction of a setback levee with seepage berm and an underlying cutoff wall along 19 elements of the RD 17 levee system.

PROJECT BACKGROUND AND PURPOSE

PROJECT BACKGROUND AND HISTORY

The RD 17 system for reducing the risk of flood damage, like other flood protection systems in the San Joaquin Valley, initially was designed to facilitate agricultural development on the extensive valley floodplains and to support river navigation. Levees set closely along the rivers were designed to contain flows generated by common floods, and bypasses were constructed to carry overflows generated by large floods. The close-set levees ensured that water velocities would help scour the river bottom and move sediment through the system, reducing dredging costs for sustaining navigation. Starting in about 1863, RD 17 undertook the maintenance and reconstruction of the levee system.

Some of the levees in the Delta are considered "federal project levees." These levees were constructed or reconstructed (e.g., existing or damaged farm levees were improved) by USACE and are intended to meet federal standards. Construction of the federal levee system that encompasses the current RD 17 levees along Walthall

Slough, the San Joaquin River, and French Camp Slough began in 1944 and was completed in 1963. The levee system has since been upgraded substantially to meet Federal Emergency Management Agency (FEMA) requirements for flood protection during a 100-year flood event (flood with a 1 percent chance of occurring in any given year, or 0.01 annual exceedance probability) [AEP]). In 1990, after extensive analysis, the RD 17 levees were accredited by FEMA as meeting the 100-year requirements for urban development.

During a high-water event on the San Joaquin River in January 1997, seepage and boils occurred at several locations along the RD 17 levees. USACE, DWR, and RD 17 successfully contained the seepage and boils, and the levees did not break. After the 1997 event, USACE, the CVFPB, and RD 17 funded a project, the Reconstruction of the California Central Valley Levees San Joaquin Basin #4, Reclamation District #17 Project, to repair the seepage and boil areas. The project was designed and constructed by USACE, and work was completed in 2003.

After reviewing the data supporting the 1990 accreditation and subsequent information, FEMA notified RD 17 of its intention to confirm full accreditation of the RD 17 levees as meeting FEMA's requirements for 100-year flood protection. On June 19, 2007, DWR wrote a letter to the City of Lathrop, with a copy to FEMA, stating that it could not support recertification of the RD 17 levees or the granting of provisional accreditation because of concerns about seepage exit gradients.[2] The basis of DWR's concern was analysis showing seepage exit gradients greater than 0.5, which indicated a higher likelihood of seepage or boils occurring during a high-water event Because of DWR's concern, FEMA then denied full accreditation and instead granted provisional accredited levee (PAL) status to the RD 17 levees. A PAL is a levee that FEMA has previously credited with providing a 100-year flood event level of flood risk reduction (i.e., flood with a 1 percent chance of occurring in any given year, or 0.01 annual exceedance probability). In fall 2007, in response to the PAL status, RD 17 initiated a levee seepage repair program and requested funding through DWR's Early Implementation Program.

RD 17 subsequently implemented Phases 1 and 2 of the LSRP. After completion of the Phase 1 and 2 levee repairs, RD 17 submitted a recertification application to FEMA. In September 2010, RD 17 received a response letter declaring that FEMA had accredited the area protected by the RD 17 levee system, including the dryland levee, thereby removing the PAL status.

The Phase 1 Project included construction of two seepage berms, located in elements III and VI of the LSRP (**Exhibit 2**). The project reconstructed and extended the landside levee toe berms with earth and gravel fill, both landward and along the levee toe, to reduce seepage exit gradients. Work areas were designed to avoid any environmental resources of possible significance, including sensitive habitats and listed species. The project was determined to be categorically exempt from the California Environmental Quality Act (CEQA), and no federal authorizations or funding was required for the Phase 1 work; therefore, no National Environmental Policy Act (NEPA) analysis was triggered. The Phase 1 Project work was completed in January 2009.

The Phase 2 Project addressed work needed at nine levee reaches in the LSRP area. At eight of the nine reaches, the project involved constructing drained seepage berms along the landside levee toe. At one site that did not include seepage berm construction, RD 17 acquired an easement on land along the levee toe and performed various maintenance and site cleanup activities. A CEQA initial study/mitigated negative declaration that was completed for the Phase 2 Project concluded that no significant effects would occur on environmental resources after mitigation measures were implemented (RD 17 2009). Potential impacts on biological resources that resulted from Phase 2 Project implementation were mitigated through participation in the SJMSCP. No federal

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2 "Seepage exit gradient" is an expression in numeric form of the potential for under seepage to exit on the landside of a levee as seepage or a boil. The lower the number used to express seepage exit gradient, the more resistant the system is to seepage or boils; the higher the number, the more likely seepage or boils may occur during a high water event. In formulas for seepage exit gradients, the numerator (top number in a fraction) typically addresses forces that cause or enhance seepage (e.g., water pressure), and the denominator typically addresses forces that resist seepage (e.g., soil resistance to water pressure, depth and weight of soil over the potential seepage area, distance from the levee toe). A lower seepage exit gradient (i.e., more resistance to seepage) is achieved when the numerator (positive seepage forces) is reduced and/or the denominator (resistance to seepage) is increased.

authorizations or funding was required for the Phase 2 work; therefore, no NEPA analysis was triggered. All Phase 2 Project work was completed in summer 2010.

Project Purpose and Objectives

The overall purpose of the Phase 3 Repair Project is to implement landside and isolated waterside levee improvements in 19 LSRP elements affecting 5.3 miles of the approximately 19-mile RD 17 levee system, to reduce the risk of flooding in the RD 17 service area during a 100-year flood event. Levee improvements would address under seepage, through seepage, and levee geometry repair and remediation. USACE and RD 17 each view the project purpose from the purview of their respective responsibilities, defined as follows:

USACE's objectives for the Phase 3 Repair Project are to:

- decide whether or not to grant permission for the RD 17 Phase 3 Repair Project to alter the federal project levees within its levee system under Section 408, and
- decide whether or not to issue permits under Section 404.

RD 17's objectives for the proposed Phase 3 Repair Project are to:

- repair seepage deficiencies where needed to meet current USACE seepage criteria standards,
- increase the levee's resistance to under seepage and/or through seepage,
- provide under seepage exit gradients equal to or less than 0.5 at the landside levee toe, and equal to or less than 0.8 at the landside drainage seepage berm at the water surface elevation associated with the design water surface, and
- meet levee geometry requirements of the permitting agencies in the specific areas of repair work.

All Phase 3 Repair Project work would occur on the landside of the existing levee system, or above the HTL on the water side of the levee, therefore, authorization under Section 10 of the Rivers and Harbors Act of 1899 would not be required. Section 404 authorization would be required for some work on the land side of the levee that would affect wetlands or waters of the U.S. USACE verified a wetland delineation that was submitted for the Phase 3 Repair Project on November 3, 2009 (a preliminary jurisdictional determination form was issued by USACE on November 10, 2009; USACE 2009b), and three supplemental wetland delineations were prepared. The first supplemental delineation was submitted on January 22, 2010 (a preliminary jurisdictional determination form was issued by USACE on April 9, 2010; USACE 2010a). The second supplemental wetland delineation was submitted on September 16, 2010 (a preliminary jurisdictional determination form was issued by USACE on October 7, 2010; USACE 2010b). The third supplemental wetland delineation was submitted on April 4, 2014 (a preliminary jurisdictional determination form was issued by USACE on April 7, 2014; USACE 2014a).

Compliance with USACE Vegetation Management Standards

With issuance of Engineering Technical Letter (ETL) 1110-2-571 in 2009,[3] USACE updated its vegetation management standards for levees, requiring the removal of all vegetation, with the exception of perennial grasses, on levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2009a). In September 2011, USACE issued a Draft Environmental Impact Statement/Draft Environmental Impact Report (DEIS/DEIR) for the Phase 3 Repair Project (USACE and RD 17 2011). The September 2011 DEIS/DEIR considered two options for complying with ETL 1110-2-571, as follows:

[3] USACE ETL 1110-2-571 subsequently was replaced by ETL 1110-2-583 on April 30, 2014 (USACE 2014b).

- Full Implementation of USACE ETL 1110-2-571: All vegetation, other than perennial grasses, would be removed from the levee slopes and out 15 feet from the waterside and landside levee toes, or

- Acquisition of a Variance from Full Compliance with USACE ETL 1110-2-571: Permission would be obtained from USACE to retain all vegetation on the lower two-thirds of the waterside levee slope and out 15 feet from the waterside levee toe; all other levee vegetation still would be removed in accordance with USACE policy.

RD17 is no longer considering full compliance with the ETL as an alternative. RD 17 will continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which includes trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up to 5 feet above the ground (or 12 feet above the crown road). In the Phase 3 Repair Project area, landside vegetation would be removed as previously evaluated in the September 2011 DEIS/DEIR (USACE and RD 17 2011) and as described under the “Additional Project Components” subsection below as well as in the “Direct and Indirect Effects on Species in the Action Area” section of this BA. Long-term vegetation management practices, for both landside and waterside vegetation, would be managed in accordance with the USACE O&M Manual which includes RD 17’s existing practices, as described under the “Additional Project Components” subsection below as well as in the “Direct and Indirect Effects on Species in the Action Area” section of this BA .

DESCRIPTION OF THE PROPOSED PHASE 3 REPAIR PROJECT

This section describes the elements of RD 17’s overall Phase 3 Repair Project; the Emergency Response Construction Project actions, which were authorized under Clean Water Act Section 404 Regional General Permit No. 8, are described under “Description of the 2017 Emergency Response Construction Project Actions” section that follows this section. This includes a description of the levee repair activities and additional project components that are proposed under the Phase 3 Repair Project, as well as the proposed construction schedule and sequencing.

The Phase 3 Repair Project would address the under seepage and/or through seepage concerns raised by DWR and repair and/or remediate levee geometry to USACE design standards along approximately 5.2 miles of the RD 17 levee system, including portions of the San Joaquin River east levee and portions of the levee along the northerly bank of Walthall Slough. Under seepage occurs below the aboveground levee prism and is caused by the buildup of water pressure in the subsurface foundation soils when high-river stages are present on the waterside of the levees. This pressure head causes water to flow through the earthen foundation layers under the levee and exit onto the ground surface on the landside of the levee prism (**Exhibit 3**). Such seepage is not uncommon and does not inherently imply that the levee is failing; however, excessive and uncontrolled under seepage can carry fine-grained material with the water flow that can undermine the levee and lead to levee failure. Through seepage is the movement of water through the levee prism when high-river stage conditions exist on the waterside of the levee (**Exhibit 3**). Depending on the duration of high water and the permeability of the levee embankment soil, seepage may exit onto the landside slope of the levee, thereby negatively affecting the stability of the landside levee slope.

Levee improvements along the USACE project levees would consist primarily of in-place repair/remediation, but would include a single setback levee at element IVc. As summarized in **Table 2** and shown in **Exhibits 4a** through **4c**, the Phase 3 Repair Project’s landside levee improvements would include a combination of construction of seepage berms, installation of chimney drains and both shallow and deep cutoff walls, the raising of landside grade, and construction of a setback levee with seepage berm and an underlying cutoff wall along 19 elements of the RD 17 levee system. These levee repair components, as well as additional project components (such as levee geometry corrections and stormwater management), are described in more detail following **Table 2**. The proposed action does not include any work that would raise the existing levee. Limited work would be performed along the waterside of the levee above the HTL in element IVc, where the setback levee would be constructed.

LEVEE REPAIR ACTIVITIES

The Phase 3 Repair Project would include seepage berms, chimney drains, cutoff walls, a setback levee, and a raised landside grade. **Table 2** summarizes the activities proposed for each project element.

Table 2
Summary of Major Activities Proposed for Each Element of the Phase 3 Repair Project

Element	Type of Remediation	Proposed Activities
Ia	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width, and install a 590-foot-long seepage berm (minimum 65 feet wide) with chimney drain to meet required exit gradients.
Ib	under seepage and through seepage	Fill existing depression to 300 feet from toe of existing levee; place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width; and install a 125-foot-long seepage berm (minimum 60 feet wide) with chimney drain on top of fill to meet required exit gradients.
Ie, IIIb, IVa, and VIIb	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and construct seepage berms with lengths of 500 feet (Ie), 650 feet (IIIb), 450 feet (IVa), and 250 feet (VIIb), and chimney drains to meet required exit gradients. Minimum seepage berm widths would vary (65–105 feet) depending on the element.
IIab	under seepage and through seepage	Install cutoff wall with a length of 2,550 feet to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.
IVc	under seepage and through seepage	Construct 1,100-foot-long setback levee with seepage berm and cutoff wall to meet required exit gradients. Depth of the cutoff wall will be 60 feet. Cutoff wall will involve degrading the top 1/3 to 1/2 of the levee crown and will begin with a 1:1 cut at the waterside crown. Seepage berm would be a minimum of 65 feet wide. Install riprap on waterside of existing levee above the high tide line where it would intersect setback levee. After setback levee is completed, remove 400 linear feet of the existing levee above the high tide line on the downstream side of oxbow. Grade approximately 8 acres of setback area, to drain to the river through the downstream opening in the remnant levee, and restore at least 9.9 acres, and up to 11.5 acres, of riparian scrub and Great Valley oak woodland in the area between the landside toe of the setback levee and the river. For more information about habitat restoration in element IVc, see the Conceptual Mitigation and Monitoring Plan for the Riparian Brush Rabbit in **Appendix E** of this document.
Va and VIa.1	under seepage and through seepage	Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width and install cutoff walls with a length of 9,520 feet to meet required exit gradients. Depth of cutoff walls would vary from 60–85 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls.
IIIa	through seepage	Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths and install chimney drain in existing 4,750-feet-long seepage berm to meet required exit gradients.
VIa.4	under seepage and through seepage	Install cutoff wall with length of 70 feet to meet required exit gradients. Depth of cutoff wall would vary from 90–100 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside

Table 2 Summary of Major Activities Proposed for Each Element of the Phase 3 Repair Project		
Element	**Type of Remediation**	**Proposed Activities**
		of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.
VIbcde	under seepage and through seepage	Install cutoff wall with length of 2,050 feet of cutoff wall at element VIb, and approximately 650' of chimney drain at elements VIcde, to meet required exit gradients. Depth of cutoff wall would vary from 70–80 feet. Cutoff wall in levee prism would involve both deep slurry mix construction as well as degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Construct new earthen railroad embankment to replace the existing wooden trestle bridge at element VIc.
VIIe	under seepage and through seepage	Install cutoff wall with a length of 2,500 feet to meet required exit gradients. Depth of cutoff wall would vary from 60–120 feet. Deep slurry mixing method would be used. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Repair Project.
VIIg	under seepage and through seepage	Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width, and construct approximately 395' of seepage berm to meet required exit gradients. Minimum seepage berm width would be 65 feet.
Source: Data provided by Kjeldsen, Sinnock & Neudeck, Inc. in 2014, updated 2017		

The respective levee improvement components are described next in more detail.

SEEPAGE BERMS

Reducing the risk of levee failure caused by under seepage and through seepage may be achieved by constructing a drained seepage berm. A drained seepage berm collects and conveys seepage, thereby reducing the flood risk associated with a high-water event. A drained seepage berm is built on the landside of a levee, and consists of layers of sand filter material, drain rock, geosynthetic filter fabric, and a seepage berm soil fill (**Exhibit 5**).

The drained seepage berm reduces flood risk during sustained high-river events by collecting seepage that otherwise would flow onto the landside ground surface at and beyond the levee's landside toe of slope, and then by conveying the seepage away from the levee. The layer of sand filter material placed on the natural ground surface serves to reduce the transmission of fine-grained soils into the drain rock, thereby maintaining the drain rock's ability to be a conductive soil unit that conveys collected seepage. Similarly, the filter fabric that separates the drain rock from the seepage berm fill soil prevents finer soils from migrating into the drain rock unit. The weight of the berm acts as ballast, reducing the potential for detrimental boils and piping.

The design width and height of a seepage berm are dependent on the relative permeability of the underlying soil layers and the amount of pressure head that push water under the levee and through these soils during sustained high-river events. The higher the water pressure head and the more dissimilar the porosity of the underlying soil layers, the wider and/or taller the seepage berm must be to prevent boils and reduce flood risk.

For the Phase 3 Repair Project, drained seepage berm widths of 65–120 feet are expected to be adequate to meet the design criteria in most cases (**Exhibit 5**). However, these types of berms may extend up to 300–400 feet inland from the landside toe of the levee. Seepage berms typically are constructed using select materials excavated from borrow sites or obtained from commercial sources. For the Phase 3 Repair Project, soil material for seepage berms would be purchased from commercial sources. A compacted-surface patrol road would be constructed near the outside edge of the seepage berm (see "Additional Project Components" below).

In urban areas, some seepage berms also would include a toe drain system (element VIIg) to safely collect and discharge the seepage water into an urban storm drainage system. A toe drain pipe is a below-grade, perforated pipe surrounded by a layer of sand and drain rock (**Exhibit 6**). The toe drain pipe is a mechanism to safely collect and convey seepage water away from the levee and seepage berm. If the toe drain pipe is unable to convey the seepage water, the water exits the drained seepage berm through the drain rock at the face of the berm, similar to a nonurban berm.

CHIMNEY DRAINS

A chimney drain is a drainage system that collects seepage waters that are flowing through the aboveground portion of the levee structure. This type of drain is used to collect and convey through seepage. A chimney drain consists of a 1 to 3-foot-thick layer of sand and drain rock. Filter fabric is placed between the soil and rock layer to avoid migration of the soil into the rock, which can clog the rock layer and reduce its ability to carry seepage flows. The chimney drain is placed directly on the landside slope of the levee and tied into an existing or new drained seepage berm at the landside base of the levee (**Exhibit 7**). The chimney drain conveys the through seepage flows to a drained seepage berm, which is located at the landside base of the levee.

Installing a chimney drain in an existing drained seepage berm would include adding the through seepage material on top of the existing seepage berm and tying this material into the existing seepage berm material by removing the seepage berm fill material and physically tying the two drainage rock layers together. When the remediation includes construction of a new drained seepage berm with a chimney drain, the chimney drain would be installed during construction of the drained seepage berm.

CUTOFF WALLS

In selected locations of the Phase 3 Repair Project, cutoff walls would be placed through the levee prism (parallel to the river). Cutoff walls use specialized earthen materials (often bentonite clay, which has low permeability, or a mixture of bentonite and cement). Cutoff walls would be constructed vertically through the levee prism, extending into or through deeper foundational soils that have low-permeability (a layer through which seepage does not flow readily). Thus, cutoff walls would substantially reduce the potential for under and through seepage flow during high-river events. Two methods for installing cutoff walls would be used along portions of the RD 17 levees: the conventional open-trench method and the deep soil mixing method.

The conventional open-trench method would be used to install shallow cutoff walls to a maximum depth of approximately 80 feet. This method involves excavating material in an open trench (the trench is filled with a bentonite slurry to maintain the side slopes of the excavation) and then replacing it with the select materials, typically a bentonite or cement-bentonite slurry (**Exhibit 8**). In this case, the top one-third to one-half of the levee height is “degraded,” meaning that it is excavated so that any weakness in the narrow upper portion of the levee does not result in failure of the levee during construction.

For the deep slurry mixing method, specialized equipment (such as augers) is used to excavate deep into the subsurface, allowing the cutoff walls to reach depths up to 120 feet (**Exhibit 9**). The deep slurry mixing method involves mixing the soil in place with cement and / or bentonite, thereby reducing the risk of failure during construction. This method does not require levee crown degradation.

For the Phase 3 Repair Project, the cutoff walls would be extended approximately 300 feet beyond the element boundary to provide the required overlap when drained seepage berms have been or are being installed along the landside of adjacent levee elements. Levee slopes (where cutoff walls would be installed) also would be modified as needed to achieve the required 20-feet width and landside 3:1 slope.

SETBACK LEVEE WITH SEEPAGE BERM AND UNDERLYING CUTOFF WALL

General Description of Setback Levees

A setback levee is a levee constructed some distance behind an existing levee. The setback is tied into the existing levee at the upstream and downstream ends of the setback area. After certification of the setback levee, all or a portion of the existing levee between these two points typically is removed to allow high-water events to inundate the newly expanded floodway. Soil from the old levee may be used as a source of fill for other levee improvement projects, depending on the quality and quantity of material generated from demolition of the old levee. In some cases, it may be necessary to continue maintaining the existing levee after a setback levee is constructed (e.g., to protect existing development in the setback area) and to use the newly constructed levee as a backup levee.

General Description of Proposed Setback Levee and Associated Floodplain Restoration

Project Element IVc involves construction of a 1,100-foot-long setback levee with an underlying cutoff wall and a seepage berm, on a major oxbow of the San Joaquin River (see Table 2). A *Conceptual Mitigation and Monitoring Plan for Riparian Brush Rabbit [for the] Phase 3 – RD 17 Levee Seepage Repair Project* (Conceptual MMP) (RD 17 2016) has been prepared to describe the expansion and restoration of riparian habitat in Element IVc; this document is included as an attachment to this BA (Appendix E).

In the Phase 3 Repair Project area, soil materials beneath a setback levee are anticipated to have properties similar to those of materials below the existing levees. Therefore, a setback levee would have no seepage-related benefit in the RD 17 area relative to other seepage control methods; like the existing levees, a setback levee would require either a cutoff wall or drained seepage berm to sufficiently reduce the potential adverse effects associated with under seepage flows (**Exhibits 10** and **11**). Nevertheless, implementation of a setback levee could provide some additional capacity in the river for floodwaters and also would have the potential to provide habitat in the area between the new and old levee locations. In the Phase 3 Repair Project area, any newly expanded floodway created by a proposed setback levee would be designed to drain surface water after a high-water event, to prevent fish stranding.

Setback Levee Considerations

As described in greater detail under Section 2.1.4 in the DEIS/DEIR (USACE and RD 17 2011), and consistent with Section 2.5.1 of the forthcoming Final Environmental Impact Statement (FEIS) (USACE *in prep.)* for the proposed project, setback levees were considered but eliminated from further consideration in several project reaches for the following reasons:

- Construction of a setback levee along certain stretches of the river would be hydraulically constrained and would greatly increase the project scope to the point of being cost prohibitive (elements VIa.4 and VIb).
- Because of the proximity to the bifurcation at Old River, the change in hydraulic conditions that would result from constructing a setback levee at these locations would increase flows down the San Joaquin River during flood events, which could lead to increased flooding downstream (elements Va and VIa.1).
- Construction of a setback levee relative to other levee improvement alternatives and/or land acquisition to accommodate construction of a setback levee would be cost prohibitive (elements Ia, Ie, IIIb, IVa, VIcde, and VIIb).
- Existing landside development would constrain the option of constructing a setback levee (elements IIab, VIIe, and VIIg).

The complete hydraulic analyses that evaluated the setback levee alternatives are included as **Appendix F**.

Tie-in to Existing Levee

Where the new setback levee would intersect the existing levee, the top one-third to one-half of the crown of the existing levee would be degraded beginning with a 1:1 cut at the existing waterside crown to facilitate tying the cutoff wall and setback levee into the existing levee.

Riprap

Approximately 0.64 acres (740 linear feet) of riprap would be installed only on the waterside of the existing levee and above the HTL in element IVc where it would intersect the setback levee. No trees/shrubs would be removed to place the riprap and any riprap around trees/shrubs would be hand-placed. The riprap would not be installed to act as launchable rock.

Remnant Levee Breach

After the setback levee is completed, 400 linear feet of the existing levee above the HTL on the downstream side of the oxbow would be degraded, reconnecting approximately 8 acres of floodplain to the river.

Floodplain Offset Area

The reconnected floodplain area would be graded to allow complete drainage of the floodplain to the river. The floodplain would be graded to drain to a central swale, approximately 2-feet deep. As flood flows recede, the swale would drain completely through the breach in the remnant levee. This would minimize the possibility of fish stranding. The periodic reactivation of floodplain rearing habitat for juvenile salmonids, in particular, and other native fishes as well would be a benefit to fish resources. The seasonal nature of inundation, along with complete drainage, would preclude establishment in the floodplain of predatory, non-native fishes.

The Conceptual MMP evaluates three breach invert elevations (8 feet [NAVD88], 10 feet [NAVD88] and 14 feet [NAVD88]) for the proposed levee breach on the downstream end of the oxbow. Hydraulic modeling, based on San Joaquin River flows as reported at the Vernalis USGS stream gage (Vernalis gage), about 17.5 miles upstream of the project area, was used to estimate the flow in the San Joaquin River at which water would enter the setback area through the remnant levee breach for the three breach invert elevations. The results are shown in Table 3.

To evaluate how often and how long the levee setback area would be expected to inundate, a review was made of the historical Vernalis gage daily flow records since the completion of New Melones Dam in 1979 (this represents a period where the San Joaquin River basin operating regime has been relatively unchanged). The evaluation used the mean daily flows for the period October 1, 1978 through September 30, 2015, or Water Years 1979 through 2015. The total number of days in the evaluation period is 13,514. Table 4 summarizes the estimated number and percent of days in the evaluation study period in which the levee setback area would flood based on the three invert elevations. Based on the historical data, the periods during which water would flow into the project breach at the three invert elevations are displayed in the figures below.

The appropriate breach elevation is under consideration and will be defined in the Final MMP. It is anticipated that the breach elevation would be set at approximately 9 or 10 feet (NAVD88). Approximately 1-2 acres of the floodplain would be set to an elevation of 14 feet (NAVD 88) or below and would inundate approximately every 6 years.

RAISED LANDSIDE GRADE

Directly adjacent to the landside toe of the levee in element Ib, an approximately 5-foot-deep depression was used as a borrow site to facilitate construction of the Howard Road Bridge. RD 17 would place fill within this depression to raise the landside grade.

Table 3 Estimated Flows for Inundation of the Element IVc Mitigation Site			
Breach Invert Elevation (feet, NAVD88)	Flow in San Joaquin River near Vernalis above which Mitigation Site Breach Flow Occurs (cfs)	Estimated Return Interval	Flow in San Joaquin River at Breach Location (cfs)
8	9,500	2 year	4,200
10	13,200	3 to 4 year	5,700
14	24,000	6 year	8,800
Note: cfs = cubic feet per second Source: MBK Engineers 2016			

Table 4 Estimated Total Duration of Mitigation Site Flooding for Evaluation Period of Record			
Breach Invert Elevation (feet, NAVD88)	San Joaquin River Flow at Vernalis above which Mitigation Site Breach Flow Occurs (cfs)	Number of Days Flow Equaled or Exceeded Since 10/1/1978	Percent of Days Flow Equaled or Exceeded Since 10/1/1978
8	9,500	1,619	12%
10	13,200	1,126	8.3%
14	24,000	423	3.1%
Note: cfs = cubic feet per second Source: MBK Engineers 2016			

ADDITIONAL PROJECT COMPONENTS

The following additional activities would occur as part of the Phase 3 Repair Project:

- **Levee geometry corrections:** Phase 3 Repair Project elements currently do not meet requirements for levee geometry (i.e., slopes, crown width). To correct levee geometry, levee fill material would be placed along the landside of existing levee slopes where needed to provide the minimum 3:1 slope and a minimum 20-foot-wide levee crown. All elements would undergo some level of levee geometry corrections.

- **Operations and Maintenance (O&M) access and utility corridors:** A 20-foot-wide permanent O&M access corridor[4] would be established adjacent to the landside toe of seepage berms and levees (if not already present for levees). Any relocated power poles and other utility infrastructure would be located outside this easement.

- **Temporary construction easements:** Where needed, a 20-foot-wide temporary construction easement and construction turnaround area (up to 80 feet in diameter) would be included adjacent to the inland side of the permanent O&M access corridor, to provide access to the site during construction. These features would be removed and the site(s) would be returned to pre-project conditions following completion of construction.

- **Stormwater /irrigation controls:** Drainage/irrigation swales would be constructed around the outside boundaries of levee repairs, where needed, and other stormwater best management practices (BMPs) would be implemented to manage stormwater runoff and/or irrigation during and after construction. These swales would be located so that they would not drain to/from wetlands or other waters of the U.S.

4 The CVFPB would require that a 20-foot-wide access corridor be established. However, on a case-by-case basis, effects on woody vegetation within this corridor may be avoided in place. However, for the purposes of the analysis in this FEIS, it was assumed that any vegetation within the 20-foot-wide corridor would be removed.

- **Right-of-way acquisition:** Lands within the Phase 3 Repair Project footprint would be acquired as needed, to accommodate levee repairs (e.g., seepage berms, setback levees) and establish the minimum 20-foot-wide O&M access corridor at the landside toes of all the improved levees, to prevent encroachment. Privately owned lands would be acquired in fee preferably, but may be taken as easements if needed. Where the project footprint overlies land owned and managed by other agencies (i.e., the City of Lathrop, San Joaquin County, Union Pacific Railroad [UPRR]), either the land would have to be acquired in fee or easements would have to be obtained and secured. Real property acquisition and any relocation services, if needed (although no relocations are anticipated), would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 USC 4601 et seq.) and implementing regulation, Title 49 of CFR Part 24, and California Government Code Section 7267 et seq.

- **Haul roads:** An estimated 700,000 cubic yards of imported material (i.e., soil, aggregate, and cement) would be required to construct these levee improvements. These materials would be hauled to the work sites from commercial sources up to 11 miles away. Personnel, equipment, and imported materials would be transported to the Phase 3 Repair Project area using various surface roads that connect with Interstate 5 or State Route 120. The primary corridors where construction activity would take place would be public roadways, on and within 300 feet of the levees, existing unpaved roads used for access to work areas, and levee patrol roads atop the levee crown.

- **Landside vegetation removal:** Landside vegetation within the footprint of the proposed levee work, including maintenance roadway corridors and temporary access easements, would be cleared to prepare for levee repair work. The proposed action would involve performing limited work on the waterside of the levee above the HTL (e.g., installing riprap and degrading a portion of the levee in element IVc); however, no waterside woody or riparian vegetation would be removed; the areas where riprap would be placed and the levee degraded are characterized by ruderal land cover.

- **Encroachment management:** Several features, including power poles, vegetation, and a variety of agricultural-related facilities (e.g., irrigation infrastructure, fences), are within the Phase 3 Repair Project footprint. Utility infrastructure would be relocated as needed to accommodate the levee repairs, and any pipelines or other underground utility crossings would be replaced as needed. Other encroachments in the Phase 3 Repair Project area would be removed or relocated as required to meet the criteria of USACE, the CVFPB, and FEMA. No waterside woody or riparian vegetation would be removed; the areas where riprap would be placed and the levee degraded are characterized by ruderal land cover.

- **Long-Term Vegetation Management:** Vegetation on the levees and within the access easements would be managed in accordance with current O&M practices to maintain access and visibility. These practices include: mechanical trimming of existing trees and removal of large dead and downed trees annually, as described under "Compliance with USACE Vegetation Management Standards"; regular summer and winter application of herbicides for weed control; and summer application of herbicides to control woody plants and berries.

Proposed Schedule and Sequence of Project Construction

Construction of the Phase 3 Repair Project is scheduled to begin in 2018, and is expected to be completed by December 2019, assuming receipt of all required environmental clearances, permits, and approvals for implementation. Some related activities, such as relocating power poles, may be conducted before levee work is begun, and site restoration and demobilization could extend through spring 2020. The general levee construction window is seasonal (July 1–November 1), avoiding the period when high-water levels have the potential to occur within the San Joaquin River system. However, depending on hydrologic conditions and subject to compliance with species work windows, a work window variance that allows an extension outside the July 1–November 1 work period may be granted by the CVFPB. The CVFPB may stipulate that RD 17 has to comply with additional conditions and commitments as a component of any work window variance.

The proposed construction sequence, which would include concurrent work in several different elements to meet the project schedule, is as follows:

- **Relocation of power poles:** Power poles currently situated on the landside of the levee toe of some elements would need to be relocated to accommodate proposed drained seepage berms. To the extent feasible, power poles would be relocated beyond the toe of the new berm, outside the maintenance access easement. If placing poles on top of the seepage berms is required, either raised foundations or steel-reinforced concrete piers would be constructed to prevent the poles from affecting the seepage berms. RD 17 would oversee relocation of the power poles, in coordination with the appropriate utility and construction companies.

- **Site preparation at existing levee sites and in levee setback area:** Site preparation (i.e., clearing, grubbing, and stripping) of the levee elements would begin by clearing structures (see discussion in next bullet) and woody vegetation from the footprint of the proposed levee work and the permanent O&M access and utility corridors. Vegetation would be retained in areas adjacent to but outside the project footprint. This operation would require removal of some trees and relocation or removal of some elderberry shrubs. Large trees would be felled approximately 3 feet above ground level, with stumps temporarily left in place. Where feasible, small trees and elderberry shrubs would be relocated. Elderberry shrubs would be relocated, in accordance with the avoidance and minimization measures outlined (see "Avoidance and Minimization Measures – Valley Elderberry Longhorn Beetle" subsection of this BA). A minimal amount of belowground disturbance would occur. The clearing operation would be followed by grubbing operations to remove stumps, root balls, and any below-ground infrastructure. The area then would be disked to chop surface vegetation and mix it with near-surface organic soils. The disking operation would be followed by stripping the top 12 inches of earthen material from the landside slope of the existing levee and the footprint of the proposed seepage berms. Excess earthen materials (i.e., organic soils, and excavated material that does not meet levee embankment criteria) would be temporarily stockpiled and then would be re-spread on the surface of the new levee slopes and seepage berms, provided this material is not contaminated with vegetation. Any stripped material contaminated with vegetation and other debris generated during the clearing and grubbing operations would be hauled off-site to a suitable landfill.

- **Removal or modification of landside structures and other facilities:** In a few levee elements, agricultural facilities (e.g., fences, drainage infrastructure) or parking lots are located within the footprint of the proposed levee work. These facilities would be removed from or relocated outside the project footprint before levee construction begins in those areas. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. Demolished concrete could be sent to a concrete recycling facility. If any wells or septic systems would be affected, they would be abandoned in accordance with the applicable State and County requirements.

- **Construction of the setback levee with drained seepage berm and underlying cutoff wall:** Construction of the setback levee embankment in element IVc would begin as soon as sufficient lengths of levee foundation are prepared and weather conditions are suitable. Foundation preparation would include constructing a levee keyway that would be excavated 3–5 feet deep across the entire footprint of the proposed setback levee. A smaller but deeper excavated inspection trench, centered beneath the new waterside hinge point of the setback levee, then would be constructed beneath a small portion of the keyway to meet DWR standards. After the foundation layers are backfilled with engineered soil, a geotechnical geogrid fabric would be installed at ground level across the entire setback levee footprint. A second layer of geogrid fabric would be placed at mid-height of the new levee fill section to further reduce the potential for post-construction settlement of the new levee. The embankment would be constructed of engineered fill, with the fill placed in 3-foot-maximum lifts by motor graders. Each lift would be moisture-conditioned using water trucks and would be compacted to the specified density using a suitable compactor, such as a sheep's foot, tamping foot, or rubber-tired roller. Next, quarry stone riprap would be applied in three segments, to armor the newly completed setback levee's waterside slope and protect against erosion. Riprap would be placed on the waterside levee above the HTL in areas that are characterized by ruderal land cover (**Exhibit 12**). All waterside woodland would be avoided; all waterside trees would be avoided as well as any tree canopy that

overlaps riprap. Riprap placement would be done either by barge or by long-arm excavator from the top of the levee crown. Riprap dimensions for the three segments are: 340 feet long by 50 feet wide (0.39 acre), 140 feet long by 30 feet wide (0.096 acre), and 230 feet long by 50 feet wide (0.26 acre). A drained seepage berm then would be constructed on the landside of the setback levee. Fill material for setback levee and drained seepage berm construction would be obtained from commercial sources and would be delivered to levee construction sites using haul trucks.

- **Setback levee site restoration and demobilization:** After completion of construction, the previously stripped topsoil material would be placed on top of the completed setback levee and associated seepage berms in element IVc, and levee slopes and the tops of the seepage berms would be hydroseeded. An aggregate-base patrol road would be constructed at the landside edge of the seepage berm and setback levees and on the new setback levee crown. The existing levee would be fully restored at the tie-in points to the new setback levee. The existing levee crown patrol road would be redressed with aggregate base, to restore it to preconstruction levels. Any disturbed riprap also would be supplemented to provide a uniform layer across the connection point with the new setback levee. Immediately after final construction, the setback levee's fill slopes would be covered with erosion control material until application of the hydroseed. Any construction debris would be hauled to an appropriate off-site waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to pre-project conditions. Demobilization would be likely to occur in various locations as construction proceeds along various elements.

- **Removal of existing levee at setback levee elements, site restoration, and demobilization:** After certification of the new setback levee and seepage berm in element IVc, a 400-linear-foot-long section of the existing outboard levee (which is approximately 2,400 linear feet long in element IVc) on the downstream side of the existing oxbow would be partially degraded. The area where the levee would be degraded is characterized by ruderal land cover (**Exhibit 13b**); some landside vegetation would be removed (as accounted in the "Direct and Indirect Effects on Species in the Action Area" section of this BA, but all waterside trees and overlapping tree canopy would be avoided. At least 9.9 acres (and up to 11.5 acres) of riparian vegetation would be established in the area between the new setback levee and the river (**Exhibit 12**) (see the "Compensation Measures" subsection of the "Avoidance and Minimization Measures" section below for additional information). This acreage would be made up of approximately 0.5 acre of floodplain swale and approximately 4.5 acres of restored riparian scrub habitat between the landside toe of the existing levee and the waterside toe of the new setback levee; approximately 2.5 acres of enhanced riparian scrub habitat between the river and the waterside toe of the existing levee; and approximately 4 acres of restored Great Valley oak woodland/upland refugia habitat along the existing levee. These acreages would include approximately 1.6 acres of contingency, with the goal of restoring a minimum of 9.9 acres of riparian habitat. This work would be completed after flood season (from July 1 through November 1) and above the HTL, primarily using scrapers, excavators, and bulldozers to remove the levee section and all present levee encroachments.

- **Construction of drained seepage berms, drained seepage berms with chimney drains, and chimney drains within existing drained seepage berms:** Fill material for levee improvements would be obtained from commercial sources and delivered to the levee construction sites by haul trucks. The material then would be spread by motor graders and compacted by sheep's foot rollers to build new seepage berms and seepage berms with chimney drains. A water truck would be used to properly moisture-condition the soils for compaction. Installing the chimney drains in existing drained seepage berms also would require use of an excavator or scraper to remove the existing drained seepage berm fill material so that the chimney drain fill material can be tied into the drainage rock layer of the existing drained seepage berm.

- **Construction of cutoff walls:** Cutoff wall construction is anticipated to occur 24 hours a day, 7 days a week, with occasional shutdowns for equipment maintenance, when necessary. Lights and possibly power generators would be used during nighttime construction hours. Additional equipment would include slurry batch plants to prepare bentonite or bentonite cement mix, pumps, and support vehicles. Four to five batch plants or slurry ponds would be required for the project; these would be located near the site of cutoff wall construction. Each batch plant or slurry pond with associated pumps and support equipment would occupy an area of approximately 100 square feet that would be restored to pre-project conditions following completion of cutoff wall construction. Cutoff walls may be installed concurrently in two or more different directions within an element. RD 17 proposes to use the deep slurry mix method for installing deep cutoff walls, which would avoid the need to degrade the top of the levee, and conventional slurry trench walls (open-cut method) for shallow cutoff walls. RD 17 also would consider driving sheet piles, using a drop impact hammer or other pile-driving technology in lieu of cutoff wall installation at element VIIe. The number of cutoff wall rig setups would depend on the project schedule and contractor preference. Each deep slurry mix cutoff wall rig would move continuously along the proposed alignment, to attain an uninterrupted cutoff wall and reduce prolonged disturbance to residences near some cutoff wall segments. Each cutoff wall rig could move 50 to 100 feet horizontally during a 12-hour work shift, while each conventional slurry trench rig could move 75 to 200 feet horizontally during a 12-hour work shift. Disturbances to nearby residences are expected to be minor because of the limited number of residences near the cutoff wall installation areas. However, where lights, noise, and/or vibration would exceed allowable nighttime standards for the applicable local jurisdiction, work hours would be restricted to daytime work hours.

- **Traffic control during construction:** Traffic control and detours could be required in the immediate vicinity of some levee improvements. Traffic control measures would include flaggers for one-way traffic control, advance construction signs and other public notices to alert drivers to activity in the area, and “positive guidance” detour signage on alternate access roads to reduce inconvenience to the driving public. Detours for through traffic are not likely to be required.

- **Site restoration and demobilization:** On completion of construction, previously stripped topsoil material not contaminated with vegetation would be placed on top of the completed seepage berms and any disturbed levee slopes. Any previously nonagricultural, vegetated areas disturbed during construction would be hydroseeded with a standard erosion control mix. An aggregate-base patrol road would be constructed at the landside edge of any seepage berms. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to pre-project conditions. Demobilization likely would occur in various locations as construction proceeds along various elements.

DESCRIPTION OF THE 2017 EMERGENCY RESPONSE CONSTRUCTION PROJECT ACTIONS

The 2017 Emergency Response Construction Project that was implemented in February 2017 included the construction of seepage berms and raised landside grades in several elements (see **Appendix G** for as-builts). Most of these activities were already planned under the Phase 3 Repair Project. All the seepage berms and raised landside grades that were installed for the emergency response, even those where cutoff walls will be done in the future as proposed under the Phase 3 Repair Project, would remain in place. **Table 5** summarizes, for each project element, the emergency construction actions that were implemented in 2017, as well as the remaining actions that would occur under the Phase 3 Repair Project.

Table 5
Summary of 2017 Emergency Response Construction Project Actions

Element	Emergency Response Construction Project Actions	Remaining Phase 3 Repair Project Actions
Ia	Constructed approximately 350’ of seepage berm, as proposed.	Construct PG&E High Voltage Tower footing raisings, approximately 240’ of additional seepage berm, and approximately 590’ of chimney drain.
Ib	Constructed approximately 130’ of seepage berm and grade raising, as proposed.	Construct approximately 130’ of chimney drain.
Ie	Constructed approximately 500’ of seepage berm, as proposed.	Construct approximately 500’ of chimney drain.

Table 5 Summary of 2017 Emergency Response Construction Project Actions		
Element	**Emergency Response Construction Project Actions**	**Remaining Phase 3 Repair Project Actions**
IIab	*None.*	Construct approximately 2,600’ of cutoff wall and levee widening.
IIIa	*None*	Construct approximately 4,750’ of chimney drain in existing seepage berm and widen levee slope.
IIIb	Constructed approximately 650’ of seepage berm, as proposed.	Construct approximately 650’ of chimney drain.
IVa	Constructed approximately 450’ of seepage berm, as proposed.	Construct approximately 450’ of chimney drain.
IVc	*None.*	Construct approximately 1,100’ long setback levee containing 300’ of seepage berm and 300’ of cutoff wall. A new waterside habitat area will also be developed on the remnant ground outside the new setback levee (see **Appendix E** of this document).
Va and VIa.1	Constructed approximately 5,800’ of seepage berm. ***This was not previously proposed but would remain in place.***	Construct approximately 9,500’ of continuous cutoff wall. The existing levee will be widened where necessary as part of cutoff wall construction.
VIa.4	*None.*	Install 70’ of cutoff wall to meet required exit gradients.
VIb	*None.*	Construct approximately 2,050’ of cutoff wall.
VIcde	Constructed approximately 300’ of seepage berm at element VIc (as proposed), constructed approximately 150’ of seepage berm and grade raising at element VId (as proposed), and constructed approximately 200’ of parking lot grade raising at element VIe (as proposed). Constructed approximately 200’ of subgrade seepage collection drain system and parking lot improvements.	Construct approximately 300’ of chimney drain and a new earthen railroad embankment to replace the existing wooden trestle bridge at element VIc, construct approximately 150’ of chimney drain at element VId, and construct approximately 200’ of chimney drain and levee widening.
VIIb	Constructed approximately 250’ of seepage berm, as proposed.	Construct approximately 250’ of chimney drain.
VIIe	*None.*	Construct approximately 2,500’ of cutoff wall.
VIIg	*None.*	Construct approximately 400’ of seepage berm and grade raising.
Source: Data provided by Kjeldsen, Sinnock & Neudeck, Inc. in 2017		

All of the emergency response construction project components were included within the Phase 3 Repair Project, except for the new seepage berm that was constructed in elements Va and VIa.1. This seepage berm was evaluated in the FEIS ((USACE *in prep.)* under Alternative 2 – Maximum Footprint, but not carried over into the Preferred Alternative, which is the Phase 3 Repair Project. However, this seepage berm overlaps with the footprint for the Phase 3 Repair Project (compare Exhibit 13b, in Appendix A, to Sheets 9 and 11 of Appendix G).

AVOIDANCE AND MINIMIZATION MEASURES

The following avoidance and minimization measures would be implemented as a component of the Phase 3 Repair Project. The measures, where applicable, were implemented during the 2017 Emergency Response Construction Project (see “Effects Related to the 2017 Emergency Response Construction Project Actions” subsection under the “Direct and Indirect Effects on Species in the Action Area” section of this document).

GENERAL

A qualified biologist, retained by RD 17, will be on-site to ensure compliance with the avoidance and minimization measures described below, particularly where construction activities occur adjacent to sensitive habitats to be avoided.

A worker awareness training program will be conducted for construction crews before the start of construction. The program will include a brief overview of special-status species and sensitive resources (including riparian habitats) in the Phase 3 Repair Project area, measures to avoid and minimize effects on those resources, and conditions of relevant regulatory permits.

Furthermore, traffic speeds on unpaved roads will be limited to 15 miles per hour, to reduce dust emissions and minimize potential effects on listed species, such as the riparian brush rabbit.

VALLEY ELDERBERRY LONGHORN BEETLE

For elderberry shrubs that are located in the Phase 3 Repair Project area, RD 17 will implement the following avoidance and minimization measures that are described in the Conservation Guidelines for the Valley Elderberry Longhorn Beetle (VELB Guidelines; USFWS 1999), to avoid and minimize effects on VELB:

- All elderberry shrubs that are located adjacent to construction areas but can be avoided will be protected by establishing a fenced avoidance area. The fencing will be placed at least 20 feet from the dripline of the shrubs. All elderberry shrubs to be protected during construction will be identified and marked by a qualified biologist. Orange construction barrier fencing will be placed at the edge of the respective buffer areas, and no construction activities will be permitted within the buffer zone other than those activities necessary to erect the fencing. In cases where the elderberry dripline is less than 20 feet from the work area, k-rails will be placed at the shrub's dripline to provide additional protection to the shrubs from construction equipment and activities. Temporary fences around the elderberry shrubs and, where appropriate, k-rails at shrub drip lines will be installed as the first order of work. Buffer area fences around elderberry shrubs will be inspected weekly by a qualified biologist during ground-disturbing activities, until adjacent project construction is complete or the fences are removed on approval by a qualified biologist and the resident engineer.
- No insecticides, herbicides, or other chemicals that may harm the beetle or its host plant will be used within 100 feet of elderberry shrubs.
- Elderberry shrubs that require removal will be transplanted to a USFWS-approved site during the dormant period for elderberry shrubs (i.e., November 1 to February 15) and in accordance with the VELB Guidelines (USFWS 1999).
- Each elderberry stem measuring 1 inch or greater in diameter at ground level that may be adversely affected (i.e., transplanted) will be replaced with elderberry seedlings and seedlings of associated species, in accordance with the VELB Guidelines (USFWS 1999).

Regarding provision for off-site compensatory mitigation for habitat losses, see the "Compensation Measures" subsection below.

RIPARIAN BRUSH RABBIT

The following measures will be implemented to avoid and minimize potential adverse effects on riparian brush rabbit in potential habitat within and adjacent to the Phase 3 Repair Project footprint (i.e., Great Valley cottonwood and Great Valley oak riparian forest communities):

- Potential riparian brush rabbit habitat will be identified and avoided wherever possible. The primary engineering and construction contractors will ensure, through coordination with a qualified biologist who is pre-approved by USFWS and retained by RD 17, that construction will be implemented in a manner that minimizes disturbance of such areas to the extent feasible.
- Temporary fencing will be used during construction to prevent disturbance of potential habitat adjacent to construction areas. Construction personnel, vehicles, and equipment will remain within the identified construction area. In addition, a silt fence or other suitable temporary barrier will be installed around the construction area where it borders suitable habitat for brush rabbits, to exclude brush rabbits from the construction site; this silt fence or temporary barrier either will be incorporated into the temporary fencing or will be installed as a separate fence. Temporary signage will be placed along the rabbit exclusion fence at 150-foot intervals, warning contractors to stay within the construction area. The temporary rabbit exclusion fence and associated signage will be inspected by a qualified biologist and the construction contractor each morning before the beginning of construction activities, and will be repaired and maintained as necessary. A biological monitor will inspect the fence at least once a week. The temporary rabbit exclusion fence and signage will be removed after construction activities are no longer occurring adjacent to the exclusion area.
- Where suitable habitat for riparian brush rabbit has to be removed, vegetation will be removed by hand 2 weeks before the start of construction so that no riparian brush rabbits are present in the construction area at the time of construction. A qualified biologist, retained by RD 17, will be on-site during vegetation removal. Areas of temporary habitat disturbance in the Phase 3 Repair Project area will be revegetated with native plant species and restored to pre-project conditions.

Regarding provision for on-site compensatory mitigation for habitat losses, see the “Compensation Measures” subsection below.

FEDERALLY LISTED FISH—DELTA SMELT, LONGFIN SMELT, ANADROMOUS SALMONIDS, AND GREEN STURGEON (WATER QUALITY)

The following measures will be implemented to avoid and minimize potential adverse effects on water quality:

- Any work within the existing floodway (i.e., placing riprap on the waterside levee above the HTL at element IVc) of the San Joaquin River will not take place during the designated flood season (i.e., November 1 to July 1) and will not begin until evaluation of upstream conditions (e.g., reservoir storage and snowpack) indicate that inundation of these areas will be unlikely to occur during construction.
- RD 17 will comply with all local, State, and federal regulations and environmental requirements regarding turbidity-reduction measures, including the following:
    - obtaining and complying with relevant agency permits (e.g., CDFW streambed alteration agreement, Central Valley Regional Water Quality Control Board [RWQCB] Clean Water Act Section 401 certification, and Section 404 permit);
    - developing and implementing a storm water pollution prevention plan (SWPPP) that identifies specific BMPs to avoid and minimize effects on water quality during construction activities; and
    - complying with the conditions of the National Pollutant Discharge Elimination System (NPDES) general stormwater permit for construction activity.
- RD 17 will file a notice of intent with the Central Valley RWQCB to discharge stormwater associated with construction activity. Final design and construction specifications will require implementation of standard erosion, siltation, and good housekeeping BMPs. Construction contractors will be required to prepare and implement a SWPPP and comply with the conditions of the NPDES general stormwater permit for

construction activity (Order No. 2009-0009-DWQ or the current permit in place at the time of construction). The SWPPP will describe the construction activities to be conducted, BMPs that will be implemented to prevent discharges of contaminated stormwater into waterways, and inspection and monitoring activities that will be conducted.

At a minimum, the following specific BMPs will be implemented:

- All work will be conducted according to site-specific construction plans that identify areas for clearing, grading, and revegetation so that ground disturbance is minimized.
- Silt fences and/or straw wattles will be installed near riparian areas or existing drainages to control erosion and trap sediment and reseed cleared areas with native vegetation.
- Maintenance will be conducted on a regular basis to ensure proper installation and function of BMPs, and during storm events, maintenance will be conducted daily.
- BMPs that have failed (within 48 hours of an event) will be repaired and replaced immediately with sufficient devices and materials (e.g., silt fence, coir rolls, and erosion blankets), provided throughout project construction to enable immediate corrective action for failed BMPs.
- Stockpiling of construction materials (e.g., portable equipment, vehicles, and supplies, including chemicals) will be restricted to designated construction staging areas, exclusive of any riparian, wetland, or other areas supporting waters.
- Disturbed soils at construction areas will be stabilized before the onset of rainfall.
- Stockpiles will be stabilized and protected from exposure to rain and potential erosion.

The SWPPP also will specify appropriate hazardous materials handling, storage, and spill response practices to reduce the possibility of effects from use or accidental spills or releases of contaminants. Specific measures applicable to the project will include the following:

- Compliance will be required by RD 17 contractors with all applicable State Water Resources Control Board (SWRCB) and Central Valley RWQCB standards and other applicable water quality standards.
- Strict on-site handling rules will be developed and implemented, to keep potentially contaminating construction and maintenance materials out of drainages and other waterways.
- When refueling and servicing equipment, absorbent material or drip pans will be used underneath such equipment to contain spilled fuel, oil, and other fluids; and any fluid drained from machinery will be collected in leak-proof containers and deliver to an appropriate disposal or recycling facility.
- Controlled construction staging and fueling areas will be maintained at least 100 feet away from channels or wetlands, to minimize accidental spills and runoff of contaminants in stormwater.
- Substances that can be hazardous to aquatic life will be prevented from contaminating the soil or entering watercourses.
- Spill cleanup equipment will be maintained in proper working condition. All spills will be cleaned up immediately according to the spill prevention and response plan, which will be prepared by RD 17 or its contractor or representative and will be approved by the RWQCB before the start of project ground-breaking.

- NMFS, USFWS, CDFW, and the Central Valley RWQCB will be notified immediately (within 24 hours) of any reportable spills and cleanup occurrences. All such spills, and the success of the efforts to clean them, will be recorded in post-construction compliance reports.
- A slurry spill contingency plan will be developed, which will be prepared by RD 17 or its contractor or representative before the start of project groundbreaking, to respond to a potential for bentonite slurry spill and prevent slurry from entering watercourses.
- Construction materials handled by RD 17 or its contractors will be stored and transported in a manner that minimizes potential water quality effects. Storage areas will be located away from drainages and waterways, outside the floodplain, and away from sensitive resources, and containment facilities will be used.

BMPs will be applied to meet the “maximum extent practicable” and “best conventional technology/best available technology” requirements and address compliance with water quality standards. RD 17 will implement a monitoring program during and after construction so that the Phase 3 Repair Project complies with all applicable standards and BMPs implementation is effective.

COMPENSATION MEASURES

VALLEY ELDERBERRY LONGHORN BEETLE

As described above under “Avoidance and Minimization Measures—Valley Elderberry Longhorn Beetle,” compensation for effects on VELB will be provided in accordance with the VELB Guidelines (USFWS 1999). Elderberry shrubs that cannot be avoided will be transplanted to the levee setback area in element IVc (**Exhibit 12**). The restoration design, as outlined in the Conceptual Mitigation and Monitoring Plan for the Riparian Brush Rabbit (Conceptual MMP; **Appendix E**), will include elderberry seedlings and associated species plantings to compensate for the effects on VELB habitat in the Phase 3 Repair Project site. Transplanting unavoidable elderberry shrubs and planting elderberry seedlings and associated species (in an amount determined through compliance with the VELB Guidelines) will fully compensate for the loss of VELB habitat resulting from construction activities associated with the Phase 3 Repair Project.

RIPARIAN BRUSH RABBIT

Compensation for effects on riparian brush rabbit habitat will consist of restoring natural habitats in the Phase 3 Repair Project area.

As described in more detail in the Conceptual MMP (**Appendix E)**, on-site compensation for adverse effects on riparian brush rabbit habitat will include restoration of at least 9.9 acres of riparian habitat in the proposed levee setback area in element IVc. This acreage will be made up of approximately 0.5 acre of floodplain swale and approximately 4.5 acres of restored riparian scrub habitat between the landside toe of the existing levee and the waterside toe of the new setback levee; approximately 2.5 acres of enhanced riparian scrub habitat between the river and the waterside toe of the existing levee; and approximately 4 acres of restored Great Valley oak woodland/upland refugia habitat along the existing levee. The total of amount of potential compensatory mitigation acreage is approximately 11.5 acres, which will allow approximately 1.6 acres of contingency to achieve the compensation for riparian brush rabbit habitat.

After the new setback levee is constructed and certified in element IVc, a small 400-foot section of the existing levee will be partially degraded. Native riparian scrub vegetation will be established within the entire setback area floodplain. Species in the plant palette will be those preferred by the riparian brush rabbit for providing cover, including: California blackberry (*Rubus ursinus*), California wild rose (*Rosa californica*), sandbar willow (*Salix exigua*), coyote brush (*Baccharis pilularis*), and golden currant (*Ribes aureum*), among others. Understory vegetation will include herbaceous species that have been identified as preferred forage by the riparian brush rabbit, such as mugwort (*Artemisia douglasiana*) and gumplant (*Grindelia camporum*). To provide refugia during flood events, the old levee footprint also will be vegetated with riparian scrub and riparian woodland tree species. The upland refugia will include elderberry seedlings and associated species plantings to compensate the effects on VELB habitat in the Phase 3 Repair Project area. In addition to plantings within the setback area, waterside riparian vegetation will be enhanced with plantings in open areas.

Between 25 feet from the landside toe of the existing levee and 25 feet from the waterside toe of the new setback levee are approximately 4.5 acres of ruderal grassland that can be restored as riparian scrub habitat (**Exhibit 12**). Approximately 2.5 additional acres of riparian scrub habitat will be restored and/or enhanced between the waterside toe of the existing levee and the river. The restored riparian scrub habitat will consist of willows, cottonwoods, valley oaks, wild rose, California blackberry, and grasses, which is comparable to the composition of habitats where riparian brush rabbit is documented to occur along the RD 17 levees. Apart from a 400-foot section along the north side, the existing levee will remain in place and approximately 4 acres of Great Valley oak woodland will be established on it, thus providing upland refugia for the riparian brush rabbit during high-water events.

Approximately a 3:1 restoration to impact mitigation ratio (for effects on potential riparian brush rabbit habitat) will be accomplished in the restoration area, with approximately 9.9 acres (and up to 11.5 acres) of riparian brush rabbit habitat restored. The expansion and restoration of riparian habitat in element IVc will augment the waterside riparian corridor along the San Joaquin River and will provide additional riparian habitat for the riparian brush rabbit between two known occurrences of this species (i.e., between elements IIIa/IIIb and elements VIa.1/VIa.4 [CDFW 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004]). The restoration area will be contiguous with existing waterside riparian habitat along element IVc; this waterside riparian habitat along element IVc extends northward through elements IVa, IIIa, and IIIb, and southward through elements Va and VIa.1. Documented occurrences exist of riparian brush rabbit in the waterside riparian habitat in elements IIIa and IIIb, and north of element IIIa and south of element VIa.1; therefore, reestablishing and protecting riparian habitat in element IVc will provide expanded and connected habitat for this species. This habitat creation and enhancement will fully compensate for the loss of habitat for riparian brush rabbit resulting from construction activities associated with the Phase 3 Repair Project.

Mitigation and Monitoring Plan

A Conceptual MMP has been prepared to describe the expansion and restoration of riparian habitat in element IVc (**Appendix E**). Specifically, this plan:

- describes specifications for the restoration of habitat components, including details about the restoration of riparian habitats, with a list of the plant species and drawings/designs to show the location of the plant species and planting density;
- establishes specific success criteria for the habitat components, including:
    - performance standards to determine whether the habitat improvement was trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in design or maintenance revisions);
    - monitoring and maintenance protocols; and
    - measurable goals to ensure vegetation survival to provide and replace riparian habitats;
- specifies remedial measures to be undertaken if success criteria are not met (e.g., adaptive management, physical adjustments, additional monitoring); and
- describes short and long-term management and maintenance of the habitat lands.

The Conceptual MMP is intended to be developed into a Final MMP, in coordination with USFWS, NMFS, and USACE, and would be reviewed and approved by USFWS and NMFS before ground-breaking in the portions of the Phase 3 Repair Project area that could affect the species addressed in this BA. RD 17 would provide conservation of the restored riparian habitat in the levee setback area in element IVc. The compensation habitat ultimately would be transferred to a suitable land management organization, for long-term management and monitoring. This habitat creation and enhancement would fully compensate for the loss of habitat for VELB and riparian brush rabbit resulting from construction activities associated with the Phase 3 Repair Project.

ACTION AREA

The action area is defined in accordance with ESA guidelines as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). The action area includes all areas that would be directly or indirectly affected by the components of the Phase 3 Repair Project and the 2017 Emergency Response Construction Project.

Areas downstream from the Phase 3 Repair Project area also may be indirectly affected by the flood risk management component of the project, through improved water quality and flood risk management conditions. The extent of this potential effect is difficult to quantify, however, for element IVc; construction of a setback levee and breaching a small downstream portion of the existing levee would be expected to create a backwater effect and would not result in a substantial widening of the flood plain. An analysis also was conducted to evaluate the hydraulic effects of the setback levee at element IVc. This hydraulic analysis showed that the proposed action would essentially have no effect on the maximum water surface elevation, with a computed maximum increase in the water surface elevation of 0.0007 feet, and maximum flow rate changes would be negligible during extreme events (100-year flood recurrence interval). Because far afield project-related hydrologic effects are not likely to occur, the action area is concluded to be in the immediate vicinity of the actual project boundaries.

ENVIRONMENTAL BASELINE

HYDROLOGY

SACRAMENTO–SAN JOAQUIN DELTA

The Delta extends inland from the confluence of the Sacramento and San Joaquin rivers west of Antioch to Sacramento on the Sacramento River and to near Mossdale on the San Joaquin River. The Phase 3 Repair Project area is in the southeastern portion of the Delta, within the legal boundary of the Delta as defined by Section 12220 of the California Water Code.

The legal Delta encompasses an area of approximately 851,000 acres (of which approximately 135,000 acres consist of waterway, marshland, or other water surfaces). The Delta is divided into a Primary Zone and a Secondary Zone, as defined by the Delta Protection Act of 1992. Land uses in the Primary Zone are regulated to protect the area for agriculture, wildlife habitat, and recreational uses. The Secondary Zone is the area outside the Primary Zone and within the legal Delta. Where urban development activities occur in the Secondary Zone, efforts should be taken to ensure that these activities do not adversely affect Delta waters, Primary Zone habitat, or recreational uses. The San Joaquin River delineates the boundary between the Primary Zone to the west and the Secondary Zone to the east. The Phase 3 Repair Project is located in the Secondary Zone.

The Sacramento River contributes roughly 75 to 80 percent of the Delta inflow in most years, and the San Joaquin River contributes about 10 to 15 percent; the Mokelumne, Cosumnes, and Calaveras rivers, which flow into the eastern side of the Delta, contribute the remainder. The rivers flow through the Delta and into Suisun Bay, San Pablo Bay, San Francisco Bay, and the Pacific Ocean. Historical annual Delta inflow averaged approximately 23 million acre-feet (MAF) between 1945 and 1995, with a minimum inflow of approximately 6 MAF in 1977 and a maximum of approximately 70 MAF in 1983. Water flowing into the Delta is used for urban and agricultural use, recreation, navigation, and wildlife and fisheries. The Delta provides drinking water for about 23 million Californians.

Freshwater inflows to the Delta vary greatly, depending on precipitation, snowmelt, and Central Valley Project (CVP) and State Water Project (SWP) water operations. During the summer months, most inflow to the Delta comes from regulated releases from SWP and CVP reservoirs. Both projects also withdraw large volumes of water from the Delta for agricultural and urban use. Precipitation in the project region occurs primarily from November through March, with the average annual precipitation ranging from about 8 inches near Tracy to approximately 17 inches near Lodi. Near Lathrop, the annual precipitation is approximately 12 inches.

Water movement in the Delta responds to four primary forcing mechanisms:

- freshwater inflows to the ocean;
- Delta exports and upstream diversions;
- operation of water control facilities such as dams, export pumps, and flow barriers; and
- the regular tidal movement of seawater into and out of the Delta.

In addition, winds and salinity behavior in the Delta can generate secondary currents that, despite being of low velocity, can be of considerable significance with respect to transporting contaminants and mixing different sources of water. Changes in flow patterns in the Delta, whether caused by export pumping, winds, atmospheric pressure, flow barriers, tidal variations, inflows, or local diversions, can influence water quality at drinking water intakes.

The Delta is a hydrologically complex region of interlacing channels, marshland, and islands. The Delta has been reclaimed into more than 60 islands and tracts, interlaced with about 700 miles of waterways. Some channels are edged with aquatic and riparian vegetation, but most are bordered by steep banks of earth or riprapped levees. Vegetation generally is removed from channel margins to increase flood flow capacity and facilitate levee maintenance. About 520,000 acres are devoted to farming. An approximately 1,100-mile network of levees protects the reclaimed land, most of which lies near or below sea level, from flooding. Some of the island interiors are as much as 25 feet below sea level.

Nearly 16.5 miles of the 19 miles of levees protecting RD 17 are considered federal project levees; the 2.6-mile dryland levee is not a federal levee. Federal project levees either were constructed by the federal government (typically through USACE) or were built by others and later brought under federal jurisdiction.

San Joaquin River

The San Joaquin River originates in the Sierra Nevada and enters the San Joaquin Valley at Friant Dam. Most of the flow in the lower San Joaquin River is derived from inflow from the Merced, Tuolumne, and Stanislaus rivers (Northeastern San Joaquin County Groundwater Banking Authority 2004). The 330-mile-long San Joaquin River, which drains a watershed area of 13,540 square miles from the Sierra Nevada to the Delta, contributes approximately 15 percent of the inflow to the Delta (Delta Protection Commission 2000). Flowing through portions of Fresno, Madera, Merced, Stanislaus, San Joaquin, Sacramento, and Contra Costa counties, the river has flows ranging from 1,500 cfs in dry years to more than 40,000 cfs in wet years (Friant Water Users Authority and Natural Resources Defense Council 2002).

Hydrologic conditions in the San Joaquin River basin are dominated by snowmelt from the Sierra Nevada. Before major water storage projects were completed on the San Joaquin River and its major tributaries, lower San Joaquin River flows generally peaked in late spring/early summer and dropped to low levels in the fall. Since completion of Friant Dam (1944), McClure Reservoir (1967 on the Merced River), Don Pedro Reservoir (1971 on the Tuolumne River), and New Melones Reservoir (1979 on the Stanislaus River), the lower San Joaquin River's seasonal flow pattern has changed substantially. Before 1944, based on 1923–1944 records, flow in the lower San Joaquin River tended to peak in May and June, with an average monthly flow of almost 11,000 cfs, and declined rapidly to an average monthly flow of approximately 1,200–1,300 cfs in August and September. Since 1979, the average monthly flow has peaked in March at just over 10,000 cfs, with a more gradual decline to approximately 2,400 cfs in August. In addition, the San Joaquin River is tidally influenced by the Delta and the San Francisco Bay. Tidal fluctuation in the San Joaquin River has been modeled to approximately the Vernalis tide gauge and the Airport Way crossing of the San Joaquin River, which is approximately 13 river miles upstream from the project site.

The SJRRP was established in late 2006, to implement the Stipulation of Settlement in *NRDC et al. v. Kirk Rodgers et al*. (Settlement). Authorization for implementing the Settlement is provided in the San Joaquin River Restoration Settlement Act, included in PL 111-11. The goal of the SJRRP is to re-operate and increase the release of water from Friant Dam in accordance with the Settlement, and in a manner consistent with federal, State, and local laws, and future agreements with downstream agencies, entities, and landowners (Reclamation and DWR 2011). The Settlement establishes two primary goals:

- *Restoration Goal*—To restore and maintain fish populations in "good condition" in the mainstem San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish. To achieve the Restoration Goal, the Settlement calls for releases of water from Friant Dam to the confluence of the Merced River (referred to as Interim and Restoration Flows), a combination of channel and structural modifications along the San Joaquin River below Friant Dam, and reintroduction of Chinook salmon.

- *Water Management Goal*—To reduce or avoid adverse water supply impacts on all of the Friant Division long-term contractors that may result from the Interim and Restoration Flows provided for in the Settlement. To achieve the Water Management Goal, the Settlement calls for recirculation, recapture, reuse, exchange, or transfer of the Interim and Restoration Flows to reduce or avoid impacts on water deliveries to all of the Friant Division long-term contractors caused by the Interim and Restoration Flows.

The SJRRP is to release Interim and Restoration Flows to the San Joaquin River from Friant Dam in accordance with the flow schedule presented in Exhibit B of the Settlement. The Settlement establishes the Recovered Water Account and recovered-water program, which make water available to all Friant Division long-term contractors who provide water to meet Interim or Restoration Flows so that the impacts of Interim and Restoration Flows on such contractors can be reduced or avoided.

LOCAL DRAINAGE

Stormwater runoff in the RD 17 area commonly is collected in agricultural ditches, channels, municipal stormwater sewers, or human-made ponds before being pumped to the San Joaquin River. Runoff from the area east of the San Joaquin River, along levee elements Ie and VIIb, is directed west through agricultural swales and ditches, and then is pumped into the river by means of private agricultural pumps. Runoff from developed lands adjacent to elements IVa, IVc, and VIa.4 is directed to the City of Lathrop's storm drainage system, held in detention basins, and ultimately pumped into the San Joaquin River through a municipal stormwater outfall. Runoff in the area around element VIIe, which encompasses the Oakwood Lake development, first flows into the artificial lake in the center of the development, and then is pumped into the river if lake levels become too high.

WATER QUALITY

Water quality in the Delta and portions of the San Joaquin River are heavily influenced by CVP and SWP operations. Generally, Delta water quality is best during the winter and spring months and poorer during the irrigation season and early fall. Water quality in the San Joaquin River is influenced by factors such as rain and snowmelt runoff, reservoir operations, and irrigation return flows in the San Joaquin river basin. Agricultural return flows commonly discharge elevated salt loads into the San Joaquin River. The SWRCB has set flow and water quality objectives at Vernalis, located just upstream from the Phase 3 Repair Project area. To meet the Vernalis objective, the U.S. Bureau of Reclamation supplements flows on the San Joaquin River with releases from New Melones Reservoir on the Stanislaus River (Northeastern San Joaquin County Groundwater Banking Authority 2004).

The latest version of the Section 303(d) list for California issued by the SWRCB (approved October 26, 2006) identifies an impaired status for waterways in the eastern Delta, including the lower San Joaquin River. Potential sources of pollution for all of the listed constituents in the basin include agriculture, urban runoff/storm sewers, resource extraction, and unknown sources. The eastern Delta, including the lower San Joaquin River, is on the Section 303(d) list for impairment from boron, chlorpyrifos, diazinon, dichlorodiphenyltrichloroethane, electrical conductivity, unknown toxicity, Group A pesticides, exotic species, and mercury. Downstream from the Phase 3 Repair Project area, the Stockton Deep Water Ship Channel is being addressed by a total maximum daily load (TMDL) plan for dissolved oxygen and is no longer on the Section 303(d) list. TMDLs have been initiated for organophosphorus pesticides (i.e., diazinon and chlorpyrifos), salinity and boron, and selenium in the lower San Joaquin River watershed and for total dissolved solids and mercury in Delta channels. TMDLs for the other listed pollutants are scheduled to be developed at various times over the next 10 years, in accordance with the priorities contained in the Section 303(d) list.

Major monitoring programs for the San Joaquin River include DWR's Municipal Water Quality Investigations Program and Water Rights Decision 1485 Water Quality Monitoring Program. The City of Stockton also monitors ambient water quality to assess potential effects of discharges from the Stockton Regional Wastewater Control Facility. Data are collected at five water quality monitoring sites along the San Joaquin River near the Phase 3

Repair Project area. The Mossdale Bridge sampling site at the Interstate 5 crossing over the San Joaquin River is near elements VIcde and VIIb. The Vernalis sampling site is located near the town of Vernalis, just upstream from the Phase 3 Repair Project area. Some of the broad categories that are monitored are discussed briefly below.

HABITAT

Dense riparian forests once flanked the San Joaquin River in this area. In contrast, the habitat today consists of linear areas and occasional remnant patches of riparian forests and related riparian scrub that grow on or adjacent to the levee, primarily on the waterside. A few larger areas of these riparian forests are present where the river turns away from the levee and creates a point bar and an upland floodplain area. Riprap or large boulders cover the lower half of most of the waterside of the San Joaquin River east levee in the Phase 3 Repair Project area, and ruderal vegetation grows in open areas, especially upslope from the riprap and on large open areas on the landside of the levee. Other areas of levee on the waterside are barren and/or covered with stumps and dead vegetation, likely because of levee maintenance that has included cutting scrub and low vegetation, burning, and applying herbicide. Some of the lands on the waterside of the levee are privately held and are affected by grazing and other landowner activities.

The landside reaches of the Phase 3 Repair Project area levees primarily are barren or covered with ruderal vegetation. Beyond the base of the levees, riparian vegetation is rare but occasionally is present in small, isolated patches. Other trees include occasional single or isolated stands of native oaks and nonnative trees that have been planted around farms, agricultural fields, and residential or other types of development. Habitat and land cover types present in the Phase 3 Repair Project area include riparian forests, nonnative woodlands, agricultural lands, ruderal and developed areas, and aquatic features (including marsh, wetlands, and ponds) (**Exhibits 13a** through **13c**).

VEGETATION AND LAND COVER

As described below, terrestrial vegetation and land cover types in the Phase 3 Repair Project area and vicinity include Great Valley cottonwood riparian forest (remnant), Great Valley oak riparian forest (remnant), nonnative woodland, agricultural (row crops, orchards, dirt roads, and irrigation ditches), and ruderal and developed (residential housing, parks, boat launch facilities, and roads).

- **Great Valley cottonwood riparian forest:** Remnant patches of Great Valley cottonwood riparian forest in the Phase 3 Repair Project area are dominated by large Fremont cottonwood (*Populus fremontii*) trees and Goodding's willow (*Salix gooddingii*). Most of the otherwise linear or smaller patchy areas of this community lack Fremont cottonwood and are represented by Goodding's willow, red willow (*S. laevigata*), arroyo willow (*S. lasiolepis*), narrow leaved-willow (*S. exigua*), scattered valley oak (*Quercus lobata*), Oregon ash (*Fraxinus* latifolia), and buttonbush (*Cephalanthus occidentalis*). Native ground cover species, found mainly in the larger remnant patches of riparian forest, include California blackberry (*Rubus ursinus*) and wild rose (*Rosa californica*). Common nonnative understory species found in most elements include Himalayan blackberry (*Rubus discolor*) and tree tobacco (*Nicotina glauca*). Most of the Great Valley cottonwood riparian forest community also could be characterized as Great Valley riparian scrub, which does not include Fremont cottonwood and is characterized by a shorter canopy and more uniform structure. This habitat, however, is part of the Great Valley cottonwood riparian forest that was extensive and connected along this entire reach of the San Joaquin River. Therefore, this BA describes all riparian habitat as such. The largest stands of Fremont cottonwood trees in the Phase 3 Repair Project area are present in elements IIIb, IVc, Va, and VIa.1.
- **Great Valley oak riparian forest:** Great Valley oak riparian forest is located in the Phase 3 Repair Project area, occurring only on the landside of the levees. This is a medium to tall (rarely to 100 feet), broadleaved, winter deciduous, closed-canopy riparian forest dominated by valley oak. Understories include scattered Northern California black walnut (*Juglans nigra*) and western sycamore (*Platanus racemosa*) as well as young valley oaks. Understory plants include California rose (*Rosa californica*), blackberry (*Rubus* spp.), and

western poison oak (*Toxicodendron diversilobum*) (Hickman 1993; Holland 1986). Two substantial oak groves of very large, healthy valley oak trees are present on the landside of elements IIIb and IVa and account for most of the Great Valley oak riparian forest. Several groups of smaller valley oak trees and individual valley oaks, scattered along the landside of other Phase 3 Repair Project elements, also contribute to this community.

- **Nonnative woodland:** Along the landside of elements Ie, VIa.1, VIde, and VIIg, nonnative trees have been planted around farms, agricultural fields, and residential or other types of development. These woodlands lack understory vegetation, other than grasses and ruderal vegetation.

- **Agricultural cropland:** Cropland in the Phase 3 Repair Project area is dominated by alfalfa fields, orchards, and row crops, such as tomatoes. Ruderal species grow along the edges of fields and irrigation ditches, some of which contain water and associated aquatic plants. The largest areas of agricultural lands are present in elements Va, VIa.1, and VIcde.

- **Ruderal vegetation:** Ruderal vegetation is characterized by nonnative weedy and sometimes invasive vegetation and nonnative annual grasses. Common weed species include yellow star-thistle (*Centaurea solstitialis*), black mustard (*Brassica nigra*), shortpod mustard (*Hirschfeldia incana*), Italian thistle (*Carduus pycnocephalus*), milk thistle (*Silybum marianum*), and Himalayan blackberry. Common grass species include ripgut brome (*Bromus diandrus*), foxtail barley (*Hordeum murinum* ssp. *leporinum*), Bermuda grass (*Cynodon dactylon*), and Johnsongrass (*Sorghum halepense*). The levee slopes are dominated by ruderal vegetation. Large open areas in elements IIIa and IVc also are composed primarily of ruderal vegetation, as are smaller open areas in elements VIcde and VIIe that border roads, parking lots, and agricultural land.

- **Developed areas:** Developed areas in the Phase 3 Repair Project area consist of residential areas bordering elements IVa, IVc, Va and VIa.1, and VIIe; parks located in elements IVc and VIa.2, the latter of which is also a boat launching facility; and ranch houses and related facilities located in or adjacent to elements Ie, IIab, Va, VIa.1, and dryland levee element XI. Vegetation in residential areas and parks consists of turf grasses, landscape trees, and occasional valley oak trees. Ranch lands often contain English walnut trees (*Juglans regia*), a variety of landscaped trees, and occasional native valley oak trees.

AQUATIC HABITATS

The principal surface water bodies associated with the Phase 3 Repair Project area are the San Joaquin River and Walthall Slough. Project elements Ia through IVc are located downstream from the confluence of the San Joaquin River and Old River. Reach V is located directly adjacent to this confluence. Elements VIa.1 through VIIe are upstream from the confluence of the San Joaquin River and Old River. Small portions of elements VIIe and VIIg are located along Walthall Slough. An approximately 3.5-acre constructed pond is located adjacent to elements IIab, but outside the project footprint (**Exhibit 13a**).

In the Phase 3 Repair Project area, the San Joaquin River is characterized as a wide channel (approximately 300 feet) with little riparian canopy or overhead vegetation and minimal bank cover. Aquatic habitat in the San Joaquin River is characterized primarily by slow-moving glides and pools, is depositional in nature, and has limited water clarity and habitat diversity. Altered flow regimes, flood risk management, and bank protection efforts along much of the San Joaquin River have reduced riparian vegetation and associated shaded riverine aquatic (SRA) habitat, sediment transport, channel migration and avulsion, and large woody debris recruitment, and have isolated the channel from its floodplain. This has resulted in a decline in habitat quality for fish species using the San Joaquin River near the Phase 3 Repair Project area. However, fish use this segment of the river, even if only as a migratory pathway to and from upstream spawning and rearing areas.

Wetland vegetation in the Phase 3 Repair Project area is limited to coastal and valley freshwater marshes, several agricultural ditches, and the edges of one constructed pond. Freshwater marsh is isolated in a depression on the landside of the levee in element Ib between Howard Road to the north and a dirt farm road on the south. A limited

amount of freshwater marsh also is present around the edges of a constructed pond, located on a large private estate and equestrian center, east of the Phase 3 Repair Project area levee in element IIab. A second area of freshwater marsh is located just outside the Phase 3 Repair Project area in element Va, and in an area of backwater on the San Joaquin River. Agricultural ditches are located along the edges of fields and orchards.

FISH POPULATIONS

The lower San Joaquin River and Delta serve as a migration corridor and/or provide other types of habitat (e.g., rearing, spawning) for steelhead, delta smelt, white sturgeon (*Acipenser transmontanus*), and green sturgeon. Numerous other resident native and nonnative species also are found in the San Joaquin River. Among the native species present in the river are blackfish (*Orthodon microlepidotus*), threespine stickleback (*Gasterosteus aculeatus*), and San Joaquin roach (*Lavinia symmetricus* sp.); while nonnative species include striped bass (*Morone saxatilis*), white catfish (*Ameiurus catus*), and bluegill (*Lepomis macrochirus*). In late 2014, experimental populations of spring-run Chinook salmon began to be reintroduced to the San Joaquin River, as a component of the SJRRP (see “San Joaquin River” subsection above).

The small, unnamed pond in elements IIab (**Exhibit 13a**) may contain fish and other aquatic species. Because of its isolated nature and size, this pond likely supports only nonnative warm-water fish that probably have been introduced. Typical fish that are found in similar ponds include bluegill, western mosquitofish (*Gambusia affinis*), and catfish (*Ameiurus* or *Ictalurus* spp.), among other nonnative warm-water species.

WILDLIFE

Common wildlife species expected in the Phase 3 Repair Project area are those typically associated with agriculture (e.g., alfalfa, row crops, and orchards) and ruderal habitat, which account for 57 percent of the Phase 3 Repair Project area’s footprint. Species include California ground squirrel (*Spermophilus beecheyi*), Botta’s pocket gopher (*Thomomys bottae*), western harvest mouse (*Reithrodontomys megalotis*), and California meadow vole (*Microtus californicus*). These small mammals are prey for a variety of raptor species known to occur in the area, including Swainson’s hawk (*Buteo swainsoni*). Riparian habitats in the Phase 3 Repair Project area provide nesting habitat for a wide variety of bird species.

SPECIES ACCOUNTS

This section presents species accounts for the federally listed species considered in this BA, including relevant life history and habitat use, as well as the species' potential for occurrence in the action area. The action area (see the "Action Area" section above) encompasses the entire area that may be affected by the Phase 3 Repair Project, including more distant locations where indirect effects may occur. However, the species accounts below focus on the habitat present in the Phase 3 Repair Project area itself and describe the potential for federally listed species to occur in the general vicinity. Only when the habitat quality or species distribution is specifically known for the action area is it described.

VALLEY ELDERBERRY LONGHORN BEETLE

VELB has four life stages: egg, larva, pupa, and adult. This species, which is federally listed as threatened, is nearly always found on or close to its host plant, the elderberry (*Sambucus* sp.). Females lay their eggs on the bark, and larvae hatch and burrow into the stems. The larval stage can last 2 years, after which the larvae enter the pupal stage and transform into adults. Adults are active (feeding and mating) from March to June (USFWS 2006). It appears that to function as VELB habitat, host elderberry shrubs must have stems that are 1.0 inch or greater in diameter at ground level. Use of the plants by the beetle rarely is apparent. Frequently, the only exterior evidence of the shrub's use by the beetle is an oval exit hole, created by the larva just before the pupal stage. Field studies conducted along the Cosumnes River and in the Folsom Lake area suggest that larval galleries can be found in elderberry stems with no evidence of exit holes, because the larvae either succumb before constructing an exit hole or are not far enough along in the developmental process to construct an exit hole (USFWS 1996a).

VELB is patchily distributed throughout the remaining riparian forests of the Central Valley, from Redding to Bakersfield, and appears to be only locally common (i.e., found in population clusters that are not evenly distributed across the Central Valley). Extensive loss of Central Valley riparian forests has occurred since 1900, with riparian forests declining by 80 to 96 percent, depending on the region (USFWS 2006). Although it is wide-ranging, VELB is thought to have suffered a long-term decline because of human activities that have caused widespread alteration and fragmentation of riparian habitats and, to a lesser extent, upland habitats that support the beetle. Low density and limited dispersal capability may cause the beetle to be particularly vulnerable to population isolation because of habitat fragmentation. Insecticide and herbicide use in agricultural areas and along road rights-of-way may be factors limiting the beetle's distribution. The age and quality of individual elderberry shrubs/trees and stands as a food plant for beetle may be a factor in its limited distribution.

Elderberry shrubs are known to occur along the San Joaquin River, on both the waterside and landside of levees in the Phase 3 Repair Project area. Focused surveys for elderberry shrubs were conducted along all levee reaches on March 8, 2011; the area was resurveyed on January 29, 2014. A total of 18 elderberry shrubs were observed within 100 feet of the Phase 3 Repair Project area: nine shrubs on the waterside of the levee and nine shrubs on the landside. None of the shrubs had evidence of beetle exit holes. One of the landside shrubs does not have stems greater than 1 inch in diameter at ground level; therefore, it is not considered suitable VELB habitat. See **Exhibit 14** for locations of the elderberry shrubs that were observed within 100 feet of the Phase 3 Repair Project area during field surveys in 2014.

CRITICAL HABITAT

Critical habitat for VELB was designated at the time of listing. Two areas along the American River in the Sacramento metropolitan area were designated as critical habitat for this species. The Phase 3 Repair Project area is not located within designated critical habitat for VELB.

RECOVERY PLAN FOR VALLEY ELDERBERRY LONGHORN BEETLE

The Recovery Plan for Valley Elderberry Longhorn Beetle (USFWS 1984) lacks specific goals and does not include objective, measurable recovery criteria (USFWS 2006). The recovery plan identified additional essential habitat for this species in an area along Putah Creek, Solano County, and an area along the American River Parkway, Sacramento County. USFWS released a 5-year status review for VELB on October 2, 2006 (USFWS 2006). This review reported an increase in known beetle locations, from 10 at the time of listing in 1980 to 190 in 2006. Because of the presumed increase in the estimated population and the concurrent protection and restoration of several thousand acres of riparian habitat suitable for VELB, USFWS's status review determined that this species is no longer in danger of extinction and recommended that the species no longer be listed under the ESA. On October 2, 2012, the USFWS issued a proposed rule to delist VELB (78 FR 66058); however, on September 17, 2014, the USFWS withdrew this proposal, stating that the scientific information and analysis reflected in the October 2012 proposal was not strong enough to support a decision to delist the species (79 FR 55874).

RIPARIAN BRUSH RABBIT

Riparian brush rabbit, which is federally listed as endangered, inhabits riparian communities in the northern San Joaquin Valley that are dominated by thickets of willows and large clumps of shrubs and vines, such as wild rose, blackberries, coyote bush, and wild grape. Historically, riparian brush rabbit inhabited dense, brushy areas of valley riparian forests, marked by extensive thickets of wild rose, blackberries, and willows (Sandoval et al. 2006).

Suitable habitat for riparian brush rabbit is characterized by an abundance of woody ground litter, mats of low-growing vines and shrubs, and areas of higher ground not subject to regular or heavy flooding (Sandoval et al. 2006). On a seasonal basis, it also may use dense, tall stands of herbaceous plants adjacent to patches of riparian shrubs (Williams and Hamilton 2002). It tends to avoid large openings in the understory cover, frequenting only small clearings in the vegetation while foraging (USFWS 1998). An essential component of habitat for riparian brush rabbit is high-ground refugia from flooding, which provides protection from predators and dry habitat during prolonged rainstorms (USFWS 1998).

The only known populations of riparian brush rabbit are confined to Caswell Memorial State Park on the Stanislaus River in Stanislaus County, approximately 10 miles southeast of the Phase 3 Repair Project area, and in the South Delta along the San Joaquin River and overflow channels (Williams and Hamilton 2002; Williams et al. 2002; Lloyd and Williams 2003; Vincent-Williams et al. 2004; CDFW 2014) (**Exhibit 15**). The population in the South Delta is found in Paradise Cut along the rights-of-way of the two railroads that cross Paradise Cut and Tom Paine Slough, and in an oxbow on the San Joaquin River near Mossdale Landing (CDFW 2014). Riparian brush rabbits also have been found along the San Joaquin River north of the oxbow population, in waterside riparian habitat near the Phase 3 Repair Project area adjacent to elements IIIa and IIIb, between elements IIab and IIIa, and between elements VIa.1, and VIa.4 (CDFW 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004) (**Exhibit 15**). Other historical habitats along the San Joaquin River and tributaries are believed to no longer be suitable for riparian brush rabbits because of irrigated agriculture, livestock grazing, and impoundment and channelization of streams. High-ground refugia also may be lacking in these areas (Williams and Hamilton 2002).

In Paradise Cut, existing habitat for riparian brush rabbits is confined to levee bases, the channel banks of Paradise Cut, and pockets of low ground along the bottom of Paradise Cut. Generally, areas of suitable habitat in these locations are very narrow (15 to 100 feet wide). Most of the channels in Paradise Cut are in effect dead-end sloughs fed by Old River, with large portions containing water year-round, which results in the isolation of some upland areas (i.e., islands). The existing habitat for rabbits is covered in water on average once every 4 years, when flood flows in the San Joaquin River are sufficient to overtop Paradise Weir. Brush rabbits probably use the UPRR right-of-way as high-ground refugia during flooding events (Williams and Hamilton 2002).

Occupied habitat for riparian brush rabbit is documented adjacent to the Phase 3 Repair Project area along the waterside levee in elements IIIa and IIIb, between elements IIab and IIIa, and between elements VIa.1, and VIa.4. The waterside habitat along elements IIIa and IIIb is dominated by willow within interspersed California blackberry and grasses. The waterside habitat between elements IIab and IIIa is dominated by willows, cottonwoods, valley oaks, wild rose, and California and Himalayan blackberry. The waterside habitat between elements VIa.1 and VIa.4 is on an oxbow with dense riparian vegetation. Other patches of riparian vegetation along the San Joaquin River and adjacent to Phase 3 Repair Project area levees, such as the Great Valley cottonwood forest and Great Valley oak riparian forest communities shown in **Exhibits 13a** through **13c**, provide potentially suitable habitat for riparian brush rabbit, including the small areas of riparian habitat that are present on the waterside of Phase 3 Repair Project area elements IIab, IVc, and Va.

Riparian brush rabbit forages along the edges of shrub cover and in small clearings in the vegetation cover rather than in large openings. It feeds on herbaceous vegetation, such as grasses, sedges, clover, forbs, and buds, bark, and leaves of woody plants (Sandoval et al. 2006; USFWS 1998). This species has a small home range and mainly remains hidden under protective shrub cover, seldom venturing more than 1 meter (3.3 feet) from cover (Sandoval et al. 2006). North of elements IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the UPRR tracks (i.e., elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species.

CRITICAL HABITAT

Critical habitat has not been designated for riparian brush rabbit.

RECOVERY PLAN FOR RIPARIAN BRUSH RABBIT

The Recovery Plan for Upland Species of the San Joaquin Valley, California addresses the riparian brush rabbit (USFWS 1998). At the time the recovery plan was prepared, only the Caswell Memorial State Park population was known to exist. One of the most important conservation actions identified in the plan was establishment of other viable populations within the park's range. The recovery plan recommended the following actions (USFWS 1998):

- Initiate a reintroduction program that includes researching genetic diversity among remaining individuals.
- Implement a captive breeding program to translocate individuals to new populations.
- Establish at least three additional wild populations in the San Joaquin Valley in restored and expanded suitable habitat within the rabbit's historical range.

In 1999, the Endangered Species Recovery Program began implementing the Controlled Propagation and Reintroduction Plan for the Riparian Brush Rabbit (Williams et al. 2002), which was recommended in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998). The primary goal of the program is to prevent extinction by providing animals for reintroduction to establish new populations or augment existing populations. In July 2002, captive-bred rabbits were released at the San Luis National Wildlife Refuge, near Los Banos in the central San Joaquin Valley, and in 2005, a population of captive-bred rabbits was introduced to a private ranch along the San Joaquin River in Stanislaus County, adjacent to the San Joaquin River National Wildlife Refuge (USFWS 2007). This effort is ongoing.

DELTA SMELT

Delta smelt was formally listed as threatened under the ESA on March 5, 1993 (59 FR 440). On December 19, 1994 (59 FR 65256), USWFS designated critical habitat. Delta smelt is found only from Suisun Bay upstream through the Sacramento–San Joaquin estuary in Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties.

Delta smelt is endemic to the upper Sacramento–San Joaquin River estuary and occurs primarily in open surface waters of Suisun Bay, in the Sacramento River downstream from Isleton, and in the San Joaquin River downstream from Mossdale (Bennett 2005), including the project area. Its historic range is thought to have extended from Suisun Bay upstream to at least the city of Sacramento on the Sacramento River and Mossdale on the San Joaquin River. Delta smelt historically was one of the most common pelagic fish (fish living in open water away from the bottom) in the upper Sacramento–San Joaquin estuary (USFWS 2004). The delta smelt population generally is concentrated in the estuary west of the confluence of the Sacramento and San Joaquin rivers in high-outflow years and in the north Delta in low-outflow years (Sweetnam 1997, 1998; Bennett 2005). Delta outflow determines the location of the salinity gradient and may strongly influence delta smelt distribution. USFWS data indicate that delta smelt is found in the San Francisco Bay/Sacramento–San Joaquin Delta (Bay-Delta) estuary where salinity generally is less than two parts per thousand. Except when spawning in freshwater, delta smelt most frequently is caught in or is slightly upstream from the entrapment zone (Bennett 2005). In the CDFW Delta-wide 20mm delta smelt survey, delta smelt larvae were observed only occasionally and in very low abundance in the vicinity of the project area (less than four larvae in 10,000 cubic meters as sampled on April 4, 2014). The species was not observed in the project vicinity in 2015 or 2016, during the delta smelt monitoring program that occurs from January through March.

CRITICAL HABITAT

Although the Phase 3 Repair Project area is near the upper limit of the known distribution of delta smelt, it is included in the area designated as critical habitat for the species (Critical Habitat Determination for the Delta Smelt, 59 FR 65256, December 19, 1994). In the critical-habitat designation, USFWS identified the following primary constituent elements essential to conservation of delta smelt: physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration (59 FR 65256). The primary constituent elements are organized by habitat conditions required for each life stage. USFWS has identified specific areas in the Delta for spawning habitat, larval and juvenile transport, and adult migration for delta smelt. The Phase 3 Repair Project area and larger action area include places identified for larval and juvenile transport and adult migration, but do not include specific areas important for delta smelt spawning habitat (59 FR 65256).

RECOVERY PLAN FOR DELTA SMELT

The Sacramento–San Joaquin Delta Native Fishes Recovery Plan includes restoration of abundance and distribution of delta smelt (USFWS 1996b). Action items in the recovery plan for delta smelt refer to four zones in the Delta. Sampling stations within these zones were chosen to measure restoration because they have a record of delta smelt catches and are sampled consistently. These zones do not include any portion of the Phase 3 Repair Project area or action area.

LONGFIN SMELT

On April 2, 2012, the USFWS issued its finding that the longfin smelt warranted protection under the ESA, and added it as a candidate species for protection under the ESA (77 FR 19755). Longfin smelt is found in bay, estuarine, and nearshore coastal environments from San Francisco Bay north to Lake Earl near the Oregon border. The southernmost detection of the species was a single fish from Monterey Bay (Eschmeyer et al. 1983), although

spawning has not been documented south of San Francisco Bay. The San Francisco estuary and the Delta support the largest longfin smelt population in California. Longfin smelt is more broadly distributed throughout the Bay-Delta estuary and is found in water with higher salinities than delta smelt. Longfin smelt most often is concentrated in Suisun Bay, San Pablo Bay, and northern San Francisco Bay during nonspawning periods (Moyle 2002). No fish surveys have been conducted by RD 17 within the river stretch adjacent to the Phase 3 Repair Project area; however, CDFW's Delta-wide sampling program, including the 20mm delta smelt survey, longfin smelt larva survey, summer tow net survey, and spring Kodiak Trawl sampling, occurs in the vicinity of this area. Longfin smelt has a short life span, generally reaching maturity at 2 years of age, when it spawns and then dies. During the second year of life, adults tend to inhabit the higher salinity western portion of the estuary system; they occasionally have been found in nearshore ocean surveys (Rosenfield and Baxter 2007). Adults spend their lives in bays, estuaries, and nearshore coastal areas, and migrate into low-salinity or freshwater reaches of coastal rivers and tributary streams to spawn. Spawning occurs in the lower portions of the Sacramento and San Joaquin rivers and adjacent sloughs, typically between November and June, with peak spawning occurring from February through April (Baxter 1999; DWR 2009; Moyle 2002; Wang 1986). On the San Joaquin River, spawning occurs downstream from Medford Island, approximately 20 miles downstream from the project site (Moyle 2002). Locations and movements of all life stages of longfin smelt are influenced by a wide range of hydrologic and environmental variables (Rosenfield 2010), all of which show high variation among and within years; accordingly, temporal and spatial distributions of longfin smelt show high variation among and within years.

Critical Habitat

Because the longfin smelt has not been listed, no critical habitat has been designated.

Recovery Plan for Longfin Smelt

The Sacramento–San Joaquin Delta Native Fishes Recovery Plan includes restoration of abundance and distribution of longfin smelt (USFWS 1996b). Action items in the recovery plan for longfin smelt refer to five zones in the Delta. Sampling stations within these zones were chosen to measure restoration because they have a record of longfin smelt catches and are sampled consistently. These zones do not include any portion of the Phase 3 Repair Project area or action area.

CENTRAL VALLEY STEELHEAD DISTINCT POPULATION SEGMENT

On March 19, 1998, NMFS listed the Central Valley steelhead DPS as threatened (63 FR 13347). Central Valley steelhead DPS is considered to be winter-run steelhead (McEwan and Jackson 1996). In the most recent 5-year review of the listing of this species, NMFS recommended that the Central Valley steelhead DPS should remain classified as a threatened species (NMFS 2011a). Findings of the next 5-year status review for all federally listed anadromous salmonids in the Central Valley are anticipated to be published in 2016. Like other anadromous salmonid species, this one matures in the ocean before entering freshwater on its spawning migrations. The major factor influencing steelhead populations in the San Joaquin River system is loss of habitat caused by construction of impassable dams on the mainstem and major tributaries.

Historically, Central Valley steelhead was found throughout the Sacramento and San Joaquin drainages, where waterways were accessible to migrating fish. Steelhead historically was present in the upper San Joaquin River basin, upstream from the current location of Friant Dam. Steelhead commonly migrated far up tributaries and into headwater streams where cool, well-oxygenated waters were present year-round.

Currently, in the Central Valley, viable populations of naturally produced steelhead are found only in the Sacramento River and its tributaries. Wild steelhead populations appear to be restricted to tributaries of the Sacramento River below Keswick Dam, such as Antelope, Deer, and Mill Creeks, and to the Yuba River below Englebright Dam (McEwan and Jackson 1996). No significant populations of steelhead remain in the San Joaquin

River basin; however, small persistent runs still occur on the Stanislaus and Tuolumne rivers, and perhaps the Merced River (McEwan and Jackson 1996).

Juvenile steelhead rear throughout the year and may spend 1 to 3 years in freshwater before emigrating to the ocean. Smoltification, the physiological adaptation that juvenile salmonids undergo to tolerate saline waters, occurs in juveniles as they begin their downstream migration. Smolting steelhead (age class 1+ and older) generally emigrate from March to June (Barnhart 1986; Reynolds et al. 1993).

The San Joaquin River near the Phase 3 Repair Project area is used by adult and juvenile steelhead primarily as a migration corridor between the ocean and cold-water habitat in the upstream tributaries. Juvenile steelhead would be likely to use the edges of rivers and sloughs, and floodplain habitats, if available, for rearing as they emigrate (Moyle 2002).

CRITICAL HABITAT

Critical habitat for the Central Valley steelhead DPS was designated on August 12, 2005; a final designation was published on September 2, 2005 (70 FR 52604), with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins. The Phase 3 Repair Project area is located within designated critical habitat for the Central Valley steelhead DPS.

RECOVERY PLAN FOR CENTRAL VALLEY STEELHEAD DISTINCT POPULATION SEGMENT

A recovery plan for the ESUs of Sacramento River winter-run Chinook salmon, the Central Valley spring-run Chinook salmon, and the DPS of Central Valley steelhead was prepared by NMFS in July 2014 (NMFS 2014b). The draft plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives. Although habitat conditions for Central Valley steelhead have improved slightly over the past decade, access to historic habitat generally remains blocked, and the quality of the species' remaining habitat generally remains degraded (Lindley et al. 2009; Cummins et al. 2008).

CENTRAL VALLEY FALL/LATE FALL-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

On September 16, 1999 (64 FR 50393), NMFS determined that listing was not warranted for the Central Valley fall/late fall–run Chinook salmon ESU; however, the ESU was designated as a future candidate for listing because of concerns about specific risk factors. On April 14, 2004 (69 FR 19975), the ESU was reclassified as a species of concern. The ESU includes all naturally spawned populations of fall-run Chinook salmon in the Sacramento and San Joaquin River basins and their tributaries, east of the Carquinez Strait. The Central Valley fall/late fall–run Chinook salmon ESU currently is the only run of Chinook salmon in the San Joaquin River system.

Adult Central Valley fall/late fall–run Chinook salmon enter the Sacramento and San Joaquin river systems from September through January and spawn from October through February. In general, San Joaquin River populations tend to mature at an earlier age and spawn later in the year than Sacramento River populations (Baker and Morhardt 2001). These differences may be phenotypic responses to the generally warmer temperature and lower flow conditions found in the San Joaquin River basin, relative to the Sacramento River basin.

Juveniles typically rear in freshwater for 3 to 6 months (fall-run) and up to 12 months (late fall–run) before entering the ocean. Juveniles migrate downstream from January through June. Juvenile Chinook salmon prefer water depths of 0.5 foot to 3.3 feet and velocities of 0.26 foot to 1.64 feet per second (Raleigh et al. 1986). Important winter habitat for juvenile Chinook salmon includes flooded bars, side channels, and overbank areas with relatively low water velocities. Juvenile Chinook salmon have been found to rear successfully in floodplain habitat, which routinely floods but is dry at other times. Growth rates appear to be enhanced by the conditions found in floodplain habitat (Sommer et al. 2001).

Cover structures, space, and food are necessary components for Chinook salmon rearing habitat. Suitable habitat includes areas with instream and overhead cover in the form of undercut banks, downed trees, and large, overhanging tree branches. The organic materials forming fish cover also help provide sources of food, in the form of both aquatic and terrestrial insects.

Fall-run Chinook salmon adults primarily pass through the Phase 3 Repair Project area on their way to spawn in upstream tributaries of the San Joaquin River (Moyle 2002). Juvenile fall-run Chinook salmon emigrate from San Joaquin River tributaries (e.g., the Stanislaus, Merced, and Tuolumne rivers) and other river tributaries through the San Joaquin River during the late winter and spring (February through mid-June) (San Joaquin River Group Authority 2009). Juvenile Chinook salmon use the edges of rivers and sloughs for rearing as they emigrate downstream (Moyle 2002).

CRITICAL HABITAT

No critical habitat has been designated for Central Valley fall/late fall-run Chinook salmon.

ESSENTIAL FISH HABITAT

EFH has been designated for Pacific Salmon. This includes identification of Chinook salmon EFH, which occurs in the project and action areas. Central Valley fall/late fall-run Chinook salmon ESU is in the Phase 3 Repair Project area along the San Joaquin River. EFH includes migration, holding, and rearing habitat and opportunistic/intermittent spawning, holding, and rearing habitat for the San Joaquin River (NMFS 2014a).

Construction of element IVc would improve EFH, by providing the type of refuge habitat for juvenile salmonids during high-water flows as described in Amendment 18 for the lower San Joaquin River tributaries (NMFS 2014c).

RECOVERY PLAN FOR CENTRAL VALLEY FALL/LATE FALL–RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

Although the Central Valley fall/late fall-run Chinook salmon is not listed as threatened or endangered under the ESA, the Sacramento–San Joaquin Delta Native Fishes Recovery Plan outlines conservation measures and restoration objectives and criteria for the species, including the San Joaquin River run, which CDFW recognizes as a distinct stock (USFWS 1996b). Reasons for decline identified by the plan include habitat loss, suitability of habitat, survival of outmigrants, harvest, hatcheries, and water quality. Conservation measures include:

- testing an electrical fish barrier and a physical barrier upstream from the confluence of the Merced River to prevent adult fish from straying,
- constructing and rehabilitating spawning riffles,
- constructing a temporary barrier at Old River to prevent entrainment of outmigrating smolts, and when possible,
- coordinating water releases to provide attraction or outmigration flows.

These efforts have been funded by a wide range of federal, State, and private agencies (USFWS 1996b).

SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

The Sacramento River winter-run Chinook salmon was formally listed as threatened in November 1990 (55 FR 46515), and was reclassified as endangered under the ESA on January 4, 1994 (59 FR 440).

In the Delta, winter-run adults begin to move through the system in early winter (November–December), with the first upstream adult migrants appearing in the upper Sacramento River during late December (Vogel and Marine 1991, cited in NMFS 2003). Adult winter-run presence in the upper Sacramento River system peaks in March. The timing of migration may vary somewhat because of changes in river flows, dam operations, and water year type. Spawning occurs primarily from mid-April to mid-August, with peak activity occurring in May and June in the river reach between Keswick Dam and the Red Bluff Diversion Dam (Vogel and Marine 1991, cited in NMFS 2003).

Juvenile winter-run Chinook salmon occur in the Delta from October through early May, based on data collected from trawls, beach seines, and salvage records at State and federal water projects (DFG 1998). The peak of juvenile arrivals is between January and March. Juveniles tend to rear in the freshwater upper Delta areas for about the first 2 months (Kjelson et al. 1981, 1982). As they mature, winter-run Chinook fry and fingerlings prefer to rear farther downstream, where ambient salinity is up to 1.5 to 2.5 parts per thousand (Healey 1980, 1982; Levings et al. 1986). Fry remain in the estuary until they reach a fork length of about 118 millimeters (i.e., at 5 to 10 months of age). Emigration from the Delta may begin as early as November and continue through May (Fisher 1994; Myers et al. 1998).

With the exception of occasional strays, adult winter-run Chinook salmon generally do not occur in the San Joaquin River or in this portion of the Delta, and therefore, do not occur in the action area. The same is true for juvenile winter-run Chinook salmon.

CRITICAL HABITAT

Critical habitat for the winter-run Chinook salmon ESU was designated by NMFS on June 16, 1993 (58 FR 33212), with an effective date of July 16, 1993. Critical habitat is designated to include the Sacramento River from Keswick Dam (River Mile 302) to Chipps Island (River Mile 0) and all waters westward, including San Francisco Bay north of the Bay Bridge to the Golden Gate Bridge. The proposed action is not within designated critical habitat.

ESSENTIAL FISH HABITAT

EFH for Chinook salmon, which includes Sacramento River winter-run Chinook salmon ESU (NMFS 2014a), has been identified in the project and action areas. See the "Essential Fish Habitat" section of this BA.

RECOVERY PLAN FOR SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

A recovery plan for the ESUs of Sacramento River winter-run Chinook salmon, the Central Valley spring-run Chinook salmon, and the DPS of Central Valley steelhead was prepared by NMFS in July 2014 (NMFS 2014b). The draft plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives. In essence, improvement in the status of winter-run Chinook salmon ESU depends on re-establishment of an alternate population in a historically used area (e.g., Battle Creek) (Williams et al. 2011). Improvement of spring-run Chinook salmon ESU is dependent on improving habitat conditions in spawning and rearing areas (Williams et al. 2011). Fish passage projects also are of primary importance in improving the status of this ESU (NMFS 2014b).

Recovery goals and restoration actions for Sacramento River winter-run Chinook salmon ESU are described by Williams et al. (2011) for the Sacramento River basin, including re-establishment of a population in a historically used area (e.g., Battle Creek) and fish passage improvement projects. Recovery goals do not, however, apply to the action area, because reintroduction of winter-run Chinook salmon is not planned for the San Joaquin River Basin.

CENTRAL VALLEY SPRING-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

NMFS listed Central Valley spring-run Chinook salmon as threatened on September 16, 1999 (50 FR 50394).

Central Valley spring-run Chinook salmon historically was the most abundant run of Central Valley Chinook salmon (Fisher 1994). It occupied the headwaters of all major river systems in the Central Valley, where no natural barriers existed. Adults returning to spawn ascended the tributaries to the upper Sacramento River, including the Pit, McCloud, and Little Sacramento rivers. They also occupied Cottonwood, Battle, Antelope, Mill, Deer, Stony, Big Chico, and Butte creeks and the Feather, Yuba, American, Mokelumne, Stanislaus, Tuolumne, Merced, San Joaquin, and Kings rivers. Spring-run Chinook salmon migrated farther into headwater streams, where cool, well-oxygenated water was available year-round.

Surveys indicate that populations of remnant, non-sustaining spring-run Chinook salmon may be found in Cottonwood, Battle, Antelope, and Big Chico creeks (DWR 1997); more sizable, consistent runs of naturally produced fish are found only in Mill, Deer, and Butte creeks (Williams et al. 2011). All these creeks are tributaries in the Sacramento River basin. The Feather River Fish Hatchery sustains the spring-run population on the Feather River, but the genetic integrity of that run is questionable (DWR 1997). Although all of these populations are found in the Sacramento River basin, the ESU boundary of Central Valley spring-run Chinook salmon includes populations spawning in the Sacramento River and San Joaquin River basins, as reflected in the current 5-year status review (Williams et al. 2011; NMFS 2011b). The status of Central Valley spring-run Chinook salmon ESU likely has not improved since the 2005 status review (Williams et al. 2011). Improvement of spring-run Chinook salmon ESU is dependent on improving habitat conditions in spawning and rearing areas (Williams et al. 2011). Fish passage projects also are of primary importance in improving the status of this ESU (NMFS 2014a). Current and future efforts to restore production in the San Joaquin River are either being planned or are just beginning, and no results about their current efficacy are available.

Like winter-run Chinook salmon, adult spring-run Chinook salmon (other than occasional strays) generally have not occurred in the San Joaquin River basin, and therefore, do not occur in the action area. The same is true for juvenile spring-run Chinook salmon.

CRITICAL HABITAT

Critical habitat for the Central Valley spring-run Chinook salmon was designated on August 12, 2005; a final designation was published on September 2, 2005, with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include selected waters in the Sacramento River basin from approximately Redding (River Mile 302) to approximately Chipps Island (River Mile 0) at the westward margin of the Delta and includes the Sacramento River. The Phase 3 Repair Project area is located outside the species' designated critical habitat.

ESSENTIAL FISH HABITAT

EFH for Chinook salmon, which includes Central Valley spring-run Chinook salmon ESU (NMFS 2014a), has been identified in the project and action areas. See the " Essential Fish Habitat" section of this BA.

RECOVERY PLAN FOR CENTRAL VALLEY SPRING-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

A recovery plan for the ESUs of Sacramento River winter-run Chinook salmon, the Central Valley spring-run Chinook salmon, and the DPS of Central Valley steelhead was prepared by NMFS in July 2014 (NMFS 2014b). The draft plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives. Recovery goals and restoration actions are outlined for the Sacramento River basin and do not apply to the action area.

As discussed above in the "San Joaquin River" subsection of the "Environmental Baseline" section, one of the goals of the SJRRP is "to restore and maintain fish populations in 'good condition' in the mainstem San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish" (Reclamation and DWR 2011). The Settlement stipulates reintroduction of spring-run and fall-run Chinook salmon, with a priority given to restoring self-sustaining populations of wild spring-run Chinook salmon.

NORTH AMERICAN GREEN STURGEON DISTINCT POPULATION SEGMENT

On April 7, 2006, NMFS listed the Southern DPS of the North American green sturgeon as threatened under the ESA. In North America, green sturgeon is found from Ensenada, Mexico to southeast Alaska. The Southern DPS includes individual reproductive populations south of the Eel River. The populations north of the Eel River, grouped as the Northern DPS, currently do not warrant listing.

Green sturgeon is found in the lower reaches of large rivers, including the Sacramento–San Joaquin River basin, and in the Eel, Mad, Klamath, and Smith rivers. Green sturgeon adults and juveniles are found throughout the upper Sacramento River, as indicated by observations incidental to winter-run Chinook monitoring at Red Bluff Diversion Dam in Tehama County (Poytress et al. 2013; NMFS 2005). Green sturgeon spawns predominantly in the upper Sacramento River and is found primarily in the mainstem Sacramento River.

The green sturgeon is a primitive, bottom-dwelling fish, characterized by its large size (up to 7 feet long and 350 pounds), with a long, round body and "scutes" or plates along its dorsal and lateral sides. It is known to migrate up to 600 miles between freshwater and salt water environments and commercially is caught in the Columbia River and coastal Washington (PFMC 2003). Like all sturgeon species, it is anadromous, but it also is the most marine-oriented of the sturgeon species (NMFS 2005). It spends most of its life in salt water and returns to spawn in freshwater. Individuals congregate in the bays of these systems in summer, while some may travel upstream to spawn in spring and summer. Adult Southern DPS green sturgeon enter San Francisco Bay in late winter through early spring and spawn from April through early July, depending on water flow and temperature (Heublein et al. 2009).

The Southern DPS of the North American green sturgeon is slow growing and late maturing, reaching sexual maturity at about 15 years, at a length of about 5 feet, and typically spawning every 3 to 4 years (NMFS 2015). Green sturgeon spawning has been documented only in the Klamath, Sacramento, and Rogue rivers during recent times (NMFS 2005), although a spawning event was documented in 2011 in the lower Feather River at the Thermalito Afterbay Outlet (Seesholtz et al. 2014). Green sturgeon spawning in the San Joaquin River is not documented, as reported in the 5-year species status review for the Southern DPS of the North American green sturgeon (NMFS 2015).

Green sturgeon populations in the Southern DPS have relatively small population sizes, potentially have lethal temperature limits, face entrainment by water projects and influences of toxic material and exotic species, and may be susceptible to catastrophic events. Impassable barriers to spawning grounds are an additional threat. Preliminary Southern DPS population size estimates are being provided from Dual Frequency Identification Sonar surveys of aggregating sites in the upper Sacramento River; surveys conducted between 2010 and 2014 indicated an annual range of 164 to 526 spawning adults (personal communication with Ethan Mora, UC Davis, March 30, 2015, reported in NMFS 2015). Based on an estimate of mean spawning periodicity, as many as 1,348 ± 524 adults are estimated in the Southern DPS (personal communication with Ethan Mora, UC Davis, May 6, 2015, reported in NMFS 2015).

Green sturgeon may occur in the San Joaquin River between Stockton and the Highway 140 bridge (IEP 2013), including in the Phase 3 Repair Project area, although no evidence exists of historical use of the San Joaquin River by green sturgeon (BRT 2005; Beamesderfer et al. 2007). No documentation is known for green sturgeon spawning in the San Joaquin River, but spawning may have occurred before construction of large-scale hydropower and irrigation development (Mora et al. 2009). White sturgeon persist in the San Joaquin River at population levels of 10 percent of Sacramento River population levels. Young green sturgeon have been taken occasionally in the Santa Clara Shoal area in the Delta, but these fish likely originated in the Sacramento River (NMFS 2005).

CRITICAL HABITAT

Critical habitat for Southern DPS of North American green sturgeon was designated on October 9, 2009 (74 FR 52300). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins, including the segment of the San Joaquin River in the action area.

RECOVERY PLAN FOR NORTH AMERICAN GREEN STURGEON DISTINCT POPULATION SEGMENT

A recovery plan has not been developed for green sturgeon, but the Federal Recovery Outline for the Southern DPS of the North American green sturgeon is available (NMFS 2010).

DIRECT AND INDIRECT EFFECTS ON SPECIES IN THE ACTION AREA

Under the ESA, direct effects are those that are caused by the project and occur at the same time as the action (e.g., construction-related effects). Indirect effects are those that are caused by the proposed action and are later in time but are reasonably certain to occur and there is a causal relationship with the action (e.g., operational effects). In other words, there is a logical, unbroken, traceable, explainable, predictable, chain of effects that results in, or "causes" a given effect on listed species. Avoidance and minimization measures for both direct and indirect effects are presented in the "Avoidance and Minimization Measures" section above. This section includes an evaluation of direct and indirect effects related to both the Phase 3 Repair Project (see "Effects Related to the Phase 3 Repair Project Actions" subsection) and the 2017 Emergency Response Construction Project (see "Effects Related to the 2017 Emergency Response Construction Project Actions" subsection).

EFFECTS RELATED TO THE PHASE 3 REPAIR PROJECT ACTIONS

VALLEY ELDERBERRY LONGHORN BEETLE

No known documented occurrences exist of VELB in the Phase 3 Repair Project area, but the species could use elderberry shrubs in the action area. Elderberry shrubs that could support beetles are sparsely scattered throughout the action area, along both the waterside and landside of the San Joaquin River levee.

Eighteen elderberry shrubs are present in or adjacent to the footprint of the Phase 3 Repair Project. The nine elderberry shrubs located along the waterside of the Phase 3 Repair Project levees would be avoided and protected during construction (see "Avoidance and Minimization Measures—Valley Elderberry Longhorn Beetle"). The nine elderberry shrubs located along the landside of the levee would require removal to accommodate construction of the Phase 3 Repair Project's seepage berms, cutoff walls, and setback levee (**Table 5**; **Exhibit 14**). However, one of these landside shrubs does not have stems greater than 1 inch in diameter at ground level; therefore, it is not considered suitable VELB habitat.

Table 5
Survey Results for Landside Elderberry Shrubs to be Removed from the Phase 3 Repair Project Area

Shrub Number	Number of Stems per Diameter Category (inches)			Beetle Exit Holes Present?	Riparian?
	≥ 1 and ≤ 3	≥ 3 and ≤ 5	≥ 5		
9	0	0	0	No	No
10	73	6	0	No	No
11	25	17	8	No	No
13	12	4	4	No	No
14	5	4	2	No	No
15	32	11	2	No	No
16	13	4	1	No	No
17	25	4	5	No	No
18	6	5	0	No	No
Total	**191**	**55**	**22**		

Notes:
Riparian = waterside of levee; Nonriparian = landside of levee
Source: Data compiled by AECOM in 2014

The eight elderberry shrubs on the landside have a total of 268 stems that are greater than 1 inch in diameter at ground level. These shrubs would require removal during construction of the Phase 3 Repair Project, resulting in direct effects on VELB. If the stems are occupied by beetles, any early-stage individuals are likely to be killed when the shrub is removed. Complete loss of the shrubs to be removed should be avoided by transplanting during the shrubs' dormant season; however, transplanted elderberry shrubs can experience stress or health problems because of changes in soil, hydrology, microclimate, or associated vegetation, and mortality of transplanted shrubs would preclude their future use by the beetle. Removing shrubs in which larvae are present could result in larvae mortality if the health of the shrubs is adversely affected; alternately, adverse effects on elderberry shrubs could have an overall effect on the beetle, even if larvae are absent at the time of impact, if the shrubs are relied on for reproduction. In addition, it takes 5 or more years for replacement elderberry plantings to reach a size conducive to use as VELB habitat. Therefore, a temporary loss of habitat available to the beetle would occur. The Phase 3 Repair Project would comply with avoidance and minimization measures described for VELB and would compensate for removal of these stems, in accordance with the VELB Guidelines (USFWS 1999). A net reduction in the number of elderberry shrubs would be avoided by requiring establishment of 367 elderberry seedlings and 367 associated native plantings.

Elderberry shrubs that cannot be avoided would be transplanted to the levee setback area in element IVc (**Exhibit 12**). The restoration design, as outlined in the Conceptual MMP (**Appendix E**), would include 367 elderberry seedlings and 367 associated species plantings to compensate for the effects to VELB habitat in the Phase 3 Repair Project area.

After construction of the Phase 3 Repair Project, RD 17 would continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which would include trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up to 5 feet above the ground (or 12 feet above the crown road). Trees only would be trimmed, not removed, under these practices. Therefore, no change would occur in the number of elderberry shrubs along the RD 17 levees.

RIPARIAN BRUSH RABBIT

As shown in **Table 6**, the Phase 3 Repair Project levee improvements would result in the removal of 3.28 acres of landside riparian habitat—specifically Great Valley cottonwood riparian forest and Great Valley oak riparian forest—that is suitable for riparian brush rabbit. This riparian habitat is located on the landside of the levee, where levee improvements (e.g., chimney drains, seepage berms) would be constructed. In general, most of the landside riparian vegetation is sparse and lacks understory vegetation other than grasses and ruderal vegetation, which would act as cover for riparian brush rabbit and would not be suitable for this species (Hansen, pers. comm., 2011). However, potential exists for some of these landside woody habitats to support suitable habitat for riparian brush rabbit, particularly because they are located adjacent to waterside riparian habitats that either are known to be occupied by this species or are highly suitable habitat. All landside riparian habitat is considered to be suitable where it is adjacent to waterside riparian habitat that is known to be occupied or highly suitable for riparian brush rabbit (i.e., elements IIab through element VIe). North of elements IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the UPRR tracks (i.e., elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species. No waterside woody or riparian habitat would be removed because of levee improvement activities.

Nearly 54 acres of ruderal annual grassland also would be affected by Phase 3 Repair Project implementation. All effects on ruderal annual grassland that would result from levee improvements are assumed to be temporary because annual grassland would be reestablished in these areas after project completion. Although riparian brush rabbit may use annual grassland as a source for foraging habitat, the key component of habitat suitability for this species in the Phase 3 Repair Project area is based on the presence of riparian woody vegetation and not the surrounding grasslands. Riparian brush rabbit forages along the edges of shrub cover and in small clearings in the vegetation cover, rather than in large openings, feeding on herbaceous vegetation, such as grasses, sedges, clover, forbs, buds, bark, and leaves of woody plants (Sandoval et al. 2006; USFWS 1998). Furthermore, because this species is known to have a small home range and seldom ventures more than 1 meter (3.3 feet) from cover (Sandoval et al. 2006), the riparian brush rabbit likely uses only a small component of the grassland, and its use of such habitat is concentrated along the edges of the riparian areas.

Table 6
Effects of Implementing the Phase 3 Repair Project on Suitable Riparian Brush Rabbit Habitats

	Acres of Directly Affected Suitable Habitat
Waterside woodlands[1]	0.00
Landside woodlands[1,2]	3.28
Total	**3.28**[3]

Notes:
1. Suitable riparian brush rabbit habitats are characterized as Great Valley cottonwood riparian forest and Great Valley oak riparian forest.
2. Most of the landside riparian vegetation is sparse and lacks understory and is not suitable for this species (Hansen, pers. comm., 2011). However, any landside riparian habitat is considered to be suitable where it is adjacent to waterside riparian habitat that is known to be occupied by or highly suitable for riparian brush rabbit (i.e., elements IIab through elements VIe). North of elements IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the Union Pacific Railroad tracks (i.e., elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species.
3. Of this, 1.61 acres were removed in elements IIIb, IVa, Va, VIa.1, and VIbcde during implementation of 2017 Emergency Response Construction Project in April 2017.

Source: Data compiled by AECOM in 2014; Updated by GEI Consultants, Inc. 2017

RD 17's ongoing practice for vegetation encroachment management is limited to trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up 5 feet above the ground or 12 feet above the crown road. Thus, trees and shrubs are only trimmed, not removed, because of this maintenance practice. Thus, RD 17's long-term management of vegetation encroachments on the landside and waterside of the levee is not expected to result in reduction or change to existing riparian habitat. The amount of waterside woodlands outside the project footprint but located along the waterside of the levee to 15 feet out from the waterside levee toe of the project levee reaches is approximately 6.87 acres; none of this vegetation would be removed because of Phase 3 Repair Project construction or future vegetation management practices. The amount of landside woodlands outside the project footprint but located along the landside of the levee to 15 feet out from the landside levee toe is approximately 5.92 acres; some of this would be removed because of Phase 3 Repair Project construction (3.28 acres; see **Table 6**), but none would be removed because of future vegetation management activities.

The loss of potential riparian brush rabbit habitat in the Phase 3 Repair Project area could restrict the range of this species because the RD 17 area currently contains the northernmost known extent of the population on the San Joaquin River. It also could isolate other populations residing in residual habitats in the project vicinity. However, the proposed conservation measures (see the "Avoidance and Minimization Measures" section above) would minimize direct loss of riparian habitat in conjunction with compensation for adverse effects. Implementing such measures is anticipated to avoid a net reduction in the number of riparian brush rabbit and its associated habitat. The Phase 3 Repair Project would include restoration of at least 9.9 acres of riparian scrub habitat and upland refugia in the setback area at element IVc (**Exhibit 12**). The expansion and restoration of riparian habitat in element IVc would augment the waterside riparian corridor along the San Joaquin River and would provide additional riparian habitat opportunities for the riparian brush rabbit between two known occurrences of this species (i.e., between elements IIIa/IIIb and elements VIa.1/VIa.4 [CDFW 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004]). The restored riparian scrub habitat (up to 7.5 acres) would consist of willows, cottonwoods, valley oaks, wild rose, California blackberry, and grasses, comparable to the composition of habitats where riparian brush rabbit is documented to occur along the RD 17 levees. Apart from a 400-foot section along the north side, the existing levee would remain in place, and up to 4 acres of Great Valley oak woodland would be established on it, thus providing upland refugia for the riparian brush rabbit during high-water events. The restoration of approximately 9.9 acres (and up to 11.5 acres) of suitable habitat for riparian brush rabbit would achieve a 3:1 restoration to impact mitigation ratio (for effect on potential riparian brush rabbit habitat).

Federally Listed Fish Species

Fish species/ESUs addressed in this BA would likely use similar habitat in the action area. Therefore, the direct and indirect effects on delta smelt, longfin smelt, Central Valley fall/late fall–run Chinook salmon, Central Valley steelhead, and green sturgeon are discussed together. Effects on Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon, which are unlikely to occur in the action area but may occasionally occur as strays, would be similar.

Temporary Construction-Related Effects

The Phase 3 Repair Project would include constructing several cutoff walls, which would entail degrading the top one-third to one-half of the levee, beginning with a 1:1 cut at the waterside crown. Implementing cutoff walls as part of the Phase 3 Repair Project would disturb soils along the top of the levee, which could enter the San Joaquin River through wind and water erosion. Soil disturbed during construction of seepage berms and other features on the landside of the levee could enter drainage ditches and ultimately could be pumped into the San Joaquin River. Therefore, erosion could temporarily increase turbidity and sedimentation in nearby waterways if soils are transported in river flows or stormwater runoff. Waters (1995) evaluated the effects of turbidity and siltation in waterways at various exposure levels. Prolonged exposure to high levels of suspended sediment could create a loss of visual capability in fish, leading to a reduction in feeding and growth rates, and to a thickening of the gill epithelia, which may cause the loss of respiratory function; clogging and abrasion of gill filaments; and increases in stress levels, reducing the tolerance of fish to disease and toxicants (Waters 1995). Also, high levels of suspended sediments could cause the movement and redistribution of fish populations or other aquatic organisms, and could affect physical habitat (Waters 1995). Sediment loading could interfere with photosynthesis of aquatic flora and displace aquatic fauna. Many fish and other aquatic species are sight feeders, and turbid waters would reduce the ability of these fish to locate and feed on prey. Some fish, particularly juveniles, could become disoriented and leave areas where their main food sources are located, ultimately reducing their growth rates. Increased turbidity and sedimentation cause fish to avoid an area, thus reducing available habitat. Fish will not occupy areas unsuitable for survival unless they have no other option. Therefore, construction-related erosion could result in elevated river turbidity in critical species-specific and life stage-specific habitats, potentially precluding a species from occupying that habitat. In addition, the potential would exist for contaminants (such as bentonite slurry, fuels, oils, and other products used in construction) to be introduced into the waterway directly or through surface runoff. Contaminants may be toxic to fish, or may alter oxygen diffusion rates and cause acute and chronic toxicity to aquatic organisms, thereby reducing growth and survival.

Through implementation of the water quality BMPs, including a SWPPP, and BMPs for slurry management and a slurry spill contingency plan, the proposed conservation measures (see the “Avoidance and Minimization Measures” section in this BA) would avoid direct and indirect take of fish during construction. The Phase 3 Repair Project would not be expected to have an effect on the overall continued existence and survival of these species.

Permanent Construction-Related Effects

Most waterside woodlands in the Phase 3 Repair Project area are assumed to provide SRA habitat functions. Apart from the placement of 0.64 acre of riprap above the HTL along the waterside levee along 740 linear feet at element IVc, the Phase 3 Repair Project would not include performing any work on the waterside of the levee, and no waterside woodlands or SRA habitat would be removed. Therefore, construction-related effects on the habitats of federally listed fish species would be limited to minor disturbance of the waterside levee at three locations that are above the HTL and characterized by ruderal vegetation.

RD 17 would continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which would include trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up to 5 feet above the ground (or 12 feet above the crown road). Because vegetation management would be limited to trimming trees, no trees would be removed; thus, no change would occur in the amount of waterside habitat that would be directly affected and removed because of future vegetation management activities.

The amount of waterside woodlands outside the project footprint but located along the waterside of the levee to 15 feet out from the waterside levee toe of the project levee reaches is approximately 6.87 acres; none of this vegetation would be removed because of construction or future vegetation management practices. The amount of landside woodlands outside the project footprint but located along the landside of the levee to 15 feet out from the landside levee toe is approximately 5.92 acres; some of this would be removed because of Phase 3 Repair Project construction (3.28 acres; see **Table 6**) but none would be removed because of future vegetation management activities.

Because all Phase 3 Repair Project construction activities would occur above the HTL and no SRA habitat would be removed during Phase 3 Repair Project construction or future vegetation management activities, the Phase 3 Repair Project would not result in adverse effects on Central Valley steelhead, Delta smelt, longfin smelt, Sacramento River winter-run and Central Valley fall- and spring-run Chinook salmon, or green sturgeon.

BENEFITS OF PROJECT ACTIONS TO REARING SALMONIDS

Construction of a 1,240-foot-long setback levee with cutoff wall and seepage berm on a major oxbow of the San Joaquin River (see **Table 2**) would directly benefit fish resources. A Conceptual MMP has been prepared to describe the planned expansion and restoration of riparian habitat that would occur in element IVc (**Appendix E**).

Approximately 0.64 acres (740 linear feet) of riprap would be installed on the waterside of the existing levee (above the HTL), where it would intersect the setback levee. After the setback levee is completed, 400 linear feet of the existing levee above the HTL on the downstream side of the oxbow would be degraded, reconnecting approximately 5 acres of floodplain to the river. That floodplain area would be graded to allow complete drainage of the floodplain to the river through the downstream opening in the remnant levee, as river flows recede. This would minimize the possibility of fish stranding. The other major benefit to fish resources would be the creation of approximately 5 acres of floodplain rearing habitat for juvenile salmonids, in particular, but also to other native fishes. The seasonal nature of inundation, along with complete drainage, would preclude establishment in the floodplain of predatory, non-native fishes.

The specific elevation of the levee breach invert elevation is under consideration. The primary purpose of the setback levee would be to provide habitat for the riparian brush rabbit. The invert elevation and the floodplain elevation would be based on site constraints, habitat requirements, and balancing the needs of riparian brush rabbit to provide protection to any individuals during high-water events while providing a level of disturbance that would support riparian scrub habitat in a sustainable way. The levee breach invert is expected to be set at an elevation to inundate approximately every 3 to 4 years, and the lower floodplain would inundate approximately every 6 years. A detailed hydraulic analysis of the surface water hydrology anticipated within the levee setback area, based on three possible levee breach invert elevations, is provided in the Conceptual MMP (**Appendix E,** see “Mitigation Site Baseline, Hydrology,” and **Appendix B**). The floodplain habitat would not be permanently inundated and would not be connected to the San Joaquin River during the dry season.

Jeffries et al. (2008) reared juvenile Chinook salmon in enclosures for two consecutive flood seasons within various habitats of the Cosumnes River and its floodplain, to compare fish growth in river channel and floodplain habitats. Significant differences in growth rates were found; salmon reared in seasonally inundated habitats with annual terrestrial vegetation experienced higher growth rates than those reared in a perennial pond on the floodplain. Furthermore, riverine fish growth upstream from the floodplain varied with flow in the river; with little growth and high mortality during high-water events. When stream flows were low and clear, fish growth was rapid. Growth rates were poor in tidally influenced riverine habitat below the floodplain, where juveniles commonly were displaced during high-water events because of a lack of in-channel complexity. Overall, ephemeral floodplain habitats supported higher growth rates for juvenile Chinook salmon than more permanent habitats in either the floodplain or river. Variable responses in both growth and mortality, however, indicate the importance of providing habitat complexity for juvenile salmon in floodplain reaches of streams, so fish can find optimal places for rearing under different flow conditions. Habitat complexity allows juvenile salmon to find cover, thereby reducing the risk of predation from avian and piscine predators. Floodplain and other off-channel habitat restoration are important for improving production of juvenile salmonids in California's Central Valley. Juvenile salmonid emigration generally is passive during high-water events (Healey 1980; Kjelson et al. 1981); they essentially are entrained in the water column until they encounter slower water velocities, where active swimming becomes possible. The San Joaquin River, like most rivers in the Central Valley, is incised and lacks channel complexity. With the exception of the Yolo Bypass for the Sacramento River (Sommer et al. 2001), juvenile salmonids frequently are displaced downstream to the intertidal Delta, where growth is diminished during high-water events in systems that lack access to floodplains. However, protected floodplain habitat provides protection for juvenile salmonids being swept downstream during high-water events.

High San Joaquin River outflows generally occur during winter and early spring months. Juvenile fall/late fall-run Chinook salmon and steelhead outmigration occurs at least partially during this period, while spring-run Chinook salmon and green sturgeon outmigration occurs later.

- Central Valley fall/late fall-run Chinook salmon juvenile outmigration may begin as early as November and extends through June.
- Central Valley spring-run Chinook salmon juvenile outmigration generally occurs from April through June.
- Central Valley steelhead juvenile outmigration generally occurs from December through March in the San Joaquin River, and continues through June in the Delta.
- North American green sturgeon outmigration of older juveniles generally occurs from June through September.

The presence of the protected floodplain likely would benefit juvenile fall/late fall-run Chinook salmon and steelhead during high-water events. The configuration of the floodplain being protected during high-water events would facilitate protection of juvenile salmonids as they are directed into the floodplain through backflow currents and are not displaced any further downstream.

Sommer et al. (2001) provided evidence that the Yolo Bypass, the primary floodplain of the lower Sacramento River, provides better rearing and migration habitat for juvenile Chinook salmon than adjacent river channels. During 1998 and 1999, salmon increased in size substantially faster in the seasonally inundated agricultural floodplain than in the river, suggesting better growth rates. Similarly, coded-wire-tagged juveniles released in the floodplain were substantially larger at recapture and had higher apparent growth rates than those concurrently released in the river. Improved growth rates in the floodplain were in part because of substantially higher prey consumption, reflecting greater availability of drift invertebrates. Bioenergetic modeling suggested that feeding success was greater in the floodplain than in the river, despite increased metabolic costs of rearing in the substantially warmer floodplain. Growth, survival, feeding success, and prey availability were higher in 1998 than in 1999, a year in which flow was more moderate, indicating that hydrology affects the quality of floodplain rearing habitat. These findings support the predictions of the flood pulse concept and provide new insight into the importance of the floodplain for salmon.

Work by Jeffries et al. (2008) and Sommer et al. (2001) indicate that off-channel floodplain habitats provide substantially improved rearing habitat, supporting higher growth rates than the intertidal river channel. However, their work shows that providing habitat complexity for juvenile salmon in floodplains is of utmost importance, so fish can find optimal places for rearing under varying flow conditions. It is well documented that survivorship to adulthood is increased when young salmonids leave freshwater at a larger size (Unwin 1997; Galat and Zweimuller 2001). Studies by Jeffries et al. (2008), Sommer et al. (2001), and others show that floodplain habitat restoration in Central California has major benefits to Chinook salmon populations, especially relative to growth and production. These studies indicate bioenergetic improvement to salmonids rearing in a flooded terrestrial floodplain because of the abundance of zooplankton (primary production), rather than having to rely on less dense prey items in the riverine channels, such as larval fish and benthic macroinvertebrates, and expending more energy for their capture. Therefore, construction of element IVc would be likely to result in bioenergetic improvement for all listed species.

EFFECTS RELATED TO THE 2017 EMERGENCY RESPONSE CONSTRUCTION PROJECT ACTIONS

Avoidance and minimization measures were implemented during the 2017 Emergency Response Construction Project. A worker environmental awareness program was provided to construction personnel prior to construction activities at element IVa, due to the proximity to potentially suitable riparian brush rabbit habitat. Construction personnel were notified of their responsibilities and provided with information on the life history of Federally listed species with the potential to occur in the construction footprint and vicinity. A biological monitor was onsite during all construction within element IVa. The biological monitor conducted preconstruction surveys for riparian brush rabbit, and was present to observe all construction activities within this area. See **Appendix H** for the construction monitoring report.

The implementation of the 2017 Emergency Response Construction Project did not result in adverse effects to valley elderberry longhorn beetle, because no elderberry shrubs were located within 100 feet of project activities. The implementation of the 2017 Emergency Response Construction Project did not result in adverse effects to special-status fish, because no waterside habitat was affected.

The implementation of the 2017 Emergency Response Construction Project resulted in the removal of 1.61 acres of potentially suitable habitat for riparian brush rabbit at element IIIb, IVa, Va, VIa.1, and VIbcde (see **Table 6**; see also **Appendix G**). No riparian brush rabbit was observed during the construction activities in this element, including during the removal of the vegetation. As described above under "Riparian Brush Rabbit" within this section, proposed conservation measures (see the "Avoidance and Minimization Measures" section above) would minimize direct loss of riparian habitat in conjunction with compensation for adverse effects. The Phase 3 Repair Project would include restoration of at least 9.9 acres of riparian scrub habitat and upland refugia in the setback area at element IVc (**Exhibit 12**). Implementing such measures is anticipated to avoid a net reduction in the number of riparian brush rabbit and its associated habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of present, pending, and future State, tribal, local, or private actions that are reasonably certain to occur in the action area under consideration. The effects of projects that require a federal action are not considered in the cumulative effects evaluation during Section 7 consultation evaluation because they are subject to separate consultation (USFWS and NMFS 1998). For example, the Central Lathrop Specific Plan (Phase 1) addresses the development of 1,521 acres of land immediately east of the RD 17 levee elements IIIa and IIIb, south of Dos Reis and north of the housing development adjacent to element IVa. The USFWS issued a Biological Opinion for this project (USFWS File No. 1-1-06-F-0114), which analyzed the effects of the project on riparian brush rabbit and VELB. Therefore, this development is not considered cumulative to the proposed project. Also, the nonfederal action must be located in the action area, or project site, that is evaluated in the Section 7 consultation process (USFWS and NMFS 1998). Several present, pending, and future projects that are located in or near the action area under consideration in this consultation could result in effects similar to those of the proposed action.

SUMMARY OF PRESENT, PENDING, AND FUTURE PROJECTS IN THE PHASE 3 REPAIR PROJECT AREA

FLOOD DAMAGE REDUCTION SYSTEM IMPROVEMENTS

Two other proposed projects related to improvements to flood damage reduction systems are located near RD 17: the Lower San Joaquin River Feasibility Study, which would determine needed improvements for future flood protection systems in an effort to reach or exceed the future 200-year level of flood protection; and the Smith Canal Closure Structure, which would install a flood control gate in the Delta in Stockton, north of the Deep Water Ship Channel, to prevent flood flows from entering the Smith Canal in the event of an imminent or existing levee breach and during 100-year flood events.

These projects may affect federally listed species and require a federal action, and therefore would be subject to Section 7 consultation. Where adverse effects would occur on the landside of the levees, the project proponents may need incidental take authorization, pursuant to incidental take permits used under the SJMSCP. Planning efforts in San Joaquin County have addressed the cumulative effects of development in the county, through preparation and adoption of the SJMSCP. The effects of these projects are not considered cumulative to the Phase 3 Repair Project because they would undergo federal review and permitting as necessary—either through a Section 7 consultation or through SJMSCP compliance. This would ensure that adverse effects would be fully mitigated.

DEVELOPMENT PROJECTS

Development projects within the RD 17 boundaries include projects in the cities of Manteca, Stockton, and Lathrop, and in unincorporated areas of San Joaquin County. These projects have been described and analyzed in their respective environmental documents, including the following:

- River Islands Project;
- San Joaquin County General Plan 2010, adopted in 1992 and as amended;
- City of Stockton General Plan, adopted in 1990 and as amended through November 3, 1998;
- City of Lathrop General Plan, adopted in 1991 and as amended through January 2003;
- Central Lathrop Specific Plan, adopted in November 2004;

- West Lathrop Specific Plan, adopted in 1995;
- Manteca General Plan, adopted in 1988 and as amended through December 20, 1993;
- City of Lathrop Water, Wastewater, and Recycled Water Master Plan, adopted in 2001 and as amended through November 9, 2004;
- City of Manteca Wastewater Treatment Plant expansion; and
- 2001 Regional Transportation Plan, San Joaquin Council of Governments, 2001.

San Joaquin County covers approximately 909,000 acres, with approximately 809,000 acres (or nearly 90 percent of the county) used or available for agriculture (i.e., row and field crops, orchards, vineyards, and grazing lands). The remaining lands are dominated by various types of development (approximately 59,000 acres), natural habitats (e.g., woodlands, riparian), and open water (e.g., lakes, rivers, Delta waterways). Most county residents and development are located in incorporated cities (i.e., Escalon, Lathrop, Lodi, Manteca, Ripon, Stockton, and Tracy). The SJMSCP anticipated that 147,000 acres of various categories of open space lands (including agriculture, range lands, and natural) in the county would be converted to non–open space uses between 2001 and 2051, based on full buildout of each of the general plans in the county and construction of all anticipated utility, transportation, and other public projects. In addition, approximately 59,000 acres of infill of urban lands were presumed to occur in this 50-year time frame.

Many development projects near the Phase 3 Repair Project area, including those described above, have been implemented recently or are in various stages of planning and entitlement, including the River Islands project. These current, pending, and potential future projects may affect federally listed species and require a federal action, and therefore would be subject to Section 7 consultation. Or, for those occurring within the SJMSCP permit area within San Joaquin County, the project applicants are expected to seek incidental take authorization, pursuant to incidental take permits used under the SJMSCP. Planning efforts in San Joaquin County have addressed the cumulative effects of development in the county, through preparation and adoption of the SJMSCP. The effects of these projects are not considered cumulative to the Phase 3 Repair Project because they would undergo federal review and permitting as necessary—either through Section 7 consultation or SJMSCP compliance.

ANALYSIS OF CUMULATIVE EFFECTS

GROWTH INDUCEMENT

Direct growth inducement would result if a project would include construction of new housing. Indirect growth inducement would occur, for instance, if implementing a project were to result in any of the following:

- substantial new permanent employment opportunities (e.g., commercial, industrial, or governmental enterprises);
- substantial short-term employment opportunities (e.g., construction employment) that indirectly would stimulate the need for additional housing and services to support the new temporary employment demand; and/or
- removal of an obstacle to additional growth and development, such as removing a constraint on a required public utility or service (e.g., construction of a major sewer line with excess capacity through an undeveloped area).

Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Local land use decisions are within the jurisdiction of the cities and county in the Phase 3 Repair Project area: the City of Stockton, the City of Lathrop, the City of Manteca, and San Joaquin County. Each of these entities has adopted a General Plan consistent with State law. These General Plans provide an overall framework for growth and development within the jurisdiction of each agency, including the Phase 3 Repair Project area. Within the RD 17 boundaries, as elsewhere, population growth and urban development also are influenced by national, regional, and local economic conditions.

Because the Phase 3 Repair Project would not include construction of housing, it would not directly induce growth. Construction activities would generate short-term employment, but project-related construction jobs are expected to be filled from the existing local employment pool and not to indirectly induce growth or result in a population increase, nor would implementation of the project indirectly induce growth by creating permanent new jobs.

The Phase 3 Repair Project would accommodate growth currently approved or planned for undeveloped lands within the RD 17boundaries. These lands have been identified as the places most suitable for urban growth in the General Plans and additional planning policy documents of the cities of Lathrop, Manteca, and Stockton, and San Joaquin County. The Phase 3 Repair Project would allow development to proceed when economic and market conditions are favorable.

Development within the RD 17 boundaries is directed by the Central Lathrop Specific Plan and the West Lathrop Specific Plan in the City of Lathrop, the City of Stockton General Plan, the City of Manteca General Plan, and the San Joaquin County General Plan. The cities of Lathrop and Manteca are where the majority of planned or proposed development projects would be located. Environmental documents have been prepared to address the General Plans in these areas.

This information provides substantial evidence that the Phase 3 Repair Project would accommodate anticipated growth in a manner that would be consistent with adopted local growth management plans and with the State Plan of Flood Control. Thus, the Phase 3 Repair Project, despite accommodating buildout of adopted Specific Plans and General Plans in the cities of Lathrop, Manteca, and Stockton, would not be growth inducing itself.

CUMULATIVE EFFECTS ON LISTED SPECIES

Implementing the plans and projects described above would permanently disturb undeveloped land that currently is or has recently been in agricultural use. These projects would have cumulative effects on agricultural resources (by converting agricultural land to nonagricultural uses) and remnant native habitats (such as woodlands and marshes), which would have the potential to cause permanent adverse cumulative effects on the species, including federally listed species, for which these lands provide habitat.

Large areas of native riparian and wetland vegetation in the Phase 3 Repair Project area and Central Valley region have been lost or degraded over the past 150 years. USFWS estimates that more than 90 percent of wetland and riparian habitat has been lost in the Central Valley, compared to historic levels (USFWS 1989). Most losses have occurred because of CVP and SWP facility construction and alteration of flow patterns below dams, particularly channelization, and then clearing or filling behind levees for the conversion to agriculture and urban land uses. Alterations to the San Joaquin River channel have resulted over time in homogenous, trapezoidal channels with little instream structure; narrow and sparse bands of riparian vegetation that provide only limited SRA habitat functions; limited recruitment of large woody debris; and limited habitat conditions for native fish species and other aquatic organisms. This habitat conversion has affected many plant and wildlife species substantially, resulting in various species being listed as threatened or endangered under the ESA as well as under the California Endangered Species Act.

Present and future conversions of open space lands in San Joaquin County and the region consist primarily of converting agricultural lands to residential and urban development. Several flood risk management projects are

being implemented across the Central Valley, including San Joaquin County, to improve the integrity of levees. However, some of these flood risk management projects would implement compensatory mitigation in the form of habitat creation and preserves, designed to actually increase these habitats and their values related to ecosystem functions and special-status species. Upstream from the Phase 3 Repair Project area, the SJRRP would result in future structural and channel improvements to benefit special-status fish and wildlife species (Reclamation and DWR 2011). Nevertheless, even with these benefits, the overall losses of sensitive habitats in the Phase 3 Repair Project region, the numerous threatened and endangered species that are present, the ongoing declines of other species, and the continuing conversions of habitats and open space lands to various developments are evidence that past, present, and reasonably foreseeable future projects would combine to result in significant cumulative effects on biological resources.

Development projects (i.e., residential, commercial, industrial), infrastructure projects, and flood facilities improvement projects include or would include grading and other earthmoving activities that could result in temporary and short-term localized soil erosion that could affect hydrology and would have the potential to release materials (e.g., runoff of soils or contaminants) into the San Joaquin River. Potential increases in sedimentation, turbidity, and contaminants could expose and adversely affect fish and aquatic habitats. However, these site-specific effects are not expected to combine with the effects of other activities, because compliance with the NPDES regulations, including construction site BMPs, would help control erosion at each construction site. The effects from development projects, infrastructure projects, and flood facilities improvement projects would be temporary and short-term, and soil erosion would be localized.

CONCLUSIONS AND DETERMINATION

In conclusion, based on the biology and ecology of the federally listed species that have the potential to occur in the Phase 3 Repair Project area, the environmental baseline for the action area, and the effects of the proposed action and its cumulative effects, implementing the Phase 3 Repair Project may affect and is likely to adversely affect VELB and riparian brush rabbit, and would result in no adverse effect on delta smelt, Central Valley fall/late fall–run Chinook salmon, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and green sturgeon. Designated critical habitat in the action area has been designated for delta smelt, Central Valley steelhead, and green sturgeon; however, none would be adversely modified or destroyed.

- **Valley elderberry longhorn beetle:** The Phase 3 Repair Project may affect and is likely to adversely affect VELB by transplanting eight elderberry shrubs. Although VELB habitat credits comparable to 367 elderberry seedlings and 367 associated native plantings would be purchased from a USFWS-approved VELB habitat conservation bank to compensate for effects on VELB and effects on 268 elderberry stems (greater than 1 inch in diameter at ground level), an adverse effect on the species could occur. Removal of shrubs in which larvae are present could result in larvae mortality if the health of the shrubs is adversely affected, and a temporary loss of habitat available to the beetle during the establishment of seedlings would occur.

- **Riparian brush rabbit:** The Phase 3 Repair Project, including the 2017 Emergency Response Construction Project, may affect and is likely to adversely affect riparian brush rabbit by removing 3.28 acres of landside riparian habitat that is suitable for the species, contributing to the further reduction of available habitat for this species.

  However, the Phase 3 Repair Project would include restoring approximately 9.9 acres of compensatory riparian habitat (**Exhibit 12**) to offset project-related habitat losses. After the new setback levee in element IVc is constructed and certified, a small section of the existing levee then would be partially degraded. Between 25 feet from the landside toe of the existing levee and 25 feet from the waterside toe of the new setback levee are approximately 9.9 acres that could be restored as riparian habitat (**Exhibit 12**). The restored riparian habitat would consist of willows, cottonwoods, valley oaks, wild rose, California blackberry, and grasses, which is comparable to the composition of habitats where this species is documented to occur along the RD 17 levees. Apart from a small notch along the north side, the existing levee would remain in place, thus providing upland refugia for the species during high-water events. The restored habitat in the setback levee area would be contiguous with existing waterside riparian habitat along element IVc; this waterside riparian habitat along element IVc extends northward through elements IVa, IIIa, and IIIb, and southward through elements Va and VIa.1. Documented occurrences exist of riparian brush rabbit in the waterside riparian habitat in elements IIIa and IIIb, north of element IIIa and south of element VIa.1; therefore, reestablishing and protecting riparian habitat in element IVc would provide expanded and connected habitat for this species.

  RD 17 also is evaluating options for providing off-site compensatory habitat to offset Phase 3 Repair Project effects on riparian brush rabbit. Additional off-site compensatory habitats would include preserving existing waterside riparian habitats and/or restoring natural riparian habitats. These options would be evaluated in coordination with USFWS during the Section 7 consultation.

- **Federally listed fish species:** The Phase 3 Repair Project would result in no adverse effects on federally proposed and federally listed fish species considered in this BA. Effects are not expected to occur because of the avoidance and minimization measures to be implemented by the Phase 3 Repair Project. The Phase 3 Repair Project would include several measures that would avoid potential direct environmental effects during project construction. The potential effects of increased sedimentation or turbidity, and/or release of contaminants on fish and other aquatic organisms, would be avoided and minimized through the use of BMPs (e.g., source control, detention basins, revegetation, and spill containment plan) that would maintain surface water quality conditions in receiving waters and minimize disturbance to fish and other aquatic habitats. No waterside riparian or SRA habitat would be removed.

ESSENTIAL FISH HABITAT ASSESSMENT

The Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 USC 1801), requires that EFH be identified and described in federal fishery management plans. Federal agencies must consult with NMFS on any activity that they fund, permit, or carry out that may adversely affect EFH. The EFH regulations require that federal agencies obligated to consult on EFH also provide NMFS with a written assessment of the effects of any action on EFH (50 CFR 600.920). NMFS is required to provide EFH conservation and enhancement recommendations to federal agencies. The statute also requires federal agencies receiving NMFS EFH conservation recommendations to provide a detailed written response to NMFS within 30 days of receipt, detailing how they intend to avoid, mitigate, or offset the impact of activity on EFH (Section 305[b][4][B]).

EFH is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purposes of interpreting the definition of EFH, "waters" includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers all habitat types used by a species throughout its life cycle.

The Pacific Fishery Management Council has identified and described EFH, adverse impacts, and recommended conservation measures for salmon in Amendment 14 to the Pacific Coast Salmon Fishery Management Plan (PFMC 2003). Amendment 18 to the Pacific Coast Salmon Fishery Management Plan revises the description and identification of EFH for Pacific salmon, designates habitat areas of particular concern, modifies the current information on fishing activities and potential measures to minimize their effects on EFH, and updates the list of fishing and non-fishing related activities that may adversely affect EFH and potential conservation and enhancement measures to minimize those effects (NMFS 2014c). Freshwater EFH for Pacific salmon in the Central Valley (i.e., Chinook salmon) includes waters currently or historically accessible to salmon within the Central Valley ecosystem, as described in Myers et al. (1998), and includes the segment of the San Joaquin River in the action area. EFH for Chinook salmon in the Lower San Joaquin River includes the San Joaquin River, its eastern tributaries, and the lower reaches of the western tributaries that could provide juvenile rearing habitat or refugia from high flows during floods as salmon migrate along the mainstem in this area. Although evidence of current or historical Chinook salmon distribution is lacking for the western tributaries (Yoshiyama et al. 2001), the lower reaches of these tributaries could provide juvenile rearing habitat or refugia. Central Valley fall/late fall–run Chinook salmon is a species managed under the Pacific Coast Salmon Plan that occurs in the San Joaquin River.

THE PROPOSED ACTION

The proposed action is described in detail in the "Description of the Proposed Action" section of this BA. The action area, environmental baseline, and species accounts, respectively, are described in the "Action Area," "Environmental Baseline," and "Species Accounts" sections of this BA.

ESSENTIAL FISH HABITAT DESIGNATION IN THE ACTION AREA

EFH has been identified for Chinook salmon, which includes Central Valley fall- and late fall-run Chinook salmon. EFH includes migration, holding, and rearing habitat and opportunistic/intermittent spawning, holding, and rearing habitat for the San Joaquin River (NMFS 2014a). EFH for Chinook salmon in the Lower San Joaquin River includes the San Joaquin River, its eastern tributaries, and the lower reaches of the western tributaries that could provide juvenile rearing habitat or refugia during floods as salmon migrate along the mainstem in this area (NMFS 2014c).

EFFECTS OF THE PROPOSED ACTION

Effects of the proposed action are described below and in the "Direct and Indirect Effects on Species in the Action Area" and "Cumulative Effects" sections of this BA.

Available literature indicates that limited Chinook salmon spawning typically occurs well upstream from the Phase 3 Repair Project area. EFH in the San Joaquin River in the vicinity of the Phase 3 Repair Project area consists of adult and juvenile (smolt) Chinook salmon passage between upstream spawning grounds and the Pacific Ocean, and limited in-channel rearing habitat for juveniles (limited because it is situated in a reach of the San Joaquin River that is bound on both banks by levees, resulting in channel incision, and is disconnected from its currently non-functioning floodplain). The river extends onto its floodplain only during high-water events, and if fish are swept into the floodplain during high flow conditions, they likely would become stranded because of the absence of a secondary channel for returning flood flows to the river. The Phase 3 Repair Project would result in improvement of EFH as functioning floodplain-rearing habitat and improvement to existing EFH in the San Joaquin River channel, by reducing and reversing the effects of current channel incision in the immediate vicinity of element IVc. Furthermore, approximately 2.5 acres of SRA habitat would be created and/or enhanced through revegetation actions between the river and the waterside toe of the existing levee in element IVc (see **Appendix E**).

Levee degradation and floodplain grading activities in element IVc would restore connectivity to the historic floodplain and improve habitat conditions in the floodplain. Although both actions would be constructed in dry conditions (above HTL), a potential short-term indirect effect of construction may be a temporary increase in sediment in the San Joaquin River, especially during the first storm or flooding event after construction. The measures (erosion control and revegetation) described in the "Avoidance and Minimization Measures" section of this BA are designed to reduce or capture any mobilized sediment resulting from the year's first rain or flooding event. Therefore, any construction-related sediment load would be temporary and negligible, especially when compared to the existing sediment load of the San Joaquin River and the project would not result in adverse effects on EFH.

The project would increase the amount and improve the quality of EFH in the project area. The new setback levee with floodplain in element IVc would improve EFH by providing refuge habitat for juvenile salmonids during high-water events, as described in Amendment 18 (NMFS 2014c). The newly reconnected floodplain would provide habitat for juvenile Chinook salmon rearing. It would also alter the channel dynamics in the immediate vicinity such that the channel incision process is expected to be reversed, thereby improving juvenile and adult migratory passage habitat.

PROPOSED CONSERVATION MEASURES

Proposed conservation measures are presented in the "Description of the Proposed Action" and "Direct and Indirect Effects on Species in the Action Area " sections of this BA. The measures include avoidance and minimization measures.

CONCLUSIONS

The proposed action would not affect the spawning, rearing, or migratory EFH functions of Chinook salmon currently or previously managed under the Magnuson-Stevens Fishery Conservation and Management Act in the San Joaquin River.

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APPENDIX A

Exhibits

Refer to **Appendix A of Attachment 9 of Appendix J of this FEIS: Exhibits, on page 1363 of this PDF.**

APPENDIX B

Species Lists

Refer to **Appendix B of Attachment 9 of Appendix J of this FEIS: Exhibits, on page 1385 of this PDF.**

APPENDIX C

Evaluation of Potential for Giant Garter Snake Occurrence in the Phase 3 Repair Project Area

Refer to **Appendix C of Attachment 9 of Appendix J of this FEIS: Exhibits, on page 1401 of this PDF.**

Appendix D

Project Correspondence

APPENDIX D-1

Letter to USFWS and NMFS Requesting Technical Assistance, May 14, 2010

Refer to **Attachment 1 of Appendix J of this FEIS:**
Letter from AECOM to USFWS and NMFS Requesting Technical Assistance. May 14, 2010. Includes two attachments (2009 preliminary wetland delineation and 2010 updated wetland delineation), on page 955 of this PDF.

APPENDIX D-2

Letter from NMFS to AECOM Responding to Technical Assistance Request,
June 11, 2010

Refer to **Attachment 2 of Appendix J of this FEIS: Letter Responding to Technical Assistance Request. June 11, 2010, on page 1067 of this PDF.**

APPENDIX D-3

Letter from NMFS to USACE Requesting Additional Information,
July 7, 2015

Refer to **Attachment 4 of Appendix J of this FEIS: Letter from NMFS to USACE, Requesting Additional Information. July 7, 2015, on page 1173 of this PDF.**

APPENDIX D-4

Response to NMFS's July 2015 Request for Additional Information

Refer to Attachment 7 of Appendix J of this FEIS:
Letter from NMFS, Responding to Request for Additional Information. October 7, 2016, on page 1259 of this PDF.

APPENDIX D-5

Letter from USFWS to USACE Requesting Additional Information,
October 2, 2015

Refer to Attachment 5 of Appendix J of this FEIS:
Letter from USFWS to USACE, Responding to Request for Additional Information. October 2, 2015, on page 1183 of this PDF.

APPENDIX D-6

Response to USFWS' October 2015 Request for Additional Information

Refer to **Attachment 8 of Appendix J of this FEIS:**
Letter to USFWS, Responding to Request for Additional Information. October 7, 2016, on page 1275 of this PDF.

APPENDIX E

Conceptual Mitigation and Monitoring Plan for Levee Setback Area
June 2016

Refer to **Attachment 6 of Appendix J of this FEIS: Conceptual Mitigation and Monitoring Plan for Levee Setback Area – June 2016, on page 1191 of this PDF.**

APPENDIX F

Hydraulic Analyses of Setback Levee Alternatives

APPENDIX F-1

January 2010 Hydraulic Analysis of Reach IVc and Reaches IIa and IIb Levee Setback Alternatives

***Refer to* Appendix D.1 of this FEIS:**
January 2010 Hydraulic Analysis of Reach IVc and Reaches IIa and IIb Levee Setback Alternatives, dated January 19, 2010, Revised April 14, 2010, on page 679 of this PDF.

APPENDIX F-2

February 2014 Hydraulic Analysis of Reach IVc Levee Setback for Preferred Alternative

Refer to **Appendix D.2 of this FEIS:**
February 2014 Hydraulic Analysis of Reach IVc Levee Setback for Preferred Alternative, on page 743 of this PDF.

APPENDIX F-3

“Setback Levee Alternative” Excerpted from March 2, 2009, Reclamation District 17 Early Implementation Project Funding Application for 100-Year Levee Seepage Area Project – 2009 Project Elements

Refer to **Appendix F-3 of Attachment 9 of Appendix J of this FEIS: “Setback Levee Alternative” Excerpted from March 2, 2009, Reclamation District 17 Early Implementation Project Funding Application for 100-Year Levee Seepage Area Project – 2009 Project Elements, on page 1453 of this PDF.**

APPENDIX G

As-Builts for Reclamation District 17's 2017 Emergency Response Construction Project, dated July 2017

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RECLAMATION DISTRICT 17
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SAN JOAQUIN COUNTY, CALIFORNIA

2017 EMERGENCY FLOOD RESPONSE AS-BUILT SURVEY

ELEMENT I-A/I-B

Revisions				
No.	Description	Date	By	Aprvd. By

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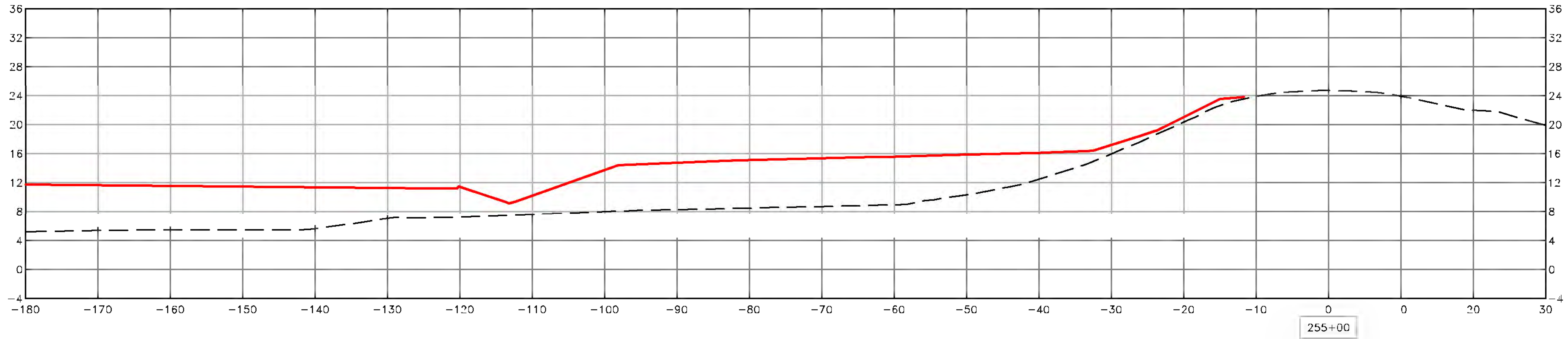
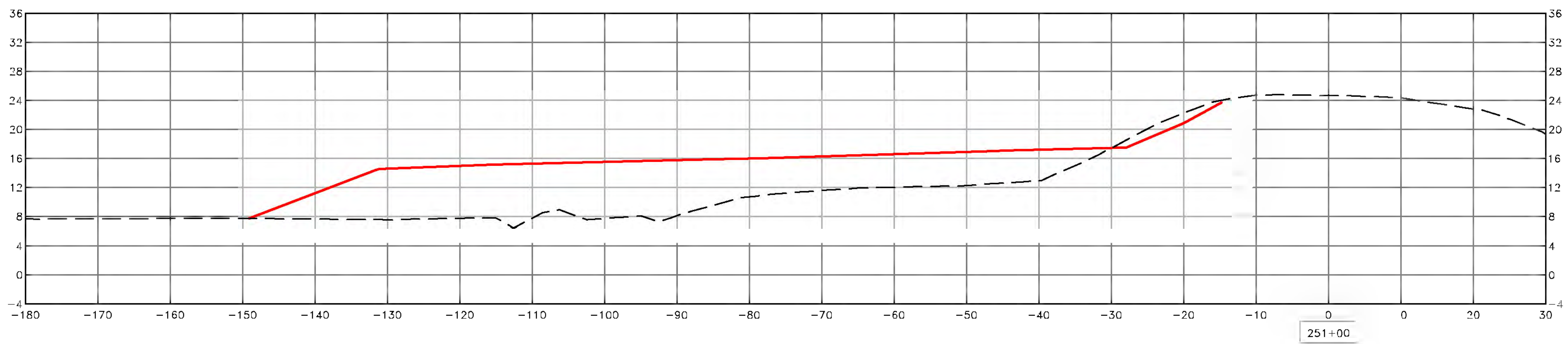
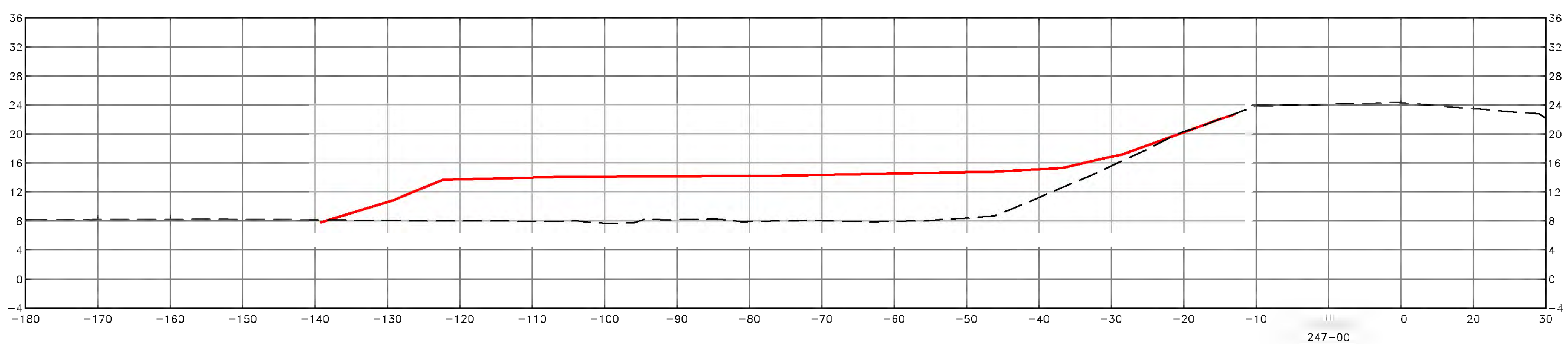
Drawn JOB
Check JAM

Scale 1" = 40'
Original Drawing Scale 0 ½" 1"

Date JULY 2017
Sheet Number 1 Of 16
Project File No. 0856-0710







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ELEMENT I–A/I–B

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2017 EMERGENCY FLOOD RESPONSE AS-BUILT SURVEY

ELEMENT I-E

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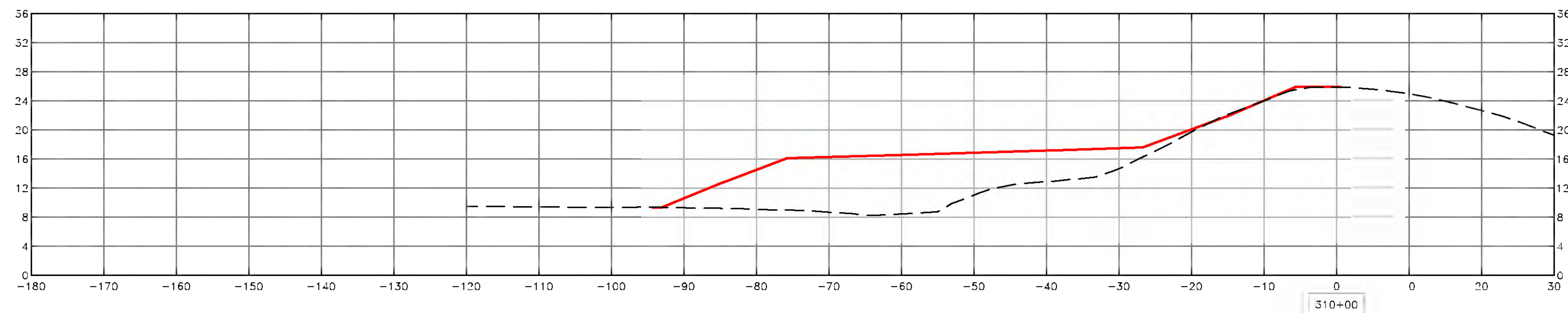

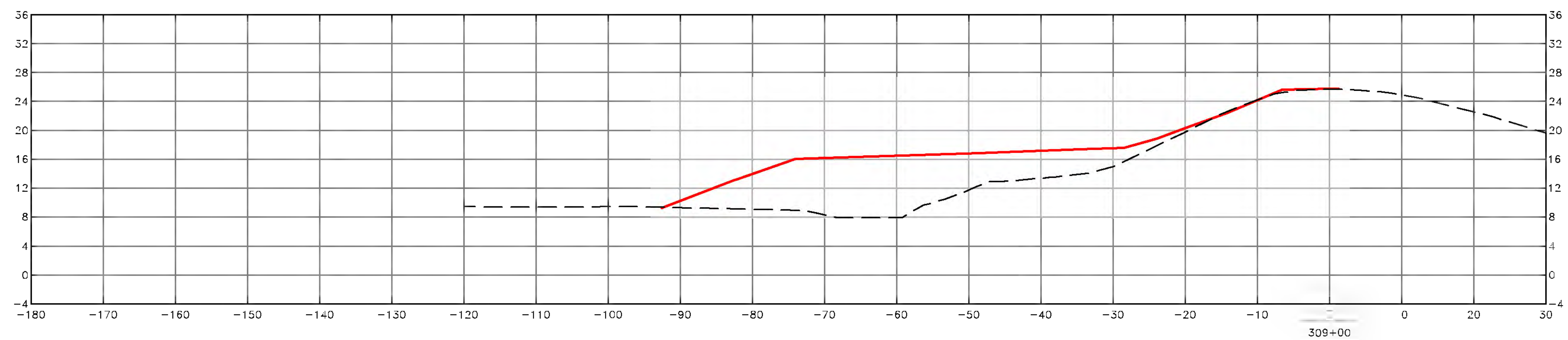

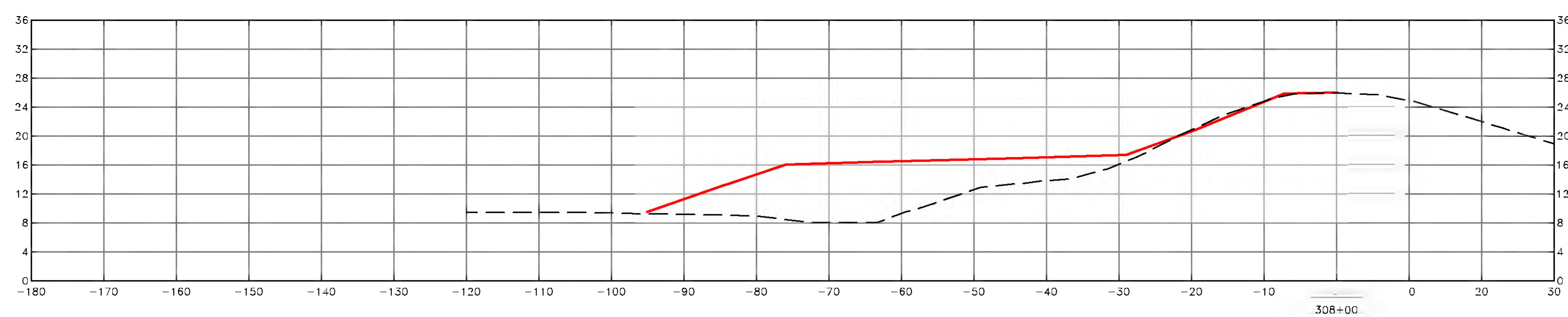

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ELEMENT I-E

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2017 EMERGENCY FLOOD RESPONSE
AS-BUILT SURVEY
ELEMENT III-B

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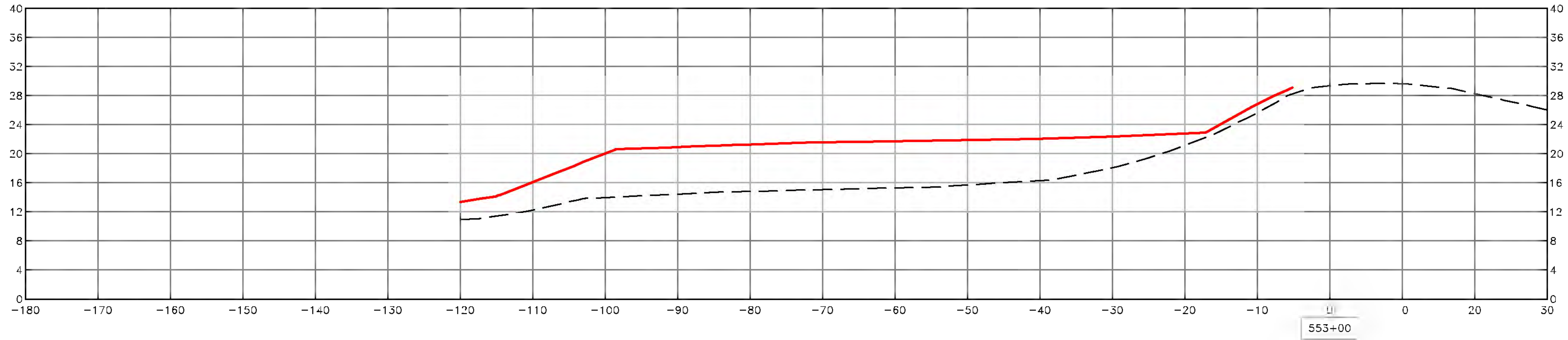

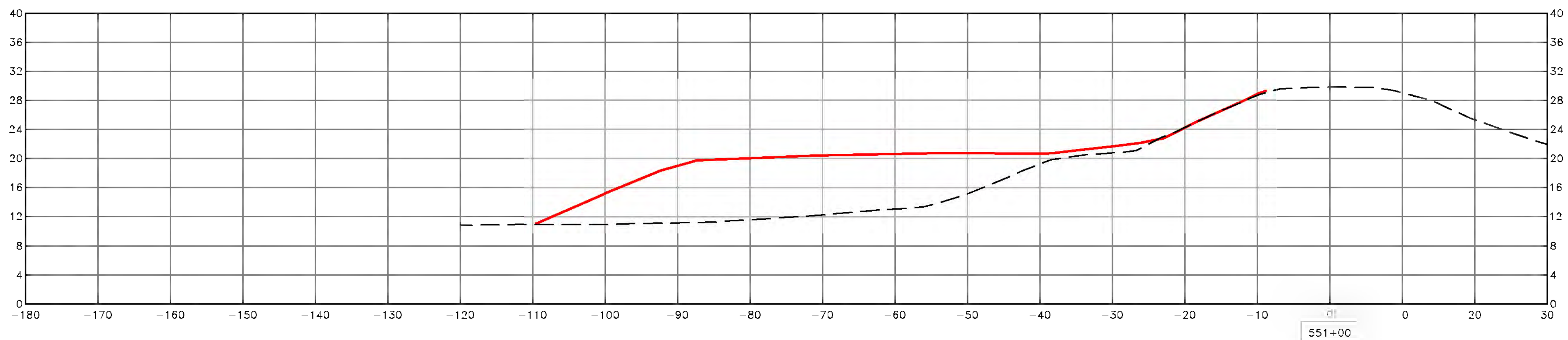

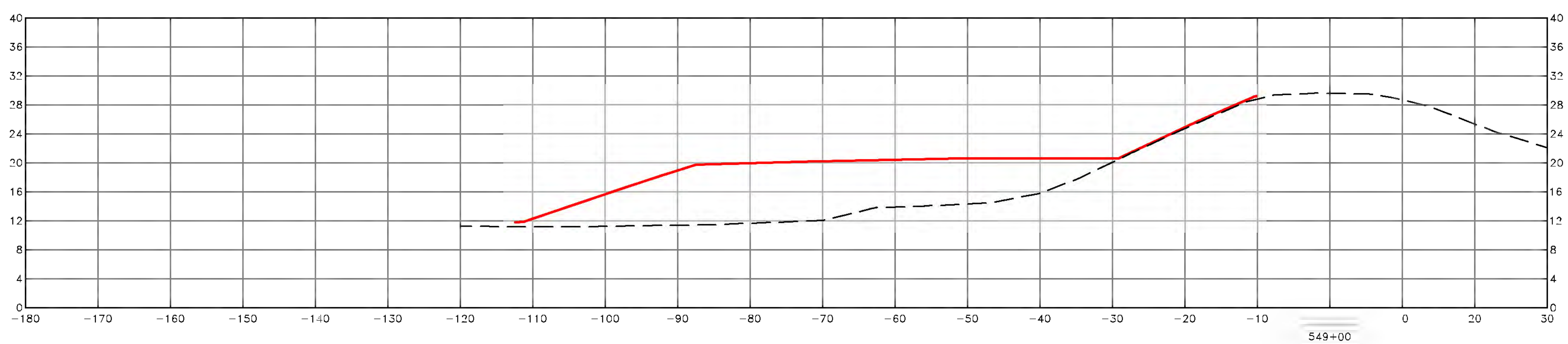

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AS-BUILT SURVEY
ELEMENT III-B

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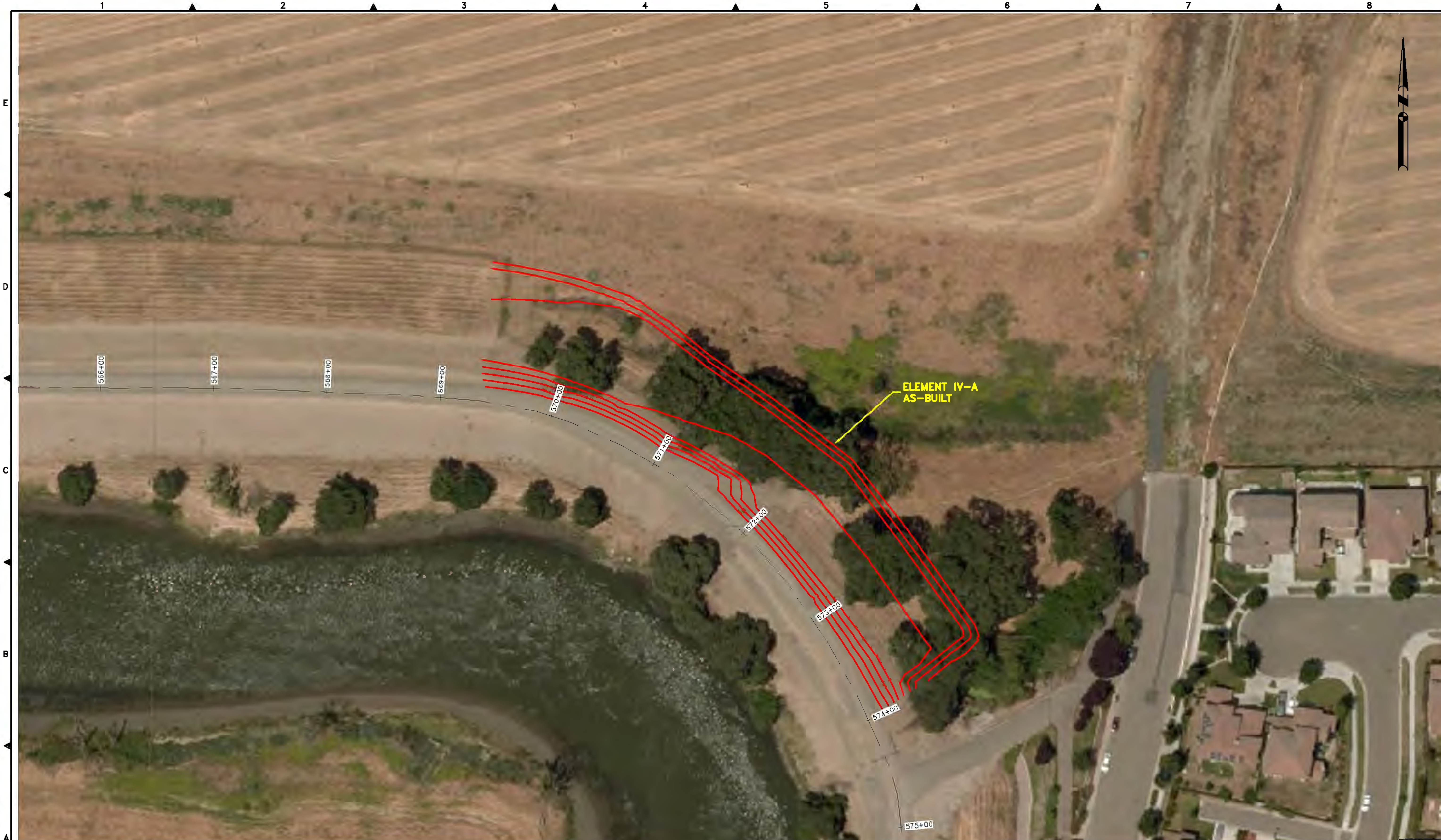

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ELEMENT IV-A

Revisions				
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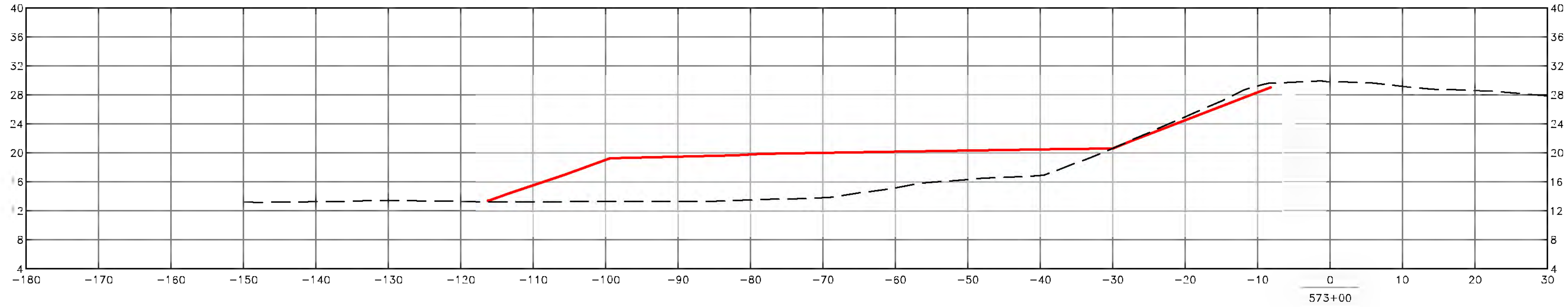
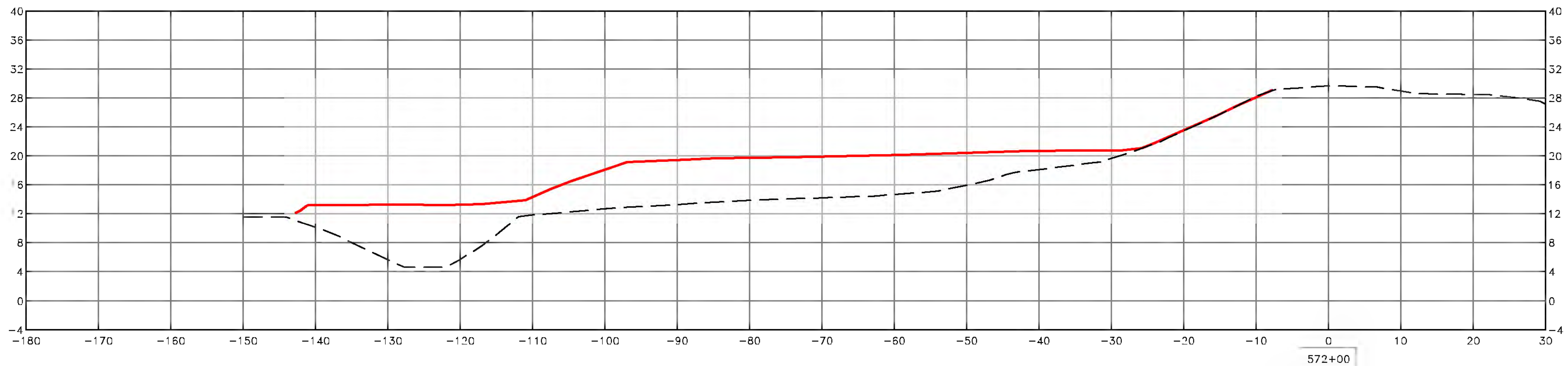
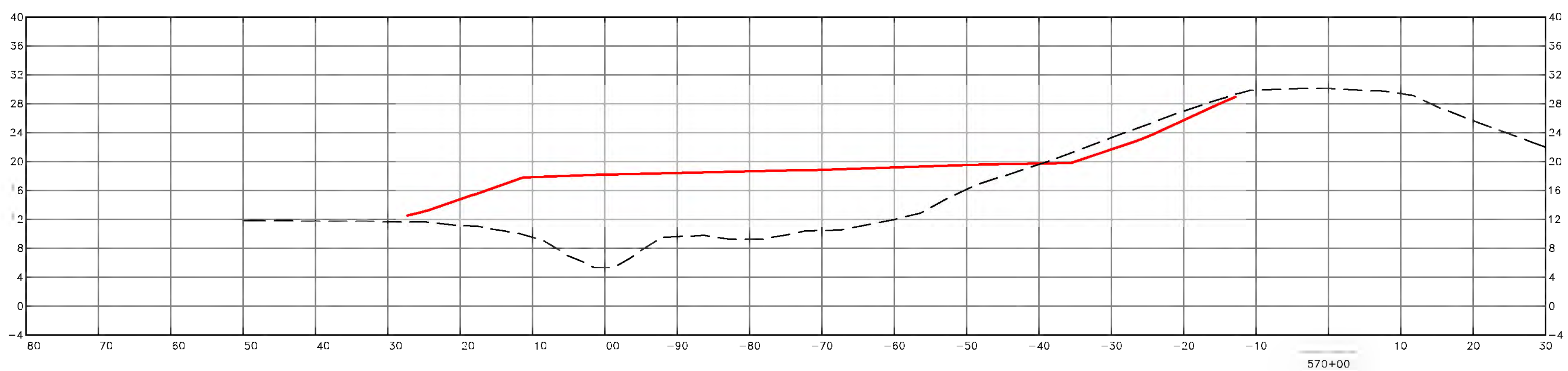
Date JULY 2017
Sheet Number 7 Of 16
Project File No. 0856-0710







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ELEMENT IV-A

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Sheet Number 8 Of 16
Project File No. 0856-0710

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2017 EMERGENCY FLOOD RESPONSE AS-BUILT SURVEY

ELEMENT V-A

No.	Description	Date	By	Aprvd. By

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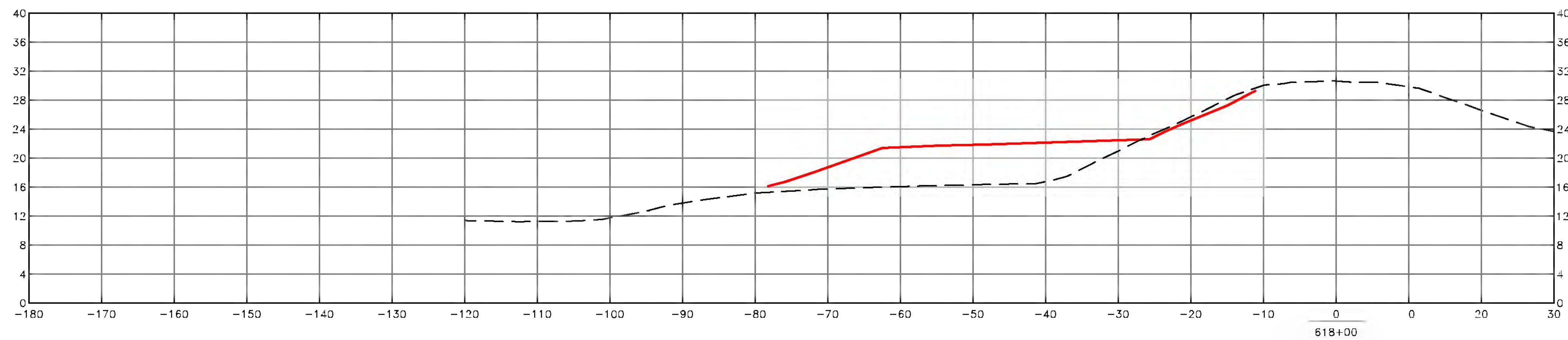

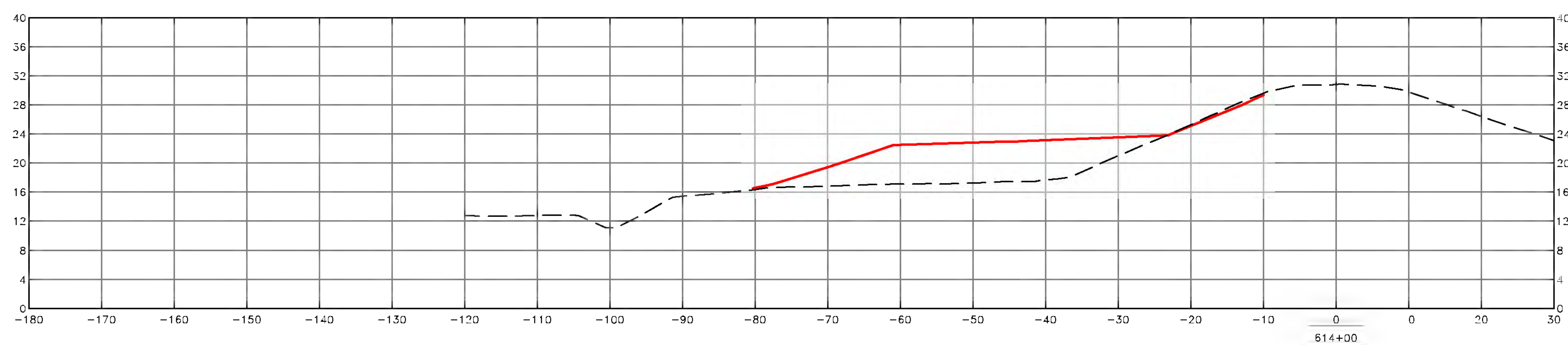

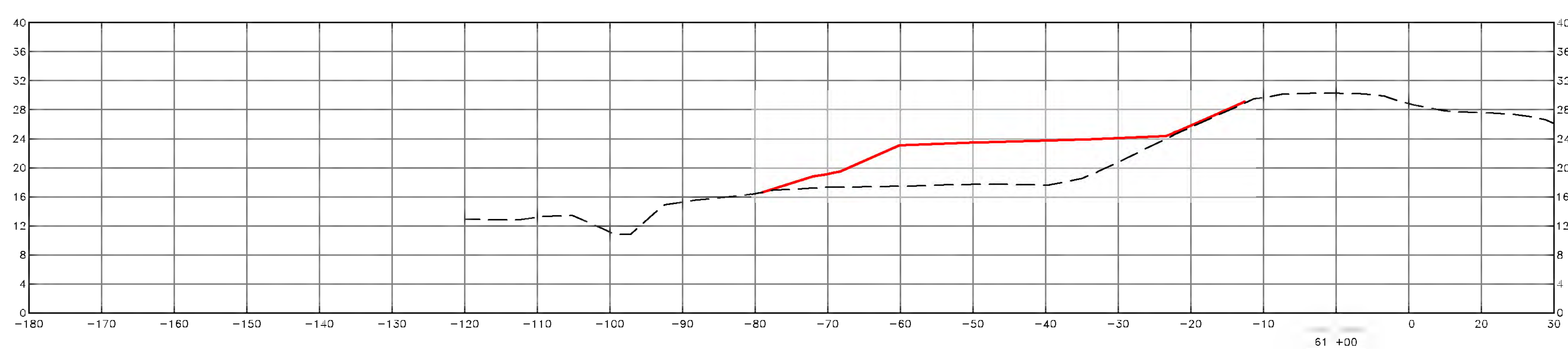

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ELEMENT V–A

Revisions				
No.	Description	Date	By	Aprvd. By

NAVD 88

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Drawn JOB	Original Drawing Scale 0 ½" 1"	Sheet Number 10 Of 16
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ELEMENT VI-A.1

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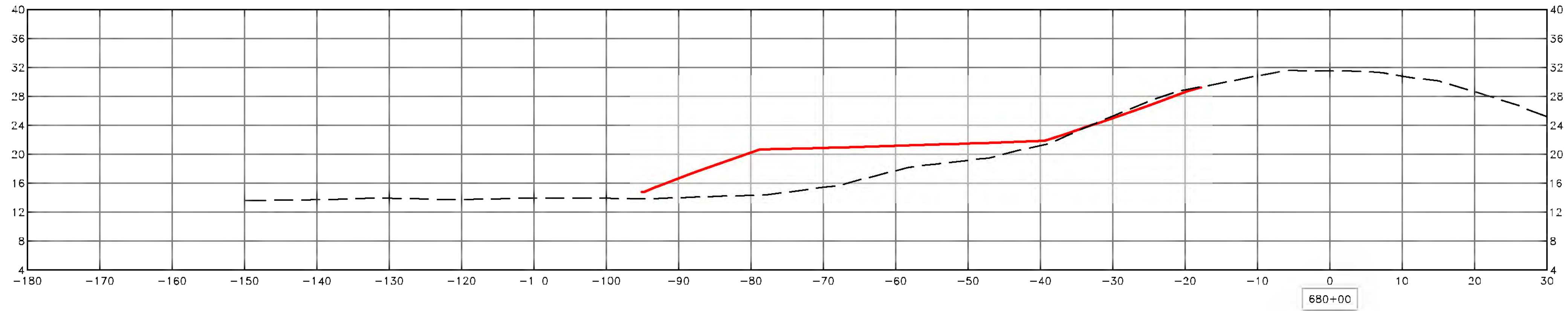

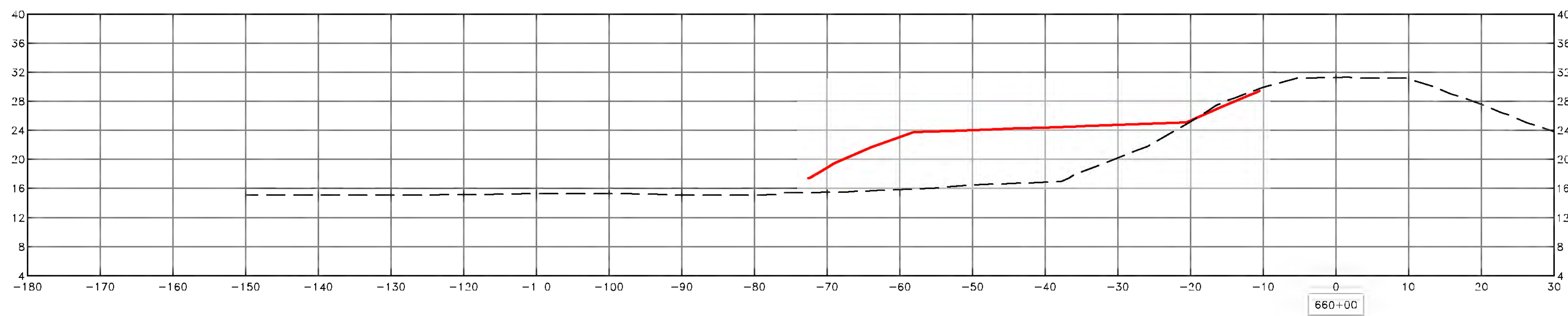

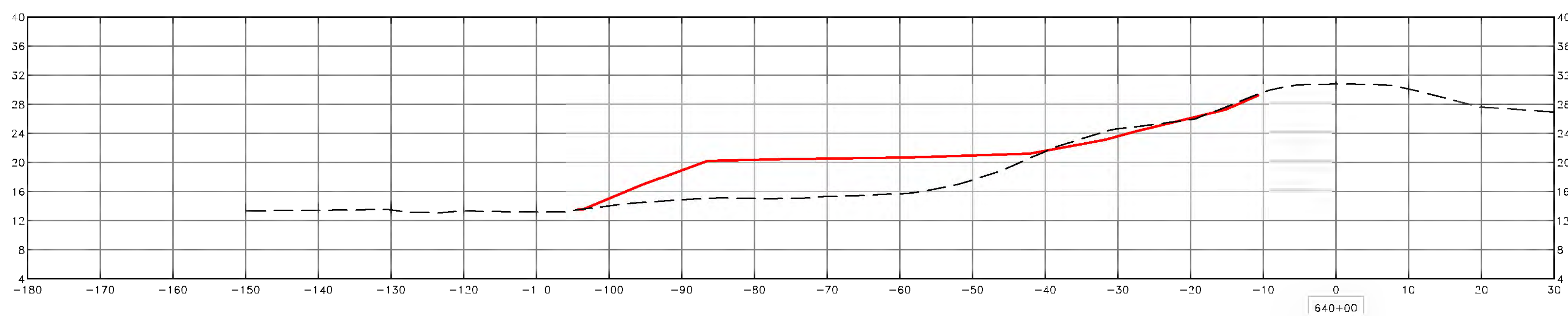

NAVD 88

AS-BUILT GROUND

PRE-CONSTRUCTION GROUND

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2017 EMERGENCY FLOOD RESPONSE
AS-BUILT SURVEY
ELEMENT VI-A.1

Revisions				
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Revisions				
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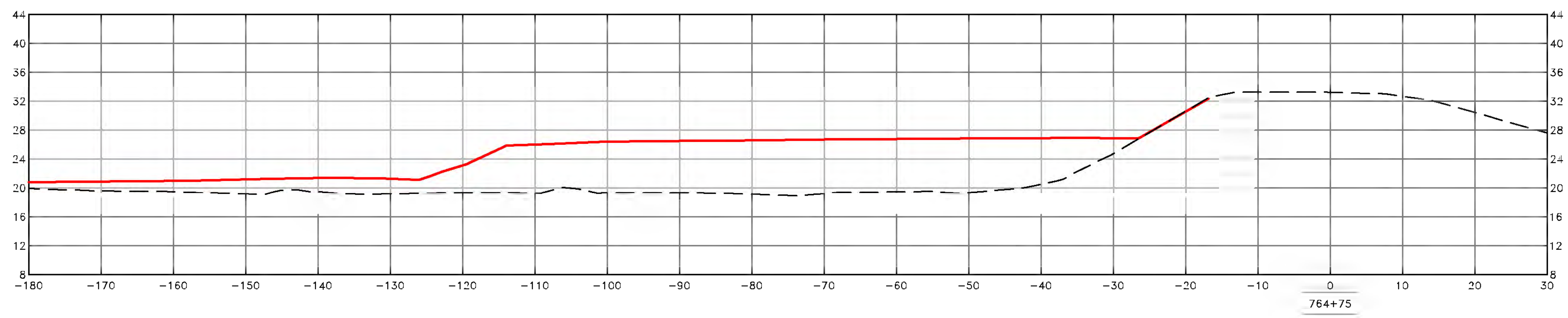

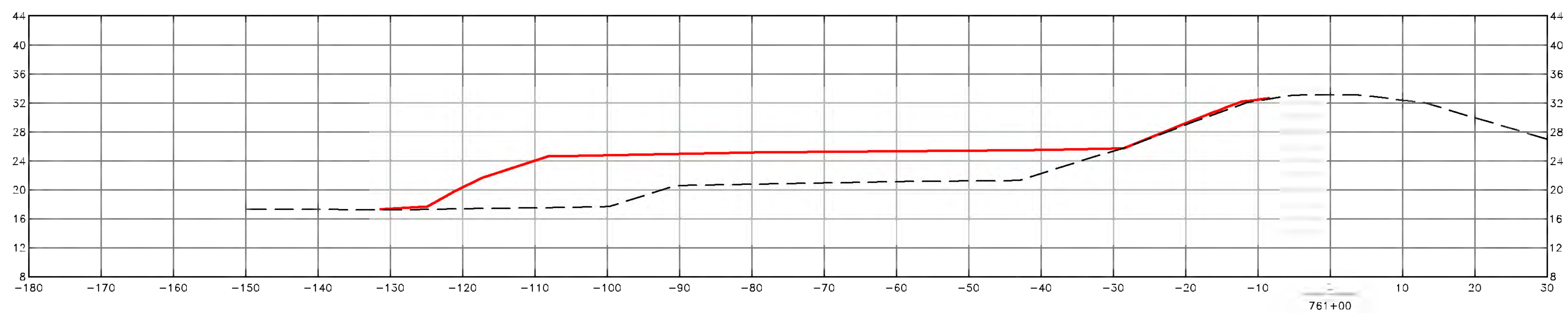

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AS–BUILT GROUND
PRE–CONSTRUCTION GROUND

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2017 EMERGENCY FLOOD RESPONSE
AS–BUILT SURVEY
ELEMENT VI–CDE

Revisions				
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Project File No. 0856–0710

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2017 EMERGENCY FLOOD RESPONSE AS-BUILT SURVEY

ELEMENT VII-B

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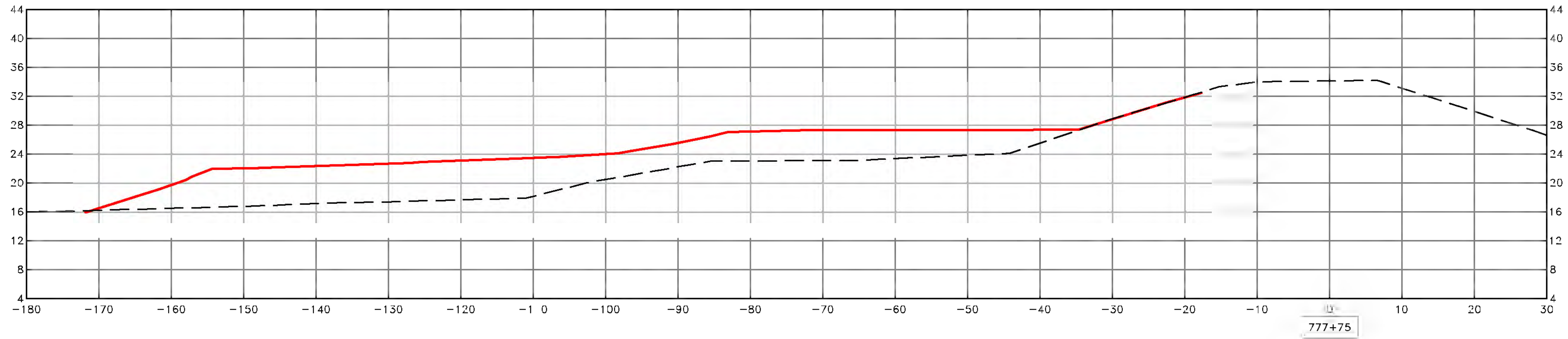

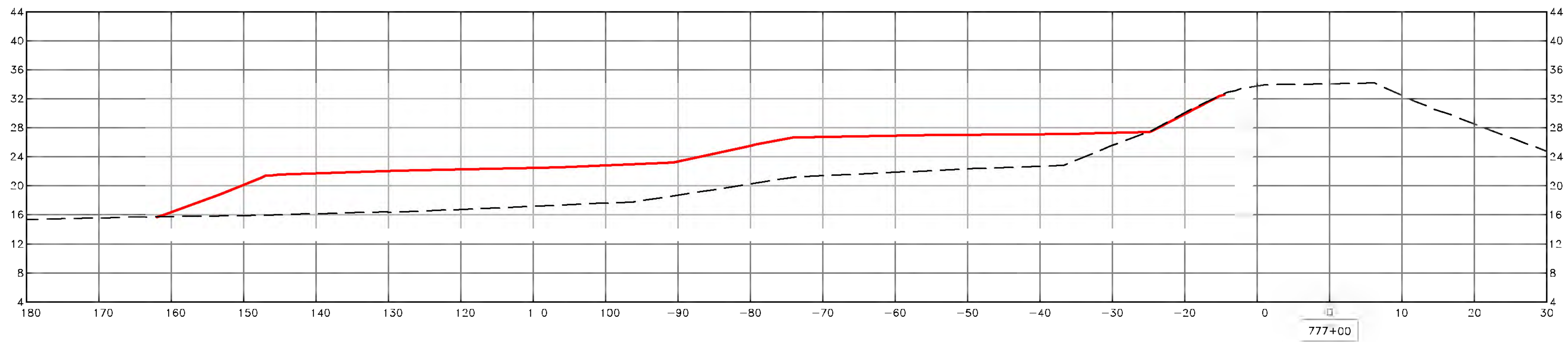

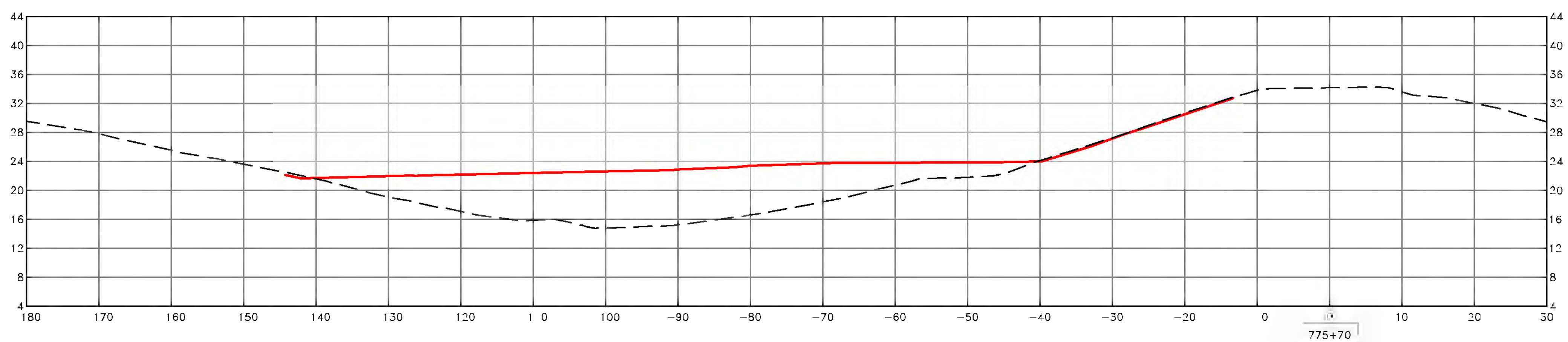

AS-BUILT GROUND
PRE-CONSTRUCTION GROUND

CALL BEFORE YOU DIG
1-800-227-2600
UNDERGROUND SERVICE ALERT

Submittal	
%	Date

KSN
KJELDSEN
SINNOCK
NEUDECK
Civil Engineers
and Land Surveyors

RECLAMATION DISTRICT 17
MOSSDALE TRACT
SAN JOAQUIN COUNTY, CALIFORNIA

2017 EMERGENCY FLOOD RESPONSE
AS-BUILT SURVEY
ELEMENT VII-B

Revisions				
No.	Description	Date	By	Aprvd. By

Design	JAM
Drawn	JOB
Check	JAM

Scale
1" = 10'
Original Drawing Scale
0 ½" 1"

NAVD 88

Date
JULY 2017
Sheet Number
16 Of 16
Project File No.
0856-0710

APPENDIX H

July 10, 2017 Construction Monitoring Report for Reclamation District 17's 2017 Emergency Response Construction Project

GEI Consultants

July 10, 2017

Geotechnical
Environmental
Water Resources
Ecological

Jeff Mueller
Kjeldsen Sinnock & Neudeck Inc.
711 N Pershing Ave,
Stockton, CA 95203

Subject: Construction Monitoring Report for Reclamation District 17's 2017 Emergency Response Construction Project

Dear Mr. Mueller:

GEI Consultants, Inc. (GEI) has prepared this Construction Monitoring Report (Report) for Reclamation District (RD) 17's 2017 Emergency Response Project (Project). The Project is located in south-central San Joaquin County, California, along the east bank of the San Joaquin River. On April 6, 2017, the U.S. Army Corps of Engineers (USACE) authorized (SPK-2009-001466) the discharge of fill into waters of the United States at Elements Ib, Ie, and IVa, which are distinct reaches along the San Joaquin River east levee, under Regional General Permit No. 8 (Emergency Actions). As part of the USACE's authorization, the agency sought input from the U.S. Fish and Wildlife Service (USFWS). Because the USFWS expressed concern over the Federally listed riparian brush rabbit (*Sylvilagus bachmani riparius*), RD 17 agreed to conduct construction monitoring for biological resources at Element IVa where vegetation was removed and a seepage berm was installed. On October 20, 2014, the Regional Water Quality Control Board issued a Technically Conditioned Water Quality Certification (WDID #5B39CR00238) for the larger Phase 3 Levee Seepage Repair Project.

Construction Monitoring – Methodology and Results

Biological monitoring was conducted along Element IVa of the Project on April 11, 13, and 17–20, 2017. During construction, the site had an average high of 69.7 degrees Fahrenheit and low of 49.7 degrees Fahrenheit, as well as 0.2 inch of precipitation on April 13 and 0.3 inch on April 18 (Stockton Metropolitan Airport). GEI biologist, Brook Constantz, was present at the construction site for 9 hours per day. The focus of the monitoring effort was to survey for riparian brush rabbit in the seepage berm construction limits and vicinity, and document the presence of birds, including special-status species and raptors, observed in this area.

Element IVa was surveyed for riparian brush rabbit presence and all areas of potentially suitable habitat within the construction limits and vicinity were investigated prior to the start of ground-disturbing activities. All construction activities were observed by the monitoring biologist to verify that any riparian brush rabbits that could be near the

GEI Consultants, Inc.
2868 Prospect Park Drive, Suite 400, Rancho Cordova, CA 95670
916.631.4500 fax 916.634.4501

construction activities in Element IVa were not harmed, harassed, injured, or killed as a result of Project implementation (**Photographs 1-3**). No riparian brush rabbits were observed during the construction of levee improvements in Element IVa.

During construction monitoring, all bird species observed within 500 feet of construction activities and Swainson's hawk within 1,320 feet were documented and observed. **Table 1** provides a list of bird species observed each day. During the preconstruction survey in Element IVa, a nest occupied by a European starling was observed inside a branch of a valley oak tree that was located within 100 feet of the construction limits; the top portion of this branch fell from the tree after the preconstruction survey exposing the nest which remained in the tree, but was abandoned before the first day of monitoring. No other species, including those listed under the Migratory Bird Treaty Act, were observed nesting within the project area or within 500 feet of construction activities. Swainson's hawk were not observed nesting within the project area or within 1,320 feet of construction activities.

Table 1. Bird Species Observed

Species	11-Apr	13-Apr	17-Apr	18-Apr	19-Apr	20-Apr
Red-winged Blackbird (*Agelaius phoeniceus*)	x		x	x		
Western scrub jay (*Aphelocoma californica*)		x	x			
Mallard (*Anas platyrhynchos*)			x			
Great egret (*Ardea alba*)				x		
Canada goose (*Branta canadensis*)			x			
Red-shouldered hawk *(Buteo lineatus)*			x	x	x	x
Swainson's Hawk (*Buteo swainsoni)*		x	x	x		
Anna's hummingbird (*Calypte anna*)			x			x
Northern flicker (*Colaptes auratus*)	x					
Common raven (*Corvus corax*)			x			
Brewer's black bird (*Euphagus cyanocephalus*)	x			x	x	x
House finch (*Haemorhous mexicanus*)						x
Black-necked stilt (*Himantopus mexicanus*)			x			
Dark-eyed junco (*Junco hyemalis*)	x	x	x			

Double-crested Cormorant (*Phalacrocorax auritus*)	x	x	x	x	x	x
White-faced Ibis (*Plegadis chihi*)		x	x	x	x	x
Black Phoebe (*Sayornis nigricans*)			x			
European starling (*Sturnus vulgaris*)			x	x		x
Tree swallow (*Tachycineta bicolor*)			x	x	x	
House wren (*Troglodytes aedon*)						x
Mourning dove (*Zenaida macroura*)					x	x

Source: GEI Consultants, Inc. 2017

Photograph 1. Removal of water pipe crossing the levee before construction of the seepage berm.

Photograph 2. Spreading topsoil over fabric, the fabric is intended to prevent mixing between the soil and gravel layers.

Photograph 3. Spreading sand at the base of the seepage berm within the project area to prevent erosion.

Worker Environmental Awareness Program

A Worker Environmental Awareness Program was provided to construction personnel prior to construction activities at Element IVa. Specifically, construction personnel were notified of their responsibilities and provided with information on the life history of the special-status species with potential to occur within the construction footprint and vicinity. Avoidance and minimization measures were discussed and construction personnel were directed to contact the on-site biologist immediately if special-status species were encountered within the construction area.

If you have any questions regarding this Report please don’t hesitate to contact me at (916) 341-9125.

Best Regards,

Kelly Fitzgerald-Holland
GEI Consultants

cc: Cindy Davis–GEI
Andrea Shephard–GEI
Nick Tomera–GEI

12. Letter from USFWS to USACE, providing comments on Conceptual MMP. February 27, 2018.

Holland, Kelly

From: Schoenberg, Steven <steven_schoenberg@fws.gov>
Sent: Tuesday, February 27, 2018 8:33 AM
To: Lee, Kevin C CIV (US)
Cc: J. Stuart - NOAA Federal; Toland, Tanis J CIV CESPK CESPD (US); Shephard, Andrea; Holland, Kelly
Subject: FWS staff review of RD17 Phase 3 Project Conceptual MMP

Kevin/Tanis:

This responds to your request for review of the Conceptual Mitigation Monitoring Plan for RD 17 Phase III.

Background:

2010 - FWS receives technical assistance request from AECOM on behalf of RD17 due to potential effects on RBR (listed rabbit). Assistance from BDFWO and SFWO. Project is fix-in-place approach

2011 - FWS attends site visit; RD 17 revises to include setback in element IVc, considering Mainstone site for other/add'l effects not compensable on site.

Sept 2011 - DEIR, FWS and NOAA comment on general/specific concerns.

2013 - FWS previews/reviews draft COE comment responses (general opinion, many non-responsive to substance).

2014 - WQ certification (mentions VELB, not RBR); AECOM indicates potential seeking of SJMSCP coverage

2015 - COE initiates formal consultation 4/6/15; 30-day letters (insufficiencies) issued by NOAA 7/10/15 (includes additional ino on inundation elevation, frequency, duration, and ponding) and FWS 10/02/15 (includes, comment #3, additional information on management and monitoring - various specifics)

2016 - FEIR - says will retain current vegetation practice (not disturb lower 2/3 and 15' waterside; trim upper 1/3); will seek SWIF. Comment responses similar to those in 2013 preview; also includes conceptual mitigation/monitoring plan

2017 - 3/8/17 - COE reinitiates formal consultation/submits revised BA. Includes various appendices dealing with GGS potential, setback levee analysis, and a conceptual mitigation/monitoring plan (Appendix E)

3/22/17 - COE notifies FWS (SFWO) of emergency construction (letter not seen by BDFWO). SFWO recommends minimization/avoidance measures, and consultation at the conclusion of the project of any effects to listed species. Limited communication with me (BDFWO), of what was done; generally, this was believed to involve landside earth placement to stabilize areas where seepage was observed, and these locations overlapped to some extent the previously proposed work for RD 17 phase III.

1/12/18 - COE (Lee) requests review of the conceptual mitigation/monitoring plan.

Outstanding issues (of conceptual mitigation/monitoring plan, hereafter "CMMP") raised in 10/2/15 30-day letter:

"moderate level of specificity" of measures, responsible parties, funding assurance, protections, planting design, irrigation, measureable objectives, monitoring of such objectives, remedial measures, maintenance such as for non-natives, culling, firebreaks, inspection/patrol of human activities, and monitoring/effects on listed species; state if elderberries are included.

Comments on CMMP:

What is the total area of the site ? (Says it will have 10 acres riparian, p. E16; or is it 11 acres (E15) but expect other cover types also, correct? how much is upland - above moderate flood stage?)

E13-14: argument about value to RBR not being in grassland, however, these grasslands could be used occasionally for dispersal activity

E14: says will mitigate at a conservation bank, but later in plan (E15), says will plant elderberries here. Clarify.

E17: verify there is enough room/space/area to plant 367 elderberries and 367 associates.

General: the 1999 VELB "guidelines" document has been superseded by the FWS' May 2017 VELB "framework", document. Please review for consistency with what you propose.

E28: use of Oxbow Preserve; seems fair on first impression; though not sure about riparian/scrub density there compared to what is proposed here, or compared to ideal/objective for RBR.

E29-33: reasonable description of conceptual measures for starting the mitigation site.

E33: Says resource protection measures are the same as the repair project, but this is a mitigation site...which typically requires more oversight for aspects such as mentioned in the 10/2/15 letter (see also above).

E34-35: mentions that performance standards will be developed; monitoring to be continued until 2 years of independence achieved. No specifics yet. That may be OK for now...although, the site may require some level of perpetual oversight; also note VELB 2017 "framework" revises guidance.

E38: written confirmation of meeting mitigation obligations/responsibilities - seems fair as to establishment period - however - note that long term management/oversight remains a requirement.

E39: includes many of the management aspects as placeholders, as to be developed/submitted to FWS prior to construction; BiOP may require our approval in writing, of this LTMP, however. As placeholder, and at conceptual stage, this section of CMMP seems fair/appropriate.

As to the e-mail remark by Kevin (below) that these comments can be addressed in the later versions of the CMMP rather than in the BA, that too seems to be an acceptable approach.

Conclusion/Way Forward:

Based on my review, the CMMP as written is sufficient to proceed with re-initiation. However, at this time, FWS (at least BDFWO/me) has no information yet on the 2017 emergency work which was done and how it interfaces with the proposed work as described previously in the 2016 FEIR. Additionally, there are other issues raised in FWS' 10/2/15 30-day letter, which I (FWS) have not yet reviewed due and which may not be fully sufficient. Due to the circumstances of this project, namely - the length of time in planning, and the imminent risks as exposed by the need for emergency work, it is my opinion that the Corps should reinitiate consultation at its discretion, and that any further information needs (including insufficient responses to prior needs) identified be addressed wherever possible through prompt coordination between FWS and COE, at their respective staff levels. Hopefully, this will keep the consultation process moving toward a sooner, rather than later, completion.

Please note that these comments/conclusions/recommendations are at my staff-level only, and are subject to change pending internal discussion with FWS management.

If any questions, let me know.

Steve

Steven Schoenberg
Sr. Fish and Wildlife Biologist
650 Capitol Mall #8-300
Sacramento, CA 95814

916-930-5672 (office)

On Fri, Jan 12, 2018 at 1:34 PM, Lee, Kevin C CIV (US) <Kevin.C.Lee@usace.army.mil> wrote:

Jeff and Steve,

As you know, the Corps suspended the transmittal of the updated BA to the Services due to the emergency levee work RD17 was conducting in response to the early 2017 high water event. We are preparing to send an updated biological assessment for the Phase 3 of the RD 17 Levee Seepage Repair Project that will include the 2017 Emergency Response Construction components.

This BA will include, as Appendix E, a Conceptual Mitigation Monitoring Plan for the proposed setback levee area, where up to 8 acres of floodplain would be restored and at least 9.9 acres of riparian brush rabbit habitat restored.

NMFS raised a number of questions and concerns about the design and function of the setback area. We feel that many of their questions/concerns would be addressed through their review of the Conceptual MMP. We request that NMFS and USFWS both review the Conceptual MMP, so that both agencies' comments on the setback area design and function are addressed jointly. We expect that most comments on the Conceptual MMP would be addressed through the Draft and Final versions of the MMP itself, rather than the BA.

Thanks,

Kevin

Kevin Lee
Flood Protection and Navigation Section
US Army Corps of Engineers, Sacramento District
(916) 557-6634 (office)
(916) 599-3257 (blackberry)
Kevin.C.Lee@usace.army.mil

13. Letter from NMFS to USACE, providing comments on Conceptual MMP. March 14, 2018.

Holland, Kelly

From: J. Stuart - NOAA Federal <j.stuart@noaa.gov>
Sent: Wednesday, March 14, 2018 1:47 PM
To: Toland, Tanis J CIV CESPK CESPD (US)
Cc: Schoenberg, Steven; Lee, Kevin C CIV (US); Shephard, Andrea; Holland, Kelly
Subject: Re: [Non-DoD Source] FWS staff review of RD17 Phase 3 Project Conceptual MMP
Attachments: Comments to the RD 17 CMMP for set back Levee Area.docx

Hi Tanis,

Please find attached my comments to the CMMP that Kevin sent to Steven and I.

Cheers,

Jeff

On Tue, Feb 27, 2018 at 8:42 AM, Toland, Tanis J CIV CESPK CESPD (US) <Tanis.J.Toland@usace.army.mil> wrote:

> Thank you, Steve.
>
> **From:** Schoenberg, Steven [mailto:steven_schoenberg@fws.gov]
> **Sent:** Tuesday, February 27, 2018 8:33 AM
> **To:** Lee, Kevin C CIV (US) <Kevin.C.Lee@usace.army.mil>
> **Cc:** J. Stuart - NOAA Federal <j.stuart@noaa.gov>; Toland, Tanis J CIV CESPK CESPD (US) <Tanis.J.Toland@usace.army.mil>; Shephard, Andrea <ashephard@geiconsultants.com>; Holland, Kelly <kholland@geiconsultants.com>
> **Subject:** [Non-DoD Source] FWS staff review of RD17 Phase 3 Project Conceptual MMP
>
> Kevin/Tanis:
>
> This responds to your request for review of the Conceptual Mitigation Monitoring Plan for RD 17 Phase III.
>
> Background:

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Outstanding issues (of conceptual mitigation/monitoring plan, hereafter "CMMP") raised in 10/2/15 30-day letter:

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Comments on CMMP:

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E14: says will mitigate at a conservation bank, but later in plan (E15), says will plant elderberries here. Clarify.

E17: verify there is enough room/space/area to plant 367 elderberries and 367 associates.

General: the 1999 VELB "guidelines" document has been superseded by the FWS' May 2017 VELB "framework", document. Please review for consistency with what you propose.

E28: use of Oxbow Preserve; seems fair on first impression; though not sure about riparian/scrub density there compared to what is proposed here, or compared to ideal/objective for RBR.

E29-33: reasonable description of conceptual measures for starting the mitigation site.

E33: Says resource protection measures are the same as the repair project, but this is a mitigation site...which typically requires more oversight for aspects such as mentioned in the 10/2/15 letter (see also above).

E34-35: mentions that performance standards will be developed; monitoring to be continued until 2 years of independence achieved. No specifics yet. That may be OK for now...although, the site may require some level of perpetual oversight; also note VELB 2017 "framework" revises guidance.

E38: written confirmation of meeting mitigation obligations/responsibilities - seems fair as to establishment period - however - note that long term management/oversight remains a requirement.

E39: includes many of the management aspects as placeholders, as to be developed/submitted to FWS prior to construction; BiOP may require our approval in writing, of this LTMP, however. As placeholder, and at conceptual stage, this section of CMMP seems fair/appropriate.

As to the e-mail remark by Kevin (below) that these comments can be addressed in the later versions of the CMMP rather than in the BA, that too seems to be an acceptable approach.

Conclusion/Way Forward:

Based on my review, the CMMP as written is sufficient to proceed with re-initiation. However, at this time, FWS (at least BDFWO/me) has no information yet on the 2017 emergency work which was done and how it interfaces with the proposed work as described previously in the 2016 FEIR. Additionally, there are other issues raised in FWS' 10/2/15 30-day letter, which I (FWS) have not yet reviewed due and which may not be fully sufficient. Due to the circumstances of this project, namely - the length of time in planning, and the imminent risks as exposed by the need for emergency work, it is my opinion that the Corps should reinitiate consultation at its discretion, and that any further information needs (including insufficient responses to prior needs) identified be addressed wherever possible through prompt coordination between FWS and COE, at their respective staff levels. Hopefully, this will keep the consultation process moving toward a sooner, rather than later, completion.

Please note that these comments/conclusions/recommendations are at my staff-level only, and are subject to change pending internal discussion with FWS management.

If any questions, let me know.

Steve

14. Letter to USFWS, responding to comments on Conceptual MMP. April 30, 2018.

April 30, 2018

RESPONSE TO U.S. FISH AND WILDLIFE SERVICE'S FEBRUARY 27, 2018, COMMENTS ON THE CONCEPTUAL MITIATION AND MONITORING PLAN FOR THE RD 17 PHASE 3 LEVEE SEEPAGE AREA PROJECT

This is in response to February 27, 2018, electronic mail from U.S. Fish and Wildlife Service (USFWS) to the U.S. Army Corps of Engineers, providing comments on the *Conceptual Mitigation and Monitoring Plan for Riparian Brush Rabbit [for the] Phase 3 – RD 17 Levee Seepage Repair Project,* which is included at Appendix E to the proposed project's Biological Assessment. To respond to the USFWS comments, we have transcribed their comments and our responses into the matrix below.

#	Agency	Document / Page	Agency Comment	Response
1	USFWS	Conceptual Mitigation Monitoring Plan (CMMP) p. E15/E16	What is the total area of the site? (Says it will have 10 acres riparian, p. E16; or is it 11 acres (E15) but expect other cover types also, correct? how much is upland - above moderate flood stage?)	Total acreage is 11.2 acres; this includes 1.2 acres of contingency. Habitat types are: 5.0 acres Great Valley Oak Woodland; 6.1 acres of Great Valley Riparian Scrub; 0.2-acre roadway at the top of the levee prism.
2	USFWS	CMMP p. E13-14	Argument about value to RBR not being in grassland, however, these grasslands could be used occasionally for dispersal activity	Comment noted. Modified sentence as follows: "Although riparian brush rabbit may use annual grassland as foraging or dispersal habitat…."
3	USFWS	CMMP p. E14	Says will mitigate at a conservation bank, but later in plan (E15), says will plant elderberries here. Clarify.	Elderberries will be planted within the Great Valley Oak Woodland.
4	USFWS	CMMP p. E17	Verify there is enough room/space/area to plant 367 elderberries and 367 associates.	Average density of plantings would be approximately 250-330 plants per acre. There is adequate area for these plantings.
5	USFWS	General	The 1999 VELB "guidelines" document has been superseded by the FWS' May 2017 VELB "framework", document. Please review for consistency with what you propose.	Final MMP will update the document to reflect the 2017 framework.

#	Agency	Document / Page	Agency Comment	Response
6	USFWS	CMMP p. E28	Use of Oxbow Preserve; seems fair on first impression; though not sure about riparian/scrub density there compared to what is proposed here, or compared to ideal/objective for RBR.	The Final MMP will clarify the density objectives. A more complete evaluation of Oxbow Preserve as a reference site will be provided.
7	USFWS	CMMP p. E29-33	Reasonable description of conceptual measures for starting the mitigation site.	Comment noted.
8	USFWS	CMMP p. E33	Says resource protection measures are the same as the repair project, but this is a mitigation site...which typically requires more oversight for aspects such as mentioned in the 10/2/15 letter (see also above).	The MMP will be followed up with the development of a long-term management plan, which will be prepared in coordination with USFWS. This plan will describe site oversight requirements, including routine inspections and site maintenance (which is expected to focus on site protection to prevent trespass and vandalism).
9	USFWS	CMMP p. E34-35	Mentions that performance standards will be developed; monitoring to be continued until 2 years of independence achieved. No specifics yet. That may be OK for now...although, the site may require some level of perpetual oversight; also note VELB 2017 "framework" revises guidance.	Comment noted. This will be addressed in the Final MMP.
10	USFWS	CMMP p. E38	Written confirmation of meeting mitigation obligations/responsibilities - seems fair as to establishment period - however - note that long term management/oversight remains a requirement.	See response to comment 9.

#	Agency	Document / Page	Agency Comment	Response
11	USFWS	CMMP p. E39	Includes many of the management aspects as placeholders, as to be developed/submitted to FWS prior to construction; BiOP may require our approval in writing, of this LTMP, however. As placeholder, and at conceptual stage, this section of CMMP seems fair/appropriate.	Comment noted.
12	USFWS	General	Based on my review, the CMMP as written is sufficient to proceed with re-initiation. However, at this time, FWS (at least BDFWO/me) has no information yet on the 2017 emergency work which was done and how it interfaces with the proposed work as described previously in the 2016 FEIR. Additionally, there are other issues raised in FWS' 10/2/15 30-day letter, which I (FWS) have not yet reviewed due and which may not be fully sufficient. Due to the circumstances of this project, namely - the length of time in planning, and the imminent risks as exposed by the need for emergency work, it is my opinion that the Corps should reinitiate consultation at its discretion, and that any further information needs (including insufficient responses to prior needs) identified be addressed wherever possible through prompt coordination between FWS and COE, at their respective staff levels. Hopefully, this will keep the consultation process moving toward a sooner, rather than later, completion.	Comment noted. The BA has been updated to address the 2017 emergency work. Other items outlined in the USFWS' 10/2/2015 letter have been addressed through the revised BA and/or CMMP.

15. Letter to NMFS, responding to comments on Conceptual MMP. April 30, 2018.

April 30, 2018

RESPONSE TO NATIONAL MARINE FISHERIES SERVICE'S MARCH 14, 2018, COMMENTS ON THE CONCEPTUAL MITIATION AND MONITORING PLAN FOR THE RD 17 PHASE 3 LEVEE SEEPAGE AREA PROJECT

This is in response to March 14, 2018, electronic mail from National Marine Fisheries Service (NMFS) to the U.S. Army Corps of Engineers, providing comments on the *Conceptual Mitigation and Monitoring Plan for Riparian Brush Rabbit [for the] Phase 3 – RD 17 Levee Seepage Repair Project,* which is included at Appendix E to the proposed project's Biological Assessment. To respond to the NMFS comments, we have transcribed their comments and our responses into the matrix below.

#	Agency	Document / Page	Agency Comment	Response
1	NMFS	Conceptual Mitigation Monitoring Plan (CMMP) p. E15	The design for the levee setback area is obviously focused on the needs of Riparian Brush Rabbit (RBR) and Valley Elderberry Longhorn Beetle (VELB). Out of 11.3 acres in the setback area, only 0.4 acres would be considered as inundated on a regular basis by design (fish swale). This minimizes potential benefits to native fish species (including salmonids) that a larger area of functional floodplain would provide.	The levee setback area is focused on RBR and VELB habitat. The fish swale has been removed from design to eliminate long term O&M concerns associated with sedimentation, access routes and fish stranding. The designed floodplain elevations will still provide important benefits to native fish species during high flow events. Primary benefits to native fish species would include velocity refugia, predator avoidance, and food web interactions.
2	NMFS	CMMP p. E16	The inundation of the fish swale is designed to occur approximately every 3-4 years and the lower floodplain every 6 years. This is less than a naturally functioning stream channel and associated floodplain. A typical natural floodplain would have an inundation cycle of every 2-3 years (the periodicity of bank full flow levels of a natural stream) where the stream overtops its banks and inundates portions of the surrounding floodplain.	The fish swale has been removed from design. The remaining area has been designed to function as a secondary floodplain to support riparian growth and enhance habitat for RBR and VELB. Inundation of this area on a 2-3year periodicity renders it ineffective as RBR and/or VELB habitat.

#	Agency	Document / Page	Agency Comment	Response
3	NMFS	CMMP p. E16	Use of native vegetation should provide benefits to native fishes during flood events.	The Final MMP will include description of this benefit.
4	NMFS	CMMP p. E17	The CMMP may need to develop a long term maintenance plan to ensure that stranding pools don't develop on the floodplain or within the swale, and that the swale drains correctly back to the river, or that future sedimentation does not raise the elevation of the floodplain to the point where it no longer meets the design inundation frequency.	The swale has been removed from the design. The area will be evenly graded to ensure drainage. The area will be inspected during the vegetation monitoring period to ensure proper drainage following inundation events.
5	NMFS	CMMP p. E20	Is there any potential to set the bench invert elevation to a height that will allow inundation to occur every 2-3 years (~normal bank full elevation)? This would get to a more functional floodplain system that would benefit native fish species.	No, the invert elevation cannot be lowered. Agree that a 2- to 3-year inundation periodicity would provide maximum to native fishes. However, the project is designed to provide habitat for VELB and RBR in a secondary floodplain/riparian habitat.
6	NMFS	CMMP p. E21	For NMFS' purposes, the percentage of days between December 1 and May 31 (i.e. the "wet" season) would be more helpful than days per year. The wet season is when the downstream migration of San Joaquin River salmonids is expected to occur. It also is when native fish species would be expected to use inundated floodplains for spawning.	At the design elevations the project area will only inundate during the "wet" season. It is unlikely that inundation events will provide the duration necessary for spawning and subsequent incubation periods for native species. Inundation events may provide benefit to emigrating and rearing salmonids. Benefits associated with emigrating salmonids is not reliant upon duration however, it is noted that longer duration periods would provide further benefit.

#	Agency	Document / Page	Agency Comment	Response
7	NMFS	CMMP p. E28	Is the Oxbow Preserve at the same elevation as the proposed set back levee area and thus would have the same inundation frequency? How do the proposed vegetation palettes for the setback levee area and the existing vegetation communities at the Oxbow Preserve compare? In order to be used as a baseline comparison, the reference site and the "experimental site" should have very similar physical and environmental characteristics so that a legitimate comparison can be made between the two sites. If the environmental and physical characteristics are too divergent, than direct comparisons become complicated and you are not sure what is driving any differences in the observed/ desired outcome.	A more complete evaluation of Oxbow Preserve as a reference site will be provided in the Final MMP.
8	NMFS	CMMP p. E29	Are there going to be any additional designs to benefit fish other than the fish swale? As stated earlier, it appears that this project is very focused on benefitting RBR and VELB and not as a holistic project that could benefit multiple species that use floodplains.	The fish swale has been removed from design and no further designs are anticipated to benefit native fish species.
9	NMFS	CMMP p. E30	If additional design elements to benefit native fish species are incorporated, earth moving equipment could be used "in the dry" before the levee is breached to achieve floodplain elevations and contours that have more inundation frequency, yet also allowing for escape corridors to high water refugia areas.	No additional design elements to benefit native fish species are anticipated.

#	Agency	Document / Page	Agency Comment	Response
10	NMFS	CMMP p. E34	Maintenance and Management of the site makes no mention of how the floodplain will be maintained at the design elevation in light of potential sediment accumulation during flood events. Will the design elevations be maintained or will the fish swale and floodplain be allowed to silt in?	The swale has been removed from the design. The area will be evenly graded to ensure drainage. The area will be inspected during the vegetation monitoring/establishment period to ensure proper drainage following inundation events.
11	NMFS	CMMP p. E36	Will any performance standards be developed for the functional performance of the floodplain during inundation (i.e., frequency of inundation, water depth, duration of water on the floodplain/ rate of water recession from the floodplain for the germination of riparian vegetation such as cottonwoods, etc.)?	Yes, the Final MMP will include additional information in sections “Performance Standards, Monitoring, and Reporting” and “Long-term Management Plan”.
12	NMFS	CMMP p. E38-39	Long term management plans should include how sedimentation issue will be addressed. Will the plan maintain a design inundation frequency by maintaining design elevations of the levee breach, fish swale, and lower floodplain?	The swale has been removed from the design. The area will be evenly graded to ensure drainage. The area will be inspected during the vegetation monitoring/establishment period to ensure proper drainage following inundation events.

Steven Schoenberg

Sr. Fish and Wildlife Biologist

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On Fri, Jan 12, 2018 at 1:34 PM, Lee, Kevin C CIV (US) <Kevin.C.Lee@usace.army.mil> wrote:

Jeff and Steve,

As you know, the Corps suspended the transmittal of the updated BA to the Services due to the emergency levee work RD17 was conducting in response to the early 2017 high water event. We are preparing to send an updated biological assessment for the Phase 3 of the RD 17 Levee Seepage Repair Project that will include the 2017 Emergency Response Construction components.

This BA will include, as Appendix E, a Conceptual Mitigation Monitoring Plan for the proposed setback levee area, where up to 8 acres of floodplain would be restored and at least 9.9 acres of riparian brush rabbit habitat restored.

NMFS raised a number of questions and concerns about the design and function of the setback area. We feel that many of their questions/concerns would be addressed through their review of the Conceptual MMP. We request that NMFS and USFWS both review the Conceptual MMP, so that both agencies' comments on the setback area design and function are addressed jointly. We expect that most comments on the Conceptual MMP would be addressed through the Draft and Final versions of the MMP itself, rather than the BA.

Thanks,
Kevin

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Comments to the RD-17 Conceptual Mitigation and Monitoring Plan (CMMP) for the Levee Setback Area

From: Jeff Stuart, Staff Fishery Biologist, NMFS Central Valley Area Office,

Page-#:

E-15: The design for the levee setback area is obviously focused on the needs of Riparian Brush Rabbit (RBR) and Valley Elderberry Longhorn Beetle (VELB). Out of 11.3 acres in the setback area, only 0.4 acres would be considered as inundated on a regular basis by design (fish swale). This minimizes potential benefits to native fish species (including salmonids) that a larger area of functional floodplain would provide.

E-16: The inundation of the fish swale is designed to occur approximately every 3-4 years and the lower floodplain every 6 years. This is less than a naturally functioning stream channel and associated floodplain. A typical natural floodplain would have an inundation cycle of every 2-3 years (the periodicity of bank full flow levels of a natural stream) where the stream overtops its banks and inundates portions of the surrounding floodplain.

E-16: Use of native vegetation should provide benefits to native fishes during flood events.

E-17: The CMMP may need to develop a long term maintenance plan to ensure that stranding pools don't develop on the floodplain or within the swale, and that the swale drains correctly back to the river, or that future sedimentation does not raise the elevation of the floodplain to the point where it no longer meets the design inundation frequency.

E-20: Is there any potential to set the bench invert elevation to a height that will allow inundation to occur every 2-3 years (~normal bank full elevation)? This would get to a more functional floodplain system that would benefit native fish species.

E-21: For NMFS' purposes, the percentage of days between December 1 and May 31 (i.e. the "wet" season) would be more helpful than days per year. The wet season is when the downstream migration of San Joaquin River salmonids is expected to occur. It also is when native fish species would be expected to use inundated floodplains for spawning.

E-28: Is the Oxbow Preserve at the same elevation as the proposed set back levee area and thus would have the same inundation frequency? How do the proposed vegetation palettes for the setback levee area and the existing vegetation communities at the Oxbow Preserve compare? In order to be used as a baseline comparison, the reference site and the "experimental site" should have very similar physical and environmental characteristics so that a legitimate comparison can be made between the two sites. If the environmental and physical characteristics are too divergent, than direct comparisons become complicated and you are not sure what is driving any differences in the observed/ desired outcome.

E-29: Are there going to be any additional designs to benefit fish other than the fish swale? As stated earlier, it appears that this project is very focused on benefitting RBR and VELB and not as a holistic project that could benefit multiple species that use floodplains.

E-30: If additional design elements to benefit native fish species are incorporated, earth moving equipment could be used "in the dry" before the levee is breached to achieve floodplain elevations and contours that have more inundation frequency, yet also allowing for escape corridors to high water refugia areas.

E-34: Maintenance and Management of the site makes no mention of how the floodplain will be maintained at the design elevation in light of potential sediment accumulation during flood events. Will the design elevations be maintained or will the fish swale and floodplain be allowed to silt in?

E-36: Will any performance standards be developed for the functional performance of the floodplain during inundation (i.e., frequency of inundation, water depth, duration of water on the floodplain/ rate of water recession from the floodplain for the germination of riparian vegetation such as cottonwoods, etc.)?

E-38-39: Long term management plans should include how sedimentation issue will be addressed. Will the plan maintain a design inundation frequency by maintaining design elevations of the levee breach, fish swale, and lower floodplain?

16. May 2018 Biological Assessment (Final).

Final Biological Assessment

Phase 3–RD 17 Levee Seepage Repair Project, Including 2017 Emergency Response Construction

Prepared for:

Reclamation District (RD) No. 17

For submittal to:

U.S. Army Corps of Engineers

US Army Corps of Engineers ®
Sacramento District

Prepared by:

GEI Consultants

in association with

AECOM

As modified by USACE

May 2018

Final Biological Assessment

Phase 3–RD 17 Levee Seepage Repair Project, Including 2017 Emergency Response Construction

Prepared for:

Reclamation District (RD) No. 17
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in association with

AECOM

As Modified by USACE

May 2018

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Appendix A – Exhibits

Appendix B – Species Lists

ACRONYMS AND OTHER ABBREVIATIONS

BA	Biological Assessment
Bay-Delta	San Francisco Bay/Sacramento–San Joaquin Delta
BMP	Best Management Practice
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CVFPB	Central Valley Flood Protection Board
CVP	Central Valley Project
DEIS/DEIR	Draft Environmental Impact Statement/Draft Environmental Impact Report
Delta	Sacramento–San Joaquin Delta
DPS	distinct population segment
DWR	California Department of Water Resources
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	evolutionary significant unit
ETL	Engineering Technical Letter
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FR	Federal Register
HTL	high tide line
LSRP	Levee Seepage Repair Project
MAF	million acre-feet
MMP	Mitigation and Monitoring Plan for the Riparian Brush Rabbit
NEP	10(j) nonessential experimental population
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
PAL	provisional accredited levee
Phase 3 Repair Project	Phase 3 of the Reclamation District No. 17 Levee Seepage Repair Project
PL	Public Law
RD 17	Reclamation District No. 17
RWQCB	Regional Water Quality Control Board
Section 404	Section 404 of the Clean Water Act (33 USC 1344)
Section 408	Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408)
Settlement	Stipulation of Settlement in *NRDC et al. v. Kirk Rodgers et al*.
SJMSCP	San Joaquin Multi-Species Habitat Conservation and Open Space Plan
SJRRP	San Joaquin River Restoration Program
SRA	shaded riverine aquatic
SWP	State Water Project
SWPPP	storm water pollution prevention plan
SWRCB	State Water Resources Control Board

TMDL	total maximum daily load
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
VELB	valley elderberry longhorn beetle
VELB Framework	Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle

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INTRODUCTION

The purpose of this Biological Assessment (BA) is to review Phase 3 of the Reclamation District No. 17 (RD 17) Levee Seepage Repair Project (LSRP) (Phase 3 Repair Project), including the components of the 2017 Emergency Response Construction Project (collectively "the proposed action"), in sufficient detail to determine the extent to which the proposed action may affect any of the federally listed species described below under "Species Considered." (See "Project Background and History" below for a brief summary of Phase 1 and Phase 2.)

RD 17, which is located in south-central San Joaquin County, California (**Exhibit 1**; see **Appendix A** for all exhibits), is responsible for maintaining 19 miles of levees along Walthall Slough, the San Joaquin River, and French Camp Slough, as well as the dryland levee along the southern boundary of Manteca. For discussion purposes, the RD 17 levees have been divided into 11 distinct "reaches," identified by Roman numerals (i.e., I, II, III…, XI), and subdivided further into 28 "elements," identified by the reach number followed by a lowercase letter and, where needed to further distinguish elements, an Arabic numeral (e.g., Ia, IIa, IIb, …, Va, VIa.1, VIa.2, VIa.4, …, VIe, VIIa, VIIb, …, VIIg…,XIa) (**Exhibit 2**).

This BA does not address the dryland levee (Reaches VIII – XI) because it is not a USACE flood risk management project, and therefore is not subject to Section 408 authorization. The dryland levee is an overland earthen berm, north and east of the San Joaquin River. Under almost all conditions, water does not come in contact with the dryland levee. It only functions as a flood risk management feature if water from the San Joaquin River or Walthall Slough leaves the banks of these waterways and inundates lands north and east, toward Manteca. The dryland levee then acts as an elevated earthen feature that prevents these flood waters from moving farther north. Suitable habitat for federally listed species does not occur along the dryland levee.

This BA has been prepared in accordance with requirements set forth under Section 7 of the federal Endangered Species Act (ESA) (16 United States Code [USC] 1536[c]). It supports formal consultation with the U.S. Fish and Wildlife Service (USFWS) and informal consultation with the National Marine Fisheries Service (NMFS) on the effects of the Phase 3 Repair Project on federally listed species and designated critical habitat. This BA also supports consultation with NMFS for project effects on Pacific Coast Salmon (*Oncorhynchus* spp.) essential fish habitat (EFH), as required by the Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 USC 1801). (See the "Essential Fish Habitat Assessment" section below.)

Section 7(a)(2) of the ESA directs federal agencies to ensure that their activities are not likely to jeopardize the continued existence of any listed species, or to result in the destruction or adverse modification of critical habitat. This section of the ESA also requires agencies with regulatory authority over listed species to issue biological opinions evaluating the direct and indirect effects of federal actions, and actions that are interrelated or interdependent with the federal action. The biological opinions must determine whether the actions being evaluated may appreciably reduce the listed species' likelihood of surviving or recovering in the wild by reducing their productivity, numbers, or distribution.

To implement the Phase 3 Repair Project, RD 17 is requesting permission from the U.S. Army Corps of Engineers (USACE) for:

- alteration of federal project levees, pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408, referred to in this BA as "Section 408"); and
- placement of fill in jurisdictional waters of the United States, pursuant to Section 404 of the Clean Water Act (33 USC 1344, referred to in this BA as "Section 404").

All Phase 3 Repair Project work occurring on the water side of the levee would be above the high tide line (HTL). Therefore, no additional authorizations under Section 10 of the Rivers and Harbors Act of 1899 are required.

On April 6, 2017, the USACE authorized (SPK-2009-001466) the discharge of fill into waters of the United States at elements Ib, Ie, and IVa, under Regional General Permit No. 8 (Emergency Actions). The 2017 Emergency Response Construction Project was implemented in elements Ia, Ib, Ie, IIIb, IVa, Va, VIa.1, VIcde, and VIIb in February 2017. The majority of the 2017 Emergency Response Construction Project actions were already planned under the Phase 3 Repair Project; however, one component (i.e., a seepage berm) within elements Va and VIa.1 was not part of the actions planned specifically within these elements.

These 2017 Emergency Response Construction Project and the Phase 3 Repair Project activities are described in more detail under "Description of the Proposed Action." This BA analyzes direct, indirect, interrelated/ interdependent, and cumulative effects of the proposed action on federally listed species.

SPECIES CONSIDERED

This document considers species that have been termed "threatened" or "endangered" under the jurisdiction of USFWS and NMFS. On February 27, 2014, biologists consulted the online database maintained by USFWS's Sacramento Office to conduct a query of the Lathrop (462D) and West Sacramento (462A) 7.5-minute quadrangles (USFWS 2014) (**Appendix B**). Another query of the USFWS database was conducted on April 18, 2016 (USFWS 2016) (**Appendix B**), and the information in this BA was updated, based on those results. Using the California Department of Fish and Wildlife's (CDFW's) California Natural Diversity Database (CNDDB) (CDFW 2014) and the California Native Plant Society's database of rare and endangered plant species (CNPS 2014), biologists also conducted a query of the topographic quadrangles in which the action area occurs (Lathrop and Stockton West) and the surrounding quadrangles; these database queries were conducted on February 27, 2014, and March 3, 2014, respectively (**Appendix B**). This query identified all listed species in the area surrounding the action area, which is defined here in accordance with ESA guidelines as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 Code of Federal Regulations [CFR] 402.02).

Based on these database queries and the biologists' familiarity with local flora and fauna, 21 plant and wildlife species that are federally listed as endangered or threatened, or are federally proposed for listing were considered as part of this BA (**Table 1**).

The following federally proposed and federally listed species are known to occur or have the potential to occur in the Phase 3 Repair Project area (USFWS 2014, 2016):

- valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*),
- riparian brush rabbit (*Sylvilagus bachmani riparius*),
- delta smelt (*Hypomesus transpacificus*),
- Central Valley steelhead distinct population segment (DPS) (*Oncorhynchus mykiss*),
- longfin smelt (*Spirinchus thaleichthys*),
- Sacramento River winter-run Chinook salmon evolutionarily significant unit (ESU) (*O. tshawytscha*),
- Central Valley spring-run Chinook salmon ESU (*O. tshawytscha*),
- Reintroduced Central Valley spring-run Chinook salmon 10 (j) nonessential experimental population (*O. tshawytscha*), and
- the Southern DPS of North American green sturgeon (*Acipenser medirostris*).

The other federally listed species shown in **Table 1** were eliminated from further consideration; they are not likely to occur in the Phase 3 Repair Project area because of a lack of suitable habitat, local range restrictions, regional extirpations, or lack of connectivity between areas of suitable or occupied habitat, or because the action area is located outside the extant range of the species (see "Action Area" section below). The USFWS and NMFS-regulated species with the potential to occur on-site are discussed in more detail in this BA.

Table 1
Fish and Wildlife Species, Federally Listed or Proposed for Listing, Considered in Evaluation of the Phase 3 Repair Project

Species	Status	Habitat	Potential to Occur in the Lower San Joaquin River[1]
Plants			
Large-flowered fiddleneck *Amsinckia grandiflora*	Endangered[2] SJMSCP-covered[4]	Annual herb with bright orange, trumpet-shaped flowers that bloom in late spring. Historically found on north-facing slopes in the upper elevations of grasslands near the blue oak belt in Contra Costa, Alameda, and San Joaquin counties.	No potential to occur. No suitable habitat is present in the action area.[3]
Palmate-bracted bird's-beak *Cordylanthus palmatus*	Endangered[2]	Annual herb that blooms from late spring through summer. Grows on seasonally flooded, saline-alkali soils in lowland plains and basins at elevations of less than 500 feet. Known from scattered locations in Sacramento and San Joaquin valleys; however, unlikely to occur in San Joaquin County because of lack of alkali habitat.	No potential to occur. No suitable habitat is present in the action area.[3]
Invertebrates			
Conservancy fairy shrimp *Branchinecta conservatio*	Endangered SJMSCP-covered[4]	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present in the action area.[3]
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	Threatened SJMSCP-covered[4]	Inhabits elderberry shrubs, primarily in riparian woodland and scrub habitat.	Could occur; elderberry shrubs present occasionally along the San Joaquin River on the waterside and landside of the Phase 3 Repair Project levee; however, no evidence of beetle exit holes was observed in these shrubs.
Vernal pool fairy shrimp *Branchinecta lynchii*	Threatened SJMSCP-covered[4]	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present in the action area.[3]
Vernal pool tadpole shrimp *Lepidurus packardi*	Endangered SJMSCP-covered[4]	Inhabits vernal pools and swales.	No potential to occur. No suitable habitat is present in the action area.[3]
Fish			
Central Valley steelhead *Oncorhynchus mykiss*	Threatened	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.	Likely to occur. Occurs in the Sacramento and San Joaquin rivers, tributaries, and the Delta. Occurs seasonally in the San Joaquin River in the action area[3]; no spawning habitat is in the action area. Designated critical habitat is in the action area.
Central Valley fall/ late fall–run Chinook salmon *Oncorhynchus tshawytscha*	Species of Concern[2]	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.	Likely to occur. Occurs in the Sacramento and San Joaquin rivers, tributaries, and the Delta. Occurs seasonally in the San Joaquin River in the action area[3]; no spawning habitat is in the action area. Essential fish habitat for this species is in the Phase 3 Repair Project area.

Table 1 Fish and Wildlife Species, Federally Listed or Proposed for Listing, Considered in Evaluation of the Phase 3 Repair Project			
Species	**Status**	**Habitat**	**Potential to Occur in the Lower San Joaquin River[1]**
Delta smelt *Hypomesus transpacificus*	Threatened[2] SJMSCP-covered[4, 5]	Spawns in tidally influenced freshwater wetlands and seasonally submerged uplands; rears seasonally in inundated floodplains, tidal marsh, and the Delta.	Could occur. Occurs in tidally influenced segments of the Sacramento and San Joaquin rivers, tributaries, and Delta. Although no spawning habitat is in the action area, delta smelt has potential to occur in the San Joaquin River in the action area.[3] Designated critical habitat is in the action area.
Longfin smelt *Spirinchus thaleichthys*	Candidate/ Proposed Threatened[2] SJMSCP-covered[4, 5]	Pelagic estuarine. Ranges from the Delta in California northward to the Cook Inlet in Alaska.	Could occur. Occurs in tidally influenced segments of the Sacramento and San Joaquin rivers, tributaries, and the Delta. Although no spawning habitat is in the action area, longfin smelt has potential to occur in the San Joaquin River in the action area.[3]
Sacramento River winter-run Chinook salmon *Oncorhynchus tshawytscha*	Endangered[2]	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.[5]	Could occur, but unlikely. Occurs in the Sacramento River, tributaries, and the Delta. No spawning habitat is in the action area. Unlikely to occur in the San Joaquin River in the action area[3]; however, occasional adult and/or juvenile strays may be present.
Central Valley spring-run Chinook salmon *Oncorhynchus tshawytscha*	Threatened[2]	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.	Could occur, but unlikely. Occurs in the Sacramento River, tributaries, and the Delta. Currently unlikely to occur in the San Joaquin River in the action area[3]; no spawning habitat is in the action area. However, occasional adult and/or juvenile strays may be present.
Central Valley spring-run Chinook salmon *Oncorhynchus tshawytscha*	10 (j) nonessential experimental population	Requires cold freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and the Delta.	Could occur. Reintroduction of spring-run Chinook salmon is currently under way as part of the SJRPP[6] with the population designated as a 10(j) nonessential experimental population (NEP) by NMFS. A "nonessential" designation for a 10(j) experimental population means that, on the basis of the best available information, the experimental population is not essential for the continued existence of the species, and regulatory restrictions are considerably reduced under a NEP designation. When an NEP is located outside a National Wildlife Refuge or National Park (as the action area is), the population is treated as proposed for listing; is not protected by the ESA; and take is not prohibited.
Green sturgeon *Acipenser medirostris*	Threatened SJMSCP-covered[4, 5]	Requires seasonally inundated floodplains, rivers, tributaries, and the Delta.[5]	Could occur. Occurs in the Sacramento and San Joaquin rivers, tributaries, and the Delta. Has potential to occur in the San Joaquin River in the action area.[3] Designated critical habitat is in the action area.

Table 1
Fish and Wildlife Species, Federally Listed or Proposed for Listing, Considered in Evaluation of the Phase 3 Repair Project

Species	Status	Habitat	Potential to Occur in the Lower San Joaquin River[1]
Amphibians and Reptiles			
California red-legged frog *Rana draytonii (=R. aurora draytonii)*	Threatened SJMSCP-covered[4]	Prefers semi-permanent and permanent stream pools, ponds, and creeks with emergent riparian vegetation and typically without predatory fish. Requires adequate hibernacula, such as small-mammal burrows and moist leaf litter.	No potential to occur. Potential aquatic habitat in the Phase 3 Repair Project area is limited to one constructed pond, likely with predatory fish, but the action area is outside the species' extant range.
California tiger salamander *Ambystoma californiense*	Threatened[2] SJMSCP-covered[4]	In winter, breeds in vernal pools and stock ponds that are fish-free and inundated for a minimum of 12 weeks. In summer, aestivates in rodent borrows in grassland habitat.	Unlikely to occur. Potential aquatic habitat in the Phase 3 Repair Project area is limited to one constructed pond, likely with predatory fish; a small area of freshwater marsh in element Ib[7]; and agricultural ditches. Much of the action area consists of urban and agricultural land that is not suitable as potential upland habitat. A 1996 CNDDB record documents California tiger salamander adjacent to State Route 120 in roadside seasonal wetland; however, it is approximately 2 miles east of the San Joaquin River and geographically isolated.
Giant garter snake *Thamnophis gigas*	Threatened[2] SJMSCP-covered[4]	Streams, sloughs, ponds, and irrigation/drainage ditches; also requires upland refugia not subject to flooding during the snake's inactive season.	Unlikely to occur. Although potential habitat for this species is present in the Phase 3 Repair Project area, none of it is suitable. The only documented occurrences of giant garter snake are separated from the Phase 3 Repair Project area by extensive urbanized development (City of Stockton) and large rivers that do not provide suitable habitat and are a greater distance than the species is known to disperse. For additional information that summarizes the rationale that supports the "unlikely to occur" determination for this species in the Phase 3 Repair Project area, refer to **Appendix C** in this document.
Birds			
Least Bell's vireo *Vireo bellii pusillus*	Endangered[2]	Nests in riparian habitat adjacent to riverine and freshwater marsh.	Unlikely to occur. Although suitable habitat is present, the last recorded observation of this species in the action area was in 1878, with no extant occurrences.
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	Threatened SJMSCP-covered[4]	Insect-feeder that forages in dense riparian oak forest canopy along major rivers. Species is considered extirpated from San Joaquin County.	No potential to occur. Although potential dispersal and foraging habitat is in the Phase 3 Repair Project area, the action area is outside the species' extant range.
Mammals			
San Joaquin kit fox *Vulpes macrotis mutica*	Endangered SJMSCP-covered[4]	Annual grassland or grassy open stages with scattered shrubby vegetation; needs loose-textured	No potential to occur. Although potential dispersal and foraging habitat is in the Phase 3 Repair Project area, the action area is outside the species' extant range.

Table 1 Fish and Wildlife Species, Federally Listed or Proposed for Listing, Considered in Evaluation of the Phase 3 Repair Project			
Species	**Status**	**Habitat**	**Potential to Occur in the Lower San Joaquin River[1]**
		sandy soils for burrowing, and suitable prey base.	
Riparian brush rabbit *Sylvilagus bachmani riparius*	Endangered[2] SJMSCP-covered[4, 5]	Inhabits riparian oak forest with dense understory of wild roses, grapes, and blackberries; small home ranges, seldom moving more than a few feet from cover, avoiding large openings in shrub cover and frequenting small clearings.	Known to occur. Occupied riparian habitat is present on the waterside of elements IIIa and IIIb, and suitable habitat is present immediately adjacent to the project area in several elements; the species also is known to occur on an oxbow between elements VIa.1 and VIa.4[7] and in waterside habitat between elements IIab and IIIa.
Riparian (=San Joaquin Valley) woodrat *Neotoma fuscipes riparia*	Endangered SJMSCP-covered[4]	Requires healthy riparian forests, where it nests in cavities in trees, snags, or logs, spaces in talus, or lodges built of downed woody materials. Known to exist in and immediately adjacent to Caswell Memorial State Park, along the Stanislaus River in San Joaquin County.	No potential to occur. The action area is outside the species' extant range.

Notes: CNDDB = California Natural Diversity Database; Delta = Sacramento–San Joaquin Delta; ESA = Endangered Species Act; NEP = 10(j) nonessential experimental population; NMFS = National Marine Fisheries Service; Phase 3 Repair Project = Phase 3 of the proposed Reclamation District No. 17 Levee Seepage Repair Project; SJMSCP = San Joaquin Multi-Species Habitat Conservation and Open Space Plan; SJRRP = San Joaquin River Restoration Program

1 **Potential for Occurrence Definitions:**

No potential to occur; Suitable habitat is not present in the Phase 3 Repair Project area and/or the Phase 3 Repair Project area is not within the historical or current range of the species.

Unlikely to occur: Potential habitat present, but species unlikely to be present in the Phase 3 Repair Project area because of current status of the species, a very restricted distribution, and/or essential habitat components are not present.

Could occur: Suitable habitat is available in the Phase 3 Repair Project area; however, few or no other indicators show that the species may be present.

Likely to occur: Habitat conditions, behavior of the species, known occurrences in the Phase 3 Repair Project area, or other factors indicate a relatively high likelihood that the species would occur in the Phase 3 Repair Project area.

Known to occur: The species, or evidence of its presence, was observed in the Phase 3 Repair Project area during reconnaissance-level surveys or was reported by others.

2 These species have a similar status listing under the California Endangered Species Act, except for delta smelt and western yellow-billed cuckoo, which are both State-listed as endangered, and longfin smelt and San Joaquin kit fox, which are both State-listed as threatened.

3 Action Area: The action area is defined here in accordance with ESA guidelines as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). The action area includes all areas that would be directly or indirectly affected by the components of the Phase 3 Repair Project. Areas downstream from the Phase 3 Repair Project area may also be indirectly affected by the flood risk management component of the project through improved water quality and flood risk management conditions.

4 SJMSCP-covered: These species are covered under the SJMSCP (San Joaquin County 2000).

5 SJMSCP-covered with limitations: The SJMSCP does not cover the conversion of occupied riparian brush rabbit habitat, limits the amount of delta smelt habitat, and does not authorize take of green sturgeon.

6 See "San Joaquin River" subsection under "Environmental Baseline" section below, for more information.

7 Elements: The RD 17 levees have been divided into seven distinct "reaches" identified by Roman numerals (i.e., I, II, III), and subdivided further into 19 "elements," identified by the reach number followed by a lowercase letter and, in some cases, an Arabic numeral (e.g., Ia, IIa, Va, VIa.1…); see **Exhibit 2**.

Sources: CDFW 2014; CNPS 2014; USFWS 2014, 2016; data compiled by AECOM in 2014 and updated by GEI Consultants in 2016

SPECIES HABITAT AND POTENTIAL FOR OCCURRENCE IN THE AREA

The following is a summary of relevant habitat conditions in the action area for species that could occur, are likely to occur, or are known to occur in the Phase 3 Repair Project area. Full species accounts for federally listed species addressed in this BA are presented in the "Species Accounts" section.

- **Valley elderberry longhorn beetle:** Elderberry shrubs provide habitat for VELB. Elderberry shrubs are known to occur along the San Joaquin River, on both the waterside and landside of levees in the Phase 3 Repair Project area. Focused surveys for elderberry shrubs were conducted along all levee reaches on March 8, 2011; the area was resurveyed on January 29, 2014. A total of 18 elderberry shrubs were observed within 100 feet of the Phase 3 Repair Project area: nine shrubs on the waterside of the levee and nine shrubs on the landside. None of the shrubs had evidence of beetle exit holes. One of the landside shrubs does not have stems greater than 1 inch in diameter at ground level; therefore, it is not considered suitable VELB habitat.

- **Riparian brush rabbit:** Trapping conducted in February 2003 and February 2004 detected occurrences of riparian brush rabbit near the Phase 3 Repair Project area in waterside riparian habitat adjacent to elements IIIa and IIIb, between elements IIab and IIIa, and between elements VIa.1 and VIa.4 (CDFW 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004). The waterside habitat along elements IIIa and IIIb is dominated by willow within interspersed California blackberry and grasses. The trapping locations between elements IIab and IIIa are dominated by willows, cottonwoods, valley oaks, wild rose, and California and Himalayan blackberry. The trapping locations between elements VIa.1 and VIa.4 are on an oxbow with dense riparian vegetation. Similar riparian habitat is present adjacent to the waterside of elements IIab, IVc, and Va. North of element IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, or isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species.

- **Delta smelt:** Delta smelt are found from Suisun Bay upstream through the Sacramento–San Joaquin Delta (Delta). Delta smelt disperse widely into freshwater in late fall and winter as the spawning period approaches, and may move as far upstream as Mossdale on the San Joaquin River (Bennett 2005). Therefore, this species has the potential to occur in the Phase 3 Repair Project area.

- **Longfin smelt:** Longfin smelt occur in the Delta and tidally influenced segments of the Sacramento and San Joaquin rivers. The occurrence of longfin smelt in the San Joaquin River is rare, but it does occur on occasion when river salinity extends farther upstream, either because of Delta pumping or because of drought. Therefore, this species has the potential to occur in the Phase 3 Repair Project area.

- **Anadromous salmonids:** The action area (see "Action Area" section below) does not provide suitable spawning habitat for salmonids because it lacks the cold freshwater and gravel substrate characteristic of salmonid spawning areas in upper river basins. However, adult and juvenile Central Valley steelhead could occur in the action area during migrations along the San Joaquin River and its tributaries. (Adult and juvenile Central Valley fall-run Chinook salmon could also occur in the action area during migrations along the San Joaquin River and its tributaries; this species is discussed under the "Essential Fish Habitat Assessment" section in this document). Winter-run and spring-run Chinook salmon are known to occur only in the Sacramento River and its tributaries (Moyle 2002). Because the action area is along the San Joaquin River, several miles upstream from its confluence with the Sacramento River, adult migrants along the Sacramento River are not expected to move into the action area. Reintroduction of spring-run Chinook salmon is currently under way as part of the San Joaquin River Restoration Program (SJRRP) with the population designated as a 10(j) nonessential experimental population (NEP) by NMFS. A "nonessential" designation for a 10(j) experimental population means that, on the basis of the best available information, the experimental population is not essential for the continued existence of the species, and regulatory restrictions are considerably reduced under a NEP designation. When an NEP is located outside a National Wildlife Refuge or National Park (as the action area is), the population is treated as proposed for listing; is not protected by the

ESA; and take is not prohibited. The goals of the SJRRP are "to restore and maintain fish populations in 'good condition' in the mainstem San Joaquin River…including naturally reproducing and self-sustaining populations of salmon and other fish" (NMFS 2013).

- **Green sturgeon:** Green sturgeon are known to occur in the San Joaquin River and Delta, and therefore, has the potential to occur in the lower San Joaquin River in the Phase 3 Repair Project area (Moyle 2002). Currently, green sturgeon spawning in the San Joaquin River is not documented.

CRITICAL HABITAT

"Critical habitat" is defined in Section 3(5)A of the ESA as the specific areas in the geographical area occupied by the species where physical or biological features are found that are essential to the conservation of the species and that may require special management considerations or protection. Specific areas outside the geographical area occupied by the species also may be included in critical-habitat designations, based on a determination that such areas are essential for conservation of the species.

The proposed action addressed in this BA would fall within designated critical habitat for delta smelt, which was designated on December 19, 1994 (59 Federal Register [FR] 65256). Critical habitat is designated to include most tidally influenced areas of the Delta.

The proposed action addressed in this BA would fall within designated critical habitat for the Central Valley steelhead DPS. Critical habitat for the Central Valley steelhead DPS was designated on August 12, 2005; a final designation was published on September 2, 2005 (70 FR 52604), with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include select waters in the Sacramento and San Joaquin river basins, including the segment of the San Joaquin River in the action area (see "Action Area" section below).

The proposed action addressed in this BA would fall within designated critical habitat for the Southern DPS of North American green sturgeon. Critical habitat for green sturgeon was designated on October 9, 2009 (74 FR 52300). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins, including the segment of the San Joaquin River in the action area.

The action area is not within designated critical habitat for the remaining species listed in **Table 1,** for which such a designation has been made: large-flowered fiddleneck, Conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, VELB, Sacramento River winter-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU, California red-legged frog, California tiger salamander, and least Bell's vireo. Critical habitat has not been designated for palmate-bracted bird's-beak, longfin smelt, Central Valley fall/late fall–run Chinook salmon ESU, giant garter snake, western yellow-billed cuckoo, San Joaquin kit fox, riparian brush rabbit, or riparian woodrat.

SAN JOAQUIN MULTI-SPECIES CONSERVATION PLAN

All of the above species, except the anadromous salmonid fish species, are covered on some level under the San Joaquin Multi-Species Habitat Conservation and Open Space Plan (SJMSCP) (San Joaquin County 2000). The SJMSCP was developed to avoid, minimize, and mitigate impacts on plant and wildlife habitat projected to occur in San Joaquin County between 2001 and 2051, resulting from the anticipated conversion of open space land to non–open space uses. Ninety-seven species are covered by the SJMSCP. The plan is intended to provide comprehensive mitigation, in accordance with local, State, and federal regulations, for impacts of SJMSCP-permitted activities on these species. USFWS and CDFW participated in development of the SJMSCP, approved the mitigation, and agreed to issue incidental take permits for species and activities covered by the SJMSCP.

The geographic area covered in the SJMSCP extends up to the landside levee crown of the San Joaquin River levee and includes the Phase 3 Repair Project area. However, the SJMSCP does not cover federal flood risk management projects or activities that involve tidally jurisdictional wetlands or other waters of the United States, and thus the Phase 3 Repair Project would not be a covered activity under the SJMSCP. The SJMSCP outlines a mechanism by which a federal flood risk management project, such as the Phase 3 Repair Project, could obtain take coverage under the SJMSCP (see Section 8.2.3 of the SJMSCP). However, because the SJMSCP does not cover special-status fish, the conversion of riparian brush rabbit habitat, or impacts on other species on the waterside of the levee, RD 17 and USACE would not rely on the SJMSCP to assess and offset Phase 3 Repair Project effects on federally listed and State-listed species. Rather, through this BA and the associated Section 7 consultations with USFWS and NMFS, RD 17 and USACE would seek take authorization for Phase 3 Repair Project activities. Species listed under the California Endangered Species Act that also are covered species under the SJMSCP would be evaluated through coordination with CDFW.

CONSULTATION TO DATE

The list below summarizes correspondence, meetings, and discussions between regulatory agencies, RD 17, and consultants that relate to potential effects of the Phase 3 Repair Project on species addressed in this document. The most recent consultation is listed first.

4/24/2018 USFWS provided GEI Consultants with guidance on updating the BA, specifically with regards to updating the effects analysis and proposed conservation measures to be consistent with the Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (VELB Framework; USFWS 2017).

3/14/2018 NMFS provided USACE with comments on the *Conceptual Mitigation and Monitoring Plan for Riparian Brush Rabbit [for the] Phase 3 – RD 17 Levee Seepage Repair Project* (Conceptual MMP) (RD 17 2016) (**Appendix D-9**). A letter response to comments was completed by GEI Consultants, on behalf of RD 17 (**Appendix D-10**).

2/27/2018 USFWS provided USACE with comments on the Conceptual MMP (**Appendix D-7**). A letter response to comments was completed by GEI Consultants, on behalf of RD 17 (**Appendix D-8**).

1/12/2018 USACE provided USFWS and NMFS with copies of the Conceptual MMP, and requested their review of the document.

12/11/2017 Meeting with representatives from USACE, NMFS, and GEI Consultants to discuss the BA and Section 7 consultation with NMFS.

4/6/2017 Authorization from USACE issued to RD 17 for discharge of fill into waters of the United States for the 2017 Emergency Response Construction Project (SPK-2009-001466) under Regional General Permit No. 8 (Emergency Actions).

3/22/2017 USACE notifies USFWS of emergency construction.

3/8/2017 USACE submits request to USFWS and NMFS to re-initiate Section 7 consultation. Request includes submittal of revised BA.

4/18/2016 Letter from USFWS to GEI Consultants regarding the Species List for Phase 3–RD 17 Levee Seepage Repair Project (**Appendix B**)

10/2/2015 Letter from USFWS to USACE requesting additional information on the RD 17 Phase 3 Repair Project BA (**Appendix D-5**). A letter response to comments was completed by GEI Consultants and AECOM, on behalf of RD 17 (**Appendix D-6**).

7/7/2015 Letter from NMFS to USACE requesting additional information on the RD 17 Phase 3 Repair Project BA (**Appendix D-3**). A letter response to comments was completed by GEI Consultants and AECOM, on behalf of RD 17 (**Appendix D-4**).

2/27/15 Letter from USACE to NMFS transmitting the BA and requesting informal consultation.

2/27/15 Letter from USACE to USFWS transmitting the BA and requesting to initiate formal Section 7 consultation.

2/27/14	Letter from USFWS to AECOM regarding the Species List for RD 17 100-Year Levee Seepage Area Project[1] (**Appendix B**)
3/1/11	Tour of proposed action area with representatives from AECOM, USACE, USFWS, NMFS, and CDFW.
1/24/11	Meeting with representatives of USFWS and AECOM to discuss project permitting coordination, potential effects of the project on federally listed species, and development of a conservation strategy.
12/9/10	Meeting with representatives of CDFW and AECOM to discuss project permitting coordination, the potential effects of the project on State-listed species, use of the SJMSCP, and development of a conservation strategy.
8/24/10	Meeting with representatives of USACE, USFWS, NMFS, and AECOM to discuss the potential effects of the project on listed species and development of a conservation strategy.
6/11/10	Letter from NMFS to AECOM, responding to May 14, 2010, letter requesting technical assistance (**Appendix D-2**).
5/14/10	Letter from AECOM, prepared on behalf of RD 17, to USFWS and NMFS requesting informal technical assistance in evaluating the potential effects on listed species that could result from implementing USACE vegetation management standards, and in developing a conservation strategy to adequately offset the potential loss of habitat. Copies of the wetland delineation report and maps were provided with the letter (**Appendix D-1**).

1 "RD 17 100-Year Levee Seepage Area Project" is a reference to the RD 17 Levee Seepage Repair Project. This former name was used in documents published before preparation of the Final Environmental Impact Statement for Phase 3 of the RD 17 Levee Seepage Repair Project.

DESCRIPTION OF THE PROPOSED ACTION

U.S. ARMY CORPS OF ENGINEERS ACTION

RD 17, in cooperation with the California Department of Water Resources (DWR) and the Central Valley Flood Protection Board (CVFPB), is the local project sponsor for the Phase 3 Repair Project. RD 17 has requested permission from the CVFPB and USACE to alter segments of the San Joaquin River Levee System, which is a federal project levee. The proposed action for USACE is to make a permit decision on the Phase 3 Repair Project under the authority of Clean Water Act Section 404 and a permission decision under Section 408 of Title 33 USC. Under Section 408, USACE may allow the permanent use or occupancy of a USACE flood risk management project with approval by the Secretary of the Army on recommendation of the Chief of Engineers, provided that such use or occupancy would not be injurious to the public interest. USACE has determined that a Section 408 decision would be required for repair of seepage deficiencies to federal project levees. The activities requiring Section 408 and/or 404 authorizations, described in more detail below, include proposed alterations/repairs to USACE flood risk management facilities and fill of jurisdictional waters during earth-moving activities for levee construction. Activities for the Phase 3 Repair Project would be processed through an encroachment permit with the CVFPB. USACE would conduct a technical engineering review as part of the evaluation of the CVFPB's request to modify the Federal flood risk management project, in accordance with USACE regulations under 33 CFR 408.

PROJECT LOCATION

RD 17 is located in south-central San Joaquin County, California, in the center of the California Central Valley, at the north end of the San Joaquin River Basin, and within the far southeast limit of the Delta (see **Exhibit 1**). The boundaries of RD 17 are marked by French Camp Slough on the north, approximately 3 miles southwest of the central business district of the city of Stockton; the San Joaquin River on the west; Walthall Slough on the south (just below State Route 120); and Airport Way/McKinley Avenue on the east, just outside the city of Manteca. RD 17 is responsible for maintaining the levees along the east bank of the San Joaquin River from just south of Mathews Road to Walthall Slough, the levees along the north bank of Walthall Slough, and the dryland levee out to approximately South Airport Way (see **Exhibit 2**).

The proposed action is located along specific reaches of the RD 17 levees, as depicted in **Exhibit 2**. The Phase 3 Repair Project's landside levee improvements would include a combination of construction of seepage berms, installation of chimney drains and both shallow and deep cutoff walls, the raising of landside grade, and construction of a setback levee with seepage berm and an underlying cutoff wall along 19 elements of the RD 17 levee system.

PROJECT BACKGROUND AND PURPOSE

PROJECT BACKGROUND AND HISTORY

The RD 17 system for reducing the risk of flood damage, like other flood protection systems in the San Joaquin Valley, initially was designed to facilitate agricultural development on the extensive valley floodplains and to support river navigation. Levees set closely along the rivers were designed to contain flows generated by common floods, and bypasses were constructed to carry overflows generated by large floods. The close-set levees ensured that water velocities would help scour the river bottom and move sediment through the system, reducing dredging costs for sustaining navigation. Starting in about 1863, RD 17 undertook the maintenance and reconstruction of the levee system.

Some of the levees in the Delta are considered "federal project levees." These levees were constructed or reconstructed (e.g., existing or damaged farm levees were improved) by USACE and are intended to meet federal standards. Construction of the federal levee system that encompasses the current RD 17 levees along Walthall

Slough, the San Joaquin River, and French Camp Slough began in 1944 and was completed in 1963. The levee system has since been upgraded substantially to meet Federal Emergency Management Agency (FEMA) requirements for flood protection during a 100-year flood event (flood with a 1 percent chance of occurring in any given year, or 0.01 annual exceedance probability) [AEP]). In 1990, after extensive analysis, the RD 17 levees were accredited by FEMA as meeting the 100-year requirements for urban development.

During a high-water event on the San Joaquin River in January 1997, seepage and boils occurred at several locations along the RD 17 levees. USACE, DWR, and RD 17 successfully contained the seepage and boils, and the levees did not break. After the 1997 event, USACE, the CVFPB, and RD 17 funded a project, the Reconstruction of the California Central Valley Levees San Joaquin Basin #4, Reclamation District #17 Project, to repair the seepage and boil areas. The project was designed and constructed by USACE, and work was completed in 2003.

After reviewing the data supporting the 1990 accreditation and subsequent information, FEMA notified RD 17 of its intention to confirm full accreditation of the RD 17 levees as meeting FEMA's requirements for 100-year flood protection. On June 19, 2007, DWR wrote a letter to the City of Lathrop, with a copy to FEMA, stating that it could not support recertification of the RD 17 levees or the granting of provisional accreditation because of concerns about seepage exit gradients.[2] The basis of DWR's concern was analysis showing seepage exit gradients greater than 0.5, which indicated a higher likelihood of seepage or boils occurring during a high-water event Because of DWR's concern, FEMA then denied full accreditation and instead granted provisional accredited levee (PAL) status to the RD 17 levees. A PAL is a levee that FEMA has previously credited with providing a 100-year flood event level of flood risk reduction (i.e., flood with a 1 percent chance of occurring in any given year, or 0.01 annual exceedance probability). In fall 2007, in response to the PAL status, RD 17 initiated a levee seepage repair program and requested funding through DWR's Early Implementation Program.

RD 17 subsequently implemented Phases 1 and 2 of the LSRP. After completion of the Phase 1 and 2 levee repairs, RD 17 submitted a recertification application to FEMA. In September 2010, RD 17 received a response letter declaring that FEMA had accredited the area protected by the RD 17 levee system, including the dryland levee, thereby removing the PAL status.

The Phase 1 Project included construction of two seepage berms, located in elements III and VI of the LSRP (**Exhibit 2**). The project reconstructed and extended the landside levee toe berms with earth and gravel fill, both landward and along the levee toe, to reduce seepage exit gradients. Work areas were designed to avoid any environmental resources of possible significance, including sensitive habitats and listed species. The project was determined to be categorically exempt from the California Environmental Quality Act (CEQA), and no federal authorizations or funding was required for the Phase 1 work; therefore, no National Environmental Policy Act (NEPA) analysis was triggered. The Phase 1 Project work was completed in January 2009.

The Phase 2 Project addressed work needed at nine levee reaches in the LSRP area. At eight of the nine reaches, the project involved constructing drained seepage berms along the landside levee toe. At one site that did not include seepage berm construction, RD 17 acquired an easement on land along the levee toe and performed various maintenance and site cleanup activities. A CEQA initial study/mitigated negative declaration that was completed for the Phase 2 Project concluded that no significant effects would occur on environmental resources after mitigation measures were implemented (RD 17 2009). Potential impacts on biological resources that resulted from Phase 2 Project implementation were mitigated through participation in the SJMSCP. No federal

[2] "Seepage exit gradient" is an expression in numeric form of the potential for under seepage to exit on the landside of a levee as seepage or a boil. The lower the number used to express seepage exit gradient, the more resistant the system is to seepage or boils; the higher the number, the more likely seepage or boils may occur during a high water event. In formulas for seepage exit gradients, the numerator (top number in a fraction) typically addresses forces that cause or enhance seepage (e.g., water pressure), and the denominator typically addresses forces that resist seepage (e.g., soil resistance to water pressure, depth and weight of soil over the potential seepage area, distance from the levee toe). A lower seepage exit gradient (i.e., more resistance to seepage) is achieved when the numerator (positive seepage forces) is reduced and/or the denominator (resistance to seepage) is increased.

authorizations or funding was required for the Phase 2 work; therefore, no NEPA analysis was triggered. All Phase 2 Project work was completed in summer 2010.

PROJECT PURPOSE AND OBJECTIVES

The overall purpose of the Phase 3 Repair Project is to implement landside and isolated waterside levee improvements in 19 LSRP elements affecting 5.3 miles of the approximately 19-mile RD 17 levee system, to reduce the risk of flooding in the RD 17 service area during a 100-year flood event. Levee improvements would address under seepage, through seepage, and levee geometry repair and remediation. USACE and RD 17 each view the project purpose from the purview of their respective responsibilities, defined as follows:

USACE's objectives for the Phase 3 Repair Project are to:

- decide whether or not to grant permission for the RD 17 Phase 3 Repair Project to alter the federal project levees within its levee system under Section 408, and
- decide whether or not to issue permits under Section 404.

RD 17's objectives for the proposed Phase 3 Repair Project are to:

- repair seepage deficiencies where needed to meet current USACE seepage criteria standards,
- increase the levee's resistance to under seepage and/or through seepage,
- provide under seepage exit gradients equal to or less than 0.5 at the landside levee toe, and equal to or less than 0.8 at the landside drainage seepage berm at the water surface elevation associated with the design water surface, and
- meet levee geometry requirements of the permitting agencies in the specific areas of repair work.

All Phase 3 Repair Project work would occur on the landside of the existing levee system, or above the HTL on the water side of the levee, therefore, authorization under Section 10 of the Rivers and Harbors Act of 1899 would not be required. Section 404 authorization would be required for some work on the land side of the levee that would affect wetlands or waters of the U.S. USACE verified a wetland delineation that was submitted for the Phase 3 Repair Project on November 3, 2009 (a preliminary jurisdictional determination form was issued by USACE on November 10, 2009; USACE 2009b), and three supplemental wetland delineations were prepared. The first supplemental delineation was submitted on January 22, 2010 (a preliminary jurisdictional determination form was issued by USACE on April 9, 2010; USACE 2010a). The second supplemental wetland delineation was submitted on September 16, 2010 (a preliminary jurisdictional determination form was issued by USACE on October 7, 2010; USACE 2010b). The third supplemental wetland delineation was submitted on April 4, 2014 (a preliminary jurisdictional determination form was issued by USACE on April 7, 2014; USACE 2014a).

COMPLIANCE WITH USACE VEGETATION MANAGEMENT STANDARDS

With issuance of Engineering Technical Letter (ETL) 1110-2-571 in 2009,[3] USACE updated its vegetation management standards for levees, requiring the removal of all vegetation, with the exception of perennial grasses, on levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2009a). In September 2011, USACE issued a Draft Environmental Impact Statement/Draft Environmental Impact Report (DEIS/DEIR) for the Phase 3 Repair Project (USACE and RD 17 2011). The September 2011 DEIS/DEIR considered two options for complying with ETL 1110-2-571, as follows:

3 USACE ETL 1110-2-571 subsequently was replaced by ETL 1110-2-583 on April 30, 2014 (USACE 2014b).

- Full Implementation of USACE ETL 1110-2-571: All vegetation, other than perennial grasses, would be removed from the levee slopes and out 15 feet from the waterside and landside levee toes, or

- Acquisition of a Variance from Full Compliance with USACE ETL 1110-2-571: Permission would be obtained from USACE to retain all vegetation on the lower two-thirds of the waterside levee slope and out 15 feet from the waterside levee toe; all other levee vegetation still would be removed in accordance with USACE policy.

RD17 is no longer considering full compliance with the ETL as an alternative. RD 17 will continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which includes trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up to 5 feet above the ground (or 12 feet above the crown road). In the Phase 3 Repair Project area, landside vegetation would be removed as previously evaluated in the September 2011 DEIS/DEIR (USACE and RD 17 2011) and as described under the "Additional Project Components" subsection below as well as in the "Direct and Indirect Effects on Species in the Action Area" section of this BA. Long-term vegetation management practices, for both landside and waterside vegetation, would be managed in accordance with the USACE O&M Manual which includes RD 17's existing practices, as described under the "Additional Project Components" subsection below as well as in the "Direct and Indirect Effects on Species in the Action Area" section of this BA.

DESCRIPTION OF THE PROPOSED PHASE 3 REPAIR PROJECT

This section describes the elements of RD 17's overall Phase 3 Repair Project; the Emergency Response Construction Project actions, which were authorized under Clean Water Act Section 404 Regional General Permit No. 8, are described under "Description of the 2017 Emergency Response Construction Project Actions" section that follows this section. This includes a description of the levee repair activities and additional project components that are proposed under the Phase 3 Repair Project, as well as the proposed construction schedule and sequencing.

The Phase 3 Repair Project would address the under seepage and/or through seepage concerns raised by DWR and repair and/or remediate levee geometry to USACE design standards along approximately 5.2 miles of the RD 17 levee system, including portions of the San Joaquin River east levee and portions of the levee along the northerly bank of Walthall Slough. Under seepage occurs below the aboveground levee prism and is caused by the buildup of water pressure in the subsurface foundation soils when high-river stages are present on the waterside of the levees. This pressure head causes water to flow through the earthen foundation layers under the levee and exit onto the ground surface on the landside of the levee prism (**Exhibit 3**). Such seepage is not uncommon and does not inherently imply that the levee is failing; however, excessive and uncontrolled under seepage can carry fine-grained material with the water flow that can undermine the levee and lead to levee failure. Through seepage is the movement of water through the levee prism when high-river stage conditions exist on the waterside of the levee (**Exhibit 3**). Depending on the duration of high water and the permeability of the levee embankment soil, seepage may exit onto the landside slope of the levee, thereby negatively affecting the stability of the landside levee slope.

Levee improvements along the USACE project levees would consist primarily of in-place repair/remediation, but would include a single setback levee at element IVc. As summarized in **Table 2** and shown in **Exhibits 4a** through **4c**, the Phase 3 Repair Project's landside levee improvements would include a combination of construction of seepage berms, installation of chimney drains and both shallow and deep cutoff walls, the raising of landside grade, and construction of a setback levee with seepage berm and an underlying cutoff wall along 19 elements of the RD 17 levee system. These levee repair components, as well as additional project components (such as levee geometry corrections and stormwater management), are described in more detail following **Table 2**. The proposed action does not include any work that would raise the existing levee. Limited work would be performed along the waterside of the levee above the HTL in element IVc, where the setback levee would be constructed. As described in greater detail under the "Description of the 2017 Emergency Response Construction Project Actions" subsection, some seepage berms and raised landside grades in several elements were constructed during February 2017; **Table 2** summarizes, for each project element, the emergency construction actions that were implemented in 2017, as well as the remaining actions that would occur under the Phase 3 Repair Project.

LEVEE REPAIR ACTIVITIES

The Phase 3 Repair Project would include seepage berms, chimney drains, cutoff walls, a setback levee, and a raised landside grade (see **Table 2**). The respective levee improvement components are described below in more detail.

SEEPAGE BERMS

Reducing the risk of levee failure caused by under seepage and through seepage may be achieved by constructing a drained seepage berm. A drained seepage berm collects and conveys seepage, thereby reducing the flood risk associated with a high-water event. A drained seepage berm is built on the landside of a levee, and consists of layers of sand filter material, drain rock, geosynthetic filter fabric, and a seepage berm soil fill (**Exhibit 5**).

The drained seepage berm reduces flood risk during sustained high-river events by collecting seepage that otherwise would flow onto the landside ground surface at and beyond the levee's landside toe of slope, and then by conveying the seepage away from the levee. The layer of sand filter material placed on the natural ground surface serves to reduce the transmission of fine-grained soils into the drain rock, thereby maintaining the drain rock's ability to be a conductive soil unit that conveys collected seepage. Similarly, the filter fabric that separates the drain rock from the seepage berm fill soil prevents finer soils from migrating into the drain rock unit. The weight of the berm acts as ballast, reducing the potential for detrimental boils and piping.

The design width and height of a seepage berm are dependent on the relative permeability of the underlying soil layers and the amount of pressure head that push water under the levee and through these soils during sustained high-river events. The higher the water pressure head and the more dissimilar the porosity of the underlying soil layers, the wider and/or taller the seepage berm must be to prevent boils and reduce flood risk.

For the Phase 3 Repair Project, drained seepage berm widths of 60–120 feet are expected to be adequate to meet the design criteria in most cases (**Exhibit 5**). However, these types of berms may extend up to 300–400 feet inland from the landside toe of the levee. Seepage berms typically are constructed using select materials excavated from borrow sites or obtained from commercial sources. For the Phase 3 Repair Project, soil material for seepage berms would be purchased from commercial sources. A compacted-surface patrol road would be constructed near the outside edge of the seepage berm (see "Additional Project Components" below).

In urban areas, some seepage berms also would include a toe drain system (element VIIg) to safely collect and discharge the seepage water into an urban storm drainage system. A toe drain pipe is a below-grade, perforated pipe surrounded by a layer of sand and drain rock (**Exhibit 6**). The toe drain pipe is a mechanism to safely collect and convey seepage water away from the levee and seepage berm. If the toe drain pipe is unable to convey the seepage water, the water exits the drained seepage berm through the drain rock at the face of the berm, similar to a nonurban berm.

CHIMNEY DRAINS

A chimney drain is a drainage system that collects seepage waters that are flowing through the aboveground portion of the levee structure. This type of drain is used to collect and convey through seepage. A chimney drain consists of a 1 to 3-foot-thick layer of sand and drain rock. Filter fabric is placed between the soil and rock layer to avoid migration of the soil into the rock, which can clog the rock layer and reduce its ability to carry seepage flows. The chimney drain is placed directly on the landside slope of the levee and tied into an existing or new

Table 2
Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)

Element	Type of Remediation	Phase 3 Project Major Features	Phase 3 Project Features Constructed as 20-17 Emergency Response Actions	Phase 3 Project Features Remaining To be Constructed[1]
Ia	under seepage and through seepage	Construct approximately 590 feet of seepage berm (approximately 110 feet wide) and approximately 590 feet of chimney drain to meet required exit gradients. Construct PG&E high voltage tower footing raisings. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 350 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 110 feet.	Construct approximately 240 feet of additional seepage berm (approximately 110 feet wide) and approximately 590 feet of chimney drain to meet required exit gradients. Construct PG&E high voltage tower footing raisings. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
Ib	under seepage and through seepage	Fill existing depression to approximately 300 feet from toe of existing levee. Construct approximately 130 feet of seepage berm (approximately 80 feet wide) and approximately 130 feet of chimney drain on top of fill to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Filled existing depression to approximately 300 feet from toe of existing levee. Constructed approximately 130 feet of seepage berm on top of fill to meet required exit gradients. The constructed seepage berm width is approximately 80 feet.	Construct approximately 130 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
Ie	under seepage and through seepage	Construct approximately 590 feet of seepage berm (approximately 70 feet wide) and approximately 590 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 590 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 70 feet.	Construct approximately 590 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
IIab	under seepage and through seepage	Construct approximately 2,600 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.	*None.*	Construct approximately 2,600 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.

Table 2
Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)

Element	Type of Remediation	Phase 3 Project Major Features	Phase 3 Project Features Constructed as 20-17 Emergency Response Actions	Phase 3 Project Features Remaining To be Constructed[1]
IIIa	Through seepage	Construct approximately 4,750 feet of chimney drain in existing seepage berm to meet required exit gradients Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths.	*None*	Construct approximately 4,750 feet of chimney drain in existing seepage berm to meet required exit gradients Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths.
IIIb	under seepage and through seepage	Construct approximately 720 feet of seepage berm (approximately 90 feet wide) and approximately 720 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 720 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 90 feet.	Construct approximately 720 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
IVa	under seepage and through seepage	Construct approximately 450 feet of seepage berm (approximately 90 feet wide) and approximately 450 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 450 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 90 feet.	Construct approximately 450 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
IVc	under seepage and through seepage	Construct approximately 1,100-foot-long setback levee containing approximately 300 feet of seepage berm and approximately 300 feet of cutoff wall to meet required exit gradients. Depth of the cutoff wall will be approximately 60 feet. Cutoff wall will involve degrading the top 1/3 to 1/2 of the levee crown and will begin with a 1:1 cut at the waterside crown. Seepage berm would be a minimum of 65 feet wide. Install riprap on waterside of existing levee above the high tide line where it would intersect setback levee. After setback levee is completed, remove 400 linear feet of the existing levee above the high tide line on the downstream side of oxbow. Grade approximately 8 acres of setback area, to	*None*	Construct approximately 1,100-foot- long setback levee containing approximately 300 feet of seepage berm and approximately 300 feet of cutoff wall to meet required exit gradients. Depth of the cutoff wall will be approximately 60 feet. Cutoff wall will involve degrading the top 1/3 to 1/2 of the levee crown and will begin with a 1:1 cut at the waterside crown. Seepage berm would be a minimum of 65 feet wide. Install riprap on waterside of existing levee above the high tide line where it would intersect setback levee. After setback levee is completed, remove 400 linear feet of the existing levee above the high tide line on the downstream side of oxbow. Grade approximately 8 acres of setback area, to drain to the river through

Table 2
Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)

Element	Type of Remediation	Phase 3 Project Major Features	Phase 3 Project Features Constructed as 20-17 Emergency Response Actions	Phase 3 Project Features Remaining To be Constructed[1]
		drain to the river through the downstream opening in the remnant levee, and restore at least 9.9 acres, and up to 11.1 acres, of riparian scrub and Great Valley oak woodland in the area between the landside toe of the setback levee and the river. For more information about habitat restoration in IVc, see the Conceptual Mitigation and Monitoring Plan for the Riparian Brush Rabbit in **Appendix E** of this document.		the downstream opening in the remnant levee, and restore at least 9.9 acres, and up to 11.1 acres, of riparian scrub and Great Valley oak woodland in the area between the landside toe of the setback levee and the river. For more information about habitat restoration in IVc, see the Conceptual Mitigation and Monitoring Plan for the Riparian Brush Rabbit in **Appendix E** of this document.
Va and VIa.1	under seepage and through seepage	Construct approximately 5,900 feet of seepage berm (approximately 60 feet wide) to meet required exit gradients. Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width. Construct 9,500 feet of continuous cutoff wall to meet required exit gradients. Depth of cutoff walls would vary from 60–85 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls. The existing levee will be widened where necessary as part of cutoff wall construction.	Constructed approximately 5,900 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 60 feet.	Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width. Construct 9,500 feet of continuous cutoff wall to meet required exit gradients. Depth of cutoff walls would vary from 60–85 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls. The existing levee will be widened where necessary as part of cutoff wall construction.
VIa.4	under seepage and through seepage	Construct approximately 70 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 90–100 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.	*None.*	Construct approximately 70 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 90–100 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.
VIb	under seepage and	Construct approximately 2,050 feet of cutoff wall to meet required exit gradients. Depth	*None.*	Construct approximately 2,050 feet of cutoff wall to meet required exit gradients. Depth of

Table 2
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Element	Type of Remediation	Phase 3 Project Major Features	Phase 3 Project Features Constructed as 20-17 Emergency Response Actions	Phase 3 Project Features Remaining To be Constructed[1]
	through seepage	of cutoff wall would vary from 70–80 feet. Cutoff wall in levee prism would involve both deep slurry mix construction as well as degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown.		cutoff wall would vary from 70–80 feet. Cutoff wall in levee prism would involve both deep slurry mix construction as well as degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown.
VIcde	under seepage and through seepage	At element, VIc, construct approximately 300 feet of seepage berm (approximately 100 feet wide) and approximately 300 feet of chimney drain to meet required exit gradients and construct a new earthen railroad embankment to replace the existing wooden trestle bridge. At element VId, construct approximately 150 feet of seepage berm (approximately 100 feet wide) and 150 feet of chimney drain to meet required existing gradients and raise grade. At element VId, construct approximately 250 feet of subgrade seepage collection drain system and 250 feet of chimney drain to meet required exit gradients, raise approximately 200 feet of parking lot grade, and levee widening.	At element VIc, constructed approximately 300 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 100 feet. At element VId, constructed approximately 150 feet of seepage berm to meet required exit gradients and raised grade. The constructed seepage berm width is approximately 100 feet. At element VIe, constructed approximately 250 feet of subgrade seepage collection drain system to meet required exit gradients and raised approximately 200 feet of parking lot grade.	At element VIc, construct approximately 300 feet of chimney drain to meet required exit gradients and construct a new earthen railroad embankment to replace the existing wooden trestle bridge. At element VId, construct approximately 150 feet of chimney drain to meet required exit gradients. At element IVe, construct approximately 250 feet of chimney drain to meet required exit gradients and levee widening.
VIIb	under seepage and through seepage	Construct approximately 350 feet of seepage berm (approximately 135 feet wide) and 350 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 350 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 135 feet.	Construct approximately 350’ of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
VIIe	under seepage and through seepage	Construct approximately 2,500 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 60–120 feet. Deep slurry mixing method would be used.	*None.*	Construct approximately 2,500 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 60–120 feet. Deep slurry mixing method would be used.

Table 2
Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)

Element	Type of Remediation	Phase 3 Project Major Features	Phase 3 Project Features Constructed as 20-17 Emergency Response Actions	Phase 3 Project Features Remaining To be Constructed[1]
		Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Repair Project.		Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Repair Project.
VIIg	under seepage and through seepage	Construct approximately 400 feet of seepage berm (approximately 65 feet wide) to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	*None.*	Construct approximately 400 feet of seepage berm (minimum 65 feet wide) to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.

Source: Data provided by Kjeldsen, Sinnock & Neudeck, Inc. in 2014, updated 2017 drained seepage berm at the landside base of the levee (**Exhibit 7**). The chimney drain conveys the through seepage flows to a drained seepage berm, which is located at the landside base of the levee.

Installing a chimney drain in an existing drained seepage berm would include adding the through seepage material on top of the existing seepage berm and tying this material into the existing seepage berm material by removing the seepage berm fill material and physically tying the two drainage rock layers together. When the remediation includes construction of a new drained seepage berm with a chimney drain, the chimney drain would be installed during construction of the drained seepage berm.

CUTOFF WALLS

In selected locations of the Phase 3 Repair Project, cutoff walls would be placed through the levee prism (parallel to the river). Cutoff walls use specialized earthen materials (often bentonite clay, which has low permeability, or a mixture of bentonite and cement). Cutoff walls would be constructed vertically through the levee prism, extending into or through deeper foundational soils that have low-permeability (a layer through which seepage does not flow readily). Thus, cutoff walls would substantially reduce the potential for under and through seepage flow during high-river events. Two methods for installing cutoff walls would be used along portions of the RD 17 levees: the conventional open-trench method and the deep soil mixing method.

The conventional open-trench method would be used to install shallow cutoff walls to a maximum depth of approximately 80 feet. This method involves excavating material in an open trench (the trench is filled with a bentonite slurry to maintain the side slopes of the excavation) and then replacing it with the select materials, typically a bentonite or cement-bentonite slurry (**Exhibit 8**). In this case, the top one-third to one-half of the levee height is "degraded," meaning that it is excavated so that any weakness in the narrow upper portion of the levee does not result in failure of the levee during construction.

For the deep slurry mixing method, specialized equipment (such as augers) is used to excavate deep into the subsurface, allowing the cutoff walls to reach depths up to 120 feet (**Exhibit 9**). The deep slurry mixing method involves mixing the soil in place with cement and / or bentonite, thereby reducing the risk of failure during construction. This method does not require levee crown degradation.

For the Phase 3 Repair Project, the cutoff walls would be extended approximately 300 feet beyond the element boundary to provide the required overlap when drained seepage berms have been or are being installed along the landside of adjacent levee elements. Levee slopes (where cutoff walls would be installed) also would be modified as needed to achieve the required 20-feet width and landside 3:1 slope.

SETBACK LEVEE WITH SEEPAGE BERM AND UNDERLYING CUTOFF WALL

General Description of Setback Levees

A setback levee is a levee constructed some distance behind an existing levee. The setback is tied into the existing levee at the upstream and downstream ends of the setback area. After certification of the setback levee, all or a portion of the existing levee between these two points typically is removed to allow high-water events to inundate the newly expanded floodway. Soil from the old levee may be used as a source of fill for other levee improvement projects, depending on the quality and quantity of material generated from demolition of the old levee. In some cases, it may be necessary to continue maintaining the existing levee after a setback levee is constructed (e.g., to protect existing development in the setback area) and to use the newly constructed levee as a backup levee.

General Description of Proposed Setback Levee and Associated Floodplain Restoration

Project Element IVc involves construction of a 1,100-foot-long setback levee with an underlying cutoff wall and a seepage berm, on a major oxbow of the San Joaquin River (see **Table 2**). A Conceptual MMP (RD 17 2016) was prepared to describe the expansion and restoration of riparian habitat in Element IVc (**Appendix E**), and submitted to USFWS and NMFS on January 12, 2018. This Conceptual MMP is being updated, in response to comments received from USFWS (on February 27, 2018) and NMFS (on March 14, 2018).

In the Phase 3 Repair Project area, soil materials beneath a setback levee are anticipated to have properties similar to those of materials below the existing levees. Therefore, a setback levee would have no seepage-related benefit in the RD 17 area relative to other seepage control methods; like the existing levees, a setback levee would require either a cutoff wall or drained seepage berm to sufficiently reduce the potential adverse effects associated with under seepage flows (**Exhibits 10** and **11**). Nevertheless, implementation of a setback levee could provide some additional capacity in the river for floodwaters and also would have the potential to provide habitat in the area between the new and old levee locations. In the Phase 3 Repair Project area, any newly expanded floodway created by a proposed setback levee would be designed to drain surface water after a high-water event, to prevent fish stranding.

Setback Levee Considerations

As described in greater detail under Section 2.1.4 in the DEIS/DEIR (USACE and RD 17 2011), and consistent with Section 2.5.1 of the forthcoming Final Environmental Impact Statement (FEIS) (USACE *in prep.)* for the proposed project, setback levees were considered but eliminated from further consideration in several project reaches for the following reasons:

- Construction of a setback levee along certain stretches of the river would be hydraulically constrained and would greatly increase the project scope to the point of being cost prohibitive (elements VIa.4 and VIb).
- Because of the proximity to the bifurcation at Old River, the change in hydraulic conditions that would result from constructing a setback levee at these locations would increase flows down the San Joaquin River during flood events, which could lead to increased flooding downstream (elements Va and VIa.1).
- Construction of a setback levee relative to other levee improvement alternatives and/or land acquisition to accommodate construction of a setback levee would be cost prohibitive (elements Ia, Ie, IIIb, IVa, VIcde, and VIIb).
- Existing landside development would constrain the option of constructing a setback levee (elements IIab, VIIe, and VIIg).

The complete hydraulic analyses that evaluated the setback levee alternatives are included as **Appendix F**.

Tie-in to Existing Levee

Where the new setback levee would intersect the existing levee, the top one-third to one-half of the crown of the existing levee would be degraded beginning with a 1:1 cut at the existing waterside crown to facilitate tying the cutoff wall and setback levee into the existing levee.

Riprap

Approximately 0.64 acres (740 linear feet) of riprap would be installed only on the waterside of the existing levee and above the HTL in element IVc where it would intersect the setback levee. No trees/shrubs would be removed to place the riprap and any riprap around trees/shrubs would be hand-placed. The riprap would not be installed to act as launchable rock.

Remnant Levee Breach

After the setback levee is completed, 400 linear feet of the existing levee above the HTL on the downstream side of the oxbow would be degraded, reconnecting approximately 8 acres of floodplain to the river.

Floodplain Offset Area

The reconnected floodplain area would be graded to allow complete drainage of the floodplain to the river. As flood flows recede, the floodplain area would drain completely through the breach in the remnant levee. This would minimize the possibility of fish stranding. The periodic reactivation of floodplain rearing habitat for juvenile salmonids, in particular, and other native fishes as well would be a benefit to fish resources. The seasonal nature of inundation, along with complete drainage, would preclude establishment in the floodplain of predatory, non-native fishes.

The Conceptual MMP evaluated three breach invert elevations (8 feet [NAVD88], 10 feet [NAVD88] and 14 feet [NAVD88]) for the proposed levee breach on the downstream end of the oxbow (RD 17 2016). Hydraulic modeling, based on San Joaquin River flows as reported at the Vernalis USGS stream gage (Vernalis gage), about 17.5 miles upstream of the project area, was used to estimate the flow in the San Joaquin River at which water would enter the setback area through the remnant levee breach for the three breach invert elevations. The results are shown in **Table 3**.

To evaluate how often and how long the levee setback area would be expected to inundate, a review was made of the historical Vernalis gage daily flow records since the completion of New Melones Dam in 1979 (this represents a period where the San Joaquin River basin operating regime has been relatively unchanged). The evaluation used the mean daily flows for the period October 1, 1978 through September 30, 2015, or Water Years 1979 through 2015. The total number of days in the evaluation period is 13,514. **Table 4** summarizes the estimated number and percent of days in the evaluation study period in which the levee setback area would flood based on the three invert elevations. Based on the historical data, the periods during which water would flow into the project breach at the three invert elevations are displayed in the figures below.

The appropriate breach elevation is under consideration and will be defined in the Final MMP. It is anticipated that the breach elevation would be set at approximately 9 or 10 feet (NAVD88). Approximately 1-2 acres of the floodplain would be set to an elevation of 14 feet (NAVD88) or below and would inundate approximately every 6 years.

Long-term Management of Floodplain Offset Area

The Final MMP will describe long-term and adaptive management strategies within the floodplain offset area. Long-term management actions for the riparian habitat area are expected to be minimal, and would be limited to regular site inspections to evaluate and address, as needed, site maintenance (e.g., trespass, vandalism, trash accumulation). In the event site conditions need to be addressed, maintenance activities would be conducted to avoid and minimize impacts to riparian vegetation and species habitat.

RAISED LANDSIDE GRADE

Directly adjacent to the landside toe of the levee in element Ib, an approximately 5-foot-deep depression was used as a borrow site to facilitate construction of the Howard Road Bridge. RD 17 would place fill within this depression to raise the landside grade.

Table 3 Estimated Flows for Inundation of the Element IVc Mitigation Site			
Breach Invert Elevation (feet, NAVD88)	Flow in San Joaquin River near Vernalis above which Mitigation Site Breach Flow Occurs (cfs)	Estimated Return Interval	Flow in San Joaquin River at Breach Location (cfs)
8	9,500	2-year	4,200
10	13,200	3- to 4-year	5,700
14	24,000	6-year	8,800
Note: cfs = cubic feet per second Source: MBK Engineers 2016			

Table 4 Estimated Total Duration of Mitigation Site Flooding for Evaluation Period of Record			
Breach Invert Elevation (feet, NAVD88)	San Joaquin River Flow at Vernalis above which Mitigation Site Breach Flow Occurs (cfs)	Number of Days Flow Equaled or Exceeded Since 10/1/1978	Percent of Days Flow Equaled or Exceeded Since 10/1/1978
8	9,500	1,619	12%
10	13,200	1,126	8.3%
14	24,000	423	3.1%
Note: cfs = cubic feet per second Source: MBK Engineers 2016			

ADDITIONAL PROJECT COMPONENTS

The following additional activities would occur as part of the Phase 3 Repair Project:

- **Levee geometry corrections:** Phase 3 Repair Project elements currently do not meet requirements for levee geometry (i.e., slopes, crown width). To correct levee geometry, levee fill material would be placed along the landside of existing levee slopes where needed to provide the minimum 3:1 slope and a minimum 20-foot-wide levee crown. All elements would undergo some level of levee geometry corrections.

- **Operations and Maintenance (O&M) access and utility corridors:** A 20-foot-wide permanent O&M access corridor[4] would be established adjacent to the landside toe of seepage berms and levees (if not already present for levees). Any relocated power poles and other utility infrastructure would be located outside this easement.

- **Temporary construction easements:** Where needed, a 20-foot-wide temporary construction easement and construction turnaround area (up to 80 feet in diameter) would be included adjacent to the inland side of the permanent O&M access corridor, to provide access to the site during construction. These features would be removed and the site(s) would be returned to pre-project conditions following completion of construction.

- **Stormwater /irrigation controls:** Drainage/irrigation swales would be constructed around the outside boundaries of levee repairs, where needed, and other stormwater best management practices (BMPs) would be implemented to manage stormwater runoff and/or irrigation during and after construction. These swales would be located so that they would not drain to/from wetlands or other waters of the U.S.

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4 The CVFPB would require that a 20-foot-wide access corridor be established. However, on a case-by-case basis, effects on woody vegetation within this corridor may be avoided in place. However, for the purposes of the analysis in this FEIS, it was assumed that any vegetation within the 20-foot-wide corridor would be removed.

- **Right-of-way acquisition:** Lands within the Phase 3 Repair Project footprint would be acquired as needed, to accommodate levee repairs (e.g., seepage berms, setback levees) and establish the minimum 20-foot-wide O&M access corridor at the landside toes of all the improved levees, to prevent encroachment. Privately owned lands would be acquired in fee preferably, but may be taken as easements if needed. Where the project footprint overlies land owned and managed by other agencies (i.e., the City of Lathrop, San Joaquin County, Union Pacific Railroad [UPRR]), either the land would have to be acquired in fee or easements would have to be obtained and secured. Real property acquisition and any relocation services, if needed (although no relocations are anticipated), would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 USC 4601 et seq.) and implementing regulation, Title 49 of CFR Part 24, and California Government Code Section 7267 et seq.

- **Haul roads:** An estimated 700,000 cubic yards of imported material (i.e., soil, aggregate, and cement) would be required to construct these levee improvements. These materials would be hauled to the work sites from commercial sources up to 11 miles away. Personnel, equipment, and imported materials would be transported to the Phase 3 Repair Project area using various surface roads that connect with Interstate 5 or State Route 120. The primary corridors where construction activity would take place would be public roadways, on and within 300 feet of the levees, existing unpaved roads used for access to work areas, and levee patrol roads atop the levee crown.

- **Landside vegetation removal:** Landside vegetation within the footprint of the proposed levee work, including maintenance roadway corridors and temporary access easements, would be cleared to prepare for levee repair work. The proposed action would involve performing limited work on the waterside of the levee above the HTL (e.g., installing riprap and degrading a portion of the levee in element IVc); however, no waterside woody or riparian vegetation would be removed; the areas where riprap would be placed and the levee degraded are characterized by ruderal land cover.

- **Encroachment management:** Several features, including power poles, vegetation, and a variety of agricultural-related facilities (e.g., irrigation infrastructure, fences), are within the Phase 3 Repair Project footprint. Utility infrastructure would be relocated as needed to accommodate the levee repairs, and any pipelines or other underground utility crossings would be replaced as needed. Other encroachments in the Phase 3 Repair Project area would be removed or relocated as required to meet the criteria of USACE, the CVFPB, and FEMA. No waterside woody or riparian vegetation would be removed; the areas where riprap would be placed and the levee degraded are characterized by ruderal land cover.

- **Long-Term Vegetation Management:** Vegetation on the levees and within the access easements would be managed in accordance with current O&M practices to maintain access and visibility. These practices include: mechanical trimming of existing trees and removal of large dead and downed trees annually, as described under “Compliance with USACE Vegetation Management Standards”; regular summer and winter application of herbicides for weed control; and summer application of herbicides to control woody plants and berries.

Proposed Schedule and Sequence of Project Construction

Construction of the Phase 3 Repair Project is scheduled to begin in 2018, and is expected to be completed by December 2019, assuming receipt of all required environmental clearances, permits, and approvals for implementation. Some related activities, such as relocating power poles, may be conducted before levee work is begun, and site restoration and demobilization could extend through spring 2020. The general levee construction window is seasonal (July 1–November 1), avoiding the period when high-water levels have the potential to occur within the San Joaquin River system. However, depending on hydrologic conditions and subject to compliance with species work windows, a work window variance that allows an extension outside the July 1–November 1 work period may be granted by the CVFPB. The CVFPB may stipulate that RD 17 has to comply with additional conditions and commitments as a component of any work window variance.

The proposed construction sequence, which would include concurrent work in several different elements to meet the project schedule, is as follows:

- **Relocation of power poles:** Power poles currently situated on the landside of the levee toe of some elements would need to be relocated to accommodate proposed drained seepage berms. To the extent feasible, power poles would be relocated beyond the toe of the new berm, outside the maintenance access easement. If placing poles on top of the seepage berms is required, either raised foundations or steel-reinforced concrete piers would be constructed to prevent the poles from affecting the seepage berms. RD 17 would oversee relocation of the power poles, in coordination with the appropriate utility and construction companies.
- **Site preparation at existing levee sites and in levee setback area:** Site preparation (i.e., clearing, grubbing, and stripping) of the levee elements would begin by clearing structures (see discussion in next bullet) and woody vegetation from the footprint of the proposed levee work and the permanent O&M access and utility corridors. Vegetation would be retained in areas adjacent to but outside the project footprint. This operation would require removal of some trees and relocation or removal of some elderberry shrubs. Large trees would be felled approximately 3 feet above ground level, with stumps temporarily left in place. Where feasible, small trees and elderberry shrubs would be relocated. Elderberry shrubs would be relocated, in accordance with the avoidance and minimization measures outlined (see "Avoidance and Minimization Measures – Valley Elderberry Longhorn Beetle" subsection of this BA). A minimal amount of belowground disturbance would occur. The clearing operation would be followed by grubbing operations to remove stumps, root balls, and any below-ground infrastructure. The area then would be disked to chop surface vegetation and mix it with near-surface organic soils. The disking operation would be followed by stripping the top 12 inches of earthen material from the landside slope of the existing levee and the footprint of the proposed seepage berms. Excess earthen materials (i.e., organic soils, and excavated material that does not meet levee embankment criteria) would be temporarily stockpiled and then would be re-spread on the surface of the new levee slopes and seepage berms, provided this material is not contaminated with vegetation. Any stripped material contaminated with vegetation and other debris generated during the clearing and grubbing operations would be hauled off-site to a suitable landfill.
- **Removal or modification of landside structures and other facilities:** In a few levee elements, agricultural facilities (e.g., fences, drainage infrastructure) or parking lots are located within the footprint of the proposed levee work. These facilities would be removed from or relocated outside the project footprint before levee construction begins in those areas. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. Demolished concrete could be sent to a concrete recycling facility. If any wells or septic systems would be affected, they would be abandoned in accordance with the applicable State and County requirements.
- **Construction of the setback levee with drained seepage berm and underlying cutoff wall:** Construction of the setback levee embankment in element IVc would begin as soon as sufficient lengths of levee foundation are prepared and weather conditions are suitable. Foundation preparation would include constructing a levee keyway that would be excavated 3–5 feet deep across the entire footprint of the proposed setback levee. A smaller but deeper excavated inspection trench, centered beneath the new waterside hinge point of the setback levee, then would be constructed beneath a small portion of the keyway to meet DWR standards. After the foundation layers are backfilled with engineered soil, a geotechnical geogrid fabric would be installed at ground level across the entire setback levee footprint. A second layer of geogrid fabric would be placed at mid-height of the new levee fill section to further reduce the potential for post-construction settlement of the new levee. The embankment would be constructed of engineered fill, with the fill placed in 3-foot-maximum lifts by motor graders. Each lift would be moisture-conditioned using water trucks and would be compacted to the specified density using a suitable compactor, such as a sheep's foot, tamping foot, or rubber-tired roller. Next, quarry stone riprap would be applied in three segments, to armor the newly completed setback levee's waterside slope and protect against erosion. Riprap would be placed on the waterside levee above the HTL in areas that are characterized by ruderal land cover (**Exhibit 12**). All waterside woodland would be avoided; all waterside trees would be avoided as well as any tree canopy that

overlaps riprap. Riprap placement would be done either by barge or by long-arm excavator from the top of the levee crown. Riprap dimensions for the three segments are: 340 feet long by 50 feet wide (0.39 acre), 140 feet long by 30 feet wide (0.096 acre), and 230 feet long by 50 feet wide (0.26 acre). A drained seepage berm then would be constructed on the landside of the setback levee. Fill material for setback levee and drained seepage berm construction would be obtained from commercial sources and would be delivered to levee construction sites using haul trucks.

- **Setback levee site restoration and demobilization:** After completion of construction, the previously stripped topsoil material would be placed on top of the completed setback levee and associated seepage berms in element IVc, and levee slopes and the tops of the seepage berms would be hydroseeded. An aggregate-base patrol road would be constructed at the landside edge of the seepage berm and setback levees and on the new setback levee crown. The existing levee would be fully restored at the tie-in points to the new setback levee. The existing levee crown patrol road would be redressed with aggregate base, to restore it to preconstruction levels. Any disturbed riprap also would be supplemented to provide a uniform layer across the connection point with the new setback levee. Immediately after final construction, the setback levee's fill slopes would be covered with erosion control material until application of the hydroseed. Any construction debris would be hauled to an appropriate off-site waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to pre-project conditions. Demobilization would be likely to occur in various locations as construction proceeds along various elements.

- **Removal of existing levee at setback levee elements, site restoration, and demobilization:** After certification of the new setback levee and seepage berm in element IVc, a 400-linear-foot-long section of the existing outboard levee (which is approximately 2,400 linear feet long in element IVc) on the downstream side of the existing oxbow would be partially degraded. The area where the levee would be degraded is characterized by ruderal land cover (**Exhibit 13b**); some landside vegetation would be removed (as accounted in the "Direct and Indirect Effects on Species in the Action Area" section of this BA), but all waterside trees and overlapping tree canopy would be avoided. Except for an approximately 20-foot-wide corridor on the top of the remnant levee that will be serve as a maintenance road to provide access to the remnant levee breach area for maintenance and flood fighting purposes, at least 9.9 acres (and up to 11.1 acres) of riparian vegetation would be established in the area between the new setback levee and the river (**Exhibit 12**) (see the "Compensation Measures" subsection of the "Avoidance and Minimization Measures" section below for additional information). This acreage would be made up of approximately 6.1 acres of restored riparian scrub habitat between the landside toe of the existing levee and the waterside toe of the new setback levee and between the river and the waterside toe of the existing levee, and approximately 5 acres of restored Great Valley oak woodland/upland refugia habitat along either side of the existing levee. These acreages would include approximately 1.2 acres of contingency, with the goal of restoring a minimum of 9.9 acres of riparian habitat. This work would be completed after flood season (from July 1 through November 1) and above the HTL, primarily using scrapers, excavators, and bulldozers to remove the levee section and all present levee encroachments.

- **Construction of drained seepage berms, drained seepage berms with chimney drains, and chimney drains within existing drained seepage berms:** Fill material for levee improvements would be obtained from commercial sources and delivered to the levee construction sites by haul trucks. The material then would be spread by motor graders and compacted by sheep's foot rollers to build new seepage berms and seepage berms with chimney drains. A water truck would be used to properly moisture-condition the soils for compaction. Installing the chimney drains in existing drained seepage berms also would require use of an excavator or scraper to remove the existing drained seepage berm fill material so that the chimney drain fill material can be tied into the drainage rock layer of the existing drained seepage berm.

- **Construction of cutoff walls:** Equipment required for cutoff wall construction would include slurry batch plants to prepare bentonite or bentonite cement mix, pumps, and support vehicles. Four to five batch plants or slurry ponds would be required for the project; these would be located near the site of cutoff wall construction. Each batch plant or slurry pond with associated pumps and support equipment would occupy an area of approximately 100 square feet that would be restored to pre-project conditions following completion of cutoff wall construction. Cutoff walls may be installed concurrently in two or more different directions within an element. RD 17 proposes to use the deep slurry mix method for installing deep cutoff walls, which would avoid the need to degrade the top of the levee, and conventional slurry trench walls (open-cut method) for shallow cutoff walls. RD 17 also would consider driving sheet piles, using a drop impact hammer or other pile-driving technology in lieu of cutoff wall installation at element VIIe. The number of cutoff wall rig setups would depend on the project schedule and contractor preference. Each deep slurry mix cutoff wall rig would move continuously along the proposed alignment, to attain an uninterrupted cutoff wall and reduce prolonged disturbance to residences near some cutoff wall segments. Each cutoff wall rig could move 50 to 100 feet horizontally during a 12-hour work shift, while each conventional slurry trench rig could move 75 to 200 feet horizontally during a 12-hour work shift. Cutoff wall construction in Elements Va and VIa.1 is anticipated to occur 24 hours a day, 7 days a week, with occasional shutdowns for equipment maintenance, when necessary. Lights and possibly power generators would be used during nighttime construction hours. Disturbances to nearby residences are expected to be minor because of the limited number of residences near these cutoff wall installation areas. However, where lights, noise, and/or vibration would exceed allowable nighttime standards for the applicable local jurisdiction, work hours would be restricted to daytime work hours.

- **Traffic control during construction:** Traffic control and detours could be required in the immediate vicinity of some levee improvements. Traffic control measures would include flaggers for one-way traffic control, advance construction signs and other public notices to alert drivers to activity in the area, and “positive guidance” detour signage on alternate access roads to reduce inconvenience to the driving public. Detours for through traffic are not likely to be required.
- **Site restoration and demobilization:** On completion of construction, previously stripped topsoil material not contaminated with vegetation would be placed on top of the completed seepage berms and any disturbed levee slopes. Any previously nonagricultural, vegetated areas disturbed during construction would be hydroseeded with a standard erosion control mix. An aggregate-base patrol road would be constructed at the landside edge of any seepage berms. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to pre-project conditions. Demobilization likely would occur in various locations as construction proceeds along various elements.

DESCRIPTION OF THE 2017 EMERGENCY RESPONSE CONSTRUCTION PROJECT ACTIONS

The 2017 Emergency Response Construction Project that was implemented in February 2017 included the construction of seepage berms and raised landside grades in several elements (see **Appendix G** for as-builts). Most of these activities were already planned under the Phase 3 Repair Project. All the seepage berms and raised landside grades that were installed for the emergency response, even those where cutoff walls will be done in the future as proposed under the Phase 3 Repair Project, would remain in place. **Table 2** summarizes, for each project element, the emergency construction actions that were implemented in 2017, as well as the remaining actions that would occur under the Phase 3 Repair Project.

All of the emergency response construction project components were included within the Phase 3 Repair Project, except for the new seepage berm that was constructed in elements Va and VIa.1. This seepage berm was evaluated in the FEIS ((USACE *in prep.)* under Alternative 2 – Maximum Footprint, but not carried over into the Preferred Alternative, which is the Phase 3 Repair Project. However, this seepage berm overlaps with the footprint for the Phase 3 Repair Project (compare **Exhibit 13b**, in **Appendix A**, to Sheets 9 and 11 of **Appendix G**).

AVOIDANCE AND MINIMIZATION MEASURES

The following avoidance and minimization measures would be implemented as a component of the Phase 3 Repair Project. The measures, where applicable, were implemented during the 2017 Emergency Response Construction Project (see "Effects Related to the 2017 Emergency Response Construction Project Actions" subsection under the "Direct and Indirect Effects on Species in the Action Area" section of this document).

GENERAL

A qualified biologist, retained by RD 17, will be on-site to ensure compliance with the avoidance and minimization measures described below, particularly where construction activities occur adjacent to sensitive habitats to be avoided.

A worker awareness training program will be conducted for construction crews before the start of construction. The program will include a brief overview of special-status species and sensitive resources (including riparian habitats) in the Phase 3 Repair Project area, measures to avoid and minimize effects on those resources, and conditions of relevant regulatory permits.

Furthermore, traffic speeds on unpaved roads will be limited to 15 miles per hour, to reduce dust emissions and minimize potential effects on listed species, such as the riparian brush rabbit.

VALLEY ELDERBERRY LONGHORN BEETLE

For elderberry shrubs that are located in the Phase 3 Repair Project area, RD 17 will implement the following avoidance and minimization measures that are described in the VELB Framework (USFWS 2017) to avoid and minimize effects on VELB:

- All elderberry shrubs that are located adjacent to construction areas but can be avoided will be protected by establishing a fenced avoidance area. The fencing will be placed at least 20 feet from the dripline of the shrubs. All elderberry shrubs to be protected during construction will be identified and marked by a qualified biologist. Orange construction barrier fencing will be placed at the edge of the respective buffer areas, and no construction activities will be permitted within the buffer zone other than those activities necessary to erect the fencing. In cases where the elderberry dripline is less than 20 feet from the work area, k-rails will be placed at the shrub's dripline to provide additional protection to the shrubs from construction equipment and activities. Temporary fences around the elderberry shrubs and, where appropriate, k-rails at shrub drip lines will be installed as the first order of work. Buffer area fences around elderberry shrubs will be inspected weekly by a qualified biologist during ground-disturbing activities, until adjacent project construction is complete or the fences are removed on approval by a qualified biologist and the resident engineer.
- No insecticides, herbicides, or other chemicals that may harm the beetle or its host plant will be used within 100 feet of elderberry shrubs.
- Elderberry shrubs that require removal will be transplanted to a USFWS-approved site during the dormant period for elderberry shrubs (i.e., November 1 to February 15) and in accordance with the VELB Framework (USFWS 2017).
- Each elderberry shrub with stems measuring 1 inch or greater in diameter at ground level that may be adversely affected (i.e., transplanted), as well as any associated riparian habitat that would be removed, will be replaced with compensatory plantings and/or the purchase of credits at a USFWS-approved conservation bank, in accordance with the VELB Framework (USFWS 2017).

Regarding provision for off-site compensatory mitigation for habitat losses, see the "Compensation Measures" subsection below.

RIPARIAN BRUSH RABBIT

The following measures will be implemented to avoid and minimize potential adverse effects on riparian brush rabbit in potential habitat within and adjacent to the Phase 3 Repair Project footprint (i.e., Great Valley cottonwood and Great Valley oak riparian forest communities):

- Potential riparian brush rabbit habitat will be identified and avoided wherever possible. The primary engineering and construction contractors will ensure, through coordination with a qualified biologist who is pre-approved by USFWS and retained by RD 17, that construction will be implemented in a manner that minimizes disturbance of such areas to the extent feasible.

- Temporary fencing will be used during construction to prevent disturbance of potential habitat adjacent to construction areas. Construction personnel, vehicles, and equipment will remain within the identified construction area. In addition, a silt fence or other suitable temporary barrier will be installed around the construction area where it borders suitable habitat for brush rabbits, to exclude brush rabbits from the construction site; this silt fence or temporary barrier either will be incorporated into the temporary fencing or will be installed as a separate fence. Temporary signage will be placed along the rabbit exclusion fence at 150-foot intervals, warning contractors to stay within the construction area. The temporary rabbit exclusion fence and associated signage will be inspected by a qualified biologist and the construction contractor each morning before the beginning of construction activities, and will be repaired and maintained as necessary. A biological monitor will inspect the fence at least once a week. The temporary rabbit exclusion fence and signage will be removed after construction activities are no longer occurring adjacent to the exclusion area.

- Where suitable habitat for riparian brush rabbit has to be removed, vegetation will be removed by hand 2 weeks before the start of construction so that no riparian brush rabbits are present in the construction area at the time of construction. A qualified biologist, retained by RD 17, will be on-site during vegetation removal. Areas of temporary habitat disturbance in the Phase 3 Repair Project area will be revegetated with native plant species and restored to pre-project conditions.

Regarding provision for on-site compensatory mitigation for habitat losses, see the “Compensation Measures” subsection below.

FEDERALLY LISTED FISH—DELTA SMELT, LONGFIN SMELT, ANADROMOUS SALMONIDS, AND GREEN STURGEON

The following measures will be implemented to avoid and minimize potential adverse effects related to lights, noise, and vibration:

- During nighttime construction, RD 17 will use shielded lighting that is directed away from the waterside levees.

- Vibratory compaction equipment will be specifically restricted on the RD 17 levees. The limited amount of compaction that would occur on landside chimney drain locations would be restricted to normal work day hours.

The following measures will be implemented to avoid and minimize potential adverse effects on water quality:

- Any work within the existing floodway (i.e., placing riprap on the waterside levee above the HTL at element IVc) of the San Joaquin River will not take place during the designated flood season (i.e., November 1 to July 1) and will not begin until evaluation of upstream conditions (e.g., reservoir storage and snowpack) indicate that inundation of these areas will be unlikely to occur during construction.

- RD 17 will comply with all local, State, and federal regulations and environmental requirements regarding turbidity-reduction measures, including the following:

  - obtaining and complying with relevant agency permits (e.g., CDFW streambed alteration agreement, Central Valley Regional Water Quality Control Board [RWQCB] Clean Water Act Section 401 certification, and Section 404 permit);

  - developing and implementing a storm water pollution prevention plan (SWPPP) that identifies specific BMPs to avoid and minimize effects on water quality during construction activities; and

  - complying with the conditions of the National Pollutant Discharge Elimination System (NPDES) general stormwater permit for construction activity.

- RD 17 will file a notice of intent with the Central Valley RWQCB to discharge stormwater associated with construction activity. Final design and construction specifications will require implementation of standard erosion, siltation, and good housekeeping BMPs. Construction contractors will be required to prepare and implement a SWPPP and comply with the conditions of the NPDES general stormwater permit for construction activity (Order No. 2009-0009-DWQ or the current permit in place at the time of construction). The SWPPP will describe the construction activities to be conducted, BMPs that will be implemented to prevent discharges of contaminated stormwater into waterways, and inspection and monitoring activities that will be conducted.

  At a minimum, the following specific BMPs will be implemented:

  - All work will be conducted according to site-specific construction plans that identify areas for clearing, grading, and revegetation so that ground disturbance is minimized.

  - Silt fences and/or straw wattles will be installed near riparian areas or existing drainages to control erosion and trap sediment and reseed cleared areas with native vegetation.

  - Maintenance will be conducted on a regular basis to ensure proper installation and function of BMPs, and during storm events, maintenance will be conducted daily.

  - BMPs that have failed (within 48 hours of an event) will be repaired and replaced immediately with sufficient devices and materials (e.g., silt fence, coir rolls, and erosion blankets), provided throughout project construction to enable immediate corrective action for failed BMPs.

  - Stockpiling of construction materials (e.g., portable equipment, vehicles, and supplies, including chemicals) will be restricted to designated construction staging areas, exclusive of any riparian, wetland, or other areas supporting waters.

  - Disturbed soils at construction areas will be stabilized before the onset of rainfall.

  - Stockpiles will be stabilized and protected from exposure to rain and potential erosion.

  The SWPPP also will specify appropriate hazardous materials handling, storage, and spill response practices to reduce the possibility of effects from use or accidental spills or releases of contaminants. Specific measures applicable to the project will include the following:

  - Compliance will be required by RD 17 contractors with all applicable State Water Resources Control Board (SWRCB) and Central Valley RWQCB standards and other applicable water quality standards.

- Strict on-site handling rules will be developed and implemented, to keep potentially contaminating construction and maintenance materials out of drainages and other waterways.
- When refueling and servicing equipment, absorbent material or drip pans will be used underneath such equipment to contain spilled fuel, oil, and other fluids; and any fluid drained from machinery will be collected in leak-proof containers and deliver to an appropriate disposal or recycling facility.
- Controlled construction staging and fueling areas will be maintained at least 100 feet away from channels or wetlands, to minimize accidental spills and runoff of contaminants in stormwater.
- Substances that can be hazardous to aquatic life will be prevented from contaminating the soil or entering watercourses.
- Spill cleanup equipment will be maintained in proper working condition. All spills will be cleaned up immediately according to the spill prevention and response plan, which will be prepared by RD 17 or its contractor or representative and will be approved by the RWQCB before the start of project groundbreaking.
- NMFS, USFWS, CDFW, and the Central Valley RWQCB will be notified immediately (within 24 hours) of any reportable spills and cleanup occurrences. All such spills, and the success of the efforts to clean them, will be recorded in post-construction compliance reports.
- A slurry spill contingency plan will be developed, which will be prepared by RD 17 or its contractor or representative before the start of project groundbreaking, to respond to a potential for bentonite slurry spill and prevent slurry from entering watercourses.
- Construction materials handled by RD 17 or its contractors will be stored and transported in a manner that minimizes potential water quality effects. Storage areas will be located away from drainages and waterways, outside the floodplain, and away from sensitive resources, and containment facilities will be used.

BMPs will be applied to meet the "maximum extent practicable" and "best conventional technology/best available technology" requirements and address compliance with water quality standards. RD 17 will implement a monitoring program during and after construction so that the Phase 3 Repair Project complies with all applicable standards and BMPs implementation is effective.

COMPENSATION MEASURES

VALLEY ELDERBERRY LONGHORN BEETLE

As described above under "Avoidance and Minimization Measures—Valley Elderberry Longhorn Beetle," compensation for effects on VELB will be provided in accordance with the VELB Framework (USFWS 2017). Elderberry shrubs that cannot be avoided will be transplanted to the levee setback area in element IVc (**Exhibit 12**). The restoration design, as outlined in the Conceptual MMP (**Appendix E**), will include elderberry seedlings and associated species plantings to compensate for the effects on VELB habitat in the Phase 3 Repair Project site. Transplanting unavoidable elderberry shrubs and planting elderberry seedlings and associated species (in an amount determined through compliance with the VELB Framework) will fully compensate for the loss of VELB habitat resulting from construction activities associated with the Phase 3 Repair Project.

Approximately a 3:1 restoration to impact mitigation ratio (for effects on riparian habitat associated with elderberry shrubs) will be accomplished in the restoration area, with approximately 9.9 acres (and up to 11.1 acres) of riparian forest and riparian scrub habitat restored. The expansion and restoration of riparian habitat in element IVc will augment the waterside riparian corridor along the San Joaquin River. This habitat creation and enhancement will fully compensate for the loss of riparian habitat associated with elderberry shrubs resulting from construction activities associated with the Phase 3 Repair Project.

Riparian Brush Rabbit

Compensation for effects on riparian brush rabbit habitat will consist of restoring natural habitats in the Phase 3 Repair Project area.

As described in more detail in the Conceptual MMP (**Appendix E)**, on-site compensation for adverse effects on riparian brush rabbit habitat will include restoration of at least 9.9 acres (and up to 11.1 acres – allowing for approximately 1.2 acres of contingency) of riparian habitat in the proposed levee setback area in element IVc. This acreage will be made up of approximately 6.1 acres of restored riparian scrub habitat between the landside toe of the existing levee and the waterside toe of the new setback levee and between the river and the waterside toe of the existing levee, and approximately 5 acres of restored Great Valley oak woodland/upland refugia habitat along either side of the existing levee. The total of amount of potential compensatory mitigation acreage would be at least 9.9 acres to achieve the compensation for riparian brush rabbit habitat.

After the new setback levee is constructed and certified in element IVc, a small 400-foot section of the existing levee will be partially degraded. Native riparian scrub vegetation will be established within the entire setback area floodplain. Species in the plant palette will be those preferred by the riparian brush rabbit for providing cover, including: California blackberry (*Rubus ursinus*), California wild rose (*Rosa californica*), sandbar willow (*Salix exigua*), coyote brush (*Baccharis pilularis*), and golden currant (*Ribes aureum*), among others. Understory vegetation will include herbaceous species that have been identified as preferred forage by the riparian brush rabbit, such as mugwort (*Artemisia douglasiana*) and gumplant (*Grindelia camporum*). To provide refugia during flood events, the old levee footprint also will be vegetated with riparian scrub and riparian woodland tree species. The upland refugia will include elderberry seedlings and associated species plantings to compensate the effects on VELB habitat in the Phase 3 Repair Project area. In addition to plantings within the setback area, waterside riparian vegetation will be enhanced with plantings in open areas.

Between 25 feet from the landside toe of the existing levee and 25 feet from the waterside toe of the new setback levee are approximately 4 acres of ruderal grassland that can be restored as riparian scrub habitat (**Exhibit 12**). Approximately 2 additional acres of riparian scrub habitat will be restored and/or enhanced between the waterside toe of the existing levee and the river. The restored riparian scrub habitat will consist of willows, cottonwoods, valley oaks, wild rose, California blackberry, and grasses, which is comparable to the composition of habitats where riparian brush rabbit is documented to occur along the RD 17 levees. Apart from a 400-foot section along the north side, the existing levee will remain in place and approximately 5 acres of Great Valley oak woodland will be established along either side of it, thus providing upland refugia for the riparian brush rabbit during high-water events.

Approximately a 3:1 restoration to impact mitigation ratio (for effects on potential riparian brush rabbit habitat) will be accomplished in the restoration area, with approximately 9.9 acres (and up to 11.1 acres) of riparian brush rabbit habitat restored. The expansion and restoration of riparian habitat in element IVc will augment the waterside riparian corridor along the San Joaquin River and will provide additional riparian habitat for the riparian brush rabbit between two known occurrences of this species (i.e., between elements IIIa/IIIb and elements VIa.1/VIa.4 [CDFW 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004]). The restoration area will be contiguous with existing waterside riparian habitat along element IVc; this waterside riparian habitat along element IVc extends northward through elements IVa, IIIa, and IIIb, and southward through elements Va and VIa.1. Documented occurrences exist of riparian brush rabbit in the waterside riparian habitat in elements IIIa and IIIb, and north of element IIIa and south of element VIa.1; therefore, reestablishing and protecting riparian habitat in element IVc will provide expanded and connected habitat for this species. This habitat creation and enhancement will fully compensate for the loss of habitat for riparian brush rabbit resulting from construction activities associated with the Phase 3 Repair Project.

MITIGATION AND MONITORING PLAN

A Conceptual MMP has been prepared to describe the expansion and restoration of riparian habitat in element IVc (**Appendix E**). Specifically, this plan:

- describes specifications for the restoration of habitat components, including details about the restoration of riparian habitats, with a list of the plant species and drawings/designs to show the location of the plant species and planting density;
- establishes specific success criteria for the habitat components, including:
  - performance standards to determine whether the habitat improvement was trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in design or maintenance revisions);
  - monitoring and maintenance protocols; and
  - measurable goals to ensure vegetation survival to provide and replace riparian habitats;
- specifies remedial measures to be undertaken if success criteria are not met (e.g., adaptive management, physical adjustments, additional monitoring); and
- describes short and long-term management and maintenance of the habitat lands.

The Conceptual MMP is intended to be developed into a Final MMP, in coordination with USFWS, NMFS, and USACE, and would be reviewed and approved by USFWS and NMFS before ground-breaking in the portions of the Phase 3 Repair Project area that could affect the species addressed in this BA. RD 17 would provide conservation of the restored riparian habitat in the levee setback area in element IVc. The compensation habitat ultimately would be transferred to a suitable land management organization, for long-term management and monitoring. This habitat creation and enhancement would fully compensate for the loss of habitat for VELB and riparian brush rabbit resulting from construction activities associated with the Phase 3 Repair Project.

ACTION AREA

The action area is defined in accordance with ESA guidelines as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action” (50 CFR 402.02). The action area includes all areas that would be directly or indirectly affected by the components of the Phase 3 Repair Project and the 2017 Emergency Response Construction Project.

Areas downstream from the Phase 3 Repair Project area also may be indirectly affected by the flood risk management component of the project, through improved water quality and flood risk management conditions. The extent of this potential effect is difficult to quantify, however, for element IVc; construction of a setback levee and breaching a small downstream portion of the existing levee would be expected to create a backwater effect and would not result in a substantial widening of the flood plain. An analysis also was conducted to evaluate the hydraulic effects of the setback levee at element IVc. This hydraulic analysis showed that the proposed action would essentially have no effect on the maximum water surface elevation, with a computed maximum increase in the water surface elevation of 0.0007 feet, and maximum flow rate changes would be negligible during extreme events (100-year flood recurrence interval). Because far afield project-related hydrologic effects are not likely to occur, the action area is concluded to be in the immediate vicinity of the actual project boundaries.

ENVIRONMENTAL BASELINE

HYDROLOGY

SACRAMENTO–SAN JOAQUIN DELTA

The Delta extends inland from the confluence of the Sacramento and San Joaquin rivers west of Antioch to Sacramento on the Sacramento River and to near Mossdale on the San Joaquin River. The Phase 3 Repair Project area is in the southeastern portion of the Delta, within the legal boundary of the Delta as defined by Section 12220 of the California Water Code.

The legal Delta encompasses an area of approximately 851,000 acres (of which approximately 135,000 acres consist of waterway, marshland, or other water surfaces). The Delta is divided into a Primary Zone and a Secondary Zone, as defined by the Delta Protection Act of 1992. Land uses in the Primary Zone are regulated to protect the area for agriculture, wildlife habitat, and recreational uses. The Secondary Zone is the area outside the Primary Zone and within the legal Delta. Where urban development activities occur in the Secondary Zone, efforts should be taken to ensure that these activities do not adversely affect Delta waters, Primary Zone habitat, or recreational uses. The San Joaquin River delineates the boundary between the Primary Zone to the west and the Secondary Zone to the east. The Phase 3 Repair Project is located in the Secondary Zone.

The Sacramento River contributes roughly 75 to 80 percent of the Delta inflow in most years, and the San Joaquin River contributes about 10 to 15 percent; the Mokelumne, Cosumnes, and Calaveras rivers, which flow into the eastern side of the Delta, contribute the remainder. The rivers flow through the Delta and into Suisun Bay, San Pablo Bay, San Francisco Bay, and the Pacific Ocean. Historical annual Delta inflow averaged approximately 23 million acre-feet (MAF) between 1945 and 1995, with a minimum inflow of approximately 6 MAF in 1977 and a maximum of approximately 70 MAF in 1983. Water flowing into the Delta is used for urban and agricultural use, recreation, navigation, and wildlife and fisheries. The Delta provides drinking water for about 23 million Californians.

Freshwater inflows to the Delta vary greatly, depending on precipitation, snowmelt, and Central Valley Project (CVP) and State Water Project (SWP) water operations. During the summer months, most inflow to the Delta comes from regulated releases from SWP and CVP reservoirs. Both projects also withdraw large volumes of water from the Delta for agricultural and urban use. Precipitation in the project region occurs primarily from November through March, with the average annual precipitation ranging from about 8 inches near Tracy to approximately 17 inches near Lodi. Near Lathrop, the annual precipitation is approximately 12 inches.

Water movement in the Delta responds to four primary forcing mechanisms:

- freshwater inflows to the ocean;
- Delta exports and upstream diversions;
- operation of water control facilities such as dams, export pumps, and flow barriers; and
- the regular tidal movement of seawater into and out of the Delta.

In addition, winds and salinity behavior in the Delta can generate secondary currents that, despite being of low velocity, can be of considerable significance with respect to transporting contaminants and mixing different sources of water. Changes in flow patterns in the Delta, whether caused by export pumping, winds, atmospheric pressure, flow barriers, tidal variations, inflows, or local diversions, can influence water quality at drinking water intakes.

The Delta is a hydrologically complex region of interlacing channels, marshland, and islands. The Delta has been reclaimed into more than 60 islands and tracts, interlaced with about 700 miles of waterways. Some channels are edged with aquatic and riparian vegetation, but most are bordered by steep banks of earth or riprapped levees. Vegetation generally is removed from channel margins to increase flood flow capacity and facilitate levee maintenance. About 520,000 acres are devoted to farming. An approximately 1,100-mile network of levees protects the reclaimed land, most of which lies near or below sea level, from flooding. Some of the island interiors are as much as 25 feet below sea level.

Nearly 16.5 miles of the 19 miles of levees protecting RD 17 are considered federal project levees; the 2.6-mile dryland levee is not a federal levee. Federal project levees either were constructed by the federal government (typically through USACE) or were built by others and later brought under federal jurisdiction.

San Joaquin River

The San Joaquin River originates in the Sierra Nevada and enters the San Joaquin Valley at Friant Dam. Most of the flow in the lower San Joaquin River is derived from inflow from the Merced, Tuolumne, and Stanislaus rivers (Northeastern San Joaquin County Groundwater Banking Authority 2004). The 330-mile-long San Joaquin River, which drains a watershed area of 13,540 square miles from the Sierra Nevada to the Delta, contributes approximately 15 percent of the inflow to the Delta (Delta Protection Commission 2000). Flowing through portions of Fresno, Madera, Merced, Stanislaus, San Joaquin, Sacramento, and Contra Costa counties, the river has flows ranging from 1,500 cfs in dry years to more than 40,000 cfs in wet years (Friant Water Users Authority and Natural Resources Defense Council 2002).

Hydrologic conditions in the San Joaquin River basin are dominated by snowmelt from the Sierra Nevada. Before major water storage projects were completed on the San Joaquin River and its major tributaries, lower San Joaquin River flows generally peaked in late spring/early summer and dropped to low levels in the fall. Since completion of Friant Dam (1944), McClure Reservoir (1967 on the Merced River), Don Pedro Reservoir (1971 on the Tuolumne River), and New Melones Reservoir (1979 on the Stanislaus River), the lower San Joaquin River's seasonal flow pattern has changed substantially. Before 1944, based on 1923–1944 records, flow in the lower San Joaquin River tended to peak in May and June, with an average monthly flow of almost 11,000 cfs, and declined rapidly to an average monthly flow of approximately 1,200–1,300 cfs in August and September. Since 1979, the average monthly flow has peaked in March at just over 10,000 cfs, with a more gradual decline to approximately 2,400 cfs in August. In addition, the San Joaquin River is tidally influenced by the Delta and the San Francisco Bay. Tidal fluctuation in the San Joaquin River has been modeled to approximately the Vernalis tide gauge and the Airport Way crossing of the San Joaquin River, which is approximately 13 river miles upstream from the project site.

The SJRRP was established in late 2006, to implement the Stipulation of Settlement in *NRDC et al. v. Kirk Rodgers et al*. (Settlement). Authorization for implementing the Settlement is provided in the San Joaquin River Restoration Settlement Act, included in PL 111-11. The goal of the SJRRP is to re-operate and increase the release of water from Friant Dam in accordance with the Settlement, and in a manner consistent with federal, State, and local laws, and future agreements with downstream agencies, entities, and landowners (Reclamation and DWR 2011). The Settlement establishes two primary goals:

- *Restoration Goal*—To restore and maintain fish populations in "good condition" in the mainstem San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish. To achieve the Restoration Goal, the Settlement calls for releases of water from Friant Dam to the confluence of the Merced River (referred to as Interim and Restoration Flows), a combination of channel and structural modifications along the San Joaquin River below Friant Dam, and reintroduction of Chinook salmon.

- *Water Management Goal*—To reduce or avoid adverse water supply impacts on all of the Friant Division long-term contractors that may result from the Interim and Restoration Flows provided for in the Settlement. To achieve the Water Management Goal, the Settlement calls for recirculation, recapture, reuse, exchange, or transfer of the Interim and Restoration Flows to reduce or avoid impacts on water deliveries to all of the Friant Division long-term contractors caused by the Interim and Restoration Flows.

The SJRRP is to release Interim and Restoration Flows to the San Joaquin River from Friant Dam in accordance with the flow schedule presented in Exhibit B of the Settlement. The Settlement establishes the Recovered Water Account and recovered-water program, which make water available to all Friant Division long-term contractors who provide water to meet Interim or Restoration Flows so that the impacts of Interim and Restoration Flows on such contractors can be reduced or avoided.

LOCAL DRAINAGE

Stormwater runoff in the RD 17 area commonly is collected in agricultural ditches, channels, municipal stormwater sewers, or human-made ponds before being pumped to the San Joaquin River. Runoff from the area east of the San Joaquin River, along levee elements Ie and VIIb, is directed west through agricultural swales and ditches, and then is pumped into the river by means of private agricultural pumps. Runoff from developed lands adjacent to elements IVa, IVc, and VIa.4 is directed to the City of Lathrop's storm drainage system, held in detention basins, and ultimately pumped into the San Joaquin River through a municipal stormwater outfall. Runoff in the area around element VIIe, which encompasses the Oakwood Lake development, first flows into the artificial lake in the center of the development, and then is pumped into the river if lake levels become too high.

WATER QUALITY

Water quality in the Delta and portions of the San Joaquin River are heavily influenced by CVP and SWP operations. Generally, Delta water quality is best during the winter and spring months and poorer during the irrigation season and early fall. Water quality in the San Joaquin River is influenced by factors such as rain and snowmelt runoff, reservoir operations, and irrigation return flows in the San Joaquin river basin. Agricultural return flows commonly discharge elevated salt loads into the San Joaquin River. The SWRCB has set flow and water quality objectives at Vernalis, located just upstream from the Phase 3 Repair Project area. To meet the Vernalis objective, the U.S. Bureau of Reclamation supplements flows on the San Joaquin River with releases from New Melones Reservoir on the Stanislaus River (Northeastern San Joaquin County Groundwater Banking Authority 2004).

The latest version of the Section 303(d) list for California issued by the SWRCB (approved October 26, 2006) identifies an impaired status for waterways in the eastern Delta, including the lower San Joaquin River. Potential sources of pollution for all of the listed constituents in the basin include agriculture, urban runoff/storm sewers, resource extraction, and unknown sources. The eastern Delta, including the lower San Joaquin River, is on the Section 303(d) list for impairment from boron, chlorpyrifos, diazinon, dichlorodiphenyltrichloroethane, electrical conductivity, unknown toxicity, Group A pesticides, exotic species, and mercury. Downstream from the Phase 3 Repair Project area, the Stockton Deep Water Ship Channel is being addressed by a total maximum daily load (TMDL) plan for dissolved oxygen and is no longer on the Section 303(d) list. TMDLs have been initiated for organophosphorus pesticides (i.e., diazinon and chlorpyrifos), salinity and boron, and selenium in the lower San Joaquin River watershed and for total dissolved solids and mercury in Delta channels. TMDLs for the other listed pollutants are scheduled to be developed at various times over the next 10 years, in accordance with the priorities contained in the Section 303(d) list.

Major monitoring programs for the San Joaquin River include DWR's Municipal Water Quality Investigations Program and Water Rights Decision 1485 Water Quality Monitoring Program. The City of Stockton also monitors ambient water quality to assess potential effects of discharges from the Stockton Regional Wastewater Control Facility. Data are collected at five water quality monitoring sites along the San Joaquin River near the Phase 3

Repair Project area. The Mossdale Bridge sampling site at the Interstate 5 crossing over the San Joaquin River is near elements VIcde and VIIb. The Vernalis sampling site is located near the town of Vernalis, just upstream from the Phase 3 Repair Project area. Some of the broad categories that are monitored are discussed briefly below.

HABITAT

Dense riparian forests once flanked the San Joaquin River in this area. In contrast, the habitat today consists of linear areas and occasional remnant patches of riparian forests and related riparian scrub that grow on or adjacent to the levee, primarily on the waterside. A few larger areas of these riparian forests are present where the river turns away from the levee and creates a point bar and an upland floodplain area. Riprap or large boulders cover the lower half of most of the waterside of the San Joaquin River east levee in the Phase 3 Repair Project area, and ruderal vegetation grows in open areas, especially upslope from the riprap and on large open areas on the landside of the levee. Other areas of levee on the waterside are barren and/or covered with stumps and dead vegetation, likely because of levee maintenance that has included cutting scrub and low vegetation, burning, and applying herbicide. Some of the lands on the waterside of the levee are privately held and are affected by grazing and other landowner activities.

The landside reaches of the Phase 3 Repair Project area levees primarily are barren or covered with ruderal vegetation. Beyond the base of the levees, riparian vegetation is rare but occasionally is present in small, isolated patches. Other trees include occasional single or isolated stands of native oaks and nonnative trees that have been planted around farms, agricultural fields, and residential or other types of development. Habitat and land cover types present in the Phase 3 Repair Project area include riparian forests, nonnative woodlands, agricultural lands, ruderal and developed areas, and aquatic features (including marsh, wetlands, and ponds) (**Exhibits 13a** through **13c**).

VEGETATION AND LAND COVER

As described below, terrestrial vegetation and land cover types in the Phase 3 Repair Project area and vicinity include Great Valley cottonwood riparian forest (remnant), Great Valley oak riparian forest (remnant), nonnative woodland, agricultural (row crops, orchards, dirt roads, and irrigation ditches), and ruderal and developed (residential housing, parks, boat launch facilities, and roads).

- **Great Valley cottonwood riparian forest:** Remnant patches of Great Valley cottonwood riparian forest in the Phase 3 Repair Project area are dominated by large Fremont cottonwood (*Populus fremontii*) trees and Goodding's willow (*Salix gooddingii*). Most of the otherwise linear or smaller patchy areas of this community lack Fremont cottonwood and are represented by Goodding's willow, red willow (*S. laevigata*), arroyo willow (*S. lasiolepis*), narrow leaved-willow (*S. exigua*), scattered valley oak (*Quercus lobata*), Oregon ash (*Fraxinus* latifolia), and buttonbush (*Cephalanthus occidentalis*). Native ground cover species, found mainly in the larger remnant patches of riparian forest, include California blackberry (*Rubus ursinus*) and wild rose (*Rosa californica*). Common nonnative understory species found in most elements include Himalayan blackberry (*Rubus discolor*) and tree tobacco (*Nicotina glauca*). Most of the Great Valley cottonwood riparian forest community also could be characterized as Great Valley riparian scrub, which does not include Fremont cottonwood and is characterized by a shorter canopy and more uniform structure. This habitat, however, is part of the Great Valley cottonwood riparian forest that was extensive and connected along this entire reach of the San Joaquin River. Therefore, this BA describes all riparian habitat as such. The largest stands of Fremont cottonwood trees in the Phase 3 Repair Project area are present in elements IIIb, IVc, Va, and VIa.1.
- **Great Valley oak riparian forest:** Great Valley oak riparian forest is located in the Phase 3 Repair Project area, occurring only on the landside of the levees. This is a medium to tall (rarely to 100 feet), broadleaved, winter deciduous, closed-canopy riparian forest dominated by valley oak. Understories include scattered Northern California black walnut (*Juglans nigra*) and western sycamore (*Platanus racemosa*) as well as young valley oaks. Understory plants include California rose (*Rosa californica*), blackberry (*Rubus* spp.), and

western poison oak (*Toxicodendron diversilobum*) (Hickman 1993; Holland 1986). Two substantial oak groves of very large, healthy valley oak trees are present on the landside of elements IIIb and IVa and account for most of the Great Valley oak riparian forest. Several groups of smaller valley oak trees and individual valley oaks, scattered along the landside of other Phase 3 Repair Project elements, also contribute to this community.

- **Nonnative woodland:** Along the landside of elements Ie, VIa.1, VIde, and VIIg, nonnative trees have been planted around farms, agricultural fields, and residential or other types of development. These woodlands lack understory vegetation, other than grasses and ruderal vegetation.
- **Agricultural cropland:** Cropland in the Phase 3 Repair Project area is dominated by alfalfa fields, orchards, and row crops, such as tomatoes. Ruderal species grow along the edges of fields and irrigation ditches, some of which contain water and associated aquatic plants. The largest areas of agricultural lands are present in elements Va, VIa.1, and VIcde.
- **Ruderal vegetation:** Ruderal vegetation is characterized by nonnative weedy and sometimes invasive vegetation and nonnative annual grasses. Common weed species include yellow star-thistle (*Centaurea solstitialis*), black mustard (*Brassica nigra*), shortpod mustard (*Hirschfeldia incana*), Italian thistle (*Carduus pycnocephalus*), milk thistle (*Silybum marianum*), and Himalayan blackberry. Common grass species include ripgut brome (*Bromus diandrus*), foxtail barley (*Hordeum murinum* ssp. *leporinum*), Bermuda grass (*Cynodon dactylon*), and Johnsongrass (*Sorghum halepense*). The levee slopes are dominated by ruderal vegetation. Large open areas in elements IIIa and IVc also are composed primarily of ruderal vegetation, as are smaller open areas in elements VIcde and VIIe that border roads, parking lots, and agricultural land.
- **Developed areas:** Developed areas in the Phase 3 Repair Project area consist of residential areas bordering elements IVa, IVc, Va and VIa.1, and VIIe; parks located in elements IVc and VIa.2, the latter of which is also a boat launching facility; and ranch houses and related facilities located in or adjacent to elements Ie, IIab, Va, VIa.1, and dryland levee element XI. Vegetation in residential areas and parks consists of turf grasses, landscape trees, and occasional valley oak trees. Ranch lands often contain English walnut trees (*Juglans regia*), a variety of landscaped trees, and occasional native valley oak trees.

AQUATIC HABITATS

The principal surface water bodies associated with the Phase 3 Repair Project area are the San Joaquin River and Walthall Slough. Project elements Ia through IVc are located downstream from the confluence of the San Joaquin River and Old River. Reach V is located directly adjacent to this confluence. Elements VIa.1 through VIIe are upstream from the confluence of the San Joaquin River and Old River. Small portions of elements VIIe and VIIg are located along Walthall Slough. An approximately 3.5-acre constructed pond is located adjacent to elements IIab, but outside the project footprint (**Exhibit 13a**).

In the Phase 3 Repair Project area, the San Joaquin River is characterized as a wide channel (approximately 300 feet) with little riparian canopy or overhead vegetation and minimal bank cover. Aquatic habitat in the San Joaquin River is characterized primarily by slow-moving glides and pools, is depositional in nature, and has limited water clarity and habitat diversity. Altered flow regimes, flood risk management, and bank protection efforts along much of the San Joaquin River have reduced riparian vegetation and associated shaded riverine aquatic (SRA) habitat, sediment transport, channel migration and avulsion, and large woody debris recruitment, and have isolated the channel from its floodplain. This has resulted in a decline in habitat quality for fish species using the San Joaquin River near the Phase 3 Repair Project area. However, fish use this segment of the river, even if only as a migratory pathway to and from upstream spawning and rearing areas.

Wetland vegetation in the Phase 3 Repair Project area is limited to coastal and valley freshwater marshes, several agricultural ditches, and the edges of one constructed pond. Freshwater marsh is isolated in a depression on the landside of the levee in element Ib between Howard Road to the north and a dirt farm road on the south. A limited

amount of freshwater marsh also is present around the edges of a constructed pond, located on a large private estate and equestrian center, east of the Phase 3 Repair Project area levee in element IIab. A second area of freshwater marsh is located just outside the Phase 3 Repair Project area in element Va, and in an area of backwater on the San Joaquin River. Agricultural ditches are located along the edges of fields and orchards.

FISH POPULATIONS

The lower San Joaquin River and Delta serve as a migration corridor and/or provide other types of habitat (e.g., rearing, spawning) for steelhead, delta smelt, white sturgeon (*Acipenser transmontanus*), and green sturgeon. Numerous other resident native and nonnative species also are found in the San Joaquin River. Among the native species present in the river are blackfish (*Orthodon microlepidotus*), threespine stickleback (*Gasterosteus aculeatus*), and San Joaquin roach (*Lavinia symmetricus* sp.); while nonnative species include striped bass (*Morone saxatilis*), white catfish (*Ameiurus catus*), and bluegill (*Lepomis macrochirus*). In late 2014, experimental populations of spring-run Chinook salmon began to be reintroduced to the San Joaquin River, as a component of the SJRRP (see "San Joaquin River" subsection above).

The small, unnamed pond in elements IIab (**Exhibit 13a**) may contain fish and other aquatic species. Because of its isolated nature and size, this pond likely supports only nonnative warm-water fish that probably have been introduced. Typical fish that are found in similar ponds include bluegill, western mosquitofish (*Gambusia affinis*), and catfish (*Ameiurus* or *Ictalurus* spp.), among other nonnative warm-water species.

WILDLIFE

Common wildlife species expected in the Phase 3 Repair Project area are those typically associated with agriculture (e.g., alfalfa, row crops, and orchards) and ruderal habitat, which account for 57 percent of the Phase 3 Repair Project area's footprint. Species include California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), western harvest mouse (*Reithrodontomys megalotis*), and California meadow vole (*Microtus californicus*). These small mammals are prey for a variety of raptor species known to occur in the area, including Swainson's hawk (*Buteo swainsoni*). Riparian habitats in the Phase 3 Repair Project area provide nesting habitat for a wide variety of bird species.

SPECIES ACCOUNTS

This section presents species accounts for the federally listed species considered in this BA, including relevant life history and habitat use, as well as the species' potential for occurrence in the action area. The action area (see the "Action Area" section above) encompasses the entire area that may be affected by the Phase 3 Repair Project, including more distant locations where indirect effects may occur. However, the species accounts below focus on the habitat present in the Phase 3 Repair Project area itself and describe the potential for federally listed species to occur in the general vicinity. Only when the habitat quality or species distribution is specifically known for the action area is it described.

VALLEY ELDERBERRY LONGHORN BEETLE

VELB has four life stages: egg, larva, pupa, and adult. This species, which is federally listed as threatened, is nearly always found on or close to its host plant, the elderberry (*Sambucus* sp.). Females lay their eggs on the bark, and larvae hatch and burrow into the stems. The larval stage can last 2 years, after which the larvae enter the pupal stage and transform into adults. Adults are active (feeding and mating) from March to June (USFWS 2006). It appears that to function as VELB habitat, host elderberry shrubs must have stems that are 1.0 inch or greater in diameter at ground level. Use of the plants by the beetle rarely is apparent. Frequently, the only exterior evidence of the shrub's use by the beetle is an oval exit hole, created by the larva just before the pupal stage. Field studies conducted along the Cosumnes River and in the Folsom Lake area suggest that larval galleries can be found in elderberry stems with no evidence of exit holes, because the larvae either succumb before constructing an exit hole or are not far enough along in the developmental process to construct an exit hole (USFWS 1996a).

VELB is patchily distributed throughout the remaining riparian forests of the Central Valley, from Redding to Bakersfield, and appears to be only locally common (i.e., found in population clusters that are not evenly distributed across the Central Valley). Extensive loss of Central Valley riparian forests has occurred since 1900, with riparian forests declining by 80 to 96 percent, depending on the region (USFWS 2006). Although it is wide-ranging, VELB is thought to have suffered a long-term decline because of human activities that have caused widespread alteration and fragmentation of riparian habitats and, to a lesser extent, upland habitats that support the beetle. Low density and limited dispersal capability may cause the beetle to be particularly vulnerable to population isolation because of habitat fragmentation. Insecticide and herbicide use in agricultural areas and along road rights-of-way may be factors limiting the beetle's distribution. The age and quality of individual elderberry shrubs/trees and stands as a food plant for beetle may be a factor in its limited distribution.

Elderberry shrubs are known to occur along the San Joaquin River, on both the waterside and landside of levees in the Phase 3 Repair Project area. Focused surveys for elderberry shrubs were conducted along all levee reaches on March 8, 2011; the area was resurveyed on January 29, 2014. A total of 18 elderberry shrubs were observed within 100 feet of the Phase 3 Repair Project area: nine shrubs on the waterside of the levee and nine shrubs on the landside. None of the shrubs had evidence of beetle exit holes. One of the landside shrubs does not have stems greater than 1 inch in diameter at ground level; therefore, it is not considered suitable VELB habitat. See **Exhibit 14** for locations of the elderberry shrubs that were observed within 100 feet of the Phase 3 Repair Project area during field surveys in 2014.

CRITICAL HABITAT

Critical habitat for VELB was designated at the time of listing. Two areas along the American River in the Sacramento metropolitan area were designated as critical habitat for this species. The Phase 3 Repair Project area is not located within designated critical habitat for VELB.

RECOVERY PLAN FOR VALLEY ELDERBERRY LONGHORN BEETLE

The Recovery Plan for Valley Elderberry Longhorn Beetle (USFWS 1984) lacks specific goals and does not include objective, measurable recovery criteria (USFWS 2006). The recovery plan identified additional essential habitat for this species in an area along Putah Creek, Solano County, and an area along the American River Parkway, Sacramento County. USFWS released a 5-year status review for VELB on October 2, 2006 (USFWS 2006). This review reported an increase in known beetle locations, from 10 at the time of listing in 1980 to 190 in 2006. Because of the presumed increase in the estimated population and the concurrent protection and restoration of several thousand acres of riparian habitat suitable for VELB, USFWS's status review determined that this species is no longer in danger of extinction and recommended that the species no longer be listed under the ESA. On October 2, 2012, the USFWS issued a proposed rule to delist VELB (78 FR 66058); however, on September 17, 2014, the USFWS withdrew this proposal, stating that the scientific information and analysis reflected in the October 2012 proposal was not strong enough to support a decision to delist the species (79 FR 55874).

RIPARIAN BRUSH RABBIT

Riparian brush rabbit, which is federally listed as endangered, inhabits riparian communities in the northern San Joaquin Valley that are dominated by thickets of willows and large clumps of shrubs and vines, such as wild rose, blackberries, coyote bush, and wild grape. Historically, riparian brush rabbit inhabited dense, brushy areas of valley riparian forests, marked by extensive thickets of wild rose, blackberries, and willows (Sandoval et al. 2006).

Suitable habitat for riparian brush rabbit is characterized by an abundance of woody ground litter, mats of low-growing vines and shrubs, and areas of higher ground not subject to regular or heavy flooding (Sandoval et al. 2006). On a seasonal basis, it also may use dense, tall stands of herbaceous plants adjacent to patches of riparian shrubs (Williams and Hamilton 2002). It tends to avoid large openings in the understory cover, frequenting only small clearings in the vegetation while foraging (USFWS 1998). An essential component of habitat for riparian brush rabbit is high-ground refugia from flooding, which provides protection from predators and dry habitat during prolonged rainstorms (USFWS 1998).

The only known populations of riparian brush rabbit are confined to Caswell Memorial State Park on the Stanislaus River in Stanislaus County, approximately 10 miles southeast of the Phase 3 Repair Project area, and in the South Delta along the San Joaquin River and overflow channels (Williams and Hamilton 2002; Williams et al. 2002; Lloyd and Williams 2003; Vincent-Williams et al. 2004; CDFW 2014) (**Exhibit 15**). The population in the South Delta is found in Paradise Cut along the rights-of-way of the two railroads that cross Paradise Cut and Tom Paine Slough, and in an oxbow on the San Joaquin River near Mossdale Landing (CDFW 2014). Riparian brush rabbits also have been found along the San Joaquin River north of the oxbow population, in waterside riparian habitat near the Phase 3 Repair Project area adjacent to elements IIIa and IIIb, between elements IIab and IIIa, and between elements VIa.1, and VIa.4 (CDFW 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004) (**Exhibit 15**). Other historical habitats along the San Joaquin River and tributaries are believed to no longer be suitable for riparian brush rabbits because of irrigated agriculture, livestock grazing, and impoundment and channelization of streams. High-ground refugia also may be lacking in these areas (Williams and Hamilton 2002).

In Paradise Cut, existing habitat for riparian brush rabbits is confined to levee bases, the channel banks of Paradise Cut, and pockets of low ground along the bottom of Paradise Cut. Generally, areas of suitable habitat in these locations are very narrow (15 to 100 feet wide). Most of the channels in Paradise Cut are in effect dead-end sloughs fed by Old River, with large portions containing water year-round, which results in the isolation of some upland areas (i.e., islands). The existing habitat for rabbits is covered in water on average once every 4 years, when flood flows in the San Joaquin River are sufficient to overtop Paradise Weir. Brush rabbits probably use the UPRR right-of-way as high-ground refugia during flooding events (Williams and Hamilton 2002).

Occupied habitat for riparian brush rabbit is documented adjacent to the Phase 3 Repair Project area along the waterside levee in elements IIIa and IIIb, between elements IIab and IIIa, and between elements VIa.1, and VIa.4. The waterside habitat along elements IIIa and IIIb is dominated by willow within interspersed California blackberry and grasses. The waterside habitat between elements IIab and IIIa is dominated by willows, cottonwoods, valley oaks, wild rose, and California and Himalayan blackberry. The waterside habitat between elements VIa.1 and VIa.4 is on an oxbow with dense riparian vegetation. Other patches of riparian vegetation along the San Joaquin River and adjacent to Phase 3 Repair Project area levees, such as the Great Valley cottonwood forest and Great Valley oak riparian forest communities shown in **Exhibits 13a** through **13c**, provide potentially suitable habitat for riparian brush rabbit, including the small areas of riparian habitat that are present on the waterside of Phase 3 Repair Project area elements IIab, IVc, and Va.

Riparian brush rabbit forages along the edges of shrub cover and in small clearings in the vegetation cover rather than in large openings. It feeds on herbaceous vegetation, such as grasses, sedges, clover, forbs, and buds, bark, and leaves of woody plants (Sandoval et al. 2006; USFWS 1998). This species has a small home range and mainly remains hidden under protective shrub cover, seldom venturing more than 1 meter (3.3 feet) from cover (Sandoval et al. 2006). North of elements IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the UPRR tracks (i.e., elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species.

Critical Habitat

Critical habitat has not been designated for riparian brush rabbit.

Recovery Plan for Riparian Brush Rabbit

The Recovery Plan for Upland Species of the San Joaquin Valley, California addresses the riparian brush rabbit (USFWS 1998). At the time the recovery plan was prepared, only the Caswell Memorial State Park population was known to exist. One of the most important conservation actions identified in the plan was establishment of other viable populations within the park's range. The recovery plan recommended the following actions (USFWS 1998):

- Initiate a reintroduction program that includes researching genetic diversity among remaining individuals.
- Implement a captive breeding program to translocate individuals to new populations.
- Establish at least three additional wild populations in the San Joaquin Valley in restored and expanded suitable habitat within the rabbit's historical range.

In 1999, the Endangered Species Recovery Program began implementing the Controlled Propagation and Reintroduction Plan for the Riparian Brush Rabbit (Williams et al. 2002), which was recommended in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998). The primary goal of the program is to prevent extinction by providing animals for reintroduction to establish new populations or augment existing populations. In July 2002, captive-bred rabbits were released at the San Luis National Wildlife Refuge, near Los Banos in the central San Joaquin Valley, and in 2005, a population of captive-bred rabbits was introduced to a private ranch along the San Joaquin River in Stanislaus County, adjacent to the San Joaquin River National Wildlife Refuge (USFWS 2007). This effort is ongoing.

DELTA SMELT

Delta smelt was formally listed as threatened under the ESA on March 5, 1993 (59 FR 440). On December 19, 1994 (59 FR 65256), USWFS designated critical habitat. Delta smelt is found only from Suisun Bay upstream through the Sacramento–San Joaquin estuary in Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties.

Delta smelt is endemic to the upper Sacramento–San Joaquin River estuary and occurs primarily in open surface waters of Suisun Bay, in the Sacramento River downstream from Isleton, and in the San Joaquin River downstream from Mossdale (Bennett 2005), including the project area. Its historic range is thought to have extended from Suisun Bay upstream to at least the city of Sacramento on the Sacramento River and Mossdale on the San Joaquin River. Delta smelt historically was one of the most common pelagic fish (fish living in open water away from the bottom) in the upper Sacramento–San Joaquin estuary (USFWS 2004). The delta smelt population generally is concentrated in the estuary west of the confluence of the Sacramento and San Joaquin rivers in high-outflow years and in the north Delta in low-outflow years (Sweetnam 1997, 1998; Bennett 2005). Delta outflow determines the location of the salinity gradient and may strongly influence delta smelt distribution. USFWS data indicate that delta smelt is found in the San Francisco Bay/Sacramento–San Joaquin Delta (Bay-Delta) estuary where salinity generally is less than two parts per thousand. Except when spawning in freshwater, delta smelt most frequently is caught in or is slightly upstream from the entrapment zone (Bennett 2005). In the CDFW Delta-wide 20mm delta smelt survey, delta smelt larvae were observed only occasionally and in very low abundance in the vicinity of the project area (less than four larvae in 10,000 cubic meters as sampled on April 4, 2014). The species was not observed in the project vicinity in 2015 or 2016, during the delta smelt monitoring program that occurs from January through March.

CRITICAL HABITAT

Although the Phase 3 Repair Project area is near the upper limit of the known distribution of delta smelt, it is included in the area designated as critical habitat for the species (Critical Habitat Determination for the Delta Smelt, 59 FR 65256, December 19, 1994). In the critical-habitat designation, USFWS identified the following primary constituent elements essential to conservation of delta smelt: physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration (59 FR 65256). The primary constituent elements are organized by habitat conditions required for each life stage. USFWS has identified specific areas in the Delta for spawning habitat, larval and juvenile transport, and adult migration for delta smelt. The Phase 3 Repair Project area and larger action area include places identified for larval and juvenile transport and adult migration, but do not include specific areas important for delta smelt spawning habitat (59 FR 65256).

RECOVERY PLAN FOR DELTA SMELT

The Sacramento–San Joaquin Delta Native Fishes Recovery Plan includes restoration of abundance and distribution of delta smelt (USFWS 1996b). Action items in the recovery plan for delta smelt refer to four zones in the Delta. Sampling stations within these zones were chosen to measure restoration because they have a record of delta smelt catches and are sampled consistently. These zones do not include any portion of the Phase 3 Repair Project area or action area.

LONGFIN SMELT

On April 2, 2012, the USFWS issued its finding that the longfin smelt warranted protection under the ESA, and added it as a candidate species for protection under the ESA (77 FR 19755). Longfin smelt is found in bay, estuarine, and nearshore coastal environments from San Francisco Bay north to Lake Earl near the Oregon border. The southernmost detection of the species was a single fish from Monterey Bay (Eschmeyer et al. 1983), although

spawning has not been documented south of San Francisco Bay. The San Francisco estuary and the Delta support the largest longfin smelt population in California. Longfin smelt is more broadly distributed throughout the Bay-Delta estuary and is found in water with higher salinities than delta smelt. Longfin smelt most often is concentrated in Suisun Bay, San Pablo Bay, and northern San Francisco Bay during nonspawning periods (Moyle 2002). No fish surveys have been conducted by RD 17 within the river stretch adjacent to the Phase 3 Repair Project area; however, CDFW's Delta-wide sampling program, including the 20mm delta smelt survey, longfin smelt larva survey, summer tow net survey, and spring Kodiak Trawl sampling, occurs in the vicinity of this area. Longfin smelt has a short life span, generally reaching maturity at 2 years of age, when it spawns and then dies. During the second year of life, adults tend to inhabit the higher salinity western portion of the estuary system; they occasionally have been found in nearshore ocean surveys (Rosenfield and Baxter 2007). Adults spend their lives in bays, estuaries, and nearshore coastal areas, and migrate into low-salinity or freshwater reaches of coastal rivers and tributary streams to spawn. Spawning occurs in the lower portions of the Sacramento and San Joaquin rivers and adjacent sloughs, typically between November and June, with peak spawning occurring from February through April (Baxter 1999; DWR 2009; Moyle 2002; Wang 1986). On the San Joaquin River, spawning occurs downstream from Medford Island, approximately 20 miles downstream from the project site (Moyle 2002). Locations and movements of all life stages of longfin smelt are influenced by a wide range of hydrologic and environmental variables (Rosenfield 2010), all of which show high variation among and within years; accordingly, temporal and spatial distributions of longfin smelt show high variation among and within years.

CRITICAL HABITAT

Because the longfin smelt has not been listed, no critical habitat has been designated.

RECOVERY PLAN FOR LONGFIN SMELT

The Sacramento–San Joaquin Delta Native Fishes Recovery Plan includes restoration of abundance and distribution of longfin smelt (USFWS 1996b). Action items in the recovery plan for longfin smelt refer to five zones in the Delta. Sampling stations within these zones were chosen to measure restoration because they have a record of longfin smelt catches and are sampled consistently. These zones do not include any portion of the Phase 3 Repair Project area or action area.

CENTRAL VALLEY STEELHEAD DISTINCT POPULATION SEGMENT

On March 19, 1998, NMFS listed the Central Valley steelhead DPS as threatened (63 FR 13347). Central Valley steelhead DPS is considered to be winter-run steelhead (McEwan and Jackson 1996). In the most recent 5-year review of the listing of this species, NMFS recommended that the Central Valley steelhead DPS should remain classified as a threatened species (NMFS 2011a). Findings of the next 5-year status review for all federally listed anadromous salmonids in the Central Valley are anticipated to be published in 2016. Like other anadromous salmonid species, this one matures in the ocean before entering freshwater on its spawning migrations. The major factor influencing steelhead populations in the San Joaquin River system is loss of habitat caused by construction of impassable dams on the mainstem and major tributaries.

Historically, Central Valley steelhead was found throughout the Sacramento and San Joaquin drainages, where waterways were accessible to migrating fish. Steelhead historically was present in the upper San Joaquin River basin, upstream from the current location of Friant Dam. Steelhead commonly migrated far up tributaries and into headwater streams where cool, well-oxygenated waters were present year-round.

Currently, in the Central Valley, viable populations of naturally produced steelhead are found only in the Sacramento River and its tributaries. Wild steelhead populations appear to be restricted to tributaries of the Sacramento River below Keswick Dam, such as Antelope, Deer, and Mill Creeks, and to the Yuba River below Englebright Dam (McEwan and Jackson 1996). No significant populations of steelhead remain in the San Joaquin

River basin; however, small persistent runs still occur on the Stanislaus and Tuolumne rivers, and perhaps the Merced River (McEwan and Jackson 1996).

Juvenile steelhead rear throughout the year and may spend 1 to 3 years in freshwater before emigrating to the ocean. Smoltification, the physiological adaptation that juvenile salmonids undergo to tolerate saline waters, occurs in juveniles as they begin their downstream migration. Smolting steelhead (age class 1+ and older) generally emigrate from March to June (Barnhart 1986; Reynolds et al. 1993).

The San Joaquin River near the Phase 3 Repair Project area is used by adult and juvenile steelhead primarily as a migration corridor between the ocean and cold-water habitat in the upstream tributaries. Juvenile steelhead would be likely to use the edges of rivers and sloughs, and floodplain habitats, if available, for rearing as they emigrate (Moyle 2002).

Critical Habitat

Critical habitat for the Central Valley steelhead DPS was designated on August 12, 2005; a final designation was published on September 2, 2005 (70 FR 52604), with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins. The Phase 3 Repair Project area is located within designated critical habitat for the Central Valley steelhead DPS.

Recovery Plan for Central Valley Steelhead Distinct Population Segment

A recovery plan for the ESUs of Sacramento River winter-run Chinook salmon, the Central Valley spring-run Chinook salmon, and the DPS of Central Valley steelhead was prepared by NMFS in July 2014 (NMFS 2014b). The draft plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives. Although habitat conditions for Central Valley steelhead have improved slightly over the past decade, access to historic habitat generally remains blocked, and the quality of the species' remaining habitat generally remains degraded (Lindley et al. 2009; Cummins et al. 2008).

SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

The Sacramento River winter-run Chinook salmon was formally listed as threatened in November 1990 (55 FR 46515), and was reclassified as endangered under the ESA on January 4, 1994 (59 FR 440).

In the Delta, winter-run adults begin to move through the system in early winter (November–December), with the first upstream adult migrants appearing in the upper Sacramento River during late December (Vogel and Marine 1991, cited in NMFS 2003). Adult winter-run presence in the upper Sacramento River system peaks in March. The timing of migration may vary somewhat because of changes in river flows, dam operations, and water year type. Spawning occurs primarily from mid-April to mid-August, with peak activity occurring in May and June in the river reach between Keswick Dam and the Red Bluff Diversion Dam (Vogel and Marine 1991, cited in NMFS 2003).

Juvenile winter-run Chinook salmon occur in the Delta from October through early May, based on data collected from trawls, beach seines, and salvage records at State and federal water projects (DFG 1998). The peak of juvenile arrivals is between January and March. Juveniles tend to rear in the freshwater upper Delta areas for about the first 2 months (Kjelson et al. 1981, 1982). As they mature, winter-run Chinook fry and fingerlings prefer to rear farther downstream, where ambient salinity is up to 1.5 to 2.5 parts per thousand (Healey 1980, 1982; Levings et al. 1986). Fry remain in the estuary until they reach a fork length of about 118 millimeters (i.e., at 5 to 10 months of age). Emigration from the Delta may begin as early as November and continue through May (Fisher 1994; Myers et al. 1998).

With the exception of occasional strays, adult winter-run Chinook salmon generally do not occur in the San Joaquin River or in this portion of the Delta, and therefore, do not occur in the action area. The same is true for juvenile winter-run Chinook salmon.

Critical Habitat

Critical habitat for the winter-run Chinook salmon ESU was designated by NMFS on June 16, 1993 (58 FR 33212), with an effective date of July 16, 1993. Critical habitat is designated to include the Sacramento River from Keswick Dam (River Mile 302) to Chipps Island (River Mile 0) and all waters westward, including San Francisco Bay north of the Bay Bridge to the Golden Gate Bridge. The proposed action is not within designated critical habitat.

Essential Fish Habitat

EFH for Chinook salmon, which includes Sacramento River winter-run Chinook salmon ESU (NMFS 2014a), has been identified in the project and action areas. See the "Essential Fish Habitat" section of this BA.

Recovery Plan for Sacramento River Winter-Run Chinook Salmon Evolutionarily Significant Unit

A recovery plan for the ESUs of Sacramento River winter-run Chinook salmon, the Central Valley spring-run Chinook salmon, and the DPS of Central Valley steelhead was prepared by NMFS in July 2014 (NMFS 2014b). The draft plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives. In essence, improvement in the status of winter-run Chinook salmon ESU depends on re-establishment of an alternate population in a historically used area (e.g., Battle Creek) (Williams et al. 2011). Improvement of spring-run Chinook salmon ESU is dependent on improving habitat conditions in spawning and rearing areas (Williams et al. 2011). Fish passage projects also are of primary importance in improving the status of this ESU (NMFS 2014b).

Recovery goals and restoration actions for Sacramento River winter-run Chinook salmon ESU are described by Williams et al. (2011) for the Sacramento River basin, including re-establishment of a population in a historically used area (e.g., Battle Creek) and fish passage improvement projects. Recovery goals do not, however, apply to the action area, because reintroduction of winter-run Chinook salmon is not planned for the San Joaquin River Basin.

CENTRAL VALLEY SPRING-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

NMFS listed Central Valley spring-run Chinook salmon as threatened on September 16, 1999 (50 FR 50394).

Central Valley spring-run Chinook salmon historically was the most abundant run of Central Valley Chinook salmon (Fisher 1994). It occupied the headwaters of all major river systems in the Central Valley, where no natural barriers existed. Adults returning to spawn ascended the tributaries to the upper Sacramento River, including the Pit, McCloud, and Little Sacramento rivers. They also occupied Cottonwood, Battle, Antelope, Mill, Deer, Stony, Big Chico, and Butte creeks and the Feather, Yuba, American, Mokelumne, Stanislaus, Tuolumne, Merced, San Joaquin, and Kings rivers. Spring-run Chinook salmon migrated farther into headwater streams, where cool, well-oxygenated water was available year-round.

Surveys indicate that populations of remnant, non-sustaining spring-run Chinook salmon may be found in Cottonwood, Battle, Antelope, and Big Chico creeks (DWR 1997); more sizable, consistent runs of naturally produced fish are found only in Mill, Deer, and Butte creeks (Williams et al. 2011). All these creeks are tributaries in the Sacramento River basin. The Feather River Fish Hatchery sustains the spring-run population on the Feather River, but the genetic integrity of that run is questionable (DWR 1997). Although all of these populations are found in the Sacramento River basin, the ESU boundary of Central Valley spring-run Chinook salmon includes populations spawning in the Sacramento River and San Joaquin River basins, as reflected in the current 5-year status review (Williams et al. 2011; NMFS 2011b). The status of Central Valley spring-run Chinook salmon ESU likely has not improved since the 2005 status review (Williams et al. 2011). Improvement of spring-run Chinook salmon ESU is dependent on improving habitat conditions in spawning and rearing areas (Williams et al. 2011). Fish passage projects also are of primary importance in improving the status of this ESU (NMFS 2014a). Current and future efforts to restore production in the San Joaquin River are either being planned or are just beginning, and no results about their current efficacy are available.

Like winter-run Chinook salmon, adult spring-run Chinook salmon (other than occasional strays) generally have not occurred in the San Joaquin River basin, and therefore, do not occur in the action area. The same is true for juvenile spring-run Chinook salmon.

Critical Habitat

Critical habitat for the Central Valley spring-run Chinook salmon was designated on August 12, 2005; a final designation was published on September 2, 2005, with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include selected waters in the Sacramento River basin from approximately Redding (River Mile 302) to approximately Chipps Island (River Mile 0) at the westward margin of the Delta and includes the Sacramento River. The Phase 3 Repair Project area is located outside the species' designated critical habitat.

Essential Fish Habitat

EFH for Chinook salmon, which includes Central Valley spring-run Chinook salmon ESU (NMFS 2014a), has been identified in the project and action areas. See the "Essential Fish Habitat" section of this BA.

Recovery Plan for Central Valley Spring-Run Chinook Salmon Evolutionarily Significant Unit

A recovery plan for the ESUs of Sacramento River winter-run Chinook salmon, the Central Valley spring-run Chinook salmon, and the DPS of Central Valley steelhead was prepared by NMFS in July 2014 (NMFS 2014b). The draft plan describes key threats and identifies recovery strategies and actions to achieve goals and objectives. Recovery goals and restoration actions are outlined for the Sacramento River basin and do not apply to the action area.

As discussed above in the "San Joaquin River" subsection of the "Environmental Baseline" section, one of the goals of the SJRRP is "to restore and maintain fish populations in 'good condition' in the mainstem San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish" (Reclamation and DWR 2011). The Settlement stipulates reintroduction of spring-run and fall-run Chinook salmon, with a priority given to restoring self-sustaining populations of wild spring-run Chinook salmon.

NORTH AMERICAN GREEN STURGEON DISTINCT POPULATION SEGMENT

On April 7, 2006, NMFS listed the Southern DPS of the North American green sturgeon as threatened under the ESA. In North America, green sturgeon is found from Ensenada, Mexico to southeast Alaska. The Southern DPS includes individual reproductive populations south of the Eel River. The populations north of the Eel River, grouped as the Northern DPS, currently do not warrant listing.

Green sturgeon is found in the lower reaches of large rivers, including the Sacramento–San Joaquin River basin, and in the Eel, Mad, Klamath, and Smith rivers. Green sturgeon adults and juveniles are found throughout the upper Sacramento River, as indicated by observations incidental to winter-run Chinook monitoring at Red Bluff Diversion Dam in Tehama County (Poytress et al. 2013; NMFS 2005). Green sturgeon spawns predominantly in the upper Sacramento River and is found primarily in the mainstem Sacramento River.

The green sturgeon is a primitive, bottom-dwelling fish, characterized by its large size (up to 7 feet long and 350 pounds), with a long, round body and “scutes” or plates along its dorsal and lateral sides. It is known to migrate up to 600 miles between freshwater and salt water environments and commercially is caught in the Columbia River and coastal Washington (PFMC 2003). Like all sturgeon species, it is anadromous, but it also is the most marine-oriented of the sturgeon species (NMFS 2005). It spends most of its life in salt water and returns to spawn in freshwater. Individuals congregate in the bays of these systems in summer, while some may travel upstream to spawn in spring and summer. Adult Southern DPS green sturgeon enter San Francisco Bay in late winter through early spring and spawn from April through early July, depending on water flow and temperature (Heublein et al. 2009).

The Southern DPS of the North American green sturgeon is slow growing and late maturing, reaching sexual maturity at about 15 years, at a length of about 5 feet, and typically spawning every 3 to 4 years (NMFS 2015). Green sturgeon spawning has been documented only in the Klamath, Sacramento, and Rogue rivers during recent times (NMFS 2005), although a spawning event was documented in 2011 in the lower Feather River at the Thermalito Afterbay Outlet (Seesholtz et al. 2014). Green sturgeon spawning in the San Joaquin River is not documented, as reported in the 5-year species status review for the Southern DPS of the North American green sturgeon (NMFS 2015).

Green sturgeon populations in the Southern DPS have relatively small population sizes, potentially have lethal temperature limits, face entrainment by water projects and influences of toxic material and exotic species, and may be susceptible to catastrophic events. Impassable barriers to spawning grounds are an additional threat. Preliminary Southern DPS population size estimates are being provided from Dual Frequency Identification Sonar surveys of aggregating sites in the upper Sacramento River; surveys conducted between 2010 and 2014 indicated an annual range of 164 to 526 spawning adults (personal communication with Ethan Mora, UC Davis, March 30, 2015, reported in NMFS 2015). Based on an estimate of mean spawning periodicity, as many as 1,348 ± 524 adults are estimated in the Southern DPS (personal communication with Ethan Mora, UC Davis, May 6, 2015, reported in NMFS 2015).

Green sturgeon may occur in the San Joaquin River between Stockton and the Highway 140 bridge (IEP 2013), including in the Phase 3 Repair Project area, although no evidence exists of historical use of the San Joaquin River by green sturgeon (BRT 2005; Beamesderfer et al. 2007). No documentation is known for green sturgeon spawning in the San Joaquin River, but spawning may have occurred before construction of large-scale hydropower and irrigation development (Mora et al. 2009). White sturgeon persist in the San Joaquin River at population levels of 10 percent of Sacramento River population levels. Young green sturgeon have been taken occasionally in the Santa Clara Shoal area in the Delta, but these fish likely originated in the Sacramento River (NMFS 2005).

Critical Habitat

Critical habitat for Southern DPS of North American green sturgeon was designated on October 9, 2009 (74 FR 52300). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins, including the segment of the San Joaquin River in the action area.

Recovery Plan for North American Green Sturgeon Distinct Population Segment

A recovery plan has not been developed for green sturgeon, but the Federal Recovery Outline for the Southern DPS of the North American green sturgeon is available (NMFS 2010).

DIRECT AND INDIRECT EFFECTS ON SPECIES IN THE ACTION AREA

Under the ESA, direct effects are those that are caused by the project and occur at the same time as the action (e.g., construction-related effects). Indirect effects are those that are caused by the proposed action and are later in time but are reasonably certain to occur and there is a causal relationship with the action (e.g., operational effects). In other words, there is a logical, unbroken, traceable, explainable, predictable, chain of effects that results in, or "causes" a given effect on listed species. Avoidance and minimization measures for both direct and indirect effects are presented in the "Avoidance and Minimization Measures" section above. This section includes an evaluation of direct and indirect effects related to both the Phase 3 Repair Project (see "Effects Related to the Phase 3 Repair Project Actions" subsection) and the 2017 Emergency Response Construction Project (see "Effects Related to the 2017 Emergency Response Construction Project Actions" subsection).

EFFECTS RELATED TO THE PHASE 3 REPAIR PROJECT ACTIONS

VALLEY ELDERBERRY LONGHORN BEETLE

No known documented occurrences exist of VELB in the Phase 3 Repair Project area, but the species could use elderberry shrubs in the action area. Elderberry shrubs that could support beetles are sparsely scattered throughout the action area, along both the waterside and landside of the San Joaquin River levee.

Eighteen elderberry shrubs are present in or adjacent to the footprint of the Phase 3 Repair Project. The nine elderberry shrubs located along the waterside of the Phase 3 Repair Project levees would be avoided and protected during construction (see "Avoidance and Minimization Measures—Valley Elderberry Longhorn Beetle"). The nine elderberry shrubs located along the landside of the levee would require removal to accommodate construction of the Phase 3 Repair Project's seepage berms, cutoff walls, and setback levee (**Exhibit 14**). However, one of these landside shrubs does not have stems greater than 1 inch in diameter at ground level; therefore, it is not considered suitable VELB habitat.

The eight elderberry shrubs on the landside of the levee that have stems that are greater than 1 inch in diameter at ground level do not have evidence of beetle exit holes. These shrubs would require removal during construction of the Phase 3 Repair Project, resulting in direct effects on VELB. If the stems are occupied by beetles, any early-stage individuals are likely to be killed when the shrub is removed. Complete loss of the shrubs to be removed should be avoided by transplanting during the shrubs' dormant season; however, transplanted elderberry shrubs can experience stress or health problems because of changes in soil, hydrology, microclimate, or associated vegetation, and mortality of transplanted shrubs would preclude their future use by the beetle. Removing shrubs in which larvae are present could result in larvae mortality if the health of the shrubs is adversely affected; alternately, adverse effects on elderberry shrubs could have an overall effect on the beetle, even if larvae are absent at the time of impact, if the shrubs are relied on for reproduction.

The Phase 3 Repair Project would result in the removal of approximately 3.03 acres of riparian habitat (i.e., Great Valley cottonwood riparian forest and Great Valley oak riparian forest) associated with elderberry shrubs within elements IIIa, IIIb, IVa, Va, and VIa.1. Although some of the elderberry shrubs in these elements would not be removed, the removal of the associated riparian habitat could adversely affect the VELB metapopulation in this area by increasing the distance between occupied and unoccupied patches of habitat, and decreasing the likelihood of successful colonization of unoccupied habitat as a result of habitat fragmentation.

The eight elderberry shrubs that cannot be avoided would be transplanted to the levee setback area in element IVc (**Exhibit 12**). The restoration design, as outlined in the Conceptual MMP (**Appendix E**), would include elderberry seedlings and associated species plantings to compensate for the effects to VELB habitat in the Phase 3 Repair Project area. The Phase 3 Repair Project would include restoration of at least 9.9 acres of riparian forest and riparian scrub habitat in the setback area at element IVc (**Exhibit 12**). The expansion and restoration of riparian habitat in element IVc would augment the waterside riparian corridor along the San Joaquin River. The restored riparian scrub habitat (up to 6.1 acres) would consist of willows, cottonwoods, valley oaks, wild rose, California blackberry, and grasses, comparable to the composition of existing habitats along the RD 17 levees. Apart from a 400-foot section along the north side, the existing levee would remain in place, and up to 5 acres of Great Valley oak woodland would be established along either side of it, thus providing an area above high-water events that is more ideal for elderberry shrubs. The restoration of approximately 9.9 acres (and up to 11.1 acres) of riparian forest and scrub habitat would achieve a 3:1 restoration to impact mitigation ratio (for effects on elderberry shrubs and associated habitat).

It can take 5 or more years for replacement elderberry plantings to reach a size conducive to use as VELB habitat. Therefore, a temporary loss of habitat available to the beetle would occur. The Phase 3 Repair Project would comply with avoidance and minimization measures described for VELB and would compensate for removal of these stems, in accordance with the VELB Framework (USFWS 2017), through the establishment of up to 9.9 acres of riparian forest and riparian scrub habitat. A net reduction in the number of elderberry shrubs would be avoided by transplanting the 8 elderberry shrubs.

After construction of the Phase 3 Repair Project, RD 17 would continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which would include trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up to 5 feet above the ground (or 12 feet above the crown road). Trees only would be trimmed, not removed, under these practices. Therefore, no change would occur in the number of elderberry shrubs along the RD 17 levees.

Riparian Brush Rabbit

As shown in **Table 5**, the Phase 3 Repair Project levee improvements would result in the removal of 3.31 acres of landside riparian habitat—specifically Great Valley cottonwood riparian forest and Great Valley oak riparian forest—that is suitable for riparian brush rabbit. This riparian habitat is located on the landside of the levee, where levee improvements (e.g., chimney drains, seepage berms) would be constructed. In general, most of the landside riparian vegetation is sparse and lacks understory vegetation other than grasses and ruderal vegetation, which would act as cover for riparian brush rabbit and would not be suitable for this species (Hansen, pers. comm., 2011). However, potential exists for some of these landside woody habitats to support suitable habitat for riparian brush rabbit, particularly because they are located adjacent to waterside riparian habitats that either are known to be occupied by this species or are highly suitable habitat. All landside riparian habitat is considered to be suitable where it is adjacent to waterside riparian habitat that is known to be occupied or highly suitable for riparian brush rabbit (i.e., elements IIab through element VIe). North of elements IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the UPRR tracks (i.e., elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species. No waterside woody or riparian habitat would be removed because of levee improvement activities.

Nearly 54 acres of ruderal annual grassland also would be affected by Phase 3 Repair Project implementation. All effects on ruderal annual grassland that would result from levee improvements are assumed to be temporary because annual grassland would be reestablished in these areas after project completion. Although riparian brush rabbit may use annual grassland as a source for foraging habitat, the key component of habitat suitability for this species in the Phase 3 Repair Project area is based on the presence of riparian woody vegetation and not the surrounding grasslands. Riparian brush rabbit forages along the edges of shrub cover and in small clearings in the vegetation cover, rather than in large openings, feeding on herbaceous vegetation, such as grasses, sedges, clover, forbs, buds, bark, and leaves of woody plants (Sandoval et al. 2006; USFWS 1998). Furthermore, because this species is known to have a small home range and seldom ventures more than 1 meter (3.3 feet) from cover (Sandoval et al. 2006), the riparian brush rabbit likely uses only a small component of the grassland, and its use of such habitat is concentrated along the edges of the riparian areas.

Table 5
Effects of Implementing the Phase 3 Repair Project on Suitable Riparian Brush Rabbit Habitats

	Acres of Directly Affected Suitable Habitat
Waterside woodlands[1]	0.00
Landside woodlands[1,2]	3.31
Total	**3.31**[3]

Notes:
[1] Suitable riparian brush rabbit habitats are characterized as Great Valley cottonwood riparian forest and Great Valley oak riparian forest.
[2] Most of the landside riparian vegetation is sparse and lacks understory and is not suitable for this species (Hansen, pers. comm., 2011). However, any landside riparian habitat is considered to be suitable where it is adjacent to waterside riparian habitat that is known to be occupied by or highly suitable for riparian brush rabbit (i.e., elements IIab through elements VIe). North of elements IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the Union Pacific Railroad tracks (i.e., elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species.
[3] Of this, 1.61 acres were removed in elements IIIb, IVa, Va, VIa.1, and VIbcde during implementation of 2017 Emergency Response Construction Project in April 2017.
Source: Data compiled by AECOM in 2014; Updated by GEI Consultants, Inc. 2017

RD 17's ongoing practice for vegetation encroachment management is limited to trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up 5 feet above the ground or 12 feet above the crown road. Thus, trees and shrubs are only trimmed, not removed, because of this maintenance practice. Thus, RD 17's long-term management of vegetation encroachments on the landside and waterside of the levee is not expected to result in reduction or change to existing riparian habitat. The amount of waterside woodlands outside the project footprint but located along the waterside of the levee to 15 feet out from the waterside levee toe of the project levee reaches is approximately 6.87 acres; none of this vegetation would be removed because of Phase 3 Repair Project construction or future vegetation management practices. The amount of landside woodlands outside the project footprint but located along the landside of the levee to 15 feet out from the landside levee toe is approximately 5.92 acres; some of this would be removed because of Phase 3 Repair Project construction (3.31 acres; see **Table 5**), but none would be removed because of future vegetation management activities.

The loss of potential riparian brush rabbit habitat in the Phase 3 Repair Project area could restrict the range of this species because the RD 17 area currently contains the northernmost known extent of the population on the San Joaquin River. It also could isolate other populations residing in residual habitats in the project vicinity. However, the proposed conservation measures (see the "Avoidance and Minimization Measures" section above) would minimize direct loss of riparian habitat in conjunction with compensation for adverse effects. Implementing such measures is anticipated to avoid a net reduction in the number of riparian brush rabbit and its associated habitat. The Phase 3 Repair Project would include restoration of at least 9.9 acres of riparian scrub habitat and upland refugia in the setback area at element IVc (**Exhibit 12**). The expansion and restoration of riparian habitat in element IVc would augment the waterside riparian corridor along the San Joaquin River and would provide additional riparian habitat opportunities for the riparian brush rabbit between two known occurrences of this species (i.e., between elements IIIa/IIIb and elements VIa.1/VIa.4 [CDFW 2014; Lloyd and Williams 2003; Vincent-Williams et al. 2004]). The restored riparian scrub habitat (up to 6.1 acres) would consist of willows, cottonwoods, valley oaks, wild rose, California blackberry, and grasses, comparable to the composition of habitats where riparian brush rabbit is documented to occur along the RD 17 levees. Apart from a 400-foot section along the north side, the existing levee would remain in place, and up to 5 acres of Great Valley oak woodland would be established along either side of it, thus providing upland refugia for the riparian brush rabbit during high-water events. The restoration of approximately 9.9 acres (and up to 11.1 acres) of suitable habitat for riparian brush rabbit would achieve a 3:1 restoration to impact mitigation ratio (for effects on potential riparian brush rabbit habitat).

FEDERALLY LISTED FISH SPECIES

Fish species/ESUs addressed in this BA would likely use similar habitat in the action area. Therefore, the direct and indirect effects on delta smelt, longfin smelt, Central Valley steelhead, and green sturgeon are discussed together. Effects on Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon, which are unlikely to occur in the action area but may occasionally occur as strays, would be similar.

TEMPORARY CONSTRUCTION-RELATED EFFECTS

The Phase 3 Repair Project would include constructing several cutoff walls, which would entail degrading the top one-third to one-half of the levee, beginning with a 1:1 cut at the waterside crown. Implementing cutoff walls as part of the Phase 3 Repair Project would disturb soils along the top of the levee, which could enter the San Joaquin River through wind and water erosion. Soil disturbed during construction of seepage berms and other features on the landside of the levee could enter drainage ditches and ultimately could be pumped into the San Joaquin River. Therefore, erosion could temporarily increase turbidity and sedimentation in nearby waterways if soils are transported in river flows or stormwater runoff. Waters (1995) evaluated the effects of turbidity and siltation in waterways at various exposure levels. Prolonged exposure to high levels of suspended sediment could create a loss of visual capability in fish, leading to a reduction in feeding and growth rates, and to a thickening of the gill epithelia, which may cause the loss of respiratory function; clogging and abrasion of gill filaments; and increases in stress levels, reducing the tolerance of fish to disease and toxicants (Waters 1995). Also, high levels of suspended sediments could cause the movement and redistribution of fish populations or other aquatic organisms, and could affect physical habitat (Waters 1995). Sediment loading could interfere with photosynthesis of aquatic flora and displace aquatic fauna. Many fish and other aquatic species are sight feeders, and turbid waters would reduce the ability of these fish to locate and feed on prey. Some fish, particularly juveniles, could become disoriented and leave areas where their main food sources are located, ultimately reducing their growth rates. Increased turbidity and sedimentation cause fish to avoid an area, thus reducing available habitat. Fish will not occupy areas unsuitable for survival unless they have no other option. Therefore, construction-related erosion could result in elevated river turbidity in critical species-specific and life stage-specific habitats, potentially precluding a species from occupying that habitat. In addition, the potential would exist for contaminants (such as bentonite slurry, fuels, oils, and other products used in construction) to be introduced into the waterway directly or through surface runoff. Contaminants may be toxic to fish, or may alter oxygen diffusion rates and cause acute and chronic toxicity to aquatic organisms, thereby reducing growth and survival.

The construction of some cutoff walls, specifically those in Elements Va and VIa.1, is anticipated to occur 24 hours a day, 7 days a week, with occasional shutdowns for equipment maintenance, when necessary. Artificial lighting on the river has the potential to disrupt fish behaviors and increase predation risk. However, lights used during nighttime construction hours would be shielded and directed away from the waterside levees; therefore, adverse effects to fish as a result of nighttime lighting would be avoided.

Low frequency vibration from construction equipment has the potential to result in adverse effects to fish behaviors, even when ground disturbance and construction activities are located well away from the water's edge. Vibratory compaction equipment will be specifically restricted on the RD 17 levees, and the limited amount of compaction that would occur on landside chimney drain locations – specifically at Elements Ia and VIIg – would be restricted to normal work day hours, outside of sunrise and sunset hours in order to avoid peak foraging and migration timing. Therefore, adverse effects to fish as a result of vibration from construction equipment would be avoided and minimized.

Through implementation of the lighting and vibration measures, water quality BMPs, including a SWPPP, and BMPs for slurry management and a slurry spill contingency plan, the proposed conservation measures (see the

"Avoidance and Minimization Measures" section in this BA) would avoid direct and indirect take of fish during construction. The Phase 3 Repair Project would not be expected to have an effect on the overall continued existence and survival of these species.

PERMANENT CONSTRUCTION-RELATED EFFECTS

Most waterside woodlands in the Phase 3 Repair Project area are assumed to provide SRA habitat functions. Apart from the placement of 0.64 acre of riprap above the HTL along the waterside levee along 740 linear feet at element IVc, the Phase 3 Repair Project would not include performing any work on the waterside of the levee, and no waterside woodlands or SRA habitat would be removed. Therefore, construction-related effects on the habitats of federally listed fish species would be limited to minor disturbance of the waterside levee at three locations that are above the HTL and characterized by ruderal vegetation.

RD 17 would continue its ongoing practice for managing vegetation encroachments on the landside and waterside of the levee, which would include trimming trees within the levee prism on the landside and waterside slopes, and within 15 feet of the landside and waterside toes, from the ground up to 5 feet above the ground (or 12 feet above the crown road). Because vegetation management would be limited to trimming trees, no trees would be removed; thus, no change would occur in the amount of waterside habitat that would be directly affected and removed because of future vegetation management activities.

The amount of waterside woodlands outside the project footprint but located along the waterside of the levee to 15 feet out from the waterside levee toe of the project levee reaches is approximately 6.87 acres; none of this vegetation would be removed because of construction or future vegetation management practices. The amount of landside woodlands outside the project footprint but located along the landside of the levee to 15 feet out from the landside levee toe is approximately 5.92 acres; some of this would be removed because of Phase 3 Repair Project construction (3.31 acres; see **Table 5**) but none would be removed because of future vegetation management activities.

Because all Phase 3 Repair Project construction activities would occur above the HTL and no SRA habitat would be removed during Phase 3 Repair Project construction or future vegetation management activities, the Phase 3 Repair Project would not result in adverse effects on Central Valley steelhead, Delta smelt, longfin smelt, Sacramento River winter-run and Central Valley fall- and spring-run Chinook salmon, or green sturgeon.

BENEFITS OF PROJECT ACTIONS TO REARING SALMONIDS

The construction of a 1,100-foot-long setback levee with cutoff wall and seepage berm on a major oxbow of the San Joaquin River (see **Table 2**) would directly benefit fish resources. A Conceptual MMP has been prepared to describe the planned expansion and restoration of riparian habitat that would occur in element IVc (**Appendix E**). This riparian habitat is designed to primarily benefit the riparian brush rabbit; however, this habitat would be secondarily beneficial to fish species.

Approximately 0.64 acre (740 linear feet) of riprap would be installed on the waterside of the existing levee (above the HTL), where it would intersect the setback levee. After the setback levee is completed, 400 linear feet of the existing levee above the HTL on the downstream side of the oxbow would be degraded, reconnecting approximately 8 acres of floodplain to the river. That floodplain area would be graded to allow complete drainage of the floodplain to the river through the downstream opening in the remnant levee, as river flows recede. This would minimize the possibility of fish stranding. The other major benefit to fish resources would be the creation of approximately 8 acres of floodplain rearing habitat for juvenile salmonids, in particular, but also to other native fishes. The seasonal nature of inundation, along with complete drainage, would preclude establishment in the floodplain of predatory, non-native fishes. As stated in "Setback Levee with Seepage Berm and Underlying Cutoff Wall" subsection of the "Description of the Proposed Action" section, the Conceptual MMP (**Appendix E**) describes a framework for long-term and adaptive management strategies within the floodplain offset area. Long-term management actions for the riparian habitat area are expected to be minimal. In the event that maintenance is required to address site conditions, maintenance activities would avoid and minimize impacts to riparian vegetation and species habitat. The specific elevation of the levee breach invert elevation is under consideration. The primary purpose of the setback levee would be to provide habitat for the riparian brush rabbit. The invert elevation and the floodplain elevation would be based on site constraints, habitat requirements, and balancing the needs of riparian brush rabbit to provide protection to any individuals during high-water events while providing a level of disturbance that would support riparian scrub habitat in a sustainable way. The levee breach invert is expected to be set at an elevation to inundate approximately every 3 to 4 years, and the lower floodplain would inundate approximately every 6 years. A detailed hydraulic analysis of the surface water hydrology anticipated within the levee setback area, based on three possible levee breach invert elevations, is provided in the Conceptual MMP (**Appendix E,** see "Mitigation Site Baseline, Hydrology," and **Appendix B**). The floodplain habitat would not be permanently inundated and would not be connected to the San Joaquin River during the dry season.

Jeffries et al. (2008) reared juvenile Chinook salmon in enclosures for two consecutive flood seasons within various habitats of the Cosumnes River and its floodplain, to compare fish growth in river channel and floodplain habitats. Significant differences in growth rates were found; salmon reared in seasonally inundated habitats with annual terrestrial vegetation experienced higher growth rates than those reared in a perennial pond on the floodplain. Furthermore, riverine fish growth upstream from the floodplain varied with flow in the river; with little growth and high mortality during high-water events. When stream flows were low and clear, fish growth was rapid. Growth rates were poor in tidally influenced riverine habitat below the floodplain, where juveniles commonly were displaced during high-water events because of a lack of in-channel complexity. Overall, ephemeral floodplain habitats supported higher growth rates for juvenile Chinook salmon than more permanent habitats in either the floodplain or river. Variable responses in both growth and mortality, however, indicate the importance of providing habitat complexity for juvenile salmon in floodplain reaches of streams, so fish can find optimal places for rearing under different flow conditions. Habitat complexity allows juvenile salmon to find cover, thereby reducing the risk of predation from avian and piscine predators. While there is some potential for wading birds to prey upon juvenile salmon, which may use the expanded floodplain when it is periodically inundated (approximately every 6 years), the habitat structure is expected to provide cover for the salmon. As a result of the high flows necessary to inundate the setback area, it is anticipated that there will be a reduction in water clarity (increased turbidity), which would further reduce avian predation.

Floodplain and other off-channel habitat restoration are important for improving production of juvenile salmonids in California's Central Valley. Juvenile salmonid emigration generally is passive during high-water events (Healey 1980; Kjelson et al. 1981); they essentially are entrained in the water column until they encounter slower water velocities, where active swimming becomes possible. The San Joaquin River, like most rivers in the Central Valley, is incised and lacks channel complexity. With the exception of the Yolo Bypass for the Sacramento River (Sommer et al. 2001), juvenile salmonids frequently are displaced downstream to the intertidal Delta, where growth is diminished during high-water events in systems that lack access to floodplains. However, protected floodplain habitat provides important velocity refuge, and rearing and foraging habitat during peak emigration timing.

High San Joaquin River outflows generally occur during winter and early spring months. Juvenile spring-run Chinook and steelhead outmigration occurs at least partially during this period, while green sturgeon outmigration typically occurs later.

- Central Valley spring-run Chinook salmon juvenile outmigration generally occurs from April through June.
- Central Valley steelhead juvenile outmigration generally occurs from December through March in the San Joaquin River, and continues through June in the Delta.
- North American green sturgeon outmigration of older juveniles generally occurs from June through September.

The presence of the protected floodplain likely would benefit juvenile Chinook salmon and steelhead during high-water events. The configuration of the floodplain would promote use by juvenile salmonids during high flow events as they are directed into the floodplain through backflow currents.

Sommer et al. (2001) provided evidence that the Yolo Bypass, the primary floodplain of the lower Sacramento River, provides better rearing and migration habitat for juvenile Chinook salmon than adjacent river channels. During 1998 and 1999, salmon increased in size substantially faster in the seasonally inundated agricultural floodplain than in the river, suggesting better growth rates. Similarly, coded-wire-tagged juveniles released in the floodplain were substantially larger at recapture and had higher apparent growth rates than those concurrently released in the river. Improved growth rates in the floodplain were in part because of substantially higher prey consumption, reflecting greater availability of drift invertebrates. Bioenergetic modeling suggested that feeding success was greater in the floodplain than in the river, despite increased metabolic costs of rearing in the substantially warmer floodplain. Growth, survival, feeding success, and prey availability were higher in 1998 than in 1999, a year in which flow was more moderate, indicating that hydrology affects the quality of floodplain rearing habitat. These findings support the predictions of the flood pulse concept and provide new insight into the importance of the floodplain for salmon.

Work by Jeffries et al. (2008) and Sommer et al. (2001) indicate that off-channel floodplain habitats provide substantially improved rearing habitat, supporting higher growth rates than the intertidal river channel. However, their work shows that providing habitat complexity for juvenile salmon in floodplains is of utmost importance, so fish can find optimal places for rearing under varying flow conditions. It is well documented that survivorship to adulthood is increased when young salmonids leave freshwater at a larger size (Unwin 1997; Galat and Zweimuller 2001). Studies by Jeffries et al. (2008), Sommer et al. (2001), and others show that floodplain habitat restoration in Central California has major benefits to Chinook salmon populations, especially relative to growth and production. These studies indicate bioenergetic improvement to salmonids rearing in a flooded terrestrial floodplain because of the abundance of zooplankton (primary production), rather than having to rely on less dense prey items in the riverine channels, such as larval fish and benthic macroinvertebrates, and expending more energy for their capture. Therefore, construction of element IVc would be likely to result in bioenergetic improvement for all listed species.

EFFECTS RELATED TO THE 2017 EMERGENCY RESPONSE CONSTRUCTION PROJECT ACTIONS

Avoidance and minimization measures were implemented during the 2017 Emergency Response Construction Project. A worker environmental awareness program was provided to construction personnel prior to construction activities at element IVa, due to the proximity to potentially suitable riparian brush rabbit habitat. Construction personnel were notified of their responsibilities and provided with information on the life history of Federally listed species with the potential to occur in the construction footprint and vicinity. A biological monitor was onsite during all construction within element IVa. The biological monitor conducted preconstruction surveys for riparian brush rabbit, and was present to observe all construction activities within this area. See **Appendix H** for the construction monitoring report.

The implementation of the 2017 Emergency Response Construction Project did not result in adverse effects to special-status fish, because no waterside habitat was affected. The implementation of the 2017 Emergency Response Construction Project did not result in adverse effects to VELB, because no elderberry shrubs were located within 100 feet of project activities; however, some riparian habitat associated with elderberry shrubs was removed.

The implementation of the 2017 Emergency Response Construction Project resulted in the removal of 1.61 acres of potentially suitable habitat for riparian brush rabbit and associated with elderberry shrubs at element IIIb, IVa, Va, VIa.1, and VIbcde (see **Table 5**; see also **Appendix G**). No riparian brush rabbit was observed during the construction activities in this element, including during the removal of the vegetation. As described above under

“Valley Elderberry Longhorn Beetle” and “Riparian Brush Rabbit” within this section, proposed conservation measures (see the “Avoidance and Minimization Measures” section above) would minimize direct loss of riparian habitat in conjunction with compensation for adverse effects. The Phase 3 Repair Project would include restoration of at least 9.9 acres (and up to 11.1 acres) of riparian forest and riparian scrub habitats and upland refugia in the setback area at element IVc (**Exhibit 12**). Implementing such measures is anticipated to avoid a net reduction in the number of VELB, riparian brush rabbit, and their associated habitats.

CUMULATIVE EFFECTS

Cumulative effects include the effects of present, pending, and future State, tribal, local, or private actions that are reasonably certain to occur in the action area under consideration. The effects of projects that require a federal action are not considered in the cumulative effects evaluation during Section 7 consultation evaluation because they are subject to separate consultation (USFWS and NMFS 1998). For example, the Central Lathrop Specific Plan (Phase 1) addresses the development of 1,521 acres of land immediately east of the RD 17 levee elements IIIa and IIIb, south of Dos Reis and north of the housing development adjacent to element IVa. The USFWS issued a Biological Opinion for this project (USFWS File No. 1-1-06-F-0114), which analyzed the effects of the project on riparian brush rabbit and VELB. Therefore, this development is not considered cumulative to the proposed project. Also, the nonfederal action must be located in the action area, or project site, that is evaluated in the Section 7 consultation process (USFWS and NMFS 1998). Several present, pending, and future projects that are located in or near the action area under consideration in this consultation could result in effects similar to those of the proposed action.

SUMMARY OF PRESENT, PENDING, AND FUTURE PROJECTS IN THE PHASE 3 REPAIR PROJECT AREA

FLOOD DAMAGE REDUCTION SYSTEM IMPROVEMENTS

Two other proposed projects related to improvements to flood damage reduction systems are located near RD 17: the Lower San Joaquin River Feasibility Study, which would determine needed improvements for future flood protection systems in an effort to reach or exceed the future 200-year level of flood protection; and the Smith Canal Closure Structure, which would install a flood control gate in the Delta in Stockton, north of the Deep Water Ship Channel, to prevent flood flows from entering the Smith Canal in the event of an imminent or existing levee breach and during 100-year flood events.

These projects may affect federally listed species and require a federal action, and therefore would be subject to Section 7 consultation. Where adverse effects would occur on the landside of the levees, the project proponents may need incidental take authorization, pursuant to incidental take permits used under the SJMSCP. Planning efforts in San Joaquin County have addressed the cumulative effects of development in the county, through preparation and adoption of the SJMSCP. The effects of these projects are not considered cumulative to the Phase 3 Repair Project because they would undergo federal review and permitting as necessary—either through a Section 7 consultation or through SJMSCP compliance. This would ensure that adverse effects would be fully mitigated.

DEVELOPMENT PROJECTS

Development projects within the RD 17 boundaries include projects in the cities of Manteca, Stockton, and Lathrop, and in unincorporated areas of San Joaquin County. These projects have been described and analyzed in their respective environmental documents, including the following:

- River Islands Project;
- San Joaquin County General Plan 2010, adopted in 1992 and as amended;
- City of Stockton General Plan, adopted in 1990 and as amended through November 3, 1998;
- City of Lathrop General Plan, adopted in 1991 and as amended through January 2003;
- Central Lathrop Specific Plan, adopted in November 2004;

- West Lathrop Specific Plan, adopted in 1995;
- Manteca General Plan, adopted in 1988 and as amended through December 20, 1993;
- City of Lathrop Water, Wastewater, and Recycled Water Master Plan, adopted in 2001 and as amended through November 9, 2004;
- City of Manteca Wastewater Treatment Plant expansion; and
- 2001 Regional Transportation Plan, San Joaquin Council of Governments, 2001.

San Joaquin County covers approximately 909,000 acres, with approximately 809,000 acres (or nearly 90 percent of the county) used or available for agriculture (i.e., row and field crops, orchards, vineyards, and grazing lands). The remaining lands are dominated by various types of development (approximately 59,000 acres), natural habitats (e.g., woodlands, riparian), and open water (e.g., lakes, rivers, Delta waterways). Most county residents and development are located in incorporated cities (i.e., Escalon, Lathrop, Lodi, Manteca, Ripon, Stockton, and Tracy). The SJMSCP anticipated that 147,000 acres of various categories of open space lands (including agriculture, range lands, and natural) in the county would be converted to non–open space uses between 2001 and 2051, based on full buildout of each of the general plans in the county and construction of all anticipated utility, transportation, and other public projects. In addition, approximately 59,000 acres of infill of urban lands were presumed to occur in this 50-year time frame.

Many development projects near the Phase 3 Repair Project area, including those described above, have been implemented recently or are in various stages of planning and entitlement, including the River Islands project. These current, pending, and potential future projects may affect federally listed species and require a federal action, and therefore would be subject to Section 7 consultation. Or, for those occurring within the SJMSCP permit area within San Joaquin County, the project applicants are expected to seek incidental take authorization, pursuant to incidental take permits used under the SJMSCP. Planning efforts in San Joaquin County have addressed the cumulative effects of development in the county, through preparation and adoption of the SJMSCP. The effects of these projects are not considered cumulative to the Phase 3 Repair Project because they would undergo federal review and permitting as necessary—either through Section 7 consultation or SJMSCP compliance.

ANALYSIS OF CUMULATIVE EFFECTS

GROWTH INDUCEMENT

Direct growth inducement would result if a project would include construction of new housing. Indirect growth inducement would occur, for instance, if implementing a project were to result in any of the following:

- substantial new permanent employment opportunities (e.g., commercial, industrial, or governmental enterprises);
- substantial short-term employment opportunities (e.g., construction employment) that indirectly would stimulate the need for additional housing and services to support the new temporary employment demand; and/or
- removal of an obstacle to additional growth and development, such as removing a constraint on a required public utility or service (e.g., construction of a major sewer line with excess capacity through an undeveloped area).

Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Local land use decisions are within the jurisdiction of the cities and county in the Phase 3 Repair Project area: the City of Stockton, the City of Lathrop, the City of Manteca, and San Joaquin County. Each of these entities has adopted a General Plan consistent with State law. These General Plans provide an overall framework for growth and development within the jurisdiction of each agency, including the Phase 3 Repair Project area. Within the RD 17 boundaries, as elsewhere, population growth and urban development also are influenced by national, regional, and local economic conditions.

Because the Phase 3 Repair Project would not include construction of housing, it would not directly induce growth. Construction activities would generate short-term employment, but project-related construction jobs are expected to be filled from the existing local employment pool and not to indirectly induce growth or result in a population increase, nor would implementation of the project indirectly induce growth by creating permanent new jobs.

The Phase 3 Repair Project would accommodate growth currently approved or planned for undeveloped lands within the RD 17boundaries. These lands have been identified as the places most suitable for urban growth in the General Plans and additional planning policy documents of the cities of Lathrop, Manteca, and Stockton, and San Joaquin County. The Phase 3 Repair Project would allow development to proceed when economic and market conditions are favorable.

Development within the RD 17 boundaries is directed by the Central Lathrop Specific Plan and the West Lathrop Specific Plan in the City of Lathrop, the City of Stockton General Plan, the City of Manteca General Plan, and the San Joaquin County General Plan. The cities of Lathrop and Manteca are where the majority of planned or proposed development projects would be located. Environmental documents have been prepared to address the General Plans in these areas.

This information provides substantial evidence that the Phase 3 Repair Project would accommodate anticipated growth in a manner that would be consistent with adopted local growth management plans and with the State Plan of Flood Control. Thus, the Phase 3 Repair Project, despite accommodating buildout of adopted Specific Plans and General Plans in the cities of Lathrop, Manteca, and Stockton, would not be growth inducing itself.

CUMULATIVE EFFECTS ON LISTED SPECIES

Implementing the plans and projects described above would permanently disturb undeveloped land that currently is or has recently been in agricultural use. These projects would have cumulative effects on agricultural resources (by converting agricultural land to nonagricultural uses) and remnant native habitats (such as woodlands and marshes), which would have the potential to cause permanent adverse cumulative effects on the species, including federally listed species, for which these lands provide habitat.

Large areas of native riparian and wetland vegetation in the Phase 3 Repair Project area and Central Valley region have been lost or degraded over the past 150 years. USFWS estimates that more than 90 percent of wetland and riparian habitat has been lost in the Central Valley, compared to historic levels (USFWS 1989). Most losses have occurred because of CVP and SWP facility construction and alteration of flow patterns below dams, particularly channelization, and then clearing or filling behind levees for the conversion to agriculture and urban land uses. Alterations to the San Joaquin River channel have resulted over time in homogenous, trapezoidal channels with little instream structure; narrow and sparse bands of riparian vegetation that provide only limited SRA habitat functions; limited recruitment of large woody debris; and limited habitat conditions for native fish species and other aquatic organisms. This habitat conversion has affected many plant and wildlife species substantially, resulting in various species being listed as threatened or endangered under the ESA as well as under the California Endangered Species Act.

Present and future conversions of open space lands in San Joaquin County and the region consist primarily of converting agricultural lands to residential and urban development. Several flood risk management projects are

being implemented across the Central Valley, including San Joaquin County, to improve the integrity of levees. However, some of these flood risk management projects would implement compensatory mitigation in the form of habitat creation and preserves, designed to actually increase these habitats and their values related to ecosystem functions and special-status species. Upstream from the Phase 3 Repair Project area, the SJRRP would result in future structural and channel improvements to benefit special-status fish and wildlife species (Reclamation and DWR 2011). Nevertheless, even with these benefits, the overall losses of sensitive habitats in the Phase 3 Repair Project region, the numerous threatened and endangered species that are present, the ongoing declines of other species, and the continuing conversions of habitats and open space lands to various developments are evidence that past, present, and reasonably foreseeable future projects would combine to result in significant cumulative effects on biological resources.

Development projects (i.e., residential, commercial, industrial), infrastructure projects, and flood facilities improvement projects include or would include grading and other earthmoving activities that could result in temporary and short-term localized soil erosion that could affect hydrology and would have the potential to release materials (e.g., runoff of soils or contaminants) into the San Joaquin River. Potential increases in sedimentation, turbidity, and contaminants could expose and adversely affect fish and aquatic habitats. However, these site-specific effects are not expected to combine with the effects of other activities, because compliance with the NPDES regulations, including construction site BMPs, would help control erosion at each construction site. The effects from development projects, infrastructure projects, and flood facilities improvement projects would be temporary and short-term, and soil erosion would be localized.

CONCLUSIONS AND DETERMINATION

In conclusion, based on the biology and ecology of the federally listed species that have the potential to occur in the Phase 3 Repair Project area, the environmental baseline for the action area, and the effects of the proposed action and its cumulative effects, implementing the Phase 3 Repair Project may affect and is likely to adversely affect VELB and riparian brush rabbit, and would result in no adverse effect on delta smelt, Central Valley fall/late fall–run Chinook salmon, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and green sturgeon. Designated critical habitat in the action area has been designated for delta smelt, Central Valley steelhead, and green sturgeon; however, none would be adversely modified or destroyed.

- **Valley elderberry longhorn beetle:** The Phase 3 Repair Project may affect and is likely to adversely affect VELB by transplanting eight elderberry shrubs. Although VELB habitat credits comparable to 367 elderberry seedlings and 367 associated native plantings would be purchased from a USFWS-approved VELB habitat conservation bank to compensate for effects on VELB and effects on 268 elderberry stems (greater than 1 inch in diameter at ground level), an adverse effect on the species could occur. Removal of shrubs in which larvae are present could result in larvae mortality if the health of the shrubs is adversely affected, and a temporary loss of habitat available to the beetle during the establishment of seedlings would occur.

- **Riparian brush rabbit:** The Phase 3 Repair Project, including the 2017 Emergency Response Construction Project, may affect and is likely to adversely affect riparian brush rabbit by removing 3.31 acres of landside riparian habitat that is suitable for the species, contributing to the further reduction of available habitat for this species.

  However, the Phase 3 Repair Project would include restoring approximately 9.9 acres (and up to 11.1 acres) of compensatory riparian habitat (**Exhibit 12**) to offset project-related habitat losses. After the new setback levee in element IVc is constructed and certified, a small section of the existing levee then would be partially degraded. Between 25 feet from the landside toe of the existing levee and 25 feet from the waterside toe of the new setback levee are approximately 4 acres of ruderal grassland that could be restored as riparian scrub habitat and approximately 2 additional acres of riparian scrub habitat will be restored and/or enhanced between the waterside toe of the existing levee and the river (**Exhibit 12**). The restored riparian habitat would consist of willows, cottonwoods, valley oaks, wild rose, California blackberry, and grasses, which is comparable to the composition of habitats where this species is documented to occur along the RD 17 levees. Apart from a small notch along the north side, the existing levee would remain in place, and up to 5 acres of Great Valley oak woodland would be established along either side of it, thus providing upland refugia for the species during high-water events. The restored habitat in the setback levee area would be contiguous with existing waterside riparian habitat along element IVc; this waterside riparian habitat along element IVc extends northward through elements IVa, IIIa, and IIIb, and southward through elements Va and VIa.1. Documented occurrences exist of riparian brush rabbit in the waterside riparian habitat in elements IIIa and IIIb, north of element IIIa and south of element VIa.1; therefore, reestablishing and protecting riparian habitat in element IVc would provide expanded and connected habitat for this species.

  RD 17 also is evaluating options for providing off-site compensatory habitat to offset Phase 3 Repair Project effects on riparian brush rabbit. Additional off-site compensatory habitats would include preserving existing waterside riparian habitats and/or restoring natural riparian habitats. These options would be evaluated in coordination with USFWS during the Section 7 consultation.

- **Federally listed fish species:** The Phase 3 Repair Project would result in no adverse effects on federally proposed and federally listed fish species considered in this BA. Effects are not expected to occur because of the avoidance and minimization measures to be implemented by the Phase 3 Repair Project. The Phase 3 Repair Project would include several measures that would avoid potential direct environmental effects during project construction. The potential effects of increased sedimentation or turbidity, and/or release of contaminants on fish and other aquatic organisms, would be avoided and minimized through the use of BMPs (e.g., source control, detention basins, revegetation, and spill containment plan) that would maintain surface water quality conditions in receiving waters and minimize disturbance to fish and other aquatic habitats. Construction-related lighting and vibration could disrupt fish behaviors and/or increase predation risk, the implementation of the lighting and vibration measures would avoid direct and indirect take of fish during construction. No waterside riparian or SRA habitat would be removed.

ESSENTIAL FISH HABITAT ASSESSMENT

The Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 USC 1801), requires that EFH be identified and described in federal fishery management plans. Federal agencies must consult with NMFS on any activity that they fund, permit, or carry out that may adversely affect EFH. The EFH regulations require that federal agencies obligated to consult on EFH also provide NMFS with a written assessment of the effects of any action on EFH (50 CFR 600.920). NMFS is required to provide EFH conservation and enhancement recommendations to federal agencies. The statute also requires federal agencies receiving NMFS EFH conservation recommendations to provide a detailed written response to NMFS within 30 days of receipt, detailing how they intend to avoid, mitigate, or offset the impact of activity on EFH (Section 305[b][4][B]).

EFH is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purposes of interpreting the definition of EFH, "waters" includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers all habitat types used by a species throughout its life cycle.

The Pacific Fishery Management Council has identified and described EFH, adverse impacts, and recommended conservation measures for salmon in Amendment 14 to the Pacific Coast Salmon Fishery Management Plan (PFMC 2003). Amendment 18 to the Pacific Coast Salmon Fishery Management Plan revises the description and identification of EFH for Pacific salmon, designates habitat areas of particular concern, modifies the current information on fishing activities and potential measures to minimize their effects on EFH, and updates the list of fishing and non-fishing related activities that may adversely affect EFH and potential conservation and enhancement measures to minimize those effects (NMFS 2014c). Freshwater EFH for Pacific salmon in the Central Valley (i.e., Chinook salmon) includes waters currently or historically accessible to salmon within the Central Valley ecosystem, as described in Myers et al. (1998), and includes the segment of the San Joaquin River in the action area. EFH for Chinook salmon in the Lower San Joaquin River includes the San Joaquin River, its eastern tributaries, and the lower reaches of the western tributaries that could provide juvenile rearing habitat or refugia from high flows during floods as salmon migrate along the mainstem in this area. Although evidence of current or historical Chinook salmon distribution is lacking for the western tributaries (Yoshiyama et al. 2001), the lower reaches of these tributaries could provide juvenile rearing habitat or refugia. Central Valley fall/late fall–run Chinook salmon is a species managed under the Pacific Coast Salmon Plan that occurs in the San Joaquin River.

THE PROPOSED ACTION

The proposed action is described in detail in the "Description of the Proposed Action" section of this BA.

ESSENTIAL FISH HABITAT DESIGNATION IN THE ACTION AREA

EFH has been identified for Chinook salmon, which includes Central Valley fall/late fall-run Chinook salmon. The species account for this species is provided below; the species accounts for federally-listed Chinook salmon are included in the "Species Accounts" section of this BA. The action area and environmental baseline, respectively, are described in the "Action Area" and "Environmental Baseline" sections of this BA.

Central Valley Fall/Late Fall-run Chinook Salmon Evolutionarily Significant Unit

On September 16, 1999 (64 FR 50393), NMFS determined that listing was not warranted for the Central Valley fall/late fall–run Chinook salmon ESU; however, the ESU was designated as a future candidate for listing because of concerns about specific risk factors. On April 14, 2004 (69 FR 19975), the ESU was reclassified as a species of concern. The ESU includes all naturally spawned populations of fall-run Chinook salmon in the Sacramento and San Joaquin River basins and their tributaries, east of the Carquinez Strait. The Central Valley fall/late fall–run Chinook salmon ESU currently is the only run of Chinook salmon in the San Joaquin River system.

Adult Central Valley fall/late fall–run Chinook salmon enter the Sacramento and San Joaquin river systems from September through January and spawn from October through February. In general, San Joaquin River populations tend to mature at an earlier age and spawn later in the year than Sacramento River populations (Baker and Morhardt 2001). These differences may be phenotypic responses to the generally warmer temperature and lower flow conditions found in the San Joaquin River basin, relative to the Sacramento River basin.

Juveniles typically rear in freshwater for 3 to 6 months (fall-run) and up to 12 months (late fall–run) before entering the ocean. Juveniles migrate downstream from January through June. Juvenile Chinook salmon prefer water depths of 0.5 foot to 3.3 feet and velocities of 0.26 foot to 1.64 feet per second (Raleigh et al. 1986). Important winter habitat for juvenile Chinook salmon includes flooded bars, side channels, and overbank areas with relatively low water velocities. Juvenile Chinook salmon have been found to rear successfully in floodplain habitat, which routinely floods but is dry at other times. Growth rates appear to be enhanced by the conditions found in floodplain habitat (Sommer et al. 2001).

Cover structures, space, and food are necessary components for Chinook salmon rearing habitat. Suitable habitat includes areas with instream and overhead cover in the form of undercut banks, downed trees, and large, overhanging tree branches. The organic materials forming fish cover also help provide sources of food, in the form of both aquatic and terrestrial insects.

Fall-run Chinook salmon adults primarily pass through the Phase 3 Repair Project area on their way to spawn in upstream tributaries of the San Joaquin River (Moyle 2002). Juvenile fall-run Chinook salmon emigrate from San Joaquin River tributaries (e.g., the Stanislaus, Merced, and Tuolumne rivers) and other river tributaries through the San Joaquin River during the late winter and spring (February through mid-June) (San Joaquin River Group Authority 2009). Juvenile Chinook salmon use the edges of rivers and sloughs for rearing as they emigrate downstream (Moyle 2002).

Critical Habitat

No critical habitat has been designated for Central Valley fall/late fall-run Chinook salmon.

Essential Fish Habitat

EFH has been designated for Pacific Salmon. This includes identification of Chinook salmon EFH, which occurs in the project and action areas. Central Valley fall/late fall-run Chinook salmon ESU is in the Phase 3 Repair Project area along the San Joaquin River. EFH includes migration, holding, and rearing habitat and opportunistic/intermittent spawning, holding, and rearing habitat for the San Joaquin River (NMFS 2014a). EFH for Chinook salmon in the Lower San Joaquin River includes the San Joaquin River, its eastern tributaries, and the lower reaches of the western tributaries that could provide juvenile rearing habitat or refugia during floods as salmon migrate along the mainstem in this area (NMFS 2014c).

Construction of element IVc would improve EFH, by providing the type of refuge habitat for juvenile salmonids during high-water flows as described in Amendment 18 for the lower San Joaquin River tributaries (NMFS 2014c).

RECOVERY PLAN FOR CENTRAL VALLEY FALL/LATE FALL–RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT

Although the Central Valley fall/late fall-run Chinook salmon is not listed as threatened or endangered under the ESA, the Sacramento–San Joaquin Delta Native Fishes Recovery Plan outlines conservation measures and restoration objectives and criteria for the species, including the San Joaquin River run, which CDFW recognizes as a distinct stock (USFWS 1996b). Reasons for decline identified by the plan include habitat loss, suitability of habitat, survival of outmigrants, harvest, hatcheries, and water quality. Conservation measures include:

- testing an electrical fish barrier and a physical barrier upstream from the confluence of the Merced River to prevent adult fish from straying,
- constructing and rehabilitating spawning riffles,
- constructing a temporary barrier at Old River to prevent entrainment of outmigrating smolts, and when possible,
- coordinating water releases to provide attraction or outmigration flows.

These efforts have been funded by a wide range of federal, State, and private agencies (USFWS 1996b).

EFFECTS OF THE PROPOSED ACTION

Effects of the proposed action are described below and in the “Direct and Indirect Effects on Species in the Action Area” and “Cumulative Effects” sections of this BA. The direct and indirect effects on Central Valley fall/late fall-run Chinook salmon would be similar to the effects described for Central Valley steelhead.

Available literature indicates that limited Chinook salmon spawning typically occurs well upstream from the Phase 3 Repair Project area. EFH in the San Joaquin River in the vicinity of the Phase 3 Repair Project area consists of adult and juvenile (smolt) Chinook salmon passage between upstream spawning grounds and the Pacific Ocean, and limited in-channel rearing habitat for juveniles (limited because it is situated in a reach of the San Joaquin River that is bound on both banks by levees, resulting in channel incision, and is disconnected from its currently non-functioning floodplain). The river extends onto its floodplain only during high-water events, and if fish are swept into the floodplain during high flow conditions, they likely would become stranded because of the absence of a secondary channel for returning flood flows to the river. The Phase 3 Repair Project would result in improvement of EFH as functioning floodplain-rearing habitat and improvement to existing EFH in the San Joaquin River channel, by reducing and reversing the effects of current channel incision in the immediate vicinity of element IVc. Furthermore, approximately 2 acres of SRA habitat would be created and/or enhanced through revegetation actions between the river and the waterside toe of the existing levee in element IVc (see **Appendix E**).

Levee degradation and floodplain grading activities in element IVc would restore connectivity to the historic floodplain and improve habitat conditions in the floodplain. Although both actions would be constructed in dry conditions (above HTL), a potential short-term indirect effect of construction may be a temporary increase in sediment in the San Joaquin River, especially during the first storm or flooding event after construction. The measures (erosion control and revegetation) described in the “Avoidance and Minimization Measures” section of this BA are designed to reduce or capture any mobilized sediment resulting from the year’s first rain or flooding event. Therefore, any construction-related sediment load would be temporary and negligible, especially when compared to the existing sediment load of the San Joaquin River and the project would not result in adverse effects on EFH.

The project would increase the amount and improve the quality of EFH in the project area. The new setback levee with floodplain in element IVc would improve EFH by providing refuge habitat for juvenile salmonids during high-water events, as described in Amendment 18 (NMFS 2014c). The newly reconnected floodplain would provide habitat for juvenile Chinook salmon rearing. It would also alter the channel dynamics in the immediate vicinity such that the channel incision process is expected to be reversed, thereby improving juvenile and adult migratory passage habitat.

PROPOSED CONSERVATION MEASURES

Proposed conservation measures are presented in the "Description of the Proposed Action" and "Direct and Indirect Effects on Species in the Action Area" sections of this BA. The measures include avoidance and minimization measures.

CONCLUSIONS

The proposed action would not affect the spawning, rearing, or migratory EFH functions of Chinook salmon currently or previously managed under the Magnuson-Stevens Fishery Conservation and Management Act in the San Joaquin River.

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APPENDIX A

Exhibits

Refer to **Appendix A of Attachment 9 of Appendix J of this FEIS: Exhibits, on page 1363 of this PDF.**

APPENDIX B

Species Lists

Refer to **Appendix B of Attachment 9 of Appendix J of this FEIS: Exhibits, on page 1385 of this PDF.**

APPENDIX C

Evaluation of Potential for Giant Garter Snake Occurrence in the Phase 3 Repair Project Area

Refer to Appendix C of Attachment 9 of Appendix J of this FEIS: Exhibits, on page 1401 of this PDF.

APPENDIX D

Project Correspondence

APPENDIX D-1

Letter to USFWS and NMFS Requesting Technical Assistance, May 14, 2010

Refer to Attachment 1 of Appendix J of this FEIS: Letter from AECOM to USFWS and NMFS Requesting Technical Assistance. May 14, 2010. Includes two attachments (2009 Preliminary Wetland Delineation and 2010 Updated Wetland Delineation), on page 955 of this PDF.

APPENDIX D-2

Letter from NMFS to AECOM Responding to Technical Assistance Request, June 11, 2010

Refer to **Attachment 2 of Appendix J of this FEIS: Letter Responding to Technical Assistance Request. June 11, 2010, on page 1067 of this PDF.**

APPENDIX D-3

Letter from NMFS to USACE Requesting Additional Information,
July 7, 2015

Refer to **Attachment 4 of Appendix J of this FEIS: Letter from NMFS to USACE, Requesting Additional Information. July 7, 2015, on page 1173 of this PDF.**

APPENDIX D-4

Response to NMFS's July 2015 Request for Additional Information

Refer to **Attachment 7 of Appendix J of this FEIS:**
Letter from NMFS, Responding to Request for Additional Information. October 7, 2016, on page 1259 of this PDF.

APPENDIX D-5

Letter from USFWS to USACE Requesting Additional Information,
October 2, 2015

Refer to Attachment 5 of Appendix J of this FEIS:
Letter from USFWS to USACE, Responding to Request for Additional Information. October 2, 2015, on page 1183 of this PDF.

APPENDIX D-6

Response to USFWS' October 2015 Request for Additional Information

Refer to **Attachment 8 of Appendix J of this FEIS: Letter to USFWS, Responding to Request for Additional Information. October 7, 2016, on page 1275 of this PDF.**

APPENDIX D-7

Letter from USFWS to USACE, Providing Comments on Conceptual MMP, February 27, 2018

Refer to **Attachment 12 of Appendix J of this FEIS: Letter from USFWS to USACE, Providing Comments on Conceptual MMP. February 27, 2018, on page 1629 of this PDF.**

APPENDIX D-8

Response to USFWS April 2018 Comments

Refer to **Attachment 14 of Appendix J of this FEIS: Letter to USFWS, Responding to Comments on Conceptual MMP. April 30, 2018, on page 1641 of this PDF.**

APPENDIX D-9

Letter from NMFS to USACE, Providing Comments on Conceptual MMP, March 14, 2018

Refer to **Attachment 13 of Appendix J of this FEIS:**
Letter to NMFS to USACE, Providing to Comments on Conceptual MMP. March 14, 2018, on page 1635 of this PDF.

APPENDIX D-10

Response to NMFS March 2018 Comments n

Refer to **Attachment 15 of Appendix J of this FEIS: Letter to NMFS, Responding to Comments on Conceptual MMP. April 30, 2018, on page 1647 of this PDF.**

APPENDIX E

Conceptual Mitigation and Monitoring Plan for Levee Setback Area
June 2016

***Refer to* Attachment 6 of Appendix J of this FEIS: Conceptual Mitigation and Monitoring Plan for levee setback area – June 2016, on page 1191 of this PDF.**

APPENDIX F

Hydraulic Analyses of Setback Levee Alternatives

APPENDIX F-1

January 2010 Hydraulic Analysis of Reach IVc and Reaches IIa and IIb Levee Setback Alternatives

***Refer to* Appendix D.1 of this FEIS:**
January 2010 Hydraulic Analysis of Reach IVc and Reaches IIa and IIb Levee Setback Alternatives, dated January 19, 2010, Revised April 14, 2010, on page 679 of this PDF.

APPENDIX F-2

February 2014 Hydraulic Analysis of Reach IVc Levee Setback for Preferred Alternative

Refer to **Appendix D.2 of this FEIS:**
February 2014 Hydraulic Analysis of Reach IVc Levee Setback for Preferred Alternative, on page 743 of this PDF.

Appendix F-3

"Setback Levee Alternative" Excerpted from March 2, 2009, Reclamation District 17 Early Implementation Project Funding Application for 100-Year Levee Seepage Area Project – 2009 Project Elements

Refer to **Appendix F-3 of Attachment 9 of Appendix J of this FEIS: "Setback Levee Alternative" Excerpted from March 2, 2009, Reclamation District 17 Early Implementation Project Funding Application for 100-Year Levee Seepage Area Project – 2009 Project Elements, on page 1453 of this PDF.**

Appendix G

As-Builts for Reclamation District 17’s 2017 Emergency Response Construction Project, dated July 2017

Refer to **Appendix G of Attachment 11 of Appendix J of this FEIS: As-Builts for Reclamation District 17’s 2017 Emergency Response Construction Project, dated July 2017, on page 1603 of this PDF.**

Appendix H

July 10, 2017, Construction Monitoring Report for Reclamation District 17's 2017 Emergency Response Construction Project

Refer to **Appendix H of Attachment 11 of Appendix J of this FEIS: July 10, 2017, Construction Monitoring Report for Reclamation District 17's 2017 Emergency Response Construction Project, on page 1621of this PDF.**

17. Letter from USACE to USFWS, requesting initiation of formal consultation. August 21, 2018.

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

Environmental Resources Branch

Ms. Jennifer Norris, Field Supervisor
U.S. Fish & Wildlife Service
2800 Cottage Way, Suite W-2605
Sacramento, California 95825-1846

Dear Ms. Norris:

I am writing to request formal consultation under Section 7 of the Endangered Species Act, for a combined Section 404 and Section 10 Department of Army permit application and a Section 408 permission request for Phase 3 of the Reclamation District 17 (RD 17) Levee Seepage Repair Project (U.S. Fish and Wildlife Service [USFWS] File No. 08FBDT00-2015-TA-0303). The project is proposed by RD 17, and is located along the San Joaquin River in RD 17 in San Joaquin County, California. A copy of the May 2018, Final Biological Assessment (BA) for the Phase 3 – RD 17 Levee Seepage Repair Project, Including 2017 Emergency Response Construction, prepared by GEI Consultants, Inc., is enclosed.

Based on the available information, we have determined that, even with the avoidance and minimization measures included in the project description, the proposed action may affect, and is likely to adversely affect, federally listed valley elderberry longhorn beetle (*Desmocerus californicus*) (VELB) and riparian brush rabbit (*Syvilagus bachmani riparius*). We have concluded that the net overall effect of the proposed action on delta smelt (Hypomesus transpacificus) would likely be beneficial; however, we are requesting your concurrence with our determination that the proposed action may affect, but is not likely to adversely affect delta smelt and would not adversely modify or destroy designated critical habitat for delta smelt. If you disagree with this determination, please consider this letter as our request to formally consult on this species. If new information becomes available indicating that other listed species or critical habitat may be affected, we will follow the procedures under 50 CFR 402.16, Reinitiation of Consultation.

The Sacramento District (Corps) originally requested formal consultation in a letter, dated February 27, 2015. USFWS responded in a letter, dated October 2, 2015, and requested additional information (see Appendix D-5 of the enclosed BA). In a letter, dated March 8, 2017, we transmitted a revised BA together with specific responses to each element of the information request (BA Appendix D-6 of the assessment (BA). On March 22, 2017, we notified USFWS that emergency construction would occur as a result of the volume and duration of flood waters in the system. USFWS recommended avoidance and minimization measures followed by consultation following the emergency. The BA transmitted with our current initiation request includes the construction completed as an emergency action as well as remaining portions of the Phase 3 Levee Seepage Repair Project.

The enclosed BA provides an updated description of the proposed action and clarifies which project features were constructed as emergency actions in response to the 2017 floods. Table 2 of the BA shows a comparison of all major RD 17 Phase 3 Levee Seepage Repair Project actions, those completed as emergency actions, and those features remaining to be constructed. The Phase 3 features that have not yet been constructed are the focus of this consultation.

To implement the Phase 3 Project, RD 17, through the Central Valley Flood Protection Board, is requesting permission from the U.S. Army Corps of Engineers pursuant to Section 14 of the Rivers and Harbors Act of 1899 (title 33 of the United States Code [USC], Section 408 [33 USC 408], referred to as Section 408, for alterations of Federal projects. RD 17 is also seeking a permit under Section 404 of the Clean Water Act (33 USC 1344) and Section 10 of the Rivers and Harbor Act (33 USC 403) for placement of fill into jurisdictional waters of the United States.

The following information is provided to your office to initiate consultation:

A description of the action to be considered: The proposed levee modifications would occur along 5.2 miles (27,456 feet) of the RD 17 levee system and would involve constructing: 17,020 feet of cutoff walls; 940 feet of seepage berms; 7,560 feet of chimney drains; 1,100 feet of new setback levee; and, placing fill on the landside slope of the levees wherever needed to achieve engineering design standards. The proposed action would also include: grading 8 acres of offset area (area between the existing levee and a new setback levee); restoring 9.9 to 11.5 acres of native vegetation in the offset area; degrading 400 feet of existing levee; raising a Pacific Gas and Electric Company (PG&E) high voltage tower footing; and, replacing a wooden railroad trestle bridge with a new embankment. Table 2 of the enclosed BA describes this information in greater detail by project element (i.e., reach). The proposed action would eliminate or reduce levee deficiencies, including through- and under-seepage, slope stability, erosion, and encroachments within the construction footprint.

Details of RD 17's preferred alternative are provided in the enclosed BA and accompanying CD. The CD contains the 65 percent engineering designs for the preferred alternative. RD 17 proposes to construct the project over two construction seasons.

A description of the specific area that may be affected by the action: The work proposed as part of the Phase 3 Project would involve modifying approximately 5.2 miles of the Federal levee on the east bank of the San Joaquin River to reduce the potential for flooding, flood damage, and public risk in RD 17. Appendix A, Exhibit 2 of the enclosed BA shows the location of the proposed Phase 3 work, including levee work completed as part of the Phase 3 emergency actions, and the earlier Phase 1 and Phase 2 projects. Site specific details are shown in the enclosed BA in Exhibits 4a through 4c, and 13a through 13c.

A description of any listed species or critical habitat that may be affected by the action: Federally listed VELB, riparian brush rabbit, and delta smelt may be affected by the proposed action. The proposed action occurs within designated critical habitat for delta smelt.

A description of the manner in which the action may affect any listed species or critical habitat and analysis of any cumulative impacts: We have determined that the proposed action may affect, and is likely to adversely affect, VELB and riparian brush rabbit. We have determined that the proposed action may affect, but not likely to adversely affect delta smelt.

VELB: The proposed action includes removing nine elderberry (*Sambucus spp.*) shrubs (host plant for VELB) from the construction area (see Exhibit 14 of the enclosed BA). These shrubs have a total of 268 stems greater than 1 inch in diameter. No VELB exit holes were visible on any of the stems. An additional nine shrubs would be protected with fencing. The proposed action would also remove about 3.31 acres of riparian habitat (i.e., Great Valley cottonwood riparian forest and Great Valley oak riparian forest) associated with elderberry shrubs. Removal of this habitat could adversely affect the VELB meta-population in this area by increasing the distance between occupied and unoccupied patches of habitat, and decreasing the likelihood of successful colonization of unoccupied habitat as a result of habitat fragmentation.

The effects on VELB resulting from removal of the potential host plants would be mitigated at the time of construction by transplanting the eight elderberry shrubs with stems greater than 1 inch in diameter at ground level. The eight elderberry shrubs that cannot be avoided would be transplanted to the offset area (i.e., water-ward of the new setback levee). In, addition, at least 9.9 acres of riparian forest and riparian scrub habitat would be established in the offset area. Because of the potential direct effects, including removal and transplantation of elderberry shrubs, we have determined that the proposed action may affect, and is likely to adversely affect VELB.

Riparian Brush Rabbit: Habitat suitable for riparian brush rabbit occurs in the project area and would be affected by the proposed project. The proposed action would remove 3.31 acres of landside riparian habitat—specifically Great Valley cottonwood riparian forest and Great Valley oak riparian forest--that is suitable for riparian brush rabbit (see Exhibit 15 of the enclosed BA). The project would also restore at least 9,9 acres of riparian forest and scrub-shrub habitat in the offset area. Avoidance and minimization measures are identified in the enclosed BA. Because of the removal of 3.31 acres of riparian brush rabbit habitat, we have determined that the proposed action may affect, and is likely to adversely affect, riparian brush rabbit.

Delta Smelt: Although the Phase 3 Levee Seepage Repair Project area is near the upper limit of the known distribution of delta smelt, it is included in the area designated as critical habitat for the species. A setback levee would be constructed along one reach and the existing project levee would be partially degraded to allow high water to flow onto the floodplain between the existing levee and the new setback levee. Fish and other aquatic organisms would also likely flow onto the floodplain. The offset area would be contoured to drain back into the San Joaquin River as the water recedes in a manner that would avoid trapping fish landward of the existing levee. Nevertheless, some stranding could occur and some predation could occur. Beneficial effects would also result from reconnecting a portion of the floodplain to the San Joaquin River. This is described in greater detail in the enclosed BA. The proposed action could result in some natural floodplain processes that could affect delta smelt should individuals enter flood plain (i.e., predation and/or stranding). With implementation of the avoidance and minimization measures identified in the BA, we have determined that the proposed action may affect, but is not likely to adversely affect delta smelt.

<u>Relevant reports including any environmental impact statement, environmental assessment, or biological assessment prepared</u>: A copy of the May 2018, "Final Biological Assessment, Phase 3 – RD 17 Levee Seepage Repair Project, Including 2017 Emergency Response Construction," prepared by GEI Consultants, Inc., is enclosed.

<u>Any other relevant available information on the action, the listed species, or critical habitat</u>: See the enclosed BA.

This constitutes the best scientific and commercial data available. If you need additional information, or determine that conditioning the permit and letter of permission or modifying the project would preclude the need for formal consultation, please contact us immediately.

A copy of this letter, with the enclosure, will be furnished to Dr. Steve Schoenberg, U.S. Fish and Wildlife Service, 2800 Cottage Way, Suite W-2605, Sacramento, CA 95825-1846. Copies of the letter will also be furnished: to Mr. Jeffrey Stuart, National Marine Fisheries Service, 650 Capitol Mall, Suite 5-100, Sacramento, CA 95814-4706; Mr. Dante Nomellini, c/o Nomellini, Grilli & McDaniel, P.O. Box 1416, Stockton, CA 95201; Mr. Henry Long, President, Reclamation District No. 17, P.O. Box 1461, Stockton, CA 95201; and Dr. Andrea Shephard, GEI Consultants, Inc., 2868 Prospect Park Drive, Suite 400, Rancho Cordova, CA 95670.

If you have any questions, please contact Ms. Tanis Toland, Environmental Manager, at (916) 557-6717 or by email at <u>Tanis.J.Toland@usace.army.mil</u>.

Sincerely,

Mark T. Ziminske

Mark T. Ziminske
Chief, Environmental Resources Branch

Enclosure

18. Letter from USACE to NMFS, requesting initiation of formal consultation. August 21, 2018.

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

Environmental Resources Branch

Ms. Maria Rae, Assistant Regional Administrator
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

Dear Ms. Rae:

I am writing to initiate informal consultation under Section 7 of the Endangered Species Act, for a combined Section 404 and Section 10 Department of Army permit application and a Section 408 permission request for Phase 3 of the Reclamation District 17 (RD 17) Levee Seepage Repair Project. We are also requesting to consult with your agency under the Magnusson-Stevens Fishery Conservation and Management Act (MSA) for Pacific Coast Salmon (*Oncorhynchus* spp.) essential fish habitat (EFH). The project is proposed by RD 17, and is located along the San Joaquin River in RD 17 in San Joaquin County, California. A copy of the May 2018, "Phase 3 – RD 17 Levee Seepage Repair Project, Including 2017 Emergency Response Construction, Final Biological Assessment" (BA), prepared by GEI Consultants, Inc., is enclosed.

Based upon the available information, we have determined that the overall effect of the proposed action on federally listed fish would be beneficial; however, we are requesting your concurrence with our determination that the proposed action may affect, but is not likely to adversely affect, federally listed Southern Distinct Population Segment (DPS) of North American green sturgeon (*Acipenser medirostris*), Central Valley steelhead DPS (*Oncorhynchus mykiss*), Central Valley spring-run Chinook salmon evolutionarily significant unit (ESU) (*Oncorhynchus tshawytscha*), and the Sacramento River winter-run Chinook salmon ESU (*Oncorhynchus tshawytscha*). The proposed action will not result in destruction or adverse modification of designated critical habitat for any of these species and will not adversely affect Chinook salmon EFH. We request your written concurrence with our determinations. If you disagree with this determination, please consider this letter as our request to formally consult on these species. If new information becomes available indicating that other listed species or critical habitat may be affected, we will follow the procedures under 50 CFR 402.16, Reinitiation of Consultation.

The Sacramento District (Corps) originally requested to informally consult on the RD 17 Levee Seepage Repair Project Phase 3 in a letter dated March, 27, 2015. The National Marine Fisheries Service (NMFS) responded in a letter, dated July 7, 2015, and requested additional information (see Appendix D-3 of the enclosed BA). In a letter, dated March 8, 2017, the Corps transmitted a revised BA, which included specific responses to each element of the information request (see Appendix D-4 of the enclosed BA). This information was also incorporated into the main body of the BA, as appropriate. On March 22, 2017, the Corps advised NMFS of anticipated emergency construction in RD 17. On April 6, 2017, the Corps authorized RD 17 to discharge fill into waters of the United States for the 2017 Emergency Response Construction Project (SPK-2009-001466) under Regional General Permit No. 8 (Emergency Actions). Informal consultation with NMFS regarding the Phase 3 Levee Seepage Repair Project continued through March 2018. In a letter dated May 16, 2018, NMFS advised the Corps of consultation close out due to inactivity.

The enclosed BA provides an updated description of the proposed action and clarifies which project features were constructed as emergency actions in response to the 2017 floods. Table 2 of the BA shows a comparison of all major RD 17 Phase 3 Levee Seepage Repair Project actions, those completed as emergency actions, and those features remaining to be constructed. The Phase 3 features that have not yet been constructed are the focus of this consultation.

To implement the Phase 3 Levee Seepage Repair Project, RD 17, through the Central Valley Flood Protection Board, is requesting permission from the U.S. Army Corps of Engineers pursuant to Section 14 of the Rivers and Harbors Act of 1899 (title 33 of the United States Code [USC], Section 408 [33 USC 408], referred to as Section 408, for alterations of Federal projects. RD 17 is also seeking a permit under Section 404 of the Clean Water Act (33 USC 1344) and Section 10 of the Rivers and Harbor Act (33 USC 403) for placement of fill into jurisdictional waters of the United States.

The following information is provided to your office to initiate consultation:

A description of the action to be considered: The proposed levee modifications would occur along 5.2 miles (27,456 feet) of the RD 17 levee system and would involve constructing: 17,020 feet of cutoff walls; 940 feet of seepage berms; 7,560 feet of chimney drains; 1,100 feet of new setback levee; and, placing fill on the landside slope of the levees wherever needed to achieve engineering design standards. The proposed action would also include: grading 8 acres of offset area (area between the existing levee and a new setback levee); restoring 9.9 to 11.5 acres of native vegetation in the offset area; degrading 400 feet of existing levee; raising a Pacific Gas and Electric Company (PG&E) high voltage tower footing; and, replacing a wooden railroad trestle bridge with a new embankment. Table 2 of the enclosed BA describes this information in greater detail by project element (i.e., reach). The proposed action would eliminate or reduce levee deficiencies, including through- and under-seepage, slope stability, erosion, and encroachments within the construction footprint.

Details of RD 17's preferred alternative are provided in the enclosed BA and accompanying CD. The CD contains the 65 percent engineering designs for the preferred alternative. RD 17 proposes to construct the project over two construction seasons.

A description of the specific area that may be affected by the action: The work proposed as part of the Phase 3 Levee Repair Project would involve modifying approximately 5.2 miles of the Federal levee on the east bank of the San Joaquin River to reduce the potential for flooding, flood damage, and public risk in RD 17. Appendix A, Exhibit 2 of the enclosed BA shows the location of the proposed Phase 3 work, including levee work completed as part of the Phase 3 emergency actions, and the earlier Phase 1 and Phase 2 projects. Site specific details are shown in the enclosed BA in Exhibits 4a through 4c, and 13a through 13c.

A description of any listed species or critical habitat that may be affected by the action: We have determined that the proposed action may affect, but is not likely to adversely affect, Southern DPS of North American green sturgeon, Central Valley steelhead DPS, Central Valley spring-run Chinook salmon ESU, and the Sacramento River winter-run Chinook Salmon ESU.

A description of the manner in which the action may affect any listed species or critical habitat and analysis of any cumulative impacts: The Phase 3 Levee Seepage Repair Project would involve constructing cutoff walls, which would entail degrading the top one-third to one-half of the levee. The levee degrade would begin at the waterside edge of the levee crown and would be accomplished without disturbing the waterside levee face. Construction of some cutoff walls, specifically those in Elements Va and VIa.1 would occur 24 hours a day, 7 days a week, with occasional shutdowns for equipment maintenance. Artificial lights used during nighttime construction would be shielded and directed away from the waterside levees.

Implementing cutoff walls as part of the Phase 3 Levee Seepage Repair Project would disturb soils along the top of the levee which, through wind and water erosion, could enter the San Joaquin River. Soil disturbed during construction of seepage berms and other features on the landside of the levee could enter drainage ditches and ultimately be pumped into the San Joaquin River. Therefore, erosion could temporarily increase turbidity and sedimentation in nearby waterways if soils are transported in river flows or stormwater runoff. Water quality best management practices, including a Stormwater Pollution Prevention Plan, would be implemented to avoid and minimize adverse effects. These measures are identified in the BA.

Vibratory compaction equipment would be specifically restricted on the RD 17 levees, and the limited amount of compaction that would occur on landside chimney drain locations (specifically Elements Ia and VIIg) would be restricted to normal work day hours, outside of sunrise and sunset hours in order to avoid peak foraging and migration timing.

Riprap would be placed around trees above the high tide line (HTL). Placement of riprap can affect the growth and health of the trees and affect, hydraulics, especially if the rock were to move down below the HTL.

A setback levee would be constructed along one reach and the existing project levee would be partially degraded to allow high water to flow onto the floodplain between the existing levee and the new setback levee. Fish and other aquatic organisms would also likely flow onto the floodplain. The offset area would be contoured to drain back into the San Joaquin River as the water recedes in a manner that would avoid trapping fish landward of the existing levee. Nevertheless, some stranding could occur and some predation could occur. Beneficial effects would also result from reconnecting a portion of the floodplain to the San Joaquin River. This is described in greater detail in the enclosed BA.

Relevant reports including any environmental impact statement, environmental assessment, or biological assessment prepared: A copy of the May 2018, "Final Biological Assessment, Phase 3 – RD 17 Levee Seepage Repair Project, Including 2017 Emergency Response Construction," prepared by GEI, is enclosed.

Any other relevant available information on the action, the listed species, or critical habitat: See the enclosed BA.

This constitutes the best scientific and commercial data available. If you need additional information, or determine that conditioning the permit and letter of permission or modifying the project would preclude the need for formal consultation, please contact us immediately.

A copy of this letter, with the enclosure, will be furnished to Mr. Howard Brown, National Marine Fisheries Service, 650 Capitol Mall, Suite 5-100, Sacramento, California 95814-4700. Copies of the letter will also be furnished: to Dr. Steve Schoenberg, U.S. Fish and Wildlife Service, 2800 Cottage Way, Suite W-2605, Sacramento, CA 95825-1846; Mr. Dante Nomellini, c/o Nomellini, Grilli & McDaniel, P.O. Box 1416, Stockton, CA 95201; Mr. Henry Long, President, Reclamation District No. 17, P.O. Box 1461, Stockton, CA 95201; and Dr. Andrea Shephard, GEI Consultants, Inc., 2868 Prospect Park Drive, Suite 400, Rancho Cordova, CA 95670.

If you have any questions, please contact Ms. Tanis Toland, Environmental Manager, at (916) 557-6717 or by email at Tanis.J.Toland@usace.army.mil.

Sincerely,

Mark T. Ziminske
Chief, Environmental Resources Branch

Enclosure

19. NMFS Biological Opinion. February 21, 2019.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

Refer to NMFS No: WCR-2018-10630

February 21, 2019

Mark T. Ziminske
Chief
Environmental Resource Branch
United States Army Corps of Engineers
Sacramento District
1326 J Street
Sacramento, California 95814-2922

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Phase 3 of the Reclamation District 17 (RD 17) Levee Seepage Repair Project along the San Joaquin River

Dear Mr. Ziminske:

Thank you for your letter of August 21, 2018, requesting initiation of consultation with the National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Phase 3 of the RD 17 Levee Seepage Repair Project (Project). The Project will implement repairs to multiple levee sites along the San Joaquin River in the southern Delta within San Joaquin County, California.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action.

The enclosed biological opinion, based on the biological assessment, and best available scientific and commercial information, concludes that the project is not likely to jeopardize the continued existence of the federally listed threatened Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit, the threatened California Central Valley (CCV) steelhead (*O. mykiss*) Distinct Population Segment (DPS), and the threatened Southern DPS (sDPS) of the North American green sturgeon (*Acipenser medirostris*). NMFS has also concluded that the Project is not likely to destroy or adversely modify the designated critical habitats for CCV steelhead, and sDPS green sturgeon that occur within the action area. NMFS has included an incidental take statement with reasonable and prudent measures and non-discretionary terms and conditions that are necessary and appropriate to avoid, minimize, or monitor incidental take of listed species associated with the Project.

This letter also transmits NMFS' EFH conservation recommendations for Pacific salmon as required by the MSA as amended (16 U.S.C. 1801 *et seq.*).

The EFH consultation concludes that the proposed action would adversely affect the EFH of Pacific salmon in the action area. The EFH consultation adopts the ESA reasonable and prudent measures and associated terms and conditions from the biological opinion and includes additional conservation recommendations specific to the adverse effects to Pacific salmon EFH in the action area as described in Amendment 18 of the Pacific Coast Salmon Plan.

The U.S. Army Corps of Engineers (USACE) has a statutory requirement under section 305(b)(4)(B) of the MSA to submit a detailed written response to NMFS within 30 days of receipt of these conservation recommendations, and 10 days in advance of any action, that includes a description of measures adopted by the USACE for avoiding, minimizing, or mitigating the impact of the Project on EFH (50 CFR 600.920(j)). If unable to complete a final response within 30 days, the USACE should provide an interim written response within 30 days before submitting its final response. In the case of a response that is inconsistent with our recommendations, the USACE must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the Phase 3 of the RD 17 Levee Seepage Repair Project and the measures needed to avoid, minimize, or mitigate such effects.

Please contact Jeffrey Stuart in NMFS' West Coast Region, California Central Valley Office at (916) 930-3607 or via email at J.Stuart@noaa.gov if you have any questions concerning this section 7 consultation, or if you require additional information.

Sincerely,

Maria Rea

Maria Rea
Assistant Regional Administrator
California Central Valley Office

Enclosure

cc: To the File ARN 151422-WCR2018-SA00470

Dr. Steve Schoenberg, U.S. Fish and Wildlife Service, 2800 Cottage Way, Suite W-2605, Sacramento, CA 95825-1846

Mr. Dante Nomellini, c/o Nomellini, Grilli, & McDaniel, P.O. Box 1416, Stockton, CA 95201

Mr. Henry Long, President, Reclamation District Number 17, P.O. Box 1461, Stockton, CA 95201

Dr. Andrea Shepard, GEI Consultants, Inc., 2868 Prospect Park Drive, Suite 400, Rancho Cordova, CA 95670

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response

Phase 3 of the RD 17 Levee Seepage Repair Project

National Marine Fisheries Service Public Tracking Consultation Number: WCR-2018-10630

Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Central Valley spring-run Chinook Salmon Evolutionarily Significant Unit (ESU) (*O. tshawytscha*)	Threatened	Yes	No	No	No
California Central Valley steelhead Distinct Population Segment (DPS (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No
Southern DPS of North American green sturgeon (*Acipenser medirostris*)	Threatened	Yes	No	Yes	No

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By: Maria Rea
Maria Rea
Assistant Regional Administrator
California Central Valley Office

Date: FEB 21 2019

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LIST OF ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
µg/L	microgram per liter
ACID	Anderson-Cottonwood Irrigation District Diversion Dam
AEP	annual exceedance probability
BA	Biological Assessment
BMPs	best management practices
CCV	California Central Valley
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CFR	Code of Federal Regulations
CNFH	Coleman National Fish Hatchery
Conceptual MMP	Conceptual Mitigation and Monitoring Plan
CPU	Catch per unit effort
CVFPB	Central Valley Flood Protection Board
Delta	Sacramento-San Joaquin River Delta
DO	Dissolved oxygen
DPS	distinct population segment
DQA	Data Quality Act
DWR	California Department of Water Resources
EFH	essential fish habitat
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FEMA	Federal Emergency Management Agency
FRFH	Feather River Fish Hatchery
FWCA	Fish and Wildlife Coordination Act
HAPCs	Habitat Areas of Particular Concern
HTL	High Tide Line
ITS	incidental take statement
IWM	instream woody materials
LSRP	levee seepage repair program
LWD	large woody debris
mg/L	milligram per liter
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAVD88	North American Vertical Datum 1988
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NPS	Non-point source
NTU	nephelometric turbidity units
opinion	biological opinion
PAHs	poly aromatic hydrocarbons
PAL	provisional accredited levee
PBFs	physical or biological features
PCE	primary constituent element

PPT	Parts per thousand
Project	Phase 3 RD 17 Levee Seepage Repair Project
PS	Point source
RD 17	Reclamation District 17
RM	River Mile
RWQCB	Central Valley Regional Water Quality Control Board
sDPS	southern DPS
SJRRP	San River Restoration Program
SRA	shaded riverine aquatic
SWPPP	storm water pollution prevention plan
SWRCB	State Water Resources Control Board
TRT	Technical Review Team
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VSP	viable salmonid population
YOY	young-of-the-year

LIST OF TABLES

LIST OF FIGURES

All Figures are located in **Section 6 – Appendix 1**, which begins at page 109

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 United States Code [USC] 1531 et seq.), and implementing regulations at 50 Code of Federal Regulations (CFR) 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 USC 1801 et seq.) and implementing regulations at 50 CFR 600.

The following provides some background information regarding the need for the levee seepage repair project in Reclamation District 17 (RD 17):

The RD 17 levee system functions to reduce the risk of damage from floods and was initially designed to facilitate agricultural development on the extensive San Joaquin Valley floodplains and to support navigation on the San Joaquin River. Narrow levee alignments along the rivers were designed to contain flows generated by common floods, and bypasses were constructed to carry overflows generated by large floods. The close-set levees ensured that water velocities would help scour the river bottom and move sediment through the river system, reducing dredging costs for sustaining navigation. Starting in approximately 1863, RD 17 undertook the maintenance and reconstruction of the levee system.

Some of the levees in the Delta are considered “federal project levees.” These levees were constructed or reconstructed (e.g., existing or damaged farm levees were improved during repairs) by the United States Army Corps of Engineers (USACE) and are intended to meet federal standards. Construction of the federal levee system that encompasses the current RD 17 levees along Walthall Slough, the San Joaquin River, and French Camp Slough began in 1944 and was completed in 1963. The levee system has since been substantially upgraded to meet Federal Emergency Management Agency (FEMA) requirements for flood protection during a 100-year flood event (flood with a 1 percent chance of occurring in any given year, or 0.01 annual exceedance probability [AEP]). In 1990, after extensive analysis, the RD 17 levees were accredited by FEMA as meeting the 100-year requirements for urban development.

During a high-water event on the San Joaquin River in January 1997, seepage and boils occurred at several locations along the RD 17 levees. The USACE, California Department of Water Resources (DWR), and RD 17 successfully contained the seepage and boils, and the levees did not break. After the 1997 event, the USACE, the Central Valley Flood Protection Board (CVFPB), and RD 17 funded a project, the Reconstruction of the California Central Valley Levees San Joaquin Basin #4, Reclamation District #17 Project, to repair the seepage and boil areas. The project was designed and constructed by USACE, and work was completed in 2003.

After reviewing the data supporting the 1990 accreditation and subsequent information, FEMA notified RD 17 of its intention to confirm full accreditation of the RD 17 levees as meeting FEMA's requirements for 100-year flood protection. On June 19, 2007, DWR wrote a letter to the City of Lathrop, with a copy to FEMA, stating that it could not support recertification of the RD 17 levees or the granting of provisional accreditation because of concerns about seepage exit gradients[1]. The basis of DWR's concern was analysis showing seepage exit gradients greater than 0.5, which indicated a higher likelihood of seepage or boils occurring during a high-water event. Because of DWR's concern, FEMA then denied full accreditation and instead granted provisional accredited levee (PAL) status to the RD 17 levees. A PAL is a levee that FEMA has previously credited with providing a 100-year flood event level of flood risk reduction (i.e., flood with a 1 percent chance of occurring in any given year, or 0.01 AEP). In fall 2007, in response to the PAL status, RD 17 initiated a levee seepage repair program (LSRP) and requested funding through DWR's Early Implementation Program.

RD 17 subsequently implemented Phases 1 and 2 of the LSRP. After completion of the Phase 1 and 2 levee repairs, RD 17 submitted a recertification application to FEMA. In September 2010, RD 17 received a response letter declaring that FEMA had accredited the area protected by the RD 17 levee system associated with phases 1 and 2, including the dryland levee, thereby removing the PAL status for these sections of levee. Phase 3 of the LSRP will address the remaining sections of levee in RD 17 that have seepage deficiencies that do not meet the current USACE seepage criteria standards and levee geometry requirements.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available through the NMFS Public Consultation Tracking System website.[2] A complete record of this consultation is on file at the California Central Valley Area Office.

1.2 Consultation History

The list below summarizes correspondence, meetings, and discussions between regulatory agencies, RD 17, and consultants that relate to potential effects of the Phase 3 of the RD 17 Levee Seepage Repair Project (Project) on species addressed in this document.

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[1] Seepage exit gradient" is an expression in numeric form of the potential for under seepage to exit on the landside of a levee as seepage or a boil. The lower the number used to express seepage exit gradient, the more resistant the system is to seepage or boils; the higher the number, the more likely seepage or boils may occur during a high water event. In formulas for seepage exit gradients, the numerator (top number in a fraction) typically addresses forces that cause or enhance seepage (e.g., water pressure), and the denominator typically addresses forces that resist seepage (e.g., soil resistance to water pressure, depth and weight of soil over the potential seepage area, distance from the levee toe). A lower seepage exit gradient (i.e., more resistance to seepage) is achieved when the numerator (positive seepage forces) is reduced and/or the denominator (resistance to seepage) is increased.

[2] Once on the PCTS homepage, use the following PCTS tracking number within the Quick Search column: WCR-2018-10630, or search for the project by name: Phase 3 RD 17 Levee Seepage Repair Project.

5/14/10 Letter from AECOM, prepared on behalf of RD 17, to US Fish and Wildlife Service (USFWS) and NMFS requesting informal technical assistance in evaluating the potential effects on listed species that could result from implementing USACE vegetation management standards, and in developing a conservation strategy to adequately offset the potential loss of habitat. Copies of the wetland delineation report and maps were provided with the letter.

6/11/10 Letter from NMFS to AECOM, responding to the May 14, 2010, letter requesting technical assistance for the Project.

8/24/10 Meeting between representatives of USACE, USFWS, NMFS, and AECOM to discuss the potential effects of the project on listed species and development of a conservation strategy.

3/1/11 Tour of proposed action area with representatives from AECOM, USACE, USFWS, NMFS, and California Department of Fish and Wildlife (CDFW).

3/27/15 Letter from USACE to NMFS transmitting the Biological Assessment (BA) and requesting informal consultation for the Project and concurrence that the Project was "not likely to adversely affect" the federally listed threatened Central Valley (CV) spring-run Chinook salmon evolutionarily significant unit (ESU) (*Oncorhynchus tshawytscha*), endangered Sacramento River winter-run Chinook salmon ESU (*O. tshawytscha*), threatened California CV (CCV) steelhead distinct population segment (DPS) (*O. mykiss*), and the threatened southern DPS (sDPS) of North American green sturgeon (*Acipenser medirostris*). The USACE also determined that the proposed Project would not result in the destruction or adverse modification of designated critical habitat for any of these species and would not adversely affect EFH of Pacific salmon under section 305(b)(2) of the MSA.

7/7/2015 NMFS sent a letter to the USACE indicating that the materials provided were insufficient to conduct a consultation for the Project and requested additional information regarding the Project.

10/7/2016 A response to the NMFS insufficiency letter of 7/7/15 requesting additional information was completed by GEI Consultants and AECOM, on behalf of RD 17, and sent to NMFS.

3/8/2017 USACE submits a new request to USFWS and NMFS to re-initiate informal Section 7 consultation. The request includes submittal of a revised BA. NMFS informs USACE that this consultation will be delayed due to NMFS staff being detailed to work on the California Water Fix consultation.

3/22/2017 USACE advised NMFS of anticipated emergency construction in RD 17 to protect levee integrity during high water events that winter.

4/6/2017 Authorization from USACE issued to RD 17 for discharge of fill into waters of the United States for the 2017 Emergency Response Construction Project (SPK-2009-001466) under Regional General Permit No. 8 (Emergency Actions).

9/22/2017 Email correspondence with USACE indicating that NMFS staff will re-engage with the RD 17 consultation following completion of the California Water Fix consultation. NMFS staff requests explanations regarding the amount of work done for emergency repairs during the previous winter's high flood flows on the San Joaquin River.

11/2/2017 USACE responds that the applicant is revising the BA to reflect emergency work done on the levees in the RD 17 Levee Seepage Repair Project area during the previous winter

12/11/2017 Meeting with representatives from USACE, NMFS, and GEI Consultants to discuss the BA and Section 7 consultation with NMFS.

1/12/2018 USACE provided USFWS and NMFS with copies of the Conceptual Mitigation and Monitoring Plan (Conceptual MMP), and requested their review of the document.

3/14/2018 NMFS provided the USACE with comments on the Conceptual MMP.

4/30/2018 A response to comments was completed by GEI Consultants, on behalf of RD 17, and included as an appendix to the proposed Project's updated BA.

5/16/2018 NMFS issued a letter to the USACE indicating that the RD 17 consultation had been closed out due to inactivity.

8/21/2018 USACE provided a new request for informal consultation for the Project with an enclosed BA containing updated information related to the emergency repairs conducted during the winter of 2017. The USACE requested concurrence from NMFS that the Project was "not likely to adversely affect" the federally listed threatened CV spring-run Chinook salmon ESU, endangered Sacramento River winter-run Chinook salmon ESU, threatened CCV steelhead DPS, and the threatened sDPS of North American green sturgeon. The USACE also determined that the proposed Project will not result in the destruction or adverse modification of designated critical habitat for any of these species and will not adversely affect EFH of Pacific salmon under section 305(b)(2) of the MSA.

9/27/2018 NMFS sent a letter to the USACE indicating that it did not concur with their request for a concurrence with a "not likely to adversely affect" determination for the Project. NMFS however concluded that there was sufficient information contained in the BA to initiate formal consultation with the USACE on this Project. NMFS informed the USACE that a biological opinion will be completed on or before January 3, 2019.

1/28/2019	NMFS initiated consultation on September 18, 2018, however, the consultation was held in abeyance for 38 days due to a lapse in appropriations and resulting partial government shutdown. Consultation resumed on January 28, 2019.

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02).

1.3.1 Federal Action

RD 17, in cooperation with DWR and the CVFPB, is the local project sponsor for the Project. RD 17 has requested permission from the CVFPB and USACE to alter segments of the San Joaquin River levee system within the district's boundaries, which are part of the federal project levee system. The proposed action for USACE is to make a combined permit decision on the Project under the authority of a Clean Water Act Section 404 (33 USC 1344) permit and a Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) permit for placement of fill into jurisdictional waters of the United States, as well as a permission decision under Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408), referred to as a Section 408, for alterations of federal projects. Under Section 408, the USACE may allow the permanent use or occupancy of a USACE flood risk management project with approval by the Secretary of the Army on the recommendation of the Chief of Engineers, provided that such use or occupancy would not be injurious to the public interest.

1.3.2 Project Location

RD 17 is located in south-central San Joaquin County, California, at the north end of the San Joaquin River Basin, and within the far southeast limit of the Delta (Figure 1). The boundaries of RD 17 are marked by French Camp Slough on the north, approximately 3 miles southwest of the central business district of the City of Stockton; the San Joaquin River on the west; Walthall Slough on the south (just below State Route 120); and Airport Way/McKinley Avenue on the east, just outside the City of Manteca. RD 17 is responsible for maintaining the levees along the east bank of the San Joaquin River from just south of Mathews Road to Walthall Slough, the levees along the north bank of Walthall Slough, and the dryland levee out to approximately South Airport Way. The locations of levee repairs that are part of the three phases of the LSRP are shown in Figure 2.

The proposed actions associated with the Project are located along specific reaches of the RD 17 levees, as depicted in Figure 2. The Project's landside levee improvements would occur along 5.2 miles (27,456 feet) of the RD 17 levee system and would involve constructing: 17,020 feet of cutoff walls; 940 feet of seepage berms; 8,280 feet of chimney drains; 1,100 feet of new setback levee; and, placing fill on the landside slope of the levees wherever needed to achieve engineering design standards for slope gradient and levee profile. The proposed action would also include: grading 8 acres of offset area (area between the existing levee and a new setback levee); restoring 9.9 to 11.5 acres of native vegetation in the offset area; degrading 400 feet of existing levee; raising a PG&E high voltage tower footing; and, replacing a wooden railroad trestle bridge with a new embankment. Table 1 describes this information in greater detail by project element (i.e., reach). The proposed action would eliminate or reduce levee deficiencies, including through- and under-seepage, slope stability, erosion, and encroachments within the construction footprint. Table 1 also includes descriptions of those portions of the Phase 3 actions that were part of the emergency actions taken in the winter of 2017, as well as the actions within each element that remain to be completed by the Project. The Phase 3 features that have not yet been constructed are the focus of this consultation with the USACE.

Table 1: RD 17 Levee Seepage Repair Project Construction Elements

Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)				
Element	**Type of Remediation**	**Phase 3 Project Major Features**	**Phase 3 Project Features Constructed as 2017 Emergency Response Actions**	**Phase 3 Project Features Remaining To be Constructed1**
Ia	under seepage and through seepage	Construct approximately 590 feet of seepage berm (approximately 110 feet wide) and approximately 590 feet of chimney drain to meet required exit gradients. Construct PG&E high voltage tower footing raisings. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 350 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 110 feet.	Construct approximately 240 feet of additional seepage berm (approximately 110 feet wide) and approximately 590 feet of chimney drain to meet required exit gradients. Construct PG&E high voltage tower footing raisings. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
Ib	under seepage and through seepage	Fill existing depression to approximately 300 feet from toe of existing levee. Construct approximately 130 feet of seepage berm (approximately 80 feet wide) and approximately 130 feet of chimney drain on top of fill to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Filled existing depression to approximately 300 feet from toe of existing levee. Constructed approximately 130 feet of seepage berm on top of fill to meet required exit gradients. The constructed seepage berm width is approximately 80 feet.	Construct approximately 130 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
Ie	under seepage and through seepage	Construct approximately 590 feet of seepage berm (approximately 70 feet wide) and approximately 590 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 590 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 70 feet.	Construct approximately 590 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
IIab	under seepage and through seepage	Construct approximately 2,600 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.	*None.*	Construct approximately 2,600 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.

Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)				
Element	**Type of Remediation**	**Phase 3 Project Major Features**	**Phase 3 Project Features Constructed as 2017 Emergency Response Actions**	**Phase 3 Project Features Remaining To be Constructed1**
IIIa	Through seepage	Construct approximately 4,750 feet of chimney drain in existing seepage berm to meet required exit gradients Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths.	*None*	Construct approximately 4,750 feet of chimney drain in existing seepage berm to meet required exit gradients Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths.
IIIb	under seepage and through seepage	Construct approximately 720 feet of seepage berm (approximately 90 feet wide) and approximately 720 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 720 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 90 feet.	Construct approximately 720 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
IVa	under seepage and through seepage	Construct approximately 450 feet of seepage berm (approximately 90 feet wide) and approximately 450 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 450 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 90 feet.	Construct approximately 450 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
IVc	under seepage and through seepage	Construct approximately 1,100-foot-long setback levee containing approximately 300 feet of seepage berm and approximately 300 feet of cutoff wall to meet required exit gradients. Depth of the cutoff wall will be approximately 60 feet. Cutoff wall will involve degrading the top 1/3 to 1/2 of the levee crown and will begin with a 1:1 cut at the waterside crown. Seepage berm would be a minimum of 65 feet wide. Install riprap on waterside of existing levee above the high tide line where it would intersect setback levee. After setback levee is completed, remove 400 linear feet of the existing levee above the high tide line onthe downstream side of oxbow. Grade approximately 8 acres of setback area, to	*None*	Construct approximately 1,100-foot- long setback levee containing approximately 300 feet of seepage berm and approximately 300 feet of cutoff wall to meet required exit gradients. Depth of the cutoff wall will be approximately 60 feet. Cutoff wall will involve degrading the top 1/3 to 1/2 of the levee crown and will begin with a 1:1 cut at the waterside crown. Seepage berm would be a minimum of 65 feet wide. Install riprap on waterside of existing levee above the high tide line where it would intersect setback levee. After setback levee is completed, remove 400 linear feet of the existing levee above the high tide line on the downstream side of oxbow. Grade approximately 8 acres of setback area, to drain to the river through

Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)				
Element	**Type of Remediation**	**Phase 3 Project Major Features**	**Phase 3 Project Features Constructed as 2017 Emergency Response Actions**	**Phase 3 Project Features Remaining To be Constructed1**
IVc cont'd	under seepage and through seepage	drain to the river through the downstream opening in the remnant levee, and restore at least 9.9 acres, and up to 11.1 acres, of riparian scrub and Great Valley oak woodland in the area between the landside toe of the setback levee and the river. For more information about habitat restoration in IVc,.	*None*	the downstream opening in the remnant levee, and restore at least 9.9 acres, and up to 11.1 acres, of riparian scrub and Great Valley oak woodland in the area between the landside toe of the setback levee and the river. For more information about habitat restoration in IVc,..
Va and VIa.1	under seepage and through seepage	Construct approximately 5,900 feet of seepage berm (approximately 60 feet wide) to meet required exit gradients. Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width. Construct 9,500 feet of continuous cutoff wall to meet required exit gradients. Depth of cutoff walls would vary from 60–85 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls. The existing levee will be widened where necessary as part of cutoff wall construction.	Constructed approximately 5,900 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 60 feet.	Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width. Construct 9,500 feet of continuous cutoff wall to meet required exit gradients. Depth of cutoff walls would vary from 60–85 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls. The existing levee will be widened where necessary as part of cutoff wall construction.
VIa.4	under seepage and through seepage	Construct approximately 70 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 90–100 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.	*None.*	Construct approximately 70 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 90–100 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.

Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)				
Element	**Type of Remediation**	**Phase 3 Project Major Features**	**Phase 3 Project Features Constructed as 2017 Emergency Response Actions**	**Phase 3 Project Features Remaining To be Constructed1**
VIb	under seepage and through seepage	Construct approximately 2,050 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 70–80 feet. Cutoff wall in levee prism would involve both deep slurry mix construction as well as degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown.	*None.*	Construct approximately 2,050 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall in levee prism would involve both deep slurry mix construction as well as degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown.
VIcde	under seepage and through seepage	At element, VIc, construct approximately 300 feet of seepage berm (approximately 100 feet wide) and approximately 300 feet of chimney drain to meet required exit gradients and construct a new earthen railroad embankment to replace the existing wooden trestle bridge. At element VId, construct approximately 150 feet of seepage berm (approximately 100 feet wide) and 150 feet of chimney drain to meet required existing gradients and raise grade. At element VIe, construct approximately 250 feet of subgrade seepage collection drain system and 250 feet of chimney drain to meet required exit gradients, raise approximately 200 feet of parking lot grade, and levee widening.	At element VIc, constructed approximately 300 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 100 feet. At element VId, constructed approximately 150 feet of seepage berm to meet required exit gradients and raised grade. The constructed seepage berm width is approximately 100 feet. At element VIe, constructed approximately 250 feet of subgrade seepage collection drain system to meet required exit gradients and raised approximately 200 feet of parking lot grade.	At element VIc, construct approximately 300 feet of chimney drain to meet required exit gradients and construct a new earthen railroad embankment to replace the existing wooden trestle bridge. At element VId, construct approximately 150 feet of chimney drain to meet required exit gradients. At element IVe, construct approximately 250 feet of chimney drain to meet required exit gradients and levee widening.
VIIb	under seepage and through seepage	Construct approximately 350 feet of seepage berm (approximately 135 feet wide) and 350 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 350 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 135 feet.	Construct approximately 350’ of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.

Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)				
Element	**Type of Remediation**	**Phase 3 Project Major Features**	**Phase 3 Project Features Constructed as 2017 Emergency Response Actions**	**Phase 3 Project Features Remaining To be Constructed1**
VIIe	under seepage and through seepage	Construct approximately 2,500 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 60–120 feet. Deep slurry mixing method would be used. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Repair Project.	*None.*	Construct approximately 2,500 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 60–120 feet. Deep slurry mixing method would be used. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Repair Project.
VIIg	under seepage and through seepage	Construct approximately 400 feet of seepage berm (approximately 65 feet wide) to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	*None.*	Construct approximately 400 feet of seepage berm (minimum 65 feet wide) to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
Source: Data provided by Kjeldsen, Sinnock & Neudeck, Inc. in 2014, updated 2017				

1.3.3 Project Purpose and Objectives

The overall purpose of the Project is to implement landside and isolated waterside levee improvements in 19 LSRP elements affecting 5.2 miles of the approximately 19-mile RD 17 levee system, leading to the reduction of flooding risk in the RD 17 service area during a 100-year flood event. Levee improvements would address under seepage, through seepage, and levee geometry repair and remediation. USACE and RD 17 each view the project purpose from the purview of their respective responsibilities, defined as follows:

USACE's objectives for the Project are to:

- decide whether or not to grant permission for the Project to alter the federal project levees within its levee system under Section 408, and;
- decide whether or not to issue combined permits under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899.

RD 17's objectives for the proposed Project are to:

- repair seepage deficiencies where needed to meet current USACE seepage criteria standards;
- increase the levee's resistance to under seepage and/or through seepage;
- provide under seepage exit gradients equal to or less than 0.5 at the landside levee toe, and equal to or less than 0.8 at the landside drainage seepage berm at the water surface elevation associated with the design water surface, and;
- meet levee geometry requirements of the permitting agencies in the specific areas of repair work.

1.3.4 Construction Actions Related to the Project Elements

The Project would address the under seepage and/or through seepage concerns raised by DWR and repair and/or remediate levee geometry to USACE design standards along approximately 5.2 miles of the RD 17 levee system, including portions of the San Joaquin River east levee and portions of the levee along the northern bank of Walthall Slough. Under seepage occurs below the above-ground levee prism and is caused by the buildup of water pressure in the subsurface foundation soils when high-river stages are present on the waterside of the levees. This pressure head causes water to flow through the earthen foundation layers under the levee and exit onto the ground surface on the landside of the levee prism (Figure 3). Such seepage is not uncommon and does not inherently imply that the levee is failing; however, excessive and uncontrolled under seepage can carry fine-grained material with the water flow that can undermine the levee and lead to levee failure. Through seepage is the movement of water through the levee prism when high-river stage conditions exist on the waterside of the levee (Figure 3). Depending on the duration of high water and the permeability of the levee embankment soil, seepage may exit onto the landside slope of the levee, thereby negatively affecting the stability of the landside levee slope.
Levee improvements along the USACE project levees would consist primarily of in-place repair/remediation actions, but would include a single setback levee at element IVc. As summarized in Table 1 and shown in Figures 4a through 4c, the Project's landside levee improvements would include a combination of construction of seepage berms, installation of

chimney drains and both shallow and deep cutoff walls, the raising of the landside grade, and construction of a setback levee with a seepage berm and an underlying cutoff wall along 19 elements of the RD 17 levee system. These levee repair components, as well as additional project components (such as levee geometry corrections and stormwater management), are described in more detail in the following sections. The proposed Project does not include any work that would raise the existing levee. Limited work would be performed along the waterside of the levee above the ordinary hide tide line (HTL) in element IVc, where the setback levee would be constructed and new floodplain created.

1.3.4.1 Seepage Berms

A drained seepage berm collects and conveys seepage that comes through the levee, thereby reducing the flood risk associated with a high-water event. Drained seepage berms are built on the landside of a levee, and consist of layers of sand filter material, drain rock, geosynthetic filter fabric, and a seepage berm soil fill (Figure 5). The design width and height of a seepage berm are dependent on the relative permeability of the underlying soil layers and the amount of pressure head that push water under the levee and through these soils during sustained high-river events. The higher the water pressure head and the more dissimilar the porosity of the underlying soil layers, the wider and/or taller the seepage berm must be to prevent boils and reduce flood risk.

For the Project, drained seepage berm widths of 60–120 feet are expected to be adequate to meet the design criteria in most cases (Figure 5). However, these types of berms may extend up to 300–400 feet inland from the landside toe of the levee. Seepage berms typically are constructed using select materials excavated from borrow sites or obtained from commercial sources. For the Project, soil material for seepage berms would be purchased from commercial sources and hauled to the construction sites by dump trucks. A compacted-surface patrol road would be constructed near the outside edge of the seepage berm (see “Additional Project Components” below).

In urban areas, some seepage berms also would include a toe drain system (element VIIg) to safely collect and discharge the seepage water into an urban storm drainage system. A toe drain pipe is a below-grade, perforated pipe surrounded by a layer of sand and drain rock (Figure 6). The toe drain pipe is a mechanism to safely collect and convey seepage water away from the levee and seepage berm. If the toe drain pipe is unable to convey the seepage water, the water exits the drained seepage berm through the drain rock at the face of the berm, similar to a nonurban berm.

1.3.4.2 Chimney Drains

A chimney drain is a drainage system that collects seepage waters that are flowing through the above-ground portion of the levee structure. This type of drain is used to collect and convey through seepage. A chimney drain consists of a 1 to 3-foot-thick layer of sand and drain rock. Filter fabric is placed between the soil and rock layer to avoid migration of the soil into the rock, which can clog the rock layer and reduce its ability to carry seepage flows. The chimney drain is placed directly on the landside slope of the levee and tied into an existing or new drained seepage berm at the landside base of the levee (Figure 7). The chimney drain conveys the through seepage flows to a drained seepage berm, which is located at the landside base of the levee as described in the previous section.

Installing a chimney drain in an existing drained seepage berm would include adding the through seepage material on top of the existing seepage berm and tying this material into the existing seepage berm material by removing the seepage berm fill material and physically tying the two drainage rock layers together. When the remediation includes construction of a new drained seepage berm with a chimney drain, the chimney drain would be installed during construction of the drained seepage berm.

1.3.4.3 Cutoff Walls

In selected locations of the Project, cutoff walls would be placed through the levee prism (parallel to the river). Cutoff walls use specialized earthen materials to create an impermeable barrier to under or through seepage in the levee (often bentonite clay, which has low permeability, or a mixture of bentonite and cement). Cutoff walls would be constructed vertically through the levee prism, extending into or through deeper foundational soils that have low-permeability (a layer through which seepage does not flow readily). Thus, cutoff walls would substantially reduce the potential for under and through seepage flow during high-river flow events. Two methods for installing cutoff walls would be used along portions of the RD 17 levees: the conventional open-trench method and the deep soil mixing method.

The conventional open-trench method would be used to install shallow cutoff walls to a maximum depth of approximately 80 feet. This method involves excavating material in an open trench (the trench is filled with a bentonite slurry to maintain the side slopes of the excavation) and then replacing it with the select materials, typically a bentonite or cement-bentonite slurry (Figure 8). Prior to excavating the open trench, the top one-third to one-half of the levee prism height is "degraded," meaning that it is excavated so that any weakness in the narrow upper portion of the levee does not result in failure of the levee during the cutoff wall construction. Following construction of the cutoff wall, the levee is restored to its original height and the levee prism constructed to achieve USACE criteria for crown width and slope gradient.

For the deep slurry mixing method, specialized equipment (such as a crane mounted auger) is used to excavate deep into the subsurface soils, allowing the cutoff walls to reach depths up to 120 feet below grade (Figure 9). The deep slurry mixing method involves mixing the loosened soil in place with cement and/ or bentonite, thereby reducing the risk of failure during construction. This method does not require levee crown degradation.

For the Project, the cutoff walls would be extended approximately 300 feet beyond the element boundary to provide the required overlap with drained seepage berms that have been or are being installed along the landside sections of adjacent levee elements. Levee slopes (where cutoff walls would be installed) also would be modified as needed to achieve the required 20-feet levee crown width and landside slope of 3:1.

1.3.4.4 Setback Levee with Seepage Berm and Cutoff Wall

Project Element IVc involves construction of a 1,100-foot-long setback levee with an underlying cutoff wall and a seepage berm, on a major oxbow of the San Joaquin River (Table 1). In the Project area, soil materials beneath a setback levee are anticipated to have properties similar to those of materials below the existing levees. Therefore, a setback levee would have no seepage-related benefit in the RD 17 area relative to other seepage control methods. Like the existing levees, a setback levee would require either a cutoff wall or drained seepage berm to sufficiently reduce the potential adverse effects associated with under seepage flows (Figures 10 and 11). Nevertheless, implementation of a setback levee could provide some additional capacity in the river for floodwaters and also would have the potential to provide habitat in the area between the new and old levee locations.

Where the new setback levee would intersect the existing levee bordering the San Joaquin River, the top one-third to one-half of the crown of the existing levee would be degraded beginning with a 1:1 cut at the existing waterside crown to facilitate tying the cutoff wall and setback levee into the existing levee. Approximately 0.64 acres (740 linear feet) of riprap would be installed only on the waterside of the existing levee and above the HTL in element IVc where it would intersect the setback levee. No trees/shrubs would be removed to place the riprap and any riprap around trees/shrubs would be hand-placed. The riprap would not be installed to act as launchable rock. After the setback levee is completed, 400 linear feet of the existing levee above the HTL on the downstream side of the oxbow would be degraded, reconnecting approximately 6 acres of floodplain to the river.

The reconnected floodplain area would be graded to allow complete drainage of the floodplain to the river after high water events that inundated the floodplain. As flood flows recede, the floodplain area would drain completely through the breach in the remnant levee. It is anticipated that this design feature will minimize the possibility of fish stranding on the floodplain (Figure 12).

The Conceptual MMP evaluated three breach invert elevations (8 feet [North American Vertical Datum 1988 {NAVD88}], 10 feet [NAVD88] and 14 feet [NAVD88]) for the proposed levee breach on the downstream end of the oxbow. Hydraulic modeling, based on San Joaquin River flows as reported at the Vernalis U.S. Geological Survey (USGS) stream gage (Vernalis gage), about 17.5 miles upstream of the project area, was used to estimate the flow in the San Joaquin River at which water would enter the setback area through the remnant levee breach for the three breach invert elevations investigated (Table 2).

To evaluate how often and how long the levee setback area would be expected to be inundated, historical Vernalis gage daily flow records were reviewed since the completion of New Melones Dam in 1979. This represents a period of time where the San Joaquin River basin operating regime has changed relatively little and portrays current reservoir operations. The evaluation used the mean daily flows for the period October 1, 1978 through September 30, 2015, or Water Years 1979 through 2015. The total number of days in the evaluation period is 13,514. Table 3 summarizes the estimated number and percent of days in the evaluation study period in which the levee setback area would flood based on the three potential invert elevations.

The appropriate breach elevation is under consideration and will be defined in the Final MMP. It is anticipated that the breach elevation would be set at approximately 9 or 10 feet (NAVD88). Approximately 1-2 acres of the floodplain would be set to an elevation of 14 feet (NAVD88) or below and would inundate approximately every 6 years.

Table 2: Estimated Flows for Inundation of the Element IVc Mitigation Site

Estimated Flows for Inundation			
Breach Invert Elevation (feet, NAVD88)	**Flow in San Joaquin River near Vernalis above which Mitigation Site Breach Flow Occurs (cfs)**	**Estimated Return Interval**	**Flow in San Joaquin River at Breach Location (cfs)**
8	9,500	2-year	4,200
10	13,200	3- to 4-year	5,700
14	24,000	6-year	8,800
Note: cfs = cubic feet per second Source: MBK Engineers 2016			

Table 3: Estimated Total Duration of Mitigation Site Flooding for Evaluation Period of Record

Estimated Total Duration of Mitigation Site Flooding			
Breach Invert Elevation (feet, NAVD88)	**San Joaquin River Flow at Vernalis above which Mitigation Site Breach Flow Occurs (cfs)**	**Number of Days Flow Equaled or Exceeded for the period between 10/1/1978 and 9/30/2015**	**Percent of Days Flow Equaled or Exceeded for the Evaluation Period**
8	9,500	1,619	12%
10	13,200	1,126	8.3%
14	24,000	423	3.1%
Note: cfs = cubic feet per second Source: MBK Engineers 2016			

1.3.4.5 Additional Project Components

The following activities will occur as part of the proposed Project in addition to the construction of seepage berms, chimney drains, cutoff walls, and the setback levee with its new floodplain area:

- **Levee geometry corrections:** Several of the Project elements currently do not meet requirements for levee geometry (i.e., slopes, crown width). To correct levee geometry deficiencies, levee fill material would be placed along the landside of existing levee slopes where needed to provide the minimum 3:1 slope and a minimum 20-foot- wide levee crown. All levee elements would undergo some level of levee geometry corrections.

- **Operations and Maintenance (O&M) access and utility corridors**: A 20-foot-wide permanent O&M access corridor would be established adjacent to the landside toe of seepage berms and levees (if not already present for levees). Any relocated power poles and other utility infrastructure would be located outside this easement.

- **Temporary construction easements**: Where needed, a 20-foot-wide temporary construction easement and construction turnaround area (up to 80 feet in diameter) would be included adjacent to the inland side of the permanent O&M access corridor, to provide access to the site during construction. These features would be removed and the site(s) would be returned to pre-project conditions following completion of construction.

- **Stormwater /irrigation controls**: Drainage/irrigation swales would be constructed around the outside boundaries of levee repairs, where needed, and other stormwater best management practices (BMPs) would be implemented to manage stormwater runoff and/or irrigation during and after construction. These swales would be located so that they would not drain to/from wetlands or other waters of the U.S.

- **Haul roads**: An estimated 700,000 cubic yards of imported material (i.e., soil, aggregate, and cement) would be required to construct these levee improvements. These materials would be hauled to the work sites from commercial sources up to 11 miles away. Personnel, equipment, and imported materials would be transported to the Project area using various surface roads that connect with Interstate 5 or State Route 120. The primary corridors where construction activity would take place would be public roadways, on and within 300 feet of the levees, existing unpaved roads used for access to work areas, and levee patrol roads atop the levee crown.

- **Landside vegetation removal**: Landside vegetation within the footprint of the proposed levee work, including maintenance roadway corridors and temporary access easements, would be cleared to prepare for levee repair work. The proposed action would involve performing limited work on the waterside of the levee above the HTL (e.g., installing riprap and degrading a portion of the levee in element IVc); however, no waterside woody or riparian vegetation would be removed; the areas where riprap would be placed and the levee degraded are characterized by ruderal land cover. Figures 13a through 13c show the relevant vegetation types at each Project element location.

- **Encroachment management**: Several features, including power poles, vegetation, and a variety of agricultural-related facilities (e.g., irrigation infrastructure, fences), are within the Project footprint. Utility infrastructure would be relocated as needed to accommodate the levee repairs, and any pipelines or other underground utility crossings would be replaced as needed. Other encroachments in the Project area would be removed or relocated as required to meet the criteria of USACE, the CVFPB, and FEMA. No waterside woody or riparian vegetation would be removed; the areas where riprap would be placed and the levee degraded are characterized by ruderal land cover.

- **Long-Term Vegetation Management**: Vegetation on the levees and within the access easements would be managed in accordance with current O&M practices to maintain access and visibility. These practices include: mechanical trimming of existing trees and removal of large dead and downed trees annually; regular summer and winter application of herbicides for weed control; and summer application of herbicides to control woody plants and berries.

1.3.5 Proposed Construction Schedule and Sequence of Project Construction

The Project is expected to take 2 years to complete the construction actions with an additional year required for site restoration and demobilization. The general levee construction window is seasonal (July 1–November 1), avoiding the period when high-water levels have the potential to occur within the San Joaquin River system. However, the Project applicant has stated that depending on hydrologic conditions and subject to compliance with species work windows, a work window variance that allows an extension outside the July 1–November 1 work period may be granted by the CVFPB. The CVFPB may stipulate that RD 17 has to comply with additional conditions and commitments as a component of any work window variance.

The proposed construction sequence, which would include concurrent work in several different Project elements to meet the project schedule, is as follows:

- **Relocation of power poles**: Power poles currently situated on the landside of the levee toe of some elements would need to be relocated to accommodate the proposed drained seepage berms. To the extent feasible, power poles would be relocated beyond the toe of the new berm, outside the maintenance access easement. If placing poles on top of the seepage berms is required, either raised foundations or steel-reinforced concrete piers would be constructed to prevent the poles from affecting the seepage berms. RD 17 would oversee relocation of the power poles, in coordination with the appropriate utility and construction companies.

- **Site preparation at existing levee sites and in levee setback area**: Site preparation (i.e., clearing, grubbing, and stripping) of the levee elements would begin by clearing structures (see discussion in the next bullet) and woody vegetation from the footprint of the proposed levee work and the permanent O&M access and utility corridors. Vegetation would be retained in areas adjacent to but outside the project footprint. This operation would require removal of some trees and relocation or removal of some elderberry shrubs. Large trees would be felled approximately 3 feet above ground level, with stumps temporarily left in place. Where feasible, small trees and elderberry shrubs would be relocated. Relocation of elderberry shrubs would be done according to guidelines from the USFWS. A minimal amount of below-ground disturbance would occur. The clearing operation would be followed by grubbing operations to remove stumps, root balls, and any below-ground infrastructure. The area then would be disked to chop surface vegetation and mix it with near-surface organic soils. The disking operation would be followed by stripping the top 12 inches of earthen material from the landside slope of the existing levee and the footprint of the proposed seepage berms. Excess earthen materials (i.e., organic soils, and excavated material that does not meet levee embankment criteria) would be temporarily stockpiled and then would be re-spread on the surface of the new levee slopes and seepage berms, provided this material is not contaminated with vegetation. Any stripped material contaminated with vegetation and other debris generated during the clearing and grubbing operations would be hauled off-site to a suitable landfill.

- **Removal or modification of landside structures and other facilities:** In a few levee elements, agricultural facilities (e.g., fences, drainage infrastructure) or parking lots are located within the footprint of the proposed levee work. These facilities would be removed from or relocated outside the project footprint before levee construction begins in those areas. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. Demolished concrete could be sent to a concrete recycling facility. If any wells or septic systems would be affected, they would be abandoned in accordance with the applicable State and County requirements.

- **Construction of the setback levee with drained seepage berm and underlying cutoff wall**: Construction of the setback levee embankment in element IVc would begin as soon as sufficient lengths of levee foundation are prepared and weather conditions are suitable. Foundation preparation would include constructing a levee keyway that would be excavated 3–5 feet deep across the entire footprint of the proposed setback levee with excavators or bulldozers. A smaller but deeper excavated inspection trench, centered beneath the new waterside hinge point of the setback levee, would be constructed beneath a small portion of the keyway at that location to meet DWR standards. After the foundation layers are backfilled with engineered soil, a geotechnical geogrid fabric would be installed at ground level across the entire setback levee footprint. A second layer of geogrid fabric would be placed at mid-height of the new levee fill section to further reduce the potential for post-construction settlement of the new levee. The embankment would be constructed of engineered fill, with the fill placed in 3-foot-maximum lifts by motor graders. Each lift would be moisture-conditioned using water trucks and would be compacted to the specified density using a suitable compactor, such as a sheep’s foot, tamping foot, or rubber-tired roller. Next, quarry stone riprap would be applied in three segments, to armor the newly completed setback levee’s waterside slope and protect against erosion. Riprap would be placed on the waterside levee above the HTL in areas that are characterized by ruderal land cover (Figure 12). All waterside woodland would be avoided; all waterside trees would be avoided as well as any tree canopy that overlaps riprap. Riprap placement would be done either by barge or by long-arm excavator from the top of the levee crown. Riprap dimensions for the three segments are: 340 feet long by 50 feet wide (0.39 acre), 140 feet long by 30 feet wide (0.096 acre), and 230 feet long by 50 feet wide (0.26 acre). A drained seepage berm then would be constructed on the landside of the setback levee. Fill material for setback levee and drained seepage berm construction would be obtained from commercial sources and would be delivered to levee construction sites using haul trucks.

- **Setback levee site restoration and demobilization:** After completion of construction, the previously stripped topsoil material would be placed on top of the completed setback levee and associated seepage berms in element IVc, and levee slopes and the tops of the seepage berms would be hydroseeded. An aggregate-base patrol road would be constructed at the landside edge of the seepage berm and setback levees and on the new setback levee crown. The existing levee would be fully restored at the tie-in points to the new setback levee. The existing levee crown patrol road would be redressed with aggregate base, to restore it to preconstruction levels. Any disturbed riprap also would be supplemented to provide a uniform layer across the connection point with the new setback levee. Immediately after final construction, the setback levee's fill slopes would be covered with erosion control material until application of the hydroseed. Any construction debris would be hauled to an appropriate off-site waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to pre-project conditions. Demobilization would be likely to occur in various locations as construction proceeds along various elements.

- **Removal of existing levee at setback levee elements, site restoration, and demobilization**: After certification of the new setback levee and seepage berm in element IVc, a 400-linear-foot-long section of the existing outboard levee (which is approximately 2,400 linear feet long in element IVc) on the downstream side of the existing oxbow would be partially degraded using earth moving equipment. The area where the levee would be degraded is characterized by ruderal land cover (Figure 13b); some landside vegetation would be removed, but all waterside trees and overlapping tree canopy would be avoided. Except for an approximately 20-foot-wide corridor on the top of the remnant levee that will serve as a maintenance road, providing access to the remnant levee breach area for maintenance and flood fighting purposes, at least 9.9 acres (and up to 11.1 acres) of riparian vegetation would be established in the area between the new setback levee and the San Joaquin River (Figure 12) (see the "Compensation Measures" subsection of the "Avoidance and Minimization Measures" section below for additional information). This acreage would be made up of approximately 6.1 acres of restored riparian scrub habitat between the landside toe of the existing levee and the waterside toe of the new setback levee and between the river and the waterside toe of the existing levee, and approximately 5 acres of restored Great Valley oak woodland/upland refugia habitat along either side of the existing levee. These acreages would include approximately 1.2 acres of contingency land area, with the goal of restoring a minimum of 9.9 acres of riparian habitat. This work would be completed after flood season (from July 1 through November 1) and above the HTL, primarily using scrapers, excavators, and bulldozers to remove the levee section and all present levee encroachments.

- **Construction of drained seepage berms, drained seepage berms with chimney drains, and chimney drains within existing drained seepage berms**: Fill material for levee improvements would be obtained from commercial sources and delivered to the levee construction sites by haul trucks. The material then would be spread by motor graders and compacted by sheep's foot rollers to build new seepage berms and seepage berms with chimney drains. A water truck would be used to properly moisture-condition the soils for compaction. Installing the chimney drains in existing drained seepage berms also would require use of an excavator or scraper to remove the existing drained seepage berm fill material so that the chimney drain fill material can be tied into the drainage rock layer of the existing drained seepage berm.

- **Construction of cutoff walls**: Equipment required for cutoff wall construction would include slurry batch plants to prepare bentonite or bentonite cement mix, pumps, and support vehicles. Four to five batch plants or slurry ponds would be required for the project; these would be located near the site of cutoff wall construction. Each batch plant or slurry pond with associated pumps and support equipment would occupy an area of approximately 100 square feet that would be restored to pre-project conditions following completion of cutoff wall construction. Cutoff walls may be installed concurrently in two or more different directions within an element. RD 17 proposes to use the deep slurry mix method for installing deep cutoff walls, which would avoid the need to degrade the top of the levee, and conventional slurry trench walls (open-cut method) for shallow cutoff walls. RD 17 also would consider driving sheet piles, using a drop impact hammer or other pile-driving technology in lieu of cutoff wall installation at element VIIe. The number of cutoff wall rig setups would depend on the project schedule and contractor preference. Each deep slurry mix cutoff wall rig would move continuously along the proposed alignment, to attain an uninterrupted cutoff wall and reduce prolonged disturbance to residences near some cutoff wall segments. Each cutoff wall rig could move 50 to 100 feet horizontally during a 12-hour work shift, while each conventional slurry trench rig could move 75 to 200 feet horizontally during a 12-hour work shift. Cutoff wall construction in Elements Va and VIa.1 is anticipated to occur 24 hours a day, 7 days a week, with occasional shutdowns for equipment maintenance, when necessary. Lights and possibly power generators would be used during nighttime construction hours. Disturbances to nearby residences are expected to be minor because of the limited number of residences near these cutoff wall installation areas. However, where lights, noise, and/or vibration would exceed allowable nighttime standards for the applicable local jurisdiction, work hours would be restricted to daytime work hours.

- **Site restoration and demobilization**: On completion of construction, previously stripped topsoil material not contaminated with vegetation would be placed on top of the completed seepage berms and any disturbed levee slopes. Any previously nonagricultural, vegetated areas disturbed during construction would be hydroseeded with a standard erosion control mix. An aggregate-base patrol road would be constructed at the landside edge of any seepage berms. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to pre-project conditions. Demobilization likely would occur in various locations as construction proceeds along various elements.

1.3.6 Avoidance and Minimization Measures

1.3.6.1 General

- A qualified biologist, retained by RD 17, will be on-site to ensure compliance with the avoidance and minimization measures described below, particularly where construction activities occur adjacent to sensitive habitats to be avoided.

- A worker awareness training program will be conducted for construction crews before the start of construction. The program will include a brief overview of special-status species and sensitive resources (including riparian habitats) in the Project area, measures to avoid and minimize effects on those resources, and conditions of relevant regulatory permits.

1.3.6.2 Federally Listed Fish Species – Anadromous Salmonids, and North American Green Sturgeon

The following measures will be implemented to avoid and minimize potential adverse effects related to lights, noise, and vibration:

- During nighttime construction, RD 17 will use shielded lighting that is directed away from the waterside levees.

- Vibratory compaction equipment will be specifically restricted on the RD 17 levees. The limited amount of compaction that would occur on landside chimney drain locations would be restricted to normal work day hours.

The following measures will be implemented to avoid and minimize potential adverse effects on water quality:

- Any work within the existing floodway (i.e., placing riprap on the waterside levee above the HTL at element IVc) of the San Joaquin River will not take place during the designated flood season (i.e., November 1 to July 1) and will not begin until evaluation of upstream conditions (e.g., reservoir storage and snowpack) indicate that inundation of these areas will be unlikely to occur during construction.

- RD 17 will comply with all local, State, and federal regulations and environmental requirements regarding turbidity-reduction measures, including the following:

    - obtaining and complying with relevant agency permits (e.g., CDFW streambed alteration agreement, Central Valley Regional Water Quality Control Board [RWQCB] Clean Water Act Section 401 certification, and Section 404 permit);

    - developing and implementing a storm water pollution prevention plan (SWPPP) that identifies specific BMPs to avoid and minimize effects on water quality during construction activities; and,

    - complying with the conditions of the National Pollutant Discharge Elimination System (NPDES) general stormwater permit for construction activity.

- RD 17 will file a notice of intent with the Central Valley RWQCB to discharge stormwater associated with construction activity. Final design and construction specifications will require implementation of standard erosion, siltation, and good housekeeping BMPs. Construction contractors will be required to prepare and implement a SWPPP and comply with the conditions of the NPDES general stormwater permit for construction activity (Order No. 2009-0009-DWQ or the current permit in place at the time of construction). The SWPPP will describe the construction activities to be conducted, BMPs that will be implemented to prevent discharges of contaminated stormwater into waterways, and inspection and monitoring activities that will be conducted. At a minimum, the following specific BMPs will be implemented:

- All work will be conducted according to site-specific construction plans that identify areas for clearing, grading, and revegetation so that ground disturbance is minimized.
- Silt fences and/or straw wattles will be installed near riparian areas or existing drainages to control erosion and trap sediment and reseed cleared areas with native vegetation.
- Maintenance will be conducted on a regular basis to ensure proper installation and function of BMPs, and during storm events, maintenance will be conducted daily.
- BMPs that have failed (within 48 hours of an event) will be repaired and replaced immediately with sufficient devices and materials (e.g., silt fence, coir rolls, and erosion blankets), provided throughout project construction to enable immediate corrective action for failed BMPs.
- Stockpiling of construction materials (e.g., portable equipment, vehicles, and supplies, including chemicals) will be restricted to designated construction staging areas, exclusive of any riparian, wetland, or other areas supporting waters.
- Disturbed soils at construction areas will be stabilized before the onset of rainfall.
- Stockpiles will be stabilized and protected from exposure to rain and potential erosion.

The SWPPP also will specify appropriate hazardous materials handling, storage, and spill response practices to reduce the possibility of effects from use or accidental spills or releases of contaminants. Specific measures applicable to the project will include the following:

- Compliance will be required by RD 17 contractors with all applicable State Water Resources Control Board (SWRCB) and Central Valley RWQCB standards and other applicable water quality standards.
- Strict on-site handling rules will be developed and implemented, to keep potentially contaminating construction and maintenance materials out of drainages and other waterways.
- When refueling and servicing equipment, absorbent material or drip pans will be used underneath such equipment to contain spilled fuel, oil, and other fluids; and any fluid drained from machinery will be collected in leak-proof containers and delivered to an appropriate disposal or recycling facility.
- Substances that can be hazardous to aquatic life will be prevented from contaminating the soil or entering watercourses.
- Spill cleanup equipment will be maintained in proper working condition. All spills will be cleaned up immediately according to the spill prevention and response plan, which

will be prepared by RD 17 or its contractor or representative and will be approved by the Central Valley RWQCB before the start of project ground- breaking.

- NMFS, USFWS, CDFW, and the Central Valley RWQCB will be notified immediately (within 24 hours) of any reportable spills and cleanup occurrences. All such spills, and the success of the efforts to clean them, will be recorded in post-construction compliance reports.

- A slurry spill contingency plan will be developed, which will be prepared by RD 17 or its contractor or representative before the start of project groundbreaking, to respond to a potential for bentonite slurry spill and prevent slurry from entering watercourses.

- Construction materials handled by RD 17 or its contractors will be stored and transported in a manner that minimizes potential water quality effects. Storage areas will be located away from drainages and waterways, outside the floodplain, and away from sensitive resources, and containment facilities will be used.

BMPs will be applied to meet the “maximum extent practicable” and “best conventional technology/best available technology” requirements and address compliance with water quality standards. RD 17 will implement a monitoring program during and after construction so that the Project complies with all applicable standards and ensures that the implementation of the BMPs are effective.

1.3.6.3 Mitigation and Monitoring Plan

A Conceptual MMP has been prepared to describe the expansion and restoration of riparian habitat in element IVc. Specifically, this plan:

- describes specifications for the restoration of habitat components, including details about the restoration of riparian habitats, with a list of the plant species and drawings/designs to show the location of the plant species and planting density;

- establishes specific success criteria for the habitat components, including:

    - performance standards to determine whether the habitat improvement was trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in design or maintenance revisions);

    - monitoring and maintenance protocols; and

    - measurable goals to ensure vegetation survival to provide and replace riparian habitats;

- specifies remedial measures to be undertaken if success criteria are not met (e.g., adaptive management, physical adjustments, additional monitoring); and

- describes short and long-term management and maintenance of the habitat lands.

The Conceptual MMP is intended to be developed into a Final MMP, in coordination with USFWS, NMFS, and USACE, and would be reviewed and approved by USFWS and NMFS before ground-breaking in the portions of the Project area that could affect the species addressed in this opinion. RD 17 would provide conservation of the restored riparian habitat in the levee setback area in element IVc. The compensation habitat ultimately would be transferred to a suitable land management organization, for long-term management and monitoring.

1.3.7 Interrelated and Interdependent Actions

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). There are no interdependent or interrelated actions associated with the Project.

2 ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and/or an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of" a listed species, which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214).

The designations of critical habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon uses the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a ''destruction or adverse modification'' analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.

- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest a RPA to the proposed action.

2.2 Range wide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential PBFs that help to form that value for the conservation of the listed species.

The following Federally listed species ESU, DPSs, and designated critical habitats occur in the action area and have the potential to be affected by the action (Table 4):

Table 4: ESA Listing History

Species	ESU or DPS	Original Final FR Listing	Current Final Listing Status	Critical Habitat Designated
Chinook salmon (*O. tshawytscha*)	Central Valley spring-run ESU	9/16/1999 64 FR 50394 Threatened	6/28/2005 70 FR 37160 Threatened	9/2/2005 70 FR 52488 (Not Present in Action Area)
Steelhead (*O. mykiss*)	California Central Valley DPS	3/19/1998 63 FR 13347 Threatened	1/5/2006 71 FR 834 Threatened	9/2/2005 70 FR 52488
Green sturgeon (*Acipenser medirostris*)	Southern DPS	4/7/2006 71 FR 17757 Threatened	4/7/2006 71 FR 17757 Threatened	10/9/2009 74 FR 52300

2.2.1 Central Valley Spring-run Chinook salmon

- Listed as threatened (September 16, 1999, 64 FR 50394), reaffirmed (June 28, 2005, 70 FR 37160).
- Designated critical habitat (September 2, 2005, 70 FR 52488)

The Federally listed ESU of Central Valley (CV) spring-run Chinook salmon ESU occurs in the action area and may be affected by the proposed action. Designated critical habitat does not occur in the action area. Detailed information regarding ESU listing and critical habitat designation history, designated critical habitat, ESU life history, and VSP parameters can be found in NMFS' 2014 Recovery Plan (NMFS 2014).

Historically, spring-run Chinook salmon were the second most abundant salmon run in the Central Valley and one of the largest on the west coast (CDFG 1990). These fish occupied the upper and middle elevation reaches (1,000 to 6,000 feet) of the San Joaquin, American, Yuba, Feather, Sacramento, McCloud and Pit rivers, with smaller populations in most tributaries with sufficient habitat for over-summering adults (Stone 1874, Rutter 1902, Clark 1929). The Central Valley drainage as a whole is estimated to have supported spring-run Chinook salmon runs as large as 600,000 fish between the late 1880s and 1940s (CDFG 1998). The San Joaquin River historically supported a large run of spring-run Chinook salmon, suggested to be one of the largest runs of any Chinook salmon on the West Coast with estimates averaging 200,000 500,000 adults returning annually (CDFG 1990).

Monitoring of the Sacramento River mainstem during spring-run Chinook salmon spawning timing indicates some spawning occurred in the river (CDFW 2018), but has been essentially non-existent since 2008/2009. Genetic introgression has likely occurred here due to lack of physical separation between spring-run and fall-run Chinook salmon populations (CDFG 1998). Sacramento River tributary populations in Mill, Deer, and Butte creeks are likely the best trend indicators for the CV spring-run Chinook salmon ESU. Generally, these streams have shown a positive escapement trend since 1991, displaying broad fluctuations in adult abundance (CDFW 2018). The Feather River Fish Hatchery (FRFH) spring-run Chinook salmon population represents an evolutionary legacy of populations that once spawned above Oroville Dam. The FRFH population is included in the ESU based on its genetic linkage to the natural spawning population, and the potential for development of a conservation strategy (June 28, 2005, 70 FR 37160).

The Central Valley Technical Review Team (TRT) estimated that historically there were 18 or 19 independent populations of CV spring-run Chinook salmon, along with a number of dependent populations, all within four distinct geographic regions, or diversity groups (Lindley et al. 2004). Of these populations, only three independent populations currently exist (Mill, Deer, and Butte creeks tributary to the upper Sacramento River) and they represent only the northern Sierra Nevada diversity group. Additionally, smaller populations are currently persisting in Antelope and Big Chico creeks, and the Feather and Yuba rivers in the northern Sierra Nevada diversity group (CDFG 1998).

In the San Joaquin River basin, observations in the last decade suggest that spring-running populations may still occur in the Stanislaus and Tuolumne rivers (Franks 2013). Currently, attempts to reintroduce an experimental population of CV spring-run Chinook salmon to the San Joaquin River basin are underway. A final rule was published to designate a nonessential experimental population of CV spring-run Chinook salmon to allow reintroduction of the species below Friant Dam on the San Joaquin River as part of the San Joaquin River Restoration Project (SJRRP) (78 FR 79622; December 31, 2013). Pursuant to ESA section 10(j), with limited exceptions, each member of an experimental population shall be treated as a threatened species. However, the rule includes proposed protective regulations under ESA section 4(d) that would provide specific exceptions to prohibitions under ESA section 9 for taking CV spring-run Chinook salmon within the experimental population area (San Joaquin River from Friant Dam downstream to the confluence of the Merced River), and in specific instances elsewhere. The first release of CV spring-run Chinook salmon juveniles into the San Joaquin River occurred in April 2014. A second release occurred in 2015, and future releases are planned to continue annually during the spring. Natural spawning of adult CV spring-run below Friant Dam on the San Joaquin River has been observed (presence of redds) in the last two years (2017, 2018). The SJRRP's future long-term contribution to the CV spring-run Chinook salmon ESU has yet to be determined, but is likely to include individuals present in the Project action area in future years.

The CV spring-run Chinook salmon ESU is comprised of two known genetic complexes. Analysis of natural and hatchery spring-run Chinook salmon stocks in the Central Valley indicates that the northern Sierra Nevada diversity group spring-run Chinook salmon populations in Mill, Deer, and Butte creeks retain genetic integrity as opposed to the genetic integrity of the Feather River population, which has been somewhat compromised by introgression with the fall-run ESU (Good et al. 2005, Garza et al. 2008, Cavallo et al. 2011).

Because the populations in Butte, Deer and Mill creeks are the best trend indicators for ESU viability, we can evaluate the risk of extinction based on VSP parameters in these watersheds. Over the long term, these three remaining populations are considered to be vulnerable to anthropogenic and naturally occurring catastrophic events. The viability assessment of CV spring-run Chinook salmon conducted during NMFS' 2010 status review (NMFS 2011a), found that the biological status of the ESU had worsened since the last status review (2005) and recommended that the species status be reassessed in two to three years as opposed to waiting another five years, if the decreasing trend continued. In 2012 and 2013, most tributary populations increased in returning adults, averaging approximately 19,000 fish in-river (CDFW 2018). However, 2014 returns were lower again, just over 7,000 fish in -river, indicating the ESU population remains highly fluctuating. The most recent status review was conducted in 2015 (NMFS 2016a), which looked at promising increasing populations for the period between 2012 and 2014. However, the 2015 returning in-river adult fish escapement was extremely low (1,195 fish), with additional pre-spawn mortality reducing populations even more. Since the effects of the 2012-2016 drought have not been fully realized, we anticipate at least several more years of very low returns, which may result in severe rates of decline (NMFS 2016a). Adult escapements for in-river adult spring-run escapement is 6,453 fish for 2016, but only 1,105 fish for 2017 (CDFW 2018). These returns are substantially lower than the cohort returns three years earlier.

Spring-run Chinook salmon adults are vulnerable to climate change because they over-summer in freshwater streams before spawning in autumn (Thompson et al. 2011). CV spring-run Chinook salmon spawn primarily in the tributaries to the Sacramento River, and those tributaries without cold water refugia (usually input from springs) will be more susceptible to impacts of climate change. Even in tributaries with cool water springs, in years of extended drought and warming water temperatures, unsuitable conditions may occur. Additionally, juveniles often rear in the natal stream for one to two summers prior to emigrating, and would be susceptible to warming water temperatures. In Butte Creek, fish are limited to low elevation habitat that is currently thermally marginal, as demonstrated by high summer mortality of adults in 2002 and 2003, and will become intolerable within decades if the climate warms as expected. Ceasing water diversion for power production from the summer holding reach in Butte Creek resulted in cooler water temperatures, more adults surviving to spawn, and extended population survival time (Mosser et al. 2013).

2.2.1.1 Summary of the Central Valley Spring-run Chinook salmon ESU Viability

In summary, the recent 5-year Status Review described the extinction risk for the CV spring-run Chinook salmon ESU as remaining at moderate risk of extinction (NMFS 2016a). Based on the severity of the drought and the low escapements as well as increased pre-spawn mortality in Butte, Mill, and Deer creeks in 2015, there is concern that these CV spring-run Chinook salmon strongholds will deteriorate into high extinction risk in the coming years based on the population size or rate of decline criteria (NMFS 2016a). This postulate is supported by the sharp declines in adult escapement for the years 2014 through 2017 for each cohort (CDFW 2018).

2.2.1.2 Critical Habitat and Physical or Biological Features for Central Valley Spring-run Chinook salmon

The critical habitat designation for CV spring-run Chinook salmon lists the PBFs (June 28, 2005, 70 FR 37160), which are described in NMFS' 2014 Recovery Plan (NMFS 2014). In summary, the PBFs include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and estuarine habitat. The geographical range of designated critical habitat includes stream reaches of the Feather, Yuba, and American rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear creeks, and the Sacramento River, as well as portions of the northern Delta (June 28, 2005, 70 FR 37160). Waterways described in the listing for spring-run critical habitat do not include the southern Delta or lower San Joaquin River which are part of the action area.

2.2.1.3 Summary of the Value of CV Spring-run Chinook salmon Critical Habitat for the Conservation of the Species

Currently, many of the PBFs of CV spring-run Chinook salmon critical habitat are degraded, and provide limited high quality habitat. Features that lessen the quality of migratory corridors for juveniles include unscreened or inadequately screened diversions, altered flows in the Delta, scarcity of complex in-river cover, and the lack of floodplain habitat. Although the current conditions of CV spring-run Chinook salmon critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain are considered to have high intrinsic value for the conservation of the species. However, the action area does not include waterways designated as critical habitat for CV spring-run Chinook salmon.

2.2.2 *California Central Valley Steelhead*

- Originally listed as threatened (March 19, 1998, 63 FR 13347); reaffirmed as threatened (January 5, 2006, 71 FR 834).
- Designated critical habitat (September 2, 2005, 70 FR 52488).

The Federally listed DPS of CCV steelhead and designated critical habitat for this DPS occurs in the action area and may be affected by the proposed action. Detailed information regarding DPS listing and critical habitat designation history, designated critical habitat, DPS life history, and VSP parameters can be found in the NMFS' 2014 Recovery Plan (NMFS 2014).

Historic CCV steelhead run sizes are difficult to estimate given the paucity of data, but may have approached one to two million adults annually (McEwan 2001). By the early 1960s the CCV steelhead run size had declined to about 40,000 adults (McEwan 2001). Current abundance data for CCV steelhead is limited to returns to hatcheries and redd surveys conducted on a few rivers. The hatchery data is the most reliable because redd surveys for steelhead are often made difficult by high flows and turbid water usually present during the winter-spring spawning period.

Overall CCV steelhead returns to the Coleman National Fish Hatchery (CNFH), which includes both wild and hatchery origin fish, have increased over the four-year period, 2011 to 2014. After hitting a low of only 790 fish in 2010, the last two years prior to the most recent 5-year review, 2013 and 2014, have averaged 2,895 fish. Wild adults counted at the hatchery each year represent a small fraction of overall returns, but their numbers have remained relatively steady, typically 200–300 fish each year. Numbers of wild adults returning each year have ranged from 252 to 610 from 2010 to 2014.

Redd counts are conducted in the American River and in Clear Creek (Shasta County). An average of 143 redds have been counted on the American River from 2002–2015 [data from Hannon et al. (2003), Hannon and Deason (2008), Chase (2010), Cramer Fish Sciences 2015, NMFS 2016b]. An average of 178 redds have been counted in Clear Creek from 2001 to 2015 following the removal of Saeltzer Dam, which allowed steelhead access to additional spawning habitat. The Clear Creek redd count data ranges from 100-1,023 and indicates an upward trend in abundance since 2006 (NMFS 2016b).

The returns of CCV steelhead to the Feather River Hatchery experienced a sharp decrease from 2003 to 2010, with only 679, 312, and 86 fish returning in 2008, 2009 and 2010, respectively. In recent years, however, returns have experienced an increase with 830, 1,797, and 1,505 fish returning in 2012, 2013, and 2014 respectively. Overall, steelhead returns to hatcheries have fluctuated so much from 2001 to 2015 that no clear trend is present.

An estimated 100,000 to 300,000 naturally produced juvenile CCV steelhead are estimated to leave the Central Valley annually, based on rough calculations from sporadic catches in trawl gear (Good et al. 2005). Nobriga and Cadrett (2001) used the ratio of adipose fin-clipped (hatchery) to unclipped (wild) CCV steelhead smolt catch ratios in the USFWS Chipps Island trawl from 1998 through 2000 to estimate that about 400,000 to 700,000 CCV steelhead smolts are produced naturally each year in the Central Valley. Trawl data indicate that the level of natural production of CCV steelhead has remained very low since the 2011 status review (NMFS 2016b), suggesting a decline in natural production based on consistent hatchery releases. Catches of CCV steelhead at the fish collection facilities in the southern Delta are another source of information on the production of wild CCV steelhead relative to hatchery CCV steelhead (data is found on the CDFW Fish Salvage Monitoring website). The overall catch of CCV steelhead has declined dramatically since the early 2000s, with an overall average of 2,705 in the last 10 years. The percentage of wild (unclipped) fish in salvage has fluctuated, but has leveled off to an average of 36 percent since a high of 93 percent in 1999. In 2018 (as of 5/22/18 – last recorded steelhead smolt for WY18), the total number of unclipped steelhead observed in salvage is 1,037. The number of clipped steelhead observed in salvage is 728 fish, which may indicate that 2017 (a wet year) had a strong year class for wild steelhead production.

About 80 percent of the historical spawning and rearing habitat once used by anadromous *O. mykiss* in the Central Valley is now upstream of impassible dams (Lindley et al. 2006). Many historical populations of CCV steelhead are entirely above impassable barriers and may persist as resident or adfluvial rainbow trout, although they are presently not considered part of the DPS. CCV steelhead are well-distributed throughout the Central Valley below the major rim dams (Good et al. 2005, NMFS 2016b). Most of the CCV steelhead populations in the Central Valley have a high hatchery component, including Battle Creek (adults intercepted at the Coleman NFH weir), American River, Feather River, and Mokelumne River, all of which have hatchery steelhead production programs.

CCV steelhead abundance and growth rates continue to decline, largely the result of a significant reduction in the amount and diversity of habitats available to these populations (Lindley et al. 2006). Recent reductions in population size are supported by genetic analysis (Nielsen et al. 2003). Garza and Pearse (2008) analyzed the genetic relationships among CCV steelhead populations and found that unlike the situation in coastal California watersheds, fish below barriers in the Central Valley were often more closely related to below barrier fish from other watersheds than to *O. mykiss* above barriers in the same watershed. This pattern suggests the ancestral genetic structure is still relatively intact above barriers, but may have been altered below barriers by stock transfers. The genetic diversity of CCV steelhead is also compromised by hatchery origin fish, placing the natural population at a high risk of extinction (Lindley et al. 2007). Historically, steelhead in the Central Valley consisted of both summer-run and winter-run migratory forms. Currently, only winter-run (ocean maturing) steelhead are found in California Central Valley rivers and streams as summer-run have been extirpated (McEwan and Jackson 1996, Moyle 2002).

CCV steelhead will experience similar effects of climate change as do Chinook salmon in the Central Valley, as they are also blocked from the vast majority of their historic spawning and rearing habitat. The effects may be even greater in some cases, as juvenile steelhead need to rear in their natal stream for one to two summers prior to emigrating as smolts. In the Central Valley, summer and fall temperatures below the dams in many streams already exceed the recommended temperatures for optimal growth of juvenile steelhead, which range from 14°C to 19°C (57°F to 66°F). Several studies have found that steelhead require colder water temperatures for spawning and embryo incubation than salmon (McCullough et al. 2001). In fact, McCullough et al. (2001) recommended an optimal incubation temperature at or below 11°C to 13°C (52°F to 55°F).

Successful smoltification in steelhead may be impaired by temperatures above 12°C (54°F), as reported in Richter and Kolmes (2005). As stream temperatures warm due to climate change, the growth rates of juvenile steelhead could increase in some systems that are currently relatively cold, but potentially at the expense of decreased survival due to higher metabolic demands and greater presence and activity of predators. Stream temperatures that are currently marginal for spawning and rearing may become too warm to support wild steelhead populations in the future.

2.2.2.1 Summary of California Central Valley Steelhead DPS Viability

All indications are that natural CCV steelhead have continued to decrease in abundance and in the proportion of natural fish observed compared to hatchery produced fish over the past 25 years (NMFS 2016b); the long-term trend remains negative. Hatchery production and returns are the dominant components of the Central Valley population structure. Most wild CCV populations are very small and may lack the resiliency to persist for protracted periods of time if subjected to additional stressors, particularly widespread stressors such as climate change. The genetic diversity of CCV steelhead has likely been impacted by low population sizes and high numbers of hatchery fish relative to wild fish.

In summary, the status of the CCV steelhead DPS appears to have remained unchanged since the 2011 status review, and the DPS is likely to become endangered within the foreseeable future throughout all or a significant portion of its range (NMFS 2016b).

2.2.2.2 Critical Habitat and Physical or Biological Features for California Central Valley Steelhead

The critical habitat designation for CCV steelhead lists the PBFs (June 28, 2005, 70 FR 37160), which are described in NMFS' 2014 Recovery Plan (NMFS 2014). In summary, the PBFs include freshwater spawning sites; freshwater rearing sites; freshwater migration corridors; and estuarine areas. The geographical extent of designated critical habitat includes: the Sacramento, Feather, and Yuba rivers, and Deer, Mill, Battle and Antelope creeks in the Sacramento River basin; the San Joaquin River, including its tributaries but excluding the mainstem San Joaquin River above the Merced River confluence; and the waterways of the Delta.

2.2.2.3 Summary of the Value of California Central Valley Steelhead Critical Habitat for the Conservation of the species

Many of the PBFs of CCV steelhead critical habitat are currently degraded and provide limited high quality habitat. Passage to historical spawning and juvenile rearing habitat has been largely eliminated due to construction of impassable dams throughout the Central Valley. Levee construction has also degraded the value for the conservation of the species of freshwater rearing and migration habitat and estuarine areas as riparian vegetation has been removed, reducing habitat complexity, food resources, and resulting in many other detrimental ecological effects. Contaminant loading and poor water quality in Central California waterways poses threats to steelhead, their habitat, and their food resources. Additionally, due to reduced access to historical habitats, genetic introgression is occurring because naturally-produced fish are interacting with hatchery-produced fish which has the potential to reduce the long-term fitness and survival of this species.

Although the current conditions of CCV steelhead critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain in the Sacramento/San Joaquin River watersheds and the Delta are considered to have high intrinsic value for the conservation of the species as they are critical to the ongoing recovery effort.

2.2.3 *Southern Distinct Population Segment of North American Green Sturgeon*

- Listed as threatened (April 7, 2006, 71 FR 17757).
- Critical habitat designated (October 9, 2009, 74 FR 52300).

The federally listed sDPS of North American green sturgeon and designated critical habitat for this DPS occurs in the action area and may be affected by the proposed action. Detailed information regarding DPS listing and critical habitat designation history, designated critical habitat, and DPS life history can be found on the following web site: NOAA Fisheries West Coast Region Green Sturgeon web page.

Green sturgeon are known to range from Baja California to the Bering Sea along the North American continental shelf. During late summer and early fall, subadults and non-spawning adult green sturgeon can frequently be found aggregating in estuaries along the Pacific coast (Emmett et al. 1991, Moser and Lindley 2007). Using polyploid microsatellite data, Israel et al. (2009) found that green sturgeon within the Central Valley of California belong to the sDPS. Additionally, acoustic tagging studies have found that green sturgeon found spawning within the Sacramento River are exclusively sDPS green sturgeon (Lindley et al. 2011). In waters inland from the Golden Gate Bridge in California, sDPS green sturgeon are known to range through the estuary and the Delta and up the Sacramento, Feather, and Yuba rivers (Israel et al. 2009, Bergman et al. 2011, Seesholtz et al. 2015). It is unlikely that green sturgeon utilize areas of the San Joaquin River upriver of the Delta with regularity, and spawning events are thought to be limited to the upper Sacramento River and its tributaries. There is no known modern usage of the San Joaquin River upstream of the Delta by green sturgeon, and adult spawning has not been documented there (Jackson and Van Eenennaam 2013). However, a confirmed sighting of a green sturgeon based on visual observation, video documentation, and positive eDNA samples occurred in the fall of 2017 on the Stanislaus River (FishBio 2017). This sighting helps to corroborate reports of green sturgeon being caught by anglers on the San Joaquin River upstream of the Delta on the CDFW's sturgeon report cards which are required for the sport fishing of sturgeon in California (Gleason et al. 2008, DuBois et al. 2009, DuBois et al. 2010, Dubois et al. 2011, DuBois et al. 2012, DuBois 2013, DuBois et al. 2014, DuBois and Harris 2015, DuBois and Harris 2016, DuBois and Danos 2017, and DuBois and Danos 2018)

Recent research indicates that the sDPS is composed of a single, independent population, which principally spawns in the mainstem Sacramento River and also breeds opportunistically in the Feather River and possibly even the Yuba River (Bergman et al. 2011, Seesholtz et al. 2015). Concentration of adults into a very few select spawning locations makes the species highly vulnerable to poaching and catastrophic events. The apparent, but unconfirmed, extirpation of spawning populations from the San Joaquin River narrows the available habitat within their range, offering fewer habitat alternatives. Whether sDPS green sturgeon display diverse phenotypic traits such as ocean behavior, age at maturity, and fecundity, or if there is sufficient diversity to buffer against long-term extinction risk is not well understood. It is likely that the diversity of sDPS green sturgeon is low, given recent abundance estimates (NMFS 2015).

Trends in abundance of sDPS green sturgeon have been estimated from two long-term data sources: (1) salvage numbers at the State and Federal pumping facilities (see below), and (2) by incidental catch of green sturgeon by the CDFW white sturgeon sampling/tagging program. Historical estimates from these sources are likely unreliable because the sDPS was likely not taken into account in incidental catch data, and salvage does not capture range-wide abundance in all water year types. A decrease in sDPS green sturgeon abundance has been inferred from the amount of take observed at the south Delta pumping facilities: the Skinner Delta Fish Protection Facility, and the Tracy Fish Collection Facility. This data should be interpreted with some caution. Operations and practices at the facilities have changed over the decades, which may affect salvage data. These data likely indicate a high production year vs. a low production year qualitatively, but cannot be used to rigorously quantify abundance.

Since 2010, more robust estimates of sDPS green sturgeon have been generated. As part of a doctoral thesis at UC Davis, Ethan Mora has been using acoustic telemetry to locate green sturgeon in the Sacramento River, and to derive an adult spawner abundance estimate (Mora et al. 2015). Preliminary results of these surveys estimate an average annual spawning run of 223 (DIDSON camera) and 236 (telemetry) fish. This estimate does not include the number of spawning adults in the lower Feather or Yuba Rivers, where green sturgeon spawning was recently confirmed (Seesholtz et al. 2015).

The parameters of green sturgeon population growth rate and carrying capacity in the Sacramento Basin are poorly understood. Larval count data shows enormous variance among sampling years. In general, sDPS green sturgeon year class strength appears to be highly variable with overall abundance dependent upon a few successful spawning individuals (NMFS 2010b). Other indicators of productivity such as data for cohort replacement ratios and spawner abundance trends are not currently available for sDPS green sturgeon.

Southern DPS green sturgeon spawn primarily in the Sacramento River in the spring and summer. Anderson-Cottonwood Irrigation District Diversion Dam (ACID) is considered the upriver extent of green sturgeon passage in the Sacramento River (71 FR 17757, April 7, 2006). The upriver extent of green sturgeon spawning, however, is approximately 30 kilometers downriver of ACID where water temperature is higher than ACID during late spring and summer (Heublein et al. 2017a). Thus, if water temperatures increase with climate change, temperatures adjacent to ACID may remain within tolerable levels for the embryonic and larval life stages of green sturgeon, but temperatures at spawning locations lower in the river may be more affected. It is uncertain, however, if green sturgeon spawning habitat exists closer to ACID, which could allow spawning to shift upstream in response to climate change effects. Successful spawning of green sturgeon in other accessible habitats in the Central Valley (i.e., the Feather River) is limited, in part, by late spring and summer water temperatures (NMFS 2015). Similar to salmonids in the Central Valley, green sturgeon spawning in tributaries to the Sacramento River is likely to be further limited if water temperatures increase and higher elevation habitats remain inaccessible.

2.2.3.1 Summary of Green Sturgeon DPS Viability

The viability of sDPS green sturgeon is constrained by factors such as a small population size, lack of multiple populations, and concentration of spawning sites into just a few locations. The risk of extinction is believed to be moderate (NMFS 2010a). Although threats due to habitat alteration are thought to be high and indirect evidence suggests a decline in abundance, there is much uncertainty regarding the scope of threats and the viability of population abundance indices (NMFS 2010b). Lindley et al. (2007), in discussing Sacramento River winter-run Chinook salmon, states that an ESU (or DPS) represented by a single population at moderate risk of extinction is at high risk of extinction over a large timescale; this would apply to the sDPS for green sturgeon. The most recent 5 year status review for sDPS green sturgeon found that some threats to the species have recently been eliminated, such as take from commercial fisheries and removal of some passage barriers (NMFS 2015). Since many of the threats cited in the original listing still exist, the threatened status of the DPS is still applicable (NMFS 2015).

2.2.3.2 Critical Habitat and Physical or Biological Factors for sDPS Green Sturgeon

The critical habitat designation for sDPS green sturgeon lists the PBFs (October 9, 2009, 74 FR 52300), which are described on the NOAA Fisheries West Coast Region's green sturgeon page. In summary, the PBFs include the following for both freshwater riverine systems and estuarine habitats: food resources, water flow, water quality, migratory corridor, depth, and sediment quality. Additionally, for riverine systems, the designation includes substrate type or size. In addition, the PBFs include migratory corridor, water quality, and food resources in nearshore coastal marine areas. The geographical range of designated critical habitat includes the following.

In freshwater, the geographical range includes:

- the Sacramento River from the Sacramento I-Street bridge to Keswick Dam, including the Sutter and Yolo bypasses and the lower American River from the confluence with the mainstem Sacramento River upstream to the highway 160 bridge;
- Feather River from its confluence with the Sacramento River upstream to Fish Barrier Dam;
- Yuba River from its confluence with the Feather River upstream to Daguerre Point Dam; and,
- the Sacramento-San Joaquin Delta (as defined by California Water Code section 12220, except for listed excluded areas).

In coastal bays and estuaries, the geographical range includes:

- San Francisco, San Pablo, Suisun, and Humboldt bays in California,
- Coos, Winchester, Yaquina, and Nehalem bays in Oregon,

- Willapa Bay and Grays Harbor in Washington, and the
- lower Columbia River estuary from the mouth to river kilometer 74.

In coastal marine waters, the geographical range includes all U.S. coastal marine waters out to the 60-fathom depth bathymetry line from Monterey Bay north and east to include waters in the Strait of Juan de Fuca, Washington.

2.2.3.3 Summary of the Value of sDPS Green Sturgeon Critical Habitat for the Conservation of the Species

Currently, many of the PBFs of sDPS green sturgeon are degraded and provide limited high quality habitat. Additional features that lessen the quality of migratory corridors for juveniles include unscreened or inadequately screened diversions, altered flows in the Delta, and presence of contaminants in sediment. Although the current conditions of green sturgeon critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain in both the Sacramento/San Joaquin River watersheds, the Delta, and nearshore coastal areas are considered to have high intrinsic value for the conservation of the species.

2.2.4 Global Climate Change

One factor affecting the range-wide status of CCV steelhead, CV spring-run Chinook salmon, and the sDPS of the North American green sturgeon, and aquatic habitat at large is climate change.

The world is about 1.3°F warmer today than a century ago and the latest computer models predict that, without drastic cutbacks in emissions of carbon dioxide and other gases released by the burning of fossil fuels, the average global surface temperature may rise by two or more degrees in the 21st century (IPCC 2001, 2007). Much of that increase likely will occur in the oceans, and evidence suggests that the most dramatic changes in ocean temperature are now occurring in the Pacific (Noakes et al. 1998). Using objectively analyzed data Huang and Liu (2001) estimated a warming of about 0.9°F per century in the Northern Pacific Ocean.

Sea levels are expected to rise by 0.5 to 1.0 meters in the northeastern Pacific coasts in the next century, mainly due to warmer ocean temperatures, which lead to thermal expansion much the same way that hot air expands. This will cause increased sedimentation, erosion, coastal flooding, and permanent inundation of low-lying natural ecosystems (e.g., salt marsh, riverine, mud flats) affecting listed salmonid and green sturgeon PBFs. Increased winter precipitation, decreased snow pack, permafrost degradation, and glacier retreat due to warmer temperatures will cause landslides in unstable mountainous regions and destroy fish and wildlife habitat, including salmon-spawning streams. Glacier reduction could affect the flow and temperature of rivers and streams that depend on glacier water, with negative impacts on fish populations and the habitat that supports them.

Summer droughts along the West Coast and in the interior Central Valley of California will mean decreased stream flow in those areas, decreasing salmonid survival and reducing water supplies in the dry summer season when irrigation and domestic water use are greatest. Global warming may also change the chemical composition of the water that fish inhabit: the amount of oxygen in the water may decline, while pollution, acidity, and salinity levels may increase. This will allow for more invasive species to overtake native fish species and impact predator-prey relationships (Petersen and Kitchell 2001, Stachowicz et al. 2002).

In light of the predicted impacts of global warming, the Central Valley has been modeled to have an increase of between 2 and 7°C by 2100, with a drier hydrology predominated by rainfall rather than snowfall (Dettinger et al. 2004, Hayhoe et al. 2004, VanRheenen et al. 2004, Stewart et al. 2005). This will alter river runoff patterns and transform the tributaries that feed the Central Valley from a spring and summer snowmelt dominated system to a winter rain dominated system. It can be hypothesized that summer temperatures and flow levels will become unsuitable for salmonid survival. The cold snowmelt that furnishes the late spring and early summer runoff will be replaced by warmer precipitation runoff. This will truncate the period of time that suitable cold-water conditions exist downstream of existing reservoirs and dams due to the warmer inflow temperatures to the reservoir from rain runoff. Without the necessary cold water pool developed from melting snow pack filling reservoirs in the spring and early summer, late summer and fall temperatures downstream of reservoirs, such as Lake Shasta, could potentially rise above thermal tolerances for juvenile and adult salmonids that must hold and/or rear downstream of the dam over the summer and fall periods.

Projected warming is expected to affect Central Valley Chinook salmon. Because the runs are restricted to low elevations as a result of impassable rim dams, if climate warms by 5°C (9°F), it is questionable whether any Central Valley Chinook salmon populations can persist (Williams 2006). Based on an analysis of an ensemble of climate models and emission scenarios and a reference temperature from 1951- 1980, the most plausible projection for warming over Northern California is 2.5°C (4.5°F) by 2050 and 5°C by 2100, with a modest decrease in precipitation (Dettinger 2005). Chinook salmon in the Central Valley are at the southern limit of their range, and warming will shorten the period in which the low elevation habitats used by naturally-producing Chinook salmon are thermally acceptable. This would particularly affect fish that emigrate as fingerlings, mainly in May and June, and especially those in the San Joaquin River and its tributaries. Specific climate change impacts have already been described in the rangewide status of the species and critical habitat sections for each species (Sections 2.2.1 through 2.2.3).

In summary, observed and predicted climate change effects are generally detrimental to the species (McClure 2011, Beechie et al. 2012,Wade et al. 2013), so unless offset by improvements in other factors, the status of the species and critical habitat is likely to decline over time. The climate change projections referenced above cover the time period between the present and approximately 2100. While there is uncertainty associated with projections, which increases over time, the direction of change is relatively certain (McClure et al. 2013).

2.3 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area is not the same as the project boundary area because the action area must delineate all areas where federally-listed populations of salmon, steelhead, and green sturgeon may be affected by the implementation of the action.

RD 17 is located in south-central San Joaquin County, California, at the north end of the San Joaquin River Basin, and within the far southeast limit of the Delta. The extent of the action area during the construction phase of the Project extends from the farthest downstream construction area (Element 1a; approximately River Mile [RM] 46) which is located on the eastern levee paralleling the San Joaquin River, just to the north of the Howard Road Bridge spanning the San Joaquin River (Figures 2 and 4a). The extent of impacts from construction actions is expected to extend no more than 1,000 feet downstream of this location due to the propagation of noise and vibrations into the adjacent river channel from construction of chimney drains and seepage berms. The upstream boundary of the action area during the construction phase of the Project is located just upstream of Element VIIe. This element location is on the eastern bank of the San Joaquin River at the junction of Walthall Slough and the mainstem San Joaquin River (RM 57) (Figures 2 and 4c). Construction of deep slurry walls at this location is expected to propagate noise and vibrations approximately 2000 feet upstream in the San Joaquin River to the next river bend (latitude 37.77374º, longitude -121.30467º). The action area during the 2-year construction phase of the Project will impact the 11.5 miles of river channel between Element 1a and Element VIIe, as multiple construction sites are located along this reach of the San Joaquin River and the Project description indicates that construction will occur simultaneously at these sites during the 2 years of the proposed Project.

The long term action area of the Project following completion of the construction phase will be the area encompassed by the setback levee at Element IVc. This encompasses no more than approximately 6.1 acres of created floodplain between the landside toe of the existing levee, and the waterside toe of the newly constructed setback levee, and the waterside toe of the existing levee adjacent to the San Joaquin River. Duration and frequency of inundation of the newly created floodplain will depend on the final design elevation of the floodplain. The setback levee is located at approximately RM 52.5 (latitude 37.814525º, longitude -121.317369º).

2.4 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

2.4.1 Local and Regional Characteristics

The Project is located in the southeastern portion of the Sacramento-San Joaquin Delta, upstream of the Port of Stockton to the north, and the Old River/ Middle River complex to the west (Figure 1), with Project construction sites distributed along the eastern bank of the mainstem San Joaquin River. This freshwater habitat provides critical habitat for CCV steelhead, and sDPS green sturgeon. All of the river channels are tidally influenced in the action area, although reversal of flow may not occur in portions of the action area when the mainstem San Joaquin River flows are elevated. This typically occurs during winter high-flow events on the San Joaquin River. Changes in water surface elevations due to tidal variation occurs in all of the waterways that contain construction element sites.

The land within the action area consist primarily of irrigated fields and orchards traversed by irrigation canals and drainage ditches to the west and northeast of the San Joaquin River, and urban developments within the southern portion of the action area (City of Lathrop and City of River Islands). The canals and ditches seasonally provide water from the Delta via pumps or siphons to the adjoining fields and then provide drainage back to the Delta, using pumps to move water over the levees to the adjoining waterways. Levees protect lands to both the east and west of the San Joaquin River from flooding during high water events. These existing levees were initially built in the late 1800s and are maintained for agricultural purposes by local Reclamation Districts, but are also part of the Federal Flood Control Project authorized by Congress in 1917, and completed in 1960 by the USACE.

2.4.1.1 Water Development

The diversion and storage of natural flows by dams and diversion structures on Central Valley watersheds has depleted stream flows in the tributaries feeding the Delta and altered the natural cycles by which juvenile and adult salmonids and sDPS green sturgeon base their migrations. As much as 60 percent of the natural historical inflow to Central Valley watersheds and the Delta have been diverted for human uses. Depleted flows have contributed to higher temperatures, lower DO levels, and decreased recruitment of gravel and large woody debris (LWD, also referred to as instream woody material or IWM). More uniform flows year round have resulted in diminished natural channel formation, altered foodweb processes, and slower regeneration of riparian vegetation (Mount 1995).

Water withdrawals, for agricultural and municipal purposes have reduced river flows and increased temperatures during the critical summer months, and in some cases, have been of a sufficient magnitude to result in reverse flows in the lower San Joaquin River (Reynolds et al. 1993). Direct relationships exist between water temperature, water flow, and juvenile salmonid survival (Brandes and McLain 2001). Elevated water temperatures in the Sacramento River have limited the survival of young salmon in those waters. Juvenile fall-run survival in the Sacramento River is also directly related with June streamflow and June and July Delta outflow (Dettman et al. 1987).

Water diversions for irrigated agriculture, municipal and industrial use, and managed wetlands are found throughout the Central Valley. Thousands of small and medium-size water diversions exist along the Sacramento River, San Joaquin River, and their tributaries as well as in the maze of Delta waterways surrounding the intensively farmed islands within the legal Delta boundaries. Although efforts have been made in recent years to screen some of these diversions, many remain unscreened. Depending on the size, location, and season of operation, these unscreened diversions entrain and kill many life stages of aquatic species, including juvenile salmonids and green sturgeon. For example, as of 1997, 98.5 percent of the 3,356 diversions included in a Central Valley database were either unscreened or screened insufficiently to prevent fish entrainment (Herren and Kawasaki 2001).

2.4.1.2 Water Conveyance and Flood Control

The development of the water conveyance system in the Delta has resulted in the construction of more than 1,100 miles of armored levees to increase channel flood capacity elevations and flow capacity of the channels (Mount 1995). Levee development in the Central Valley affects spawning habitat, freshwater rearing habitat, freshwater migration corridors, and freshwater riverine and estuarine habitat PBFs. As Mount (1995) indicates, there is an "underlying, fundamental conflict inherent in this channelization." Natural rivers strive to achieve dynamic equilibrium to handle a watershed's supply of discharge and sediment (Mount 1995). The construction of levees disrupts the natural processes of the river, resulting in a multitude of habitat-related effects; including isolation of the watershed's natural floodplain behind the levee from the active river channel and its fluctuating hydrology.

Many of these levees use angular rock (riprap) to armor the bank from erosive forces. The effects of channelization, and riprapping, include the alteration of river hydraulics and riparian vegetative cover along the bank as a result of changes in bank configuration and structural features (Stillwater Sciences 2006). These changes affect the quantity and quality of nearshore habitat for juvenile salmonids and have been thoroughly studied (USFWS 2000, Schmetterling et al. 2001, Garland et al. 2002). Simple slopes protected with rock revetment generally create nearshore hydraulic conditions characterized by greater depths and faster, more homogeneous water velocities than occur along natural banks. Higher water velocities typically inhibit deposition and retention of sediment and woody debris. These changes generally reduce the range of habitat conditions typically found along natural shorelines, especially by eliminating the shallow, slow-velocity river margins used by juvenile fish as refuge and escape from fast currents, deep water, and predators (Stillwater Sciences 2006).

2.4.1.3 Land Use Activities

Since the 1850s, wetlands reclamation for urban and agricultural development has caused the cumulative loss of 79 and 94 percent of the tidal marsh habitat in the Delta downstream and upstream of Chipps Island, respectively (Conomos et al. 1985, Nichols et al. 1986, Wright and Phillips 1988, Goals Project 1999). Prior to 1850, approximately 1400 km^2 of freshwater marsh surrounded the confluence of the Sacramento and San Joaquin Rivers, and another 800 km^2 of saltwater marsh fringed San Francisco Bay's margins. Of the original 2,200 km^2 of tidally influenced marsh, only about 125 km^2 of undiked marsh remains today. Even more extensive losses of wetland marshes occurred in the Sacramento and San Joaquin River basins. Little of the extensive tracts of wetland marshes that existed prior to 1850 along the valley's river systems and within the natural flood basins exist today. Most has been "reclaimed" for agricultural purposes, leaving only small remnant patches. Engineered levees have isolated the rivers from their natural floodplains and have resulted in the loss of their ecological functions.

Dredging of river channels to enhance inland maritime trade and to provide raw material for levee construction has significantly and detrimentally altered the natural hydrology and function of the river systems in the Central Valley. Starting in the mid-1800s, the USACE and other private consortiums began straightening river channels and artificially deepening them to enhance shipping commerce. This has led to declines in the natural meandering of river channels and the formation of pool and bar segments. The deepening of channels beyond their natural depth also has led to a significant alteration in the transport of bedload in the riverine system as well as the local flow velocity in the channel (Mount 1995). The Sacramento Flood Control Project at the turn of the nineteenth century ushered in the start of large scale USACE actions in the Delta and along the rivers of California for reclamation and flood control. The creation of levees and the deep shipping channels reduced the natural tendency of the San Joaquin and Sacramento rivers to create floodplains along their banks with seasonal inundations during the wet winter season and the spring snow melt periods. These annual inundations provided necessary habitat for rearing and foraging of juvenile native fish that evolved with this flooding process. The armored riprapped levee banks and active maintenance actions of Reclamation Districts precluded the establishment of ecologically important riparian vegetation, introduction of valuable LWD/ IWM from these riparian corridors, and the productive intertidal mudflats characteristic of the undisturbed Delta habitat.

Urban stormwater and agricultural runoff may be contaminated with pesticides, oil, grease, heavy metals, poly-aromatic hydrocarbons (PAHs), and other organics and nutrients (Regional Board 1998), which can destroy aquatic life necessary for salmonid survival (NMFS 1996a, b) and are also expected to negatively impact the different green sturgeon life stages also present. Point source (PS) and non-point source (NPS) pollution occurs at almost every point that urbanization activity influences the watershed. Impervious surfaces (i.e., concrete, asphalt, and buildings) reduce water infiltration and increase runoff, thus creating greater flood hazard (NMFS 1996a, b). Flood control and land drainage schemes may increase the flood risk downstream by concentrating runoff. A flashy discharge pattern results in increased bank erosion with subsequent loss of riparian vegetation, undercut banks and stream channel widening. In addition to the PS and NPS inputs from urban runoff, juvenile salmonids and green sturgeon are exposed to increased water temperatures as a result of thermal inputs from municipal, industrial, and agricultural discharges.

2.4.1.4 Water Quality

The water quality of the Delta has been negatively impacted over the last 150 years. Increased water temperatures, decreased dissolved oxygen (DO) levels, and increased turbidity and contaminant loads have degraded the quality of the aquatic habitat for the rearing and migration of salmonids and sDPS green sturgeon. Some common pollutants include effluent from wastewater treatment plants and chemical discharges such as dioxin from San Francisco Bay petroleum refineries (McEwan and Jackson 1996). In addition, agricultural drain water, another possible source of contaminants, can contribute up to 30 percent of the total inflow into the Sacramento River during the low-flow period of a dry year. The Regional Board, in its 1998 Clean Water Act §303(d) list characterized the Delta as an impaired waterbody having elevated levels of chlorpyrifos, dichlorodiphenyltrichlor (i.e. DDT), diazinon, electrical conductivity, Group A pesticides [aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, hexachlorocyclohexanes (including lindane), endosulfan and toxaphene], mercury, low DO, organic enrichment, and unknown toxicities (Regional Board 1998, 2001, California State Water Resources Control Board 2010).

In general, water degradation or contamination can lead to either acute toxicity, resulting in death when concentrations are sufficiently elevated, or more typically, when concentrations are lower, to chronic or sublethal effects that reduce the physical health of the organism, and lessens its survival over an extended period of time. Mortality may become a secondary effect due to compromised physiology or behavioral changes that lessen the organism's ability to carry out its normal activities. For example, increased levels of heavy metals are detrimental to the health of an organism because they interfere with metabolic functions by inhibiting key enzyme activity in metabolic pathways, decrease neurological function, degrade cardiovascular output, and act as mutagens, teratogens or carcinogens in exposed organisms (Rand et al. 1995, Goyer 1996). For listed species, these effects may occur directly to the listed fish or to its prey base, which reduces the forage base available to the listed species.

In the aquatic environment, most anthropogenic chemicals and waste materials, including toxic organic and inorganic chemicals, eventually accumulate in sediment (Ingersoll 1995). Direct exposure to contaminated sediments may cause deleterious effects to listed salmonids and green sturgeon. This may occur if a fish swims through a plume of the resuspended sediments or rests on contaminated substrate and absorbs the toxic compounds through one of several routes: dermal contact, ingestion, or uptake across the gills. Elevated contaminant levels may be found in localized “hot spots” where discharge occurs or where river currents deposit sediment loads. Sediment contaminant levels can thus be significantly higher than the overlying water column concentrations (U.S. Environmental Protection Agency [USEPA] 1994). However, the more likely route of exposure to salmonids or green sturgeon is through the food chain, when the fish feed on organisms that are contaminated with toxic compounds. Prey species become contaminated either by feeding on the detritus associated with the sediments or dwelling in the sediment itself. Therefore, the degree of exposure to the salmonids and green sturgeon depends on their trophic level and the amount of contaminated forage base they consume. Response of salmonids and green sturgeon to contaminated sediments is similar to water borne exposures once the contaminant has entered the body of the fish.

2.4.1.5 Hydrology of the Delta

Substantial changes have occurred in the hydrology of the Central Valley’s watersheds over the past 150 years. Many of these changes are linked to the ongoing actions of the CVP and SWP in their pursuit of water storage and delivery of this water to their contractors.

Prior to the construction of dams on the tributaries surrounding the Central Valley, parts of the valley floor hydrologically functioned as a series of natural reservoirs seasonally filling and draining every year with the cycles of rainfall and snow melt in the surrounding watersheds. These reservoirs delayed and muted the transmission of floodwaters traveling down the length of the Sacramento and San Joaquin rivers. Historically, there were at least six distinct flood basins in the Sacramento Valley. These extensive flood basins created excellent shallow water habitat for fish such as juvenile Chinook salmon, steelhead, and sturgeon to grow and rear before moving downstream into the Delta (The Bay Institute 1998). The magnitude of the seasonal flood pulses were reduced before entering the Delta, but the duration of the elevated flows into the Delta were prolonged for several months, thereby providing extended rearing opportunities for emigrating Chinook salmon, steelhead, and green sturgeon to grow larger and acquire additional nutritional energy stores before entering the main Delta and upper estuarine reaches.

Prior to the construction of dams, there were distinct differences in the natural seasonal flow patterns between the northern Sacramento River watershed and the southern San Joaquin River watershed. Furthermore, the natural unimpaired runoff in the Central Valley watersheds historically showed substantial seasonal and inter-annual variability. Watersheds below 5,000 feet in elevation followed a hydrograph dominated by rainfall events with peak flows occurring in late fall or early winter (northern Sierra Nevada, Cascade Range, and most of the western coastal mountains). Conversely, those watersheds with catchment areas above 5,000 feet, such as the Central and Southern Sierras, had hydrographs dominated by the spring snowmelt runoff period and had their highest flows in the late spring/early summer period. Summertime flows on the valley floor were considerably reduced after the seasonal rain and snowmelt pulses were finished (Figure 14), with base flows supported by the stored groundwater in the surrounding alluvial plains (The Bay Institute 1998). Since the construction of the more than 600 dams in the mountains surrounding the Central Valley, the variability in seasonal and inter-annual runoff has been substantially reduced and the peak flows muted, except in exceptional runoff years. Currently, average winter/spring flows are typically reduced compared to natural conditions, while summer/fall flows have been artificially increased by reservoir releases. Wintertime releases are coordinated for preserving flood control space in the valley's large terminal storage dams, and typically do not reach the levels necessary for bed load transport and reshaping of the river channels below the dams. Summertime flows have been scheduled for meeting water quality goals and consumptive water demands downstream (Figures 15 and 16). Mean outflow from the Sacramento River during the later portion of the 19th century has been reduced from nearly 50 percent of the annual discharge occurring in the period between April and June to only about 20 percent of the total mean annual outflow under current dam operations (The Bay Institute 1998). Currently, the highest mean flows occur in January, February, and March. The San Joaquin River has seen its snowmelt flood peak essentially eliminated, and the total discharge to the valley floor portion of the mainstem greatly reduced during the spring. Only in very wet years is there any marked late spring outflow peak (The Bay Institute 1998).

These changes in the hydrographs of the two main river systems in the Central Valley are also reflected in the inflow and outflow of water to the Delta. The operations of the dams and water transfer operations of the CVP and SWP have reduced the winter and spring flows into the Delta, while artificially maintaining elevated flows in the summer and late fall periods. The Delta has thus become a conveyance apparatus to move water from the Sacramento side of the Delta to the southwestern corner of the Delta where the CVP and SWP pumping facilities are located. Releases of water to the Delta during the normally low flow summer period have had several impacts on Delta ecology and hydrology. Since the projects started transferring water through the Delta, the normal variability in the hydrology of the Delta has diminished. Annual incursions of saline water into the Delta still occur each summer, but have been substantially muted compared to their historical levels by the release of summer water from the reservoirs (Herbold and Moyle 1989, Figures 17 and 18). The Delta has become a stable freshwater body, which is more suitable for introduced and invasive exotic freshwater species of fish, plants, and invertebrates than for the native organisms that evolved in a fluctuating and "unstable" Delta environment.

Furthermore, Delta outflow has been reduced by approximately 14 percent from the pre-dam period (1921-1943) when compared to the modern state and federal water project operations period (1968-1994). When differences in the hydrologic year types are accounted for and the "wet" years are excluded, the comparison between similar year types indicates that outflow has been reduced by 30 to 60 percent (The Bay Institute 1998), with most of this "lost" water going to exports. Currently, the Sacramento River contributes roughly 75-80% of the Delta inflow in most years and the San Joaquin River contributes about 10-15%; the Mokelumne, Cosumnes, and Calaveras rivers, which enter into the eastern side of the Delta, contribute the remainder. The sum of the river contributions flow through the Delta and into Suisun Bay, San Pablo Bay, San Francisco Bay, and eventually empties into the Pacific Ocean. Historical annual Delta inflow between 1945 and 1995 (i.e., the period of modern dam operations) averaged approximately 23 million acre-feet (MAF), with a minimum inflow of approximately 6 MAF in 1977 and a maximum of approximately 70 MAF in 1983 (USACE 2015).

Water movement in the Delta responds to four primary forcing mechanisms: (1) freshwater inflows draining to the ocean; (2) Delta exports and diversions; (3) operation of water control facilities such as dams, export pumps, and flow barriers; and (4) the regular tidal movement of seawater into and out of the Delta. In addition, winds and salinity behavior within the Delta can generate a number of secondary currents that, although of low velocity, can be of considerable significance with respect to transporting contaminants and mixing different sources of water. Changes in flow patterns within the Delta, whether caused by export pumping, winds, atmospheric pressure, flow barriers, tidal variations, inflows, or local diversions, can influence water quality at drinking water intakes (USACE 2015).

2.4.1.6 NMFS Salmon and Steelhead Recovery Plan Action Recommendations

The NMFS Recovery Plan that includes Sacramento River winter-run Chinook salmon, CV Spring-run Chinook salmon and CCV steelhead (NMFS 2014) identifies recovery goals for the Sacramento River and San Joaquin River basin populations that utilize the waterways of the Delta for aspects of their life history. These waterways include the action area for the proposed Project. Recovery efforts focus on addressing several key stressors that are vital to Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead: (1) Altered natural riverine flows entering the Delta from the Sacramento and San Joaquin River basins affecting adult and juvenile migration and holding; (2) Altered hydrodynamics due to operations of the CVP and SWP export facilities affecting migratory cues of migrating juveniles; (3) Altered riparian and marsh habitats due to levee construction and marshland reclamation efforts; and (4) Increased exposure to non-native predation within the waterways of the Delta.

2.4.1.6.1 Specific Key Stressors in the Delta described in the Recovery Plan

- Altered hydrographs of the Sacramento and San Joaquin rivers entering the Delta due to upstream operations of reservoirs that does not represent the historic natural unimpaired inflow pattern used by fish for attraction and migratory behavioral cues.

- Altered hydrodynamics in the central and southern Delta due to the operations of the SWP and CVP export facilities.

- Loss of natural ecological function in the majority of the Delta landscape due to human activities.

- Limited quantity and quality of rearing and migratory habitat due to human actions related to levee construction.

- Loss of extensive marshland habitat in both fresh and saltwater habitats used for rearing and holding of migrating salmonids due to human activities.
- Unscreened or poorly screened agricultural diversions.
- Increased predation risks to juvenile salmonids from non-native predators.
- Restoration and/or creation of floodplain habitat for juvenile salmonids entering or rearing in the Delta.

Recovery actions identified in the Recovery Plan for the Delta that are relevant to this consultation include: landscape level restoration of ecological functions within the Delta waterways, and restoration of floodplain habitat, which are the subjects of the restoration actions currently being implemented in the south Delta region in concert with the Recovery Plan.

2.4.2 Status of Species and Critical Habitat within the Action Area

2.4.2.1 Status of the Species within the Action Area

The action area functions primarily as a migratory corridor for CV spring-run Chinook salmon from the San Joaquin River Restoration Program's (SJRRP) experimental population, CCV steelhead from the Southern Sierra Nevada Diversity Group, and potentially the sDPS of North American green sturgeon, but it also provides some use as holding and rearing habitat for each of these species as well. Juvenile salmonids may use the area for rearing for several weeks during the winter and spring before migrating to the marine environment. Green sturgeon may use the area for rearing and potentially migration into/ out of the San Joaquin River Basin year-round. Generally, as flows increase in the fall and through the winter, adult salmon, CCV steelhead, and sDPS green sturgeon migrate upstream through the Sacramento and San Joaquin rivers. Juvenile salmonids migrate downstream in the winter and spring, while juvenile green sturgeon have a protracted downstream migration that lasts from summer into winter. Adult CV spring-run migrate through the Delta between January and June (Table 5). Adult CCV steelhead migration typically begins in August, with a peak in September and October for the Sacramento River basin and slightly later for San Joaquin River basin fish, and extends through the winter to as late as May (Table 6). Adult green sturgeon start to migrate upstream to spawning reaches in the Sacramento River basin in February and their migrations can extend into July (Table 7), but may also be found holding in waters of the Sacramento River basin and Delta year-round. Less is known regarding their potential use of the San Joaquin River basin upstream of the Delta, but sturgeon report card information and the observation of a live green sturgeon in the Stanislaus River in October 2017, indicate that there is opportunistic use of this watershed to some degree.

2.4.2.1.1 CV Spring-run Chinook salmon

Currently there are no documented natural populations of CV spring-run in the San Joaquin River basin that would likely occur in the action area. However, there is anecdotal evidence of Chinook salmon occurring in the Stanislaus and Tuolumne Rivers that may represent residual populations of spring-run Chinook salmon or individuals that have strayed from other river basins and use the Stanislaus and Tuolumne rivers for spawning based on their run timing and the presence of fry and juveniles that show traits characteristic of spring-run populations such as hatching dates and seasonal sizes (Franks 2013). Furthermore, the SJRRP goal of re-establishing an experimental population of CV spring-run in the San Joaquin River basin will create the potential that spring-run Chinook salmon will be present in the action area over the Project's lifetime due to the continued presence of the constructed floodplain area into the future. Presence of adult or juvenile CV spring-run in the action area during the proposed construction window of July 1 through November 1 over the two year construction period is unlikely based on the following life history characteristics.

There are no spawning areas in the action area that could be used by adult spring-run, therefore the potential that eggs would be present in the action area is nonexistent. Likewise, the potential for alevins to be present in the action area is also unlikely, since only extreme precipitation events in the fall and early winter resulting in high river flows in the San Joaquin River basin could flush alevins out of their natal tributaries into the action area. Fry and parr are more likely to be present in the action area in response to high river flows due to the timing of winter storms and the progressive maturation of the fish. This period would be from approximately November through March. By April, juvenile spring-run are reaching the size that smoltification occurs, and the majority of smolts would be moving downriver to enter the Delta on their emigration to the ocean. Spring-run smolt outmigration is essentially over by mid-May with only a few late fish emigrating in early June. There is the potential that some juvenile spring-run will remain in the tributaries through the summer and outmigrate the following fall and winter as yearlings, but until the experimental population has had time to establish itself, this behavior is uncertain to occur (Table 5). Adult CV spring-run are expected to be migrating upstream through the action area from January to June with a peak presence from February to April (Table 5). Adult migration is also likely to be strongly influenced by the flow levels in the San Joaquin River basin that provides access to the upstream holding and spawning areas. The broodstock for the spring-run experimental population came from the Sacramento River basin (Feather River Fish Hatchery spring-run Chinook salmon) and are expected to exhibit similar migration timing behavior for both adult and juvenile life stages in the San Joaquin River basin.

The proposed construction period for the Project's actions on the mainstem San Joaquin in the action area is from July 1 through November 1. This will not overlap with the adult CV spring-run Chinook salmon migration period in the San Joaquin River basin (i.e., the months of January through June). The construction window will also avoid overlapping with juvenile CV spring-run Chinook salmon emigration during late winter and spring. However, the long-term operations of the Project's setback levee and constructed floodplain will overlap with both adult migration upstream and juvenile migration downstream every year.

Table 5: Temporal occurrence of spring-run Chinook salmon in the Delta

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Adult SR[1]	MED	HIGH	HIGH	HIGH	MED	MED	NONE	NONE	NONE	NONE	NONE	NONE
Juvenile SR[2]	LOW	LOW	LOW	HIGH	MED	NONE	NONE	NONE	NONE	NONE	NONE	LOW
Salvaged SR[3]	LOW	LOW	MED	HIGH	MED	NONE	NONE	NONE	NONE	NONE	NONE	NONE

HIGH MED LOW NONE

[1]Adults enter the Bay late January to early February (CDFW 1998) and enter the Sacramento River in March (Yoshiyama *et al.* 1998, 2001). Adults travel to tributaries as late as July (Lindley *et al.* 2004). Spawning occurs September to October (Moyle 2002).
[2]Juvenile presence in the Delta based on DJFMP data.
[3]Juvenile presence in the Delta based on salvage data (NMFS 2016d).

Darker shades indicating months of high presence and lighter shades indicating months of low presence.

2.4.2.1.2 CCV Steelhead

Small, but persistent populations of CCV steelhead are present in the Calaveras River and San Joaquin River basins and are part of the Southern Sierra Nevada Diversity Group. Both adults and smolts are detected by monitoring efforts in these basins indicating spawning is occurring in the basin's tributaries. There are no spawning areas in the action area that could be used by adult CCV steelhead; therefore the potential that eggs would be present in the action area is nonexistent. All adult CCV steelhead originating in the San Joaquin River basin will pass through the action area to reach their spawning grounds in the Stanislaus, Tuolumne, and Merced rivers, and the tailwater section of the San Joaquin River below Friant Dam, and return to the ocean following spawning through these same waterways. Some adults may access the San Joaquin River basin through the south Delta waterways leading to the Head of Old River near Lathrop, and may return to the ocean via this route too, but most fish are believed to use the mainstem of the San Joaquin River as their migratory route. CCV steelhead smolts leaving the San Joaquin River basin during their emigration pass through the action area. Some fish will use the Old River corridor while others will remain in the mainstem of the river, particularly if a fish barrier is installed at the Head of Old River during their emigration period. The waterways in the action area are expected to be used primarily as migration corridors for adult steelhead and emigrating steelhead smolts, but may also provide some rearing benefits to the emigrating smolts.

CCV steelhead smolts are expected to appear in the action area waterways as early as January, based on observations in tributary monitoring studies on the Stanislaus River, but in very low numbers. The peak emigration in the lower San Joaquin, as determined by the Mossdale trawls near the Head of Old River, occurs from April to May, but with presence of fish typically extending from late February to late June.

Adult CCV steelhead are expected to start moving upstream through the action area into the lower San Joaquin River as early as September, with the peak migration period occurring later in the fall during the November through January period, based on Stanislaus River fish weir counts. Adult CCV steelhead will continue to migrate upriver through March, with post spawn fish, "kelts", moving downstream potentially through spring and early summer, although most are expected to move back downstream earlier than later (Table 6).

The proposed construction period for the Project's actions on the mainstem San Joaquin in the action area is from July 1 through November 1. This will overlap with the adult CCV steelhead migration period in the San Joaquin River basin (i.e., the months of September and October) but will avoid the peak of spawning migration from November through January. However, the long-term operations of the Project's setback levee and constructed floodplain will overlap with both adult migration upstream, and juvenile migration downstream every year.

Table 6: Temporal occurrence of steelhead in the Delta

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Adult SH[1]	MED	MED	MED	MED	HIGH	NONE	LOW	MED	HIGH	MED	MED	MED
Juvenile SH[2]	LOW	MED	MED	HIGH	HIGH	LOW	LOW	NONE	LOW	NONE	NONE	LOW
Salvaged SH[3]	MED	HIGH	HIGH	MED	LOW	LOW	NONE	NONE	NONE	NONE	LOW	LOW

HIGH MED LOW NONE

[1]Adult presence was determined using information in (Moyle 2002), (Hallock *et al.* 1961), and (CDFW 2015).
[2]Juvenile presence in the Delta was determined using DJFMP data.
[3]Months in which salvage of wild juvenile steelhead at State and Federal pumping plants occurred; values in cells are salvage data reported by the facilities (NMFS 2016c).

Darker shades indicating months of high presence and lighter shades indicating months of low presence.

2.4.2.1.3 Southern DPS of North American Green Sturgeon

Adult green sturgeon begin to enter the Sacramento – San Joaquin Delta in late February and early March during the initiation of their upstream spawning run (Moyle et al. 1995, Heublein et al. 2009). The peak of adult entrance into the Delta appears to occur in late February through early April, with fish arriving upstream of the Glen-Colusa Irrigation District's water diversion on the upper Sacramento River in April and May to access known spawning areas (Moyle 2002). Adults continue to enter the Delta until early summer (June-July) as they move upriver to spawn in the upper Sacramento River basin. It is also possible that some adult green sturgeon will be moving back downstream as early as April and May through the Delta, either as early post-spawners or as unsuccessful spawners. The majority of post-spawn adult green sturgeon will move down river to the Delta either in the summer or during the fall. Fish that over-summer in the upper Sacramento will move downstream when the river water cools and rain events increase the river's flow and either hold in the Delta or migrate to the ocean. Data on green sturgeon distribution is extremely limited and out-migration appears to be variable occurring at different times of year. Seven years of recreational fishing catch data for adult green sturgeon (CDFW sturgeon fishing report cards) show that they are present in the Delta during all months of the year (Figure 19). Although the majority of green sturgeon are expected to be found along the Sacramento River corridor and within the western Delta, observations of green sturgeon occur in the San Joaquin River and upstream of the action area based on the information provided in the

CDFW sturgeon fishing report cards. Presence of fish occurs during all seasons of the year, but primarily from fall through spring. Few fish are caught during the summer period.

Juvenile green sturgeon migrate to the sea when they are 1 to 4 years old (Moyle et al. 1995). According to Radtke (1966), juveniles were collected year round in the Delta during a 1-year study in 1963-1964. The DJFMP rarely collected juvenile green sturgeon at the seine and trawl monitoring sites. From 1981 to 2012, 7,200 juvenile green sturgeon were reported at the State and Federal export facilities (Figure 20), which indicates a higher presence of juvenile green sturgeon during the spring and summer months in the south Delta where the export facilities are located. Based on the above information, adult and juvenile green sturgeon were determined to be present in the Delta year-round (Table 7).

Table 7. Temporal occurrence of green sturgeon in the Delta

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
*Adult GS[1]	MED	MED	MED	MED	MED	MED	MED	MED	MED	MED	MED	MED
*Juvenile GS[2]	MED	MED	MED	MED	MED	MED	MED	MED	MED	MED	MED	MED
Salvaged GS[3]	LOW	LOW	LOW	LOW	LOW	NONE	MED	HIGH	LOW	LOW	LOW	LOW

HIGH	MED	LOW	NONE
HIGH	MED	LOW	NONE

[1]Adult presence was determined to be year round according to information in (CDFW sturgeon report cards 2008-2014), (Heublein et al. 2009), and (Moyle 2002).
[2]Juvenile presence in the Delta was determined to be year round by using information in (USFWS DJFMP data), (Moyle et al. 1995) and (Radtke 1966).
[3]Months in which salvage of green sturgeon at State and Federal pumping plants occurred; values in cells are salvage data reported by the facilities (1981-2012 CDFW daily salvage data).
*Not enough catch data to determine percent presence by month for adults or juveniles, except for salvaged green sturgeon.

Darker shades indicating months of high presence and lighter shades indicating months of low presence.

2.4.2.2 Status of Critical Habitat within the Action Area

The PBFs for steelhead critical habitat within the action area include freshwater rearing habitat and freshwater migration corridors. Estuarine areas occur farther downstream where mixing occurs and salinity is greater than 0.5 ppt. The features of the PBFs included in these different sites essential to the conservation of the CCV steelhead DPS include the following: sufficient water quantity and floodplain connectivity to form and maintain physical habitat conditions necessary for salmonid development and mobility, sufficient water quality, food and nutrients sources, natural cover and shelter, migration routes free from obstructions, no excessive predation, holding areas for juveniles and adults, and shallow water areas and wetlands. Habitat within the action area is primarily utilized for freshwater rearing and migration by CCV steelhead smolts and for adult freshwater migration. No spawning of CCV steelhead occurs within the action area.

In regards to the designated critical habitat for the sDPS of North American green sturgeon, the action area includes PBFs which provide: adequate food resources for all life stages utilizing the Delta; water flows sufficient to allow adults, sub-adults, and juveniles to orient to flows for migration and normal behavioral responses; water quality sufficient to allow normal physiological and behavioral responses; unobstructed migratory corridors for all life stages utilizing the Delta; a broad spectrum of water depths to satisfy the needs of the different life stages present in the Delta and estuary; and sediment with sufficiently low contaminant burdens to allow for normal physiological and behavioral responses to the environment.

The general condition and function of the aquatic habitat has already been described in the *Rangewide Status of the Species and Critical Habitat* section of this Opinion. The substantial degradation over time of several of the PBFs has diminished the function and condition of the freshwater rearing and migration habitats in the action area.

Even though the habitat has been substantially altered and its quality diminished through years of human actions, its conservation value remains high for the CCV steelhead DPS and the sDPS of North American green sturgeon. All juvenile CCV steelhead smolts originating in the San Joaquin River basin will likely pass downstream through the action area within the San Joaquin River mainstem channel, particularly if there is a fish barrier at the Head of Old River to prevent smolt entrance into that route. Some steelhead smolts may enter the Old River migratory pathway at the Head of Old River junction, or enter Paradise Cut under high flows. Likewise, adults migrating upstream to spawn are likely to pass through the action area within the main stem of the San Joaquin River to reach their upstream spawning areas in the San Joaquin River basin. Therefore, it is of critical importance to the long-term viability of the CCV steelhead to maintain a functional migratory corridor and freshwater rearing habitat through the action area to sustain the Southern Sierra Nevada Diversity Group, and provide the necessary spatial diversity to achieve recovery.

Due to a deficit of monitoring data directed at this species, an unknown fraction of the sDPS green sturgeon population utilizes the middle and upper San Joaquin River reaches within the Delta, and even less is known about utilization of the San Joaquin River upstream of the Delta. However, designated critical habitat occurs in the action area and includes the San Joaquin River upstream to the limits of the legal Delta (Vernalis) on the San Joaquin River. Preservation of the functionality of the PBFs within this region is important to the long term viability of the sDPS green sturgeon population by providing suitable habitat for the rearing of juveniles, and the foraging and migratory movements of adults.

2.5 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

To evaluate the effects of the Project's levee repairs, NMFS examined the effects of the action. We analyzed construction-related impacts and the fish response to habitat modifications from the setback levee and the newly created floodplain. We also reviewed and considered RD 17's conservation measures taken during the repairs.

Our assessment considers the nature, duration, and extent of the action relative to the rearing, and migration timing, behavior, and habitat requirements of all life stages of federally listed fish in the action area. Effects of the levee repair on aquatic resources included both short- and long-term impacts. Short-term impacts include the impacts of construction during the repair. Long-term impacts include the permanent physical alteration of the river bank and riparian vegetation, as well as the construction of the setback levee and associated floodplain, which will last for many years.

Adverse effects can include any impact that reduces the quality or quantity of critical habitat, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components. In addition, adverse effects can include any direct or indirect impact to an individual fish that results in take. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). The proposed actions include minimal waterside levee alterations (levee breech) and is dominated by bank stabilization measures on the upland portions of the levee above the ordinary high tide elevation, including the levee crown and landside portions of the levees that may impact NMFS-listed species and critical habitat.

Construction activities may increase the level of ambient noise and vibrations in the surrounding aquatic environment, increase turbidity and suspended sediment in adjacent waterways from erosion and airborne sources, and increased night time illumination of the river channel, all of which may disrupt feeding or temporarily displace fish from preferred habitat or impair normal behavior. Some of these effects may occur at a distance from the construction activities because noise and sediment may be propagated away from their point of origin in both an upstream and downstream direction from the construction sites. Substantial increases in suspended sediment could temporarily bury substrates and submerged aquatic vegetation that supports invertebrates for feeding juvenile fish.

The approach used for this analysis was to identify which ESA-listed species would be likely to be present in the action area from July 1 through October 31 (November 1) during construction activities (Table 8). NMFS conducted a review of nearby CDFW and USFWS monitoring locations, run timing, and fish salvage data to determine the likelihood of ESA-listed fish presence (Tables 5-7). Adult salmonids typically migrate through the Delta within a few days. Juvenile Chinook salmon spend from 3 days to 3 months rearing and migrating through the Delta to the mouth of San Francisco Bay (Brandes and McLain 2001, MacFarlane and Norton 2002).

Table 8: Presence of ESA-listed species in the action area during construction.

Month								
	July		August		September		October	
Life Stage								
Species	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile
CV Spring-run	No	No	No	No	No	No	No	No
CCV Steelhead	No	No	No	No	Yes (Low[a])	Yes (Very Low[b])	Yes (Medium[a])	Yes (Very Low[b])
sDPS Green Sturgeon	Year-round		Year-round		Year-round		Year-round	

[a] Based on the data from the Stanislaus Fish Weir, adult CCV steelhead begin to migrate through the lower San Joaquin River region starting in September, and increasing to higher levels in October.
[b] Based on the DJFMP Sacramento trawl and Chipps Island trawl data, very low levels of juvenile steelhead have been observed in July, September, and October in the Delta region. Fall pulse flows on the San Joaquin River tributaries and fall storms in the San Joaquin River basin may stimulate out migration of steelhead smolts from the San Joaquin River Basin due to elevated flows similar to the emigration behavior observed in Sacramento River basin fish.

The levee repairs will also contribute to the continued confinement of the riverine system that in turn negatively impacts listed fish species and their designated critical habitat. This analysis also evaluates the long-term impacts of the levee repair on fish species and their critical habitat. Presence of CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon in the action area is assumed to occur during their migratory and rearing behaviors that correspond to their presence in the Delta as described in the baseline status section for each listed species.

2.5.1 Construction Related Effects

NMFS expects that adult CCV steelhead as well as juvenile and adult green sturgeon are likely to be present in the action area during the construction actions, although in low numbers. There is a very low probability that juvenile CCV steelhead may be present during the work-window. It is not expected that there is any potential for the presence of CV spring-run at any of the repair sites during the construction window for the Project. No spawning habitat for CV spring-run Chinook salmon, CCV steelhead, or green sturgeon is present in the action area, therefore no adverse effects to spawning adults or incubating eggs are expected.

2.5.1.1 Noise Related Effects

The repair and rehabilitation of the multiple levee elements described in the Project will necessitate the use of heavy construction equipment to transport soils, excavate and grade chimney drains and seepage berms, and excavate trenches or drill holes to create slurry cutoff walls. This equipment will include vehicles such as: dump trucks, front loaders, bulldozers, motor graders, earth compactors, water tank trucks, excavators, and crane mounted augers and drills (deep slurry wall construction). Vehicles are expected to use both patrol roads on existing levee crowns or haul roads on the landside of the levees to gain access to construction locations for each of the Project's elements. Active construction will be carried out on the landside of the existing levees (chimney drains, seepage berms), and upon the levee crown and landside slope to modify the geometry of the existing levee prism at each Project element to conform to USACE specifications for crown width and landside levee slope grade. In addition, the Project elements requiring open trenching to construct shallow slurry cutoff walls will require degradation of the levee prism to approximately 30-50 percent of the levee height. The degradation of the levee will start at the waterside edge of the levee crown, with soil excavated to final construction elevation with a 1:1 slope. These actions will require considerable construction activity at these locations. Those Project elements that require deep slurry cutoff walls will not require degradation of the levee crown, but rather have a special crane mounted auger/drill rig boring into the levee prism to a depth of 80 to 100 feet or more to loosen and mix the soil. Then, as the auger/drill rig is withdrawn, cement or bentonite slurry is injected and mixed with the loosened soil to form the impervious slurry wall.

Sounds can enter water through a variety of pathways. Sounds may enter from the air, although with strong attenuation of the signal, at the surface of the water (for example shipping and waves), and within the water column itself. In addition, sound may be generated within the substrate, especially by human activities such as pile driving, dredging, and the passage of vehicular traffic along adjacent highways and bridges (Popper and Hawkins 2018). Construction activities such as excavation, grading, and construction of slurry cut-off walls, as well as vehicular traffic of heavy construction equipment is expected to create vibrations and airborne sounds adjacent to the San Joaquin River at all Project element levee locations. These vibrations and sounds are expected to alter the soundscape of the aquatic environment in the adjacent river. Vibrations from construction activities and vehicular traffic will create compression waves in the soil of the levee prism that will rapidly propagate through this dense medium to the adjacent river channel. When the compression wave meets the interface between the soil and the overlying water body, a wave is created at the interface. This wave creates both a sound pressure wave that radiates away from the soil-water boundary as well as a localized acceleration of particles in the water (particle motion) (Popper and Hawkins 2018). Fish are able to detect both the sound pressure wave as well as the particle motion (Popper and Hastings 2009, Radford et al. 2012, Hawkins, Pembroke, and Popper 2015, and Popper and Hawkins 2018). The propagation of sound in the shallow-water environment of the San Joaquin River channel is likely to be highly complex, reflecting off of the water surface, from the substrate, discontinuities in the water, and any immersed objects.

Direct effects upon listed fish in the San Joaquin River are associated with the aforementioned construction work, and will produce the underwater sound pressure waves, and particle motion described above, thereby temporarily altering in-river conditions. Noise generated by construction activities are expected to take two main forms: sharp, transient spikes in noise caused typically by metal (such as an excavator bucket or bulldozer blade) striking a hard object, or by rocks falling on top of each other when armoring the levee face with stone riprap (levee breech location); and lower frequency or infrasonic sound caused by the movement of construction equipment and their earthmoving and excavation activities. Transient noise spikes that occur in the upland areas of the construction sites will be much lower in magnitude when they reach the water, losing energy as the sound travels through the soil and through the soil/water interface into the active channel. There is a very low potential for direct injury or mortality due to the short duration of transient spikes and the nature of their wave rise form. Transient noise is more likely to result in behavioral reactions in exposed fish, such as a startle response. Low frequency or infrasonic noise is also likely to have a low potential for causing direct injury to exposed fish. It is more likely to cause behavioral responses, such as avoidance or movement away from the noise source, or a delay in migration past the location of the noise source.

Only those fish that are holding adjacent to or migrating past the levee repair site will be directly exposed or affected by construction related noise. Those fish that are exposed to the effects of construction activities will encounter short-term construction-related noise (several hours during the day) for most of the Project element locations. Most of the Project elements are likely to have construction work occurring during the day with a period of relative quiet during the night. However, some locations (elements Va and VI1a.1) are described as having construction activities continuing over a 24 hour period, 7 days a week, until the construction activity is completed. These two sites are associated with the construction of 9,500 feet of continuous cutoff walls using the open-cut method of slurry cutoff wall construction. Although direct injury or harm is unlikely, behavioral avoidance may cause injury or harm by increasing the susceptibility of some individuals to predation by temporarily disrupting normal sheltering behaviors. These changes may also impair feeding behaviors, which in turn impact their ability to grow and survive. Fish, especially adults, often respond to construction activities by quickly swimming away from the construction sites, resulting in the majority escaping direct physical injury. Avoidance of the reach of river with construction related noise may prolong or inhibit migratory behavior through that reach. This is considered a form of harassment that results in take of the exposed fish.

Based on the timing of the construction actions, only adult steelhead and adult and juvenile green sturgeon are likely to be present in the action area during the construction window (July 1 through November 1) and therefore be exposed to construction related noise. Based on the observations of steelhead passage at the Stanislaus fish weir, adult steelhead begin to be observed moving into San Joaquin River basin tributaries in September, but do not arrive in any substantial numbers until after the middle of September to early October. By mid-October and through the end December, the frequency of adult steelhead observations at the Stanislaus River weir increases. Observation of adult steelhead passage into the Stanislaus River is artificially truncated in most years by the removal of the fish counting weir on the Stanislaus River by the end of December or early January. There is a very low probability that juvenile CCV steelhead may be present in the action area during the construction window and thus be exposed to construction related noise. Presence of juvenile steelhead would likely only occur if significant increases in river flows occur either through dam releases or strong fall storms. Since both juvenile and adult green sturgeon are observed year–round in the Delta, it is assumed that these life stages of green sturgeon will be present in the action area during the entire construction window. No life stages of CV spring-run Chinook salmon will be directly affected by construction associated noise during the construction work window since they are not present in the action area during this period of time.

2.5.1.2 Contaminant Related Effects

Toxic substances used at construction sites, including gasoline, lubricants, and other petroleum-based products, could enter the waterway as a result of spills or leakage from machinery and injure listed salmonids and green sturgeon exposed to these substances. Petroleum products also tend to form oily films on the water surface that can reduce the exchange of oxygen between the atmosphere and the water, thus reducing the concentration of dissolved oxygen available to aquatic organisms. The exposure to these substances can kill fish directly in high enough concentrations through acute toxicity or suffocation from lack of oxygen. These chemicals may also kill the prey of listed fish species, reducing their ability to feed and therefore grow and survive. However, due to adherence to BMPs that dictate the use, containment, and cleanup of contaminants, the use of toxic substances within the action area is unlikely to negatively impact listed fish species.

Furthermore, based on the timing of the construction window, only adult CCV steelhead, and adult and juvenile green sturgeon are likely to be present during the period of construction activities that might cause the release of contaminants. As stated previously, it is very unlikely that juvenile steelhead would be present during the construction window. It is also not likely that any life stages of CV spring-run will be present during the construction window and thus potentially be exposed to any spill of contaminants related to the construction of the Project.

2.5.1.3 Turbidity Related Effects

Excavation of the levee crown and landside levee face will create conditions that can increase the amount of local water turbidity through erosion of exposed soils through precipitation runoff and by soils dislodged by winds during construction being carried into adjacent San Joaquin River waters. Responses of salmonids to elevated levels of suspended sediments often fall into three major categories: physiological effects, behavioral effects, and habitat effects (Bash et al. 2001). Salmonids exposed to slight to moderate increases in turbidity exhibited avoidance, loss of station in the stream, reduced feeding rates and reduced use of overhead cover. Reaction distances of rainbow trout to prey were reduced with increases of turbidity of only 15 NTUs over an ambient level of 4 to 6 NTUs in experimental stream channels (Barret et al. 1992). Increased turbidity, used as an indicator of increased suspended sediments, also is correlated with a decline in primary productivity, a decline in the abundance of periphyton, and reductions in the abundance and diversity of invertebrate fauna in the affected area (Lloyd 1987, Newcombe and MacDonald 1991). These impacts to the aquatic environment decrease the availability of food resources for salmonids and sturgeon through trophic energy transfers from the lowest trophic levels (i.e., phytoplankton and periphyton) through intermediate levels (e.g., invertebrates) to higher trophic levels (i.e., salmonids and sturgeon).

Based on the timing of construction, it is unlikely that any other listed salmonid other than adult steelhead, will be present during the construction window. It is expected that any adult steelhead will move away from any turbidity plume and seek waters that are more acceptable to their preferences. It is very unlikely that any juvenile steelhead will be present during the construction window and thus be exposed to construction related turbidity. Furthermore, NMFS anticipates adherence to the BMPs described above in the Proposed Action section will greatly minimize the risk of injury or death caused by increases in turbidity. The Project description indicates that a

SWPPP will be developed and implemented for the Project that identifies specific BMPs to avoid and minimize Project effects on water quality, and that the Project will have all appropriate NPDES permits in place before construction starts. Thus, short term turbidity increases associated with construction will be minimized by the implementation of these permits and plans.

It is expected that both juvenile and adult green sturgeon will be present during the construction window. Increases in turbidity and sedimentation events are not expected to affect visual feeding success of green sturgeon, as they are not believed to utilize visual cues (Sillman et al. 2005). Green sturgeon, which can occupy waters containing variable levels of suspended sediment and thus turbidity, are not expected to be impacted by the increases in the turbidity levels anticipated from the proposed project directly, but suffer secondary effects due to impacts on the habitat (i.e., invertebrate forage base populations).

2.5.1.4 Nighttime Worksite Illumination

In order to continue construction work to install the cutoff walls at elements Va and VIa.1 at night, the work site areas must be illuminated by artificial light. This will require that lights and potentially power generators be used during the nighttime construction hours. Lights will be located along the crown of the levee where the trenching and slurry wall work is occurring. The Project description indicates that one of the avoidance and minimization measures to be used for listed fish is to shield any lighting used for nighttime work and to direct the lights away from the waterside face of the levee. The intent is to reduce or avoid any direct illumination of the adjacent river waters during the night. Although direct lighting of the adjacent waterway will be avoided, illumination of the work areas will still create elevated light levels over the river channel due to backscatter from dust or moisture in the air.

Natural conditions would normally have low light levels during the nocturnal period, with light provided only by the moon or by starlight. Due to the increase in artificial lights related to modern civilization, the nighttime environment has been transformed, and true darkness at night is rare. Even in relatively isolated areas with little development or human populations, the night time sky has increased illumination due to “light pollution” from distant urban centers that will brighten the horizon. Light pollution is the degradation of the photic habitat by artificial light and impacts organisms when they are exposed to light in the wrong place, at the wrong time, or at the wrong intensity.

Alterations in the level of light at night has been shown to alter the circadian rhythms of European perch (*Perca fluviatilis*) by altering the production of the hormone melatonin (Brüning et al. 2015). Melatonin is typically produced at night by the pineal organ. Melatonin production is suppressed during the day due to increased light. The pineal organ in fish is light sensitive and directly processes photoperiodic information for cells and organs. Melatonin production was inhibited by light levels as low as 1 lux (approximately equivalent to the light of a full moon). Impairment of melatonin production can eventually affect sexual maturation and gonadal development in multiple species of fish. Increased illumination at night has also been shown to alter the behavior of juvenile salmonids (Tabor and Bell 2015, Tabor et al. 2017). Experimentally manipulating illumination along the shoreline of lakes in Washington increased the abundance of juvenile salmon, including Chinook salmon, Coho salmon (*O. kisutch*), and sockeye salmon (*O. nerka*) in the nearshore areas illuminated by artificial light sources compared to areas of no additional lighting. Other ecological effects of light pollution, besides changes to physiology, include disruption of predator-prey relationships. Yurk and Trites (2000) observed that harbor seals (*Phoca vitulina*) congregated to feed on juvenile salmon in illuminated areas below bridges as the salmon migrated downstream. Seal predation on the juvenile salmon was reduced when the lights were turned off. Tabor et al. (2017) observed avian predators feeding on subyearling salmon in their illuminated study areas at night.

NMFS anticipates that the increased nighttime illumination provided by the work lights at the two construction locations (Va and VIa.1) will negatively impact fish present in those river reaches. Impacts may be either physiological (i.e., altered melatonin levels affecting circadian rhythms) or behavioral (alteration of migratory or movement behavior). Nighttime illumination may also enhance the risk of predation. The longer the exposure to the increased nighttime illumination, the higher the risk of potential harm.

Based on the timing of the construction window, only adult CCV steelhead, and adult and juvenile green sturgeon are likely to be present during the period of construction activities that would increase nighttime illumination. As stated previously, it is very unlikely that juvenile steelhead would be present during the construction window. It is not likely that any life stages of CV spring-run will be present during the construction window and thus potentially be exposed to increased nighttime illumination related to the construction of the Project.

2.5.1.5 Perpetuation of Levee presence

The repair of the levees will perpetuate the current habitat conditions in the southern Delta. The construction of levees to protect against flooding has significantly altered the environment of the southern Delta. Levees replaced the naturally occurring shallow water habitat that existed along the banks of rivers and sloughs in the Delta and the spectrum of complex habitats they provided. Shallow water habitats had a broad range of depths and water velocities present due to the presence of shallow water and riparian vegetation, fallen trees and woody materials (i.e., IWM) that existed on their banks, and the ability of the river to migrate across the floodplain to create additional complexity in the geometry of the river's cross section. Native fish species, including listed salmonids and green sturgeon, evolved under these environmental conditions. In addition, naturally flowing rivers were able to construct riverside benches and naturally formed levees during flood events. These benches could be up to 20 feet high and extended for considerable distances inland creating suitable conditions for the establishment and successional development of structurally diverse riparian vegetation communities (The Bay Institute 1998).

Rock rip-rapping, which is designed to protect the levee faces from erosion, will have deleterious effects on the functioning of the riverine process (USFWS 2000). The intent of riprap is to stabilize stream channels and limit natural fluvial processes. The reduction of the erosion and consequent deposition cycle, naturally inherent to all alluvial channels, eliminates a channel's ability to maintain bedforms for salmonid habitat and impairs the ability for a stream to be maintained in a dynamic steady state. This alteration of the aquatic ecosystem has diverse deleterious effects on aquatic communities, ranging from carbon cycling to altering salmonid population structures and fish assemblages (Schmetterling et al. 2001). Riprap does not provide the intricate habitat requirements for multiple age classes or species similar to natural banks, or banks that include IWM (Peters et al. 1998).

Loss of IWM negatively impacts salmonids through multiple phases of their life history. Schaffter et al. (1983) showed that juvenile Chinook salmon densities along riprapped banks are one third that of natural banks with the presence of fallen trees and their root balls in the water. They concluded that traditional riprap methods of protection will likely cause decreases in the salmon numbers in the Sacramento River basin. USFWS (2000) reported that in studies conducted in the Sacramento River near the Butte Basin, the highest number of juvenile Chinook salmon were associated with the nearshore areas with woody material, sloping banks, and moderate velocities. Juvenile Chinook salmon catches (measured as catch per unit effort or "CPU") were consistently lowest at riprapped sites and highest at natural bank sites (areas with overhead cover and instream woody cover) and intermediate in areas where experimental mitigation studies placed artificial IWM bundles and root balls. USFWS (2000) reported that additional studies conducted between Chico Landing and Red Bluff on the Sacramento River confirmed the low value of riprapped banks, the high value of natural banks with varying degrees of instream and overhead woody cover, and the intermediate value of mitigated sites.

In large mainstem streams and rivers such as the Sacramento and San Joaquin rivers, the primary benefit of IWM is to the channel margins. The woody materials act to deflect and break up stream flow, creating small eddies, pools, undercut banks, variability in channel depth, and back water areas conducive to rearing and growth of salmonids (Murphy and Meehan 1991, Bisson et al. 1987). Sediment that is trapped by the woody material and stored along the channel margins contributes to the hydraulic and biologic complexity of the stream reach, particularly where organically rich materials are present (Bisson et al. 1987). These storage areas create new habitat complexity by trapping inorganic material that creates bars and holes and organic materials that contribute energy and carbon to the local food web of the stream reach (Murphy and Meehan 1991, Bisson et al. 1987). These breaks in the river flow also create beneficial holding areas with plentiful food resources and the conditions where salmonids can hold with minimal energy expenditure and feed while rearing. These areas are also beneficial to a wide range of other species native to the system. Such refuges are critically important to the lower river reaches where levee construction and riprapping have disconnected the rivers from the adjoining floodplain where these refuges and rearing habitats formerly existed.

Riprapping affects the stability of IWM along the river channel margin. Stable wood retention is important for creating and maintaining good fish habitat (Bisson et al. 1987). Whole trees and their root balls are more important for long-term stability than smaller fragments, as they tend to stay in place for long periods of time. These large pieces of wood may remain in place for decades and in the process trap additional IWM, thus adding to the structure. The longevity of large woody debris however may mask changes in the input of woody materials to the river. Since these large pieces of wood would normally be slow to decay, a decline in the woody material input may be masked. Riprapping of the San Joaquin and Sacramento rivers and Delta waterway banks prevents the normal input of upstream woody materials through erosion. The smooth hydraulic roughness along the riprapped banks prevents pieces of woody materials from becoming anchored and remaining in place. The woody materials are transported downstream, but the riprapping of the lower river and Delta waterway banks further limit these pieces from becoming lodged on the banks and the woody material is lost to the system. There is a continuing reduction of IWM input from upstream and local waterways, so that the presence of large pieces of IWM in the Delta is becoming exceedingly rare. Existing pieces that are removed or break apart from decay are not being replenished from upstream.

Like the studies upriver in the mainstem Sacramento River, salmonids in the Delta are associated with natural banks and IWM cover where there is sandy or muddy substrates and shallow water shorelines (McLain and Castillo 2009). Areas with riprap and a lack of cover tended to be dominated by non-native predators and these riprapped shorelines had lower densities of salmonids present. Other studies have shown this trend for non-natives, in particular piscivorous fish that prey on salmonids, (Nobriga et al. 2005, Brown and May 2006, Brown and Michniuk 2007, and Grimaldo et al. 2012). It is unclear whether the low density of salmonids in riprapped areas is caused by salmon avoiding these areas volitionally or whether they are very vulnerable to predation from non-native predators with a resulting high predation loss (Schmetterling et al. 2001, McLain and Castillo 2009).

2.5.1.6 Setback Levee

The Project proposes to construct a setback levee at element IVc and create up to 11.1 acres of riparian vegetation between the setback levee and the San Joaquin River. This will include approximately 6.1 acres of restored riparian scrub habitat between the landside of the existing levee along the San Joaquin River and the waterside toe of the newly constructed setback levee, and between the river and the waterside toe of the existing levee. In addition, approximately 5 acres of Great Valley oak woodland/ upland refugia habitat along the existing levee prism will be created. The elevation of the proposed floodplain portion of this newly constructed area is still under review. Current proposals range from an elevation of 8 feet NAVD88 to 14 feet NAVD88 with a return interval of 2 to 6 years respectively for inundation of the levee breech invert (Table 2). Based on current design, not all of the interior floodplain will be inundated once the high river flows inundate the levee breech. The Project description states that 1-2 acres of the interior floodplain will be set to 14 feet NAVD88 or below, which will inundate at least every 6 years on average based on historical hydrology. More frequent inundation of this area could occur if the elevation is set lower than 14 feet NAVD88.

Over a much longer time period, inundation may become more frequent due to sea level rise, resulting in tides in the Delta reaching higher water surface elevations than are currently seen. Although the elevation of the setback levee and created floodplain is much higher than sea level and above any predicted increase in sea level rise, the effects of tides in the Delta are manifested by increasing the level of the river surface elevations as the flood tides push back upstream against the river flow. There is typically a 2 to 3 foot change in water surface elevation between low tide and high tide in the action area with a slightly greater range during spring tides. Over the next century, predicted sea level rise in the northern Pacific ranges from 0.5 meters to 1 meter (~ 20 to 40 inches) and thus could potentially raise the water surface elevation of the San Joaquin River in the action area due to tidal actions an equivalent amount. This has the potential to increase the frequency of the inundation of the breeched levee invert due to typical tides increasing the water surface elevation an additional 20 to 40 inches during high river flows.

Annual inundation of seasonal floodplains enhances the productivity and biotic interactions in river-floodplain systems as proposed by Junk et al. (1989) in their flood pulse concept. Floodplains provide higher biotic diversity, increasing the production of fish and invertebrates, while increasing habitat diversity and enhancing nutrient flow and cycling between terrestrial and aquatic habitats. Inundation of floodplains has been shown to be beneficial to Central Valley native fish including Chinook salmon (Sommer et al. 2001a, b; Sommer et al. 2005, Moyle et al. 2007, Jeffres et al. 2008; Takata et al. 2017). These studies reported that the growth of juvenile Chinook salmon on the inundated floodplains was enhanced and fish were typically larger than fish that remained in the mainstem river channel. In the Yolo Bypass, the duration of floodplain inundation is positively associated with hatchery juvenile Chinook salmon residing longer on the floodplain and growing to larger sizes. Wild juvenile Chinook salmon also grew larger and emigrated later (Takata et al. 2017). Jeffres et al. (2008) found similar results on the Cosumnes River floodplain, with significant differences in growth rates between salmon reared on the floodplain and those reared in river enclosures. Salmon reared in seasonally inundated habitats with annual terrestrial vegetation experienced higher growth rates than those fish reared in perennial ponds on the floodplain.

Rearing on floodplains can also increase risks such as stranding or predation (Sommer et al. 2005, Moyle et al. 2007, Takata et al. 2017). Floodplain habitats are typically spatially and temporally variable, with the period and extent of inundation changing from year to year and even month to month during the wet winters in California. However, Chinook salmon appear to successfully avoid most stranding and predation issues. Although some fish may become stranded, particularly in manmade structures such as the concrete scour ponds adjacent to the Fremont and Sacramento weirs at the upstream end of the Yolo Bypass (Sommer et al. 2005), most fish appeared to successfully negotiate leaving the floodplains as the water levels receded (Sommer et al. 2005, Moyle et al. 2007). Moyle et al. (2007) also found that the majority of fish found stranded in isolated pools and ponds on the Consumnes River floodplain after the flood waters receded were non-native species, although some native species such as Chinook salmon and splittail (*Pogonichthys macrolepidotus*) were seen immediately after the floodplain stopped draining. Predation is also possible, but appears to be offset by the size of the floodplain inundated during flood events. Sommers et al. (2001a) reported that while avian predation was likely, the density of wading birds on the inundated floodplain was low due to the area of habitat flooded, and the variability of the habitat used by fish on the floodplain. Likewise, predation by fish is also likely to occur, but due to the area of inundated habitat, the amount of habitat refugia used by juvenile fish should reduce the probability of encounters with a predator.

Moyle et al. (2007) reported that native fish do best in open floodplain areas covered with annual vegetation and provided suggested guidelines for floodplain restoration. These guidelines include:

1. Provide early season flooding, preferably from early January through April. Flooding can come in pulses, but duration of flooding is also important to maximize the floodplain benefits to native fishes.
2. Create floodplains that drain completely. Avoid artificial structures that obstruct the drainage pattern, and could lead to stranding.

3. Reduce permanent water habitats such as ponds or sloughs. These waterways favor non-native fish species which may be a significant source of predators on juvenile native fish.
4. Maintain a mosaic of habitats on the floodplain.
5. Maintain both a high variability in flood regime and regular annual flooding. High year to year variability in the extent and duration of flooding is both natural and desirable to maintain habitat diversity. Some flooding should occur every year if possible to benefit native fishes.
6. Create experimental habitats to help maintain or re-establish populations of native fishes.
7. Provide long-term monitoring programs to enhance the knowledge of floodplain dynamics.

The new floodplain, as proposed, meets some of these guideline. However the main difference between these guidelines and the proposed floodplain design lies in the frequency and duration of inundation. A floodplain elevation of 14 feet (NAVD88) will only inundate on average every 6 years, based on the Project's modeling. An elevation of 9 to 10 feet (NAVD88) for the levee breach will only allow water onto the floodplain every 2 to 4 years. As designed, only 1 to 2 acres of the restored riparian scrub habitat will be below 14 feet (NAVD88) and has the potential to flood with any frequency. Elevations greater than this on the floodplain will flood only in years when flows on the San Joaquin exceed 24,000 cfs, which is an infrequent occurrence. Thus the full benefits of the newly created floodplain will be greatly diminished for native fish due to the infrequency of the floodplain being activated by high water conditions.

2.5.2 Effects to Critical Habitat

The levee repairs as proposed for the Project will not create any permanent impacts to critical habitat for CCV steelhead or sDPS green sturgeon. All impacts related to the construction phase of the Project will last only as long as the construction actions are taking place, and are therefore transitory in nature. As described in the description of the action, construction will occur between July 1 and November 1 over the planned two year duration of the construction phase. Although the Project's goals are to improve and repair the levees in the RD 17 sphere of operations, none of the Project's actions will physically alter current critical habitat for either CCV steelhead or sDPS green sturgeon as the Project's actions are above the normal high tide elevation on the waterside of the levees and are predominately located from the edge of the levee crown on the waterside of the levee and landwards from the levee crown. Thus, the current condition of the waterside face of the levee is essentially unaltered by the Project's actions except for the location of the levee breach for the new floodplain.

2.5.2.1 CCV Steelhead Designated Critical Habitat

The effects to designated critical habitat for CCV steelhead related to the direct effects of construction actions will be short lived during the construction season. Within the action area of the Project, the PBFs for designated critical habitat for CCV steelhead are freshwater rearing habitat and freshwater migration corridors. The period of active migration for CCV steelhead adults in the San Joaquin River during fall and early winter (Table 6) overlaps with the proposed work window of July 1 through October 31 in the action area. There is a very low probability that juvenile steelhead may be emigrating downstream through this area during the work window, and would likely only do so if flows in the basin tributaries were elevated by storms or reservoir releases.

As described earlier in this document regarding Project effects, the construction actions are anticipated to create elevated levels of noise due to construction equipment moving on the levees and the actual construction activities associated with the levee repairs (i.e., grubbing, excavations, and construction of the slurry cutoff walls). Noise related to construction equipment and vehicles and the proposed construction activities on the levees will degrade the functioning of the waterways as a freshwater migration corridor during the migration period. NMFS expects that fish will be startled by the construction activity and associated noise, temporarily leaving the nearshore area while the construction is taking place. NMFS assumes that fish will move to an area of the river that is quieter and resume holding or upstream movements during their upstream migration phase. Migration during the daytime may be depressed by the construction activities along the levees, and fish will potentially hold until evening and night before moving through the active construction areas when construction activities cease for the night. In those sections of river within the action area where work will occur during the night and lights will illuminate the work area, migratory movements will potentially be delayed or halted until there is a lull in the construction activities or the behavioral need to migrate upstream surpasses the avoidance response of the exposed fish to noise and higher light levels. Overall, the impacts to critical habitat associated with construction related activities, traffic, and noise are expected to be temporary and result in no permanent damage to the PBFs of the designated critical habitat. When construction in a given reach of the levee repair site is completed, the construction related traffic, activities, and noise ends and no further acute construction related impacts will affect the aquatic system.

As previously described in this document, the perpetuation of the levees, their armored riprapped waterside faces, and the removal of vegetation will diminish the functioning of the action area’s waterways for rearing and migration of juvenile CCV steelhead. Levees simplify riverine and estuary habitat complexity and reduce the integrity of the riparian and wetland corridors associated with stream borders and sloughs. Levees also isolate the floodplains from the river, destroying the valuable interface between the riparian and the adjacent aquatic communities that depend on an exchange of inorganic and organic materials to function fully. Riprapping the waterside faces of the levees to provide protection against erosion reduces the ability of riparian vegetation to establish itself, changes the hydrodynamics of the river adjacent to the bank in an ecologically unfavorable manner, and reduces and prevents the establishment of IWM along the river’s edge.

2.5.2.2 sDPS of North American Green Sturgeon

The potential impacts to sDPS green sturgeon critical habitat are similar to that just described for the CCV steelhead critical habitat. The construction actions will create temporary noise impacts on the waterways of the action area as described for the CCV steelhead above. Presence of juvenile sDPS sturgeon, however, are likely to overlap with all of the construction in-water work window since juveniles are expected to be present year round in the action area. Adults are most likely to be present in the winter and spring, but may also be present year round in low numbers. Potential effects range from delay of migration through the affected reaches due to behavioral avoidance of the construction sounds (and potentially increased light levels at night). As described for the CCV steelhead, construction will occur from July 1 to November 1, for two years. There will be no permanent impacts to designated critical habitat due to the construction generated noises, and no noise related effects when construction is not occurring or when construction has been completed after two years.

The long term presence of the levees, with riprapped armored levee faces, will impair the functioning of the riparian and aquatic habitats as already discussed in this Opinion. NMFS expects that food resources will be negatively affected due to a lack of riparian and shallow water habitat that would benefit food webs in the action area. Likewise the benefit of diverse channel morphology and variable flows and water depths that a naturally meandering river channel would provide are prohibited from occurring due to the levee construction and armoring. This affects the quality of the migratory corridor, food resources, and variable water depths identified as PBFs for freshwater riverine habitats.

2.6 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.2.4).

2.6.1 Agricultural Practices

Agricultural practices in the Delta may negatively affect riparian and wetland habitats through upland modifications of the watershed that lead to increased siltation or reductions in water flow in stream channels flowing into the Delta. The Delta islands surrounding the action area are primarily agricultural lands with orchards, row crops, and grazing lands for dairy cattle present. Unscreened agricultural diversions throughout the Delta entrain fish including juvenile salmonids and juvenile green sturgeon and are present in the action area within the mainstem San Joaquin River, and Old River. Grazing activities from dairy and cattle operations can degrade or reduce suitable critical habitat for listed salmonids by increasing erosion and sedimentation as well as introducing nitrites, nitrates, ammonia, and other nutrients into the watershed, which then flow into the receiving waters of the Delta. Stormwater and irrigation discharges related to both agricultural and urban activities contain numerous pesticides and herbicides that may negatively affect salmonid reproductive success and survival rates (Dubrovsky et al. 1998, 2000; Daughton 2003).

2.6.2 Increased Urbanization

The action area occurs within the Delta and Stockton regions, which include portions of San Joaquin County. Population is expected to increase by nearly 3 million people by the year 2020 in the Delta region. Expansion of urban development is occurring in the cities of Manteca, Lathrop, Stockton, and Tracy along the I-5 and I-205/580 corridors. Increases in urbanization and housing developments can impact habitat by altering watershed characteristics, and changing both water use and stormwater runoff patterns. Increased growth will place additional burdens on resource allocations, including natural gas, electricity, and water, as well as on infrastructure such as wastewater sanitation plants, roads and highways, and public utilities. Some of these actions, particularly those which are situated away from waterbodies, will not require Federal permits, and thus will not undergo review through the ESA section 7 consultation processes with NMFS.

Increased urbanization also is expected to result in increased recreational activities in the region. Among the activities expected to increase in volume and frequency is recreational boating. There are currently several boating facilities (large private and public facilities with docks, boat launches, and marinas) within the immediate vicinity of the action area. These sites provide recreational boaters access to the Delta. Any increase in recreational boating due to population growth would likely result in increased boat traffic in the action area. Boating activities typically result in increased wave action and propeller wash in waterways. This potentially will degrade riparian and wetland habitat by eroding channel banks and mid-channel islands, thereby causing an increase in siltation and turbidity. Wakes and propeller wash also churn up benthic sediments thereby potentially resuspending contaminated sediments and degrading areas of submerged vegetation. This in turn would reduce habitat quality for the invertebrate forage base required for the survival of juvenile salmonids and green sturgeon moving through the system. Increased recreational boat operation in the Delta is anticipated to result in more contamination from the operation of gasoline and diesel powered engines on watercraft entering the water bodies of the Delta. Furthermore, increased recreational boating, particularly those that can be trailered from one water body to another, greatly increases the risk of spreading non-native invasive species into the Delta.

Increased commercial activity in the Port of Stockton has the potential to increase commercial shipping in the Port of Stockton. Increased commercial shipping increases the potential for spills of petroleum products and other toxic compounds into the Stockton deep water ship channel (DWSC) from the large vessels, as well as the introduction of non-native invasive species into the area waterways through the discharge of ballast waters. Ship movements increase the resuspension of sediments from the channel bottom which may introduce contaminants into the water column and increase turbidity in the DWSC. Finally, increased shipping traffic may increase the risks of propeller entrainment and propeller strikes to listed fish in the DWSC. Propeller strikes are particularly dangerous to adult sturgeon (Brown and Murphy 2010, Balazik et al. 2012).

2.6.3 Rock Revetment and Levee Repair Projects

Cumulative effects include non-Federal riprap projects. Depending on the scope of the action, some non-Federal riprap projects carried out by state or local agencies do not require Federal permits. These types of actions as well as illegal placement of riprap occur within the watersheds of the Sacramento and San Joaquin rivers and their tributaries, as well as the waterways of the Delta. For example, most of the levees have roads on top of the levees which are either maintained by the county, the local reclamation district, the landowner, or by the state. Landowners may utilize roads at the top of the levees to access parts of their agricultural lands and repair the levees to protect property with unauthorized materials (i.e., concrete rubble, asphalt, etc.). The effects of such actions result in continued fragmentation of existing high-quality habitat, and conversion of complex nearshore aquatic to simplified habitats that affect salmonids in ways similar to the adverse effects associated with the Project.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminishes the value of designated or proposed critical habitat for the conservation of the species.

2.7.1 Status of CV Spring-run Chinook Salmon

In the 2016 status review (NMFS 2016a), NMFS found, with a few exceptions, that CV spring-run Chinook salmon populations have generally increased through the 2013 returns (23,696 fish total including hatchery fish) but then sharply declined in 2014 (9,901 total fish including hatchery fish; the last escapement numbers available to the TRT since the last status review in 2010/2011). Based on these escapement numbers, the 2016 status review changed the status of the Mill and Deer creek populations from the high extinction risk category, to moderate, while keeping the Butte Creek in the low risk of extinction category. Additionally, the Battle Creek and Clear Creek populations continued to show stable or increasing numbers in that period, putting them at moderate risk of extinction based on abundance. Overall, the Southwest Fisheries Science Center concluded in their viability report that the status of CV spring-run Chinook salmon (through 2014) had probably improved since the 2010/2011 status review and that the ESU's extinction risk may have decreased.

However, adult escapement numbers in 2015 were extremely low. The adult escapement to Central Valley waterways was 1,195 fish. The return to the Feather River Fish Hatchery was 4,440 fish. Returns in 2016 increased slightly but then declined again in 2017. Since the effects of the 2012 to 2016 drought have not been fully realized, NMFS anticipates at least several more years of very low returns, which may result in severe rates of decline (NMFS 2016a).

2.7.2 Status of CCV Steelhead

The 2016 status review (NMFS 2016b) concluded that overall, the status of CCV steelhead appears to have changed little since the 2011 status review when the TRT concluded that the

DPS was in danger of extinction. Furthermore, there is still a general lack of data on the status of wild populations. The Central Valley population of steelhead still faces the loss of the majority of the historical spawning and rearing habitat due to dams and other passage impediments, as well as the other factors previously described for their decline. There are some encouraging signs however, as several hatcheries in the Central Valley have experienced increased returns of steelhead over the last few years. There has also been a slight increase in the percentage of wild steelhead in salvage at the south Delta fish facilities, and the percentage of wild fish in those data remains much higher than at Chipps Island. The new video counts at Ward Dam show that Mill Creek likely supports one of the best wild steelhead populations in the Central Valley, though at much reduced levels from the 1950's and 60's. Restoration efforts in Clear Creek continue to benefit CCV steelhead. However, the catch of unmarked (wild) steelhead at Chipps Island is still less than 5 percent of the total smolt catch, which indicates that natural production of steelhead throughout the Central Valley remains at very low levels. Despite the positive trend on Clear Creek and encouraging signs from Mill Creek, all other concerns raised in the previous status review remain.

2.7.3 Status of sDPS North American Green Sturgeon

The viability of sDPS green sturgeon is constrained by factors such as a small population size, lack of multiple populations, and concentration of spawning sites into just a few locations. The risk of extinction is believed to be moderate because, although threats due to habitat alteration are thought to be high and indirect evidence suggests a decline in abundance, there is much uncertainty regarding the scope of threats and the viability of population abundance indices (NMFS 2015).

Although the population structure of sDPS green sturgeon is still being refined, it is currently believed that only one population of sDPS green sturgeon exists. Lindley et al. (2007), in discussing winter-run Chinook salmon, states that an ESU represented by a single population at moderate risk of extinction is at high risk of extinction over the long run. This concern applies to any DPS or ESU represented by a single population, and if this were to be applied to sDPS green sturgeon directly, it could be said that sDPS green sturgeon face a high extinction risk. However, the position of NMFS, upon weighing all available information (and lack of information) has stated the extinction risk to be moderate (NMFS 2015).

There is a strong need for additional information about sDPS green sturgeon, especially with regards to a robust abundance estimate, a greater understanding of their biology, and further information about their micro- and macro-habitat ecology.

2.7.4 Status of Environmental Baseline and Cumulative Effects in the Action Area

Salmon, steelhead, and green sturgeon use the action area as an upstream and downstream migration corridor and for rearing. Within the action area, the essential features of freshwater rearing and migration habitats for salmon, steelhead and green sturgeon have been transformed from meandering waterways lined with dense riparian vegetation, to a highly leveed system. Levees have been constructed near the edge of the river and sloughs and most floodplains have been completely separated and isolated from the river. Severe long-term riparian vegetation losses have occurred throughout the Delta, and there are large gaps along leveed shorelines devoid of riparian vegetation due to the high amount of riprap. The change in the ecosystem as a result of halting the lateral migration of the river channels, the loss of floodplains, and the removal of riparian vegetation and IWM have likely affected the functional ecological processes that are essential for growth and survival of salmon, steelhead, and green sturgeon in the action area.

The Cumulative Effects section of this opinion describes how continuing or future effects such as the agricultural transformation of the land within the action area, increased runoff and non-point source contaminants, armoring of levees and shoreline modifications, and increased urbanization affect the species in the action area. These actions typically result in habitat fragmentation, and conversion of complex nearshore aquatic habitat to simplified habitats that incrementally reduces the carrying capacity of the rearing and migratory corridors.

2.7.5 Summary of Project Effects on CV Spring-run Chinook Salmon, CCV Steelhead, and sDPS North American Green Sturgeon

2.7.5.1 CV Spring-run Chinook salmon

2.7.5.1.1 Active Construction Related Effects

These effects are related to the immediate acute effects of the construction activities at the repair sites during the July 1 through November 1 construction work window. This will apply to all of the impacted fish species for acute construction related actions.

2.7.5.1.1.1 Temporal and Spatial Overlap

Adults: It is not anticipated that there will be any spatial or temporal overlap between construction activities and the presence of adult spring-run Chinook salmon in the action area. The timing of the construction work window (July 1 through November 1) does not overlap with the anticipated timing of adult spring-run upstream migrations through the Delta and into the San Joaquin River basin (Table 5). Since the likelihood of adult spring-run Chinook salmon presence in the action area at the time of construction activities is remote, NMFS does not anticipate that there will be any affects to individual adult spring-run, and therefore no effects to the ESU.

Juveniles: It is not anticipated that there will be any spatial or temporal overlap between construction activities and the presence of juvenile spring-run Chinook salmon in the action area. The timing of the construction work window (July 1 through November 1) does not overlap with the anticipated timing of the downstream emigration of young-of-the-year spring-run Chinook salmon from the San Joaquin River basin (Table 5). Since the likelihood of juvenile spring-run Chinook salmon presence in the action area at the time of construction activities is remote, NMFS does not anticipate that there will be any affects to individual juvenile spring-run, and therefore no effects to the ESU.

2.7.5.1.1.2 Effects to Individual Fish

Adults - Since it is not expected that any adult spring-run will be present during the construction work window of July 1 to November 1, at any of the repair sites, there are no effects to individual fish.

Juveniles - Since it is not expected that any juvenile spring-run will be present during the construction work window of July 1 to November 1, at any of the repair sites, there are no effects to individual fish.

2.7.5.1.1.3 Effects to the CV Spring-run Chinook salmon ESU

Adults - NMFS expects that there will be no effects to the spring-run ESU due to the lack of effects to individual fish as previously explained.

Juveniles - NMFS expects that there will be no effects to the spring-run ESU due to the lack of effects to individual fish as previously explained.

2.7.5.1.2 Long Term Effects

2.7.5.1.2.1 Temporal and Spatial Overlap

Adults – Returning adults from the SJRRP introductions of spring-run Chinook salmon will migrate upstream in the San Joaquin River each year enroute to the San Joaquin River below Friant Dam. These fish will pass the location of the setback levee and new floodplain. Access to the floodplain would only occur when the area is inundated during the adult migratory period. Adults may potentially migrate into other tributaries of the San Joaquin River such as the Stanislaus, Tuolumne, and Merced rivers as this population re-colonizes former habitat in those watersheds. It is expected that adult spring-run will move through the lower reaches of the San Joaquin River where the Project actions took place relatively quickly, taking from a few hours to a few days to transit these reaches.

Juveniles – Downstream emigration of juvenile spring-run will occur through the winter and spring each year within the mainstem San Joaquin River. A proportion of the juvenile population may leave the mainstem of the river at the Head of Old River and migrate through the Old River/ Middle River complex to the western Delta, avoiding the setback levee area. Most of the young-of-the-year spring-run juveniles are expected to move downstream in the March through May time frame, with a peak in April, when flows from the tributaries are typically elevated. However, some fish may emigrate earlier than March, or later than May, if river flows are elevated during those periods of time. Access to the floodplain would only occur when the floodplain is inundated during juvenile outmigration.

2.7.5.1.2.2 Effects to Individual Fish

Adults - It is not anticipated that adult spring-run Chinook salmon will be substantially affected by the long term effects of the setback levee and new floodplain. Adult Chinook salmon do not feed during their upstream migration, and thus would not benefit from the additional food base created by an inundated floodplain. It is also unlikely that adult fish would consistently be attracted to the floodplain due to the lack of any attractant flows from incoming streams or watercourses. As proposed, most of the floodplain is unlikely to become activated more than once every 3 to 6 years, based on the design elevations. Under lower flow conditions when the floodplain is not inundated, there would be no effect on individual fish. A few fish may hold for a short time due to the velocity break the floodplain would offer from the mainstem flows in the San Joaquin River during the high flow events that would lead to the inundation of the floodplain. The frequency of inundation may increase in the future due to climate change and projected increases in sea level elevations as discussed earlier in this document. However, this increase may take decades to be realized.

Outside of the levee setback area, adult fish would encounter the same altered aquatic habitat due to the continued presence of levees that currently exists into the foreseeable future. This alteration of aquatic habitat and its effects are described in section 2.5.1.5 *Perpetuation of Levee Presence*.

Juveniles – Juvenile spring-run Chinook salmon are expected to utilize the floodplain when it is inundated during their downstream migration in spring. As described above, flows that inundate the floodplain for longer than a few days will enhance the growth potential of the fish rearing on it. Food resources are expected to increase through the growth in biomass of invertebrates occupying the flooded habitat. The inundated floodplain will also offer refuge from high velocity water currents in the mainstem river channel, and provide slightly warmer waters to enhance the bioenergetics of the salmon rearing there. While most of the effects of the inundated floodplain are positive to individual fish, some fish will be lost to predation while rearing on the floodplain or by stranding during the draining of the floodplain. These negative effects are far outweighed by the positive aspects of enhanced juvenile salmon growth that the floodplain can provide. During those periods when San Joaquin River flows are insufficient to inundate the floodplain, fish will not be benefit from the presence of the floodplain. There will be essentially “no effect” of the floodplain if it remains dry and inaccessible to emigrating spring-run juveniles. As proposed, most of the floodplain is unlikely to become activated more than once every 3 to 6 years, based on the design elevations. The frequency of inundation may increase in the future due to climate change and projected increases in sea level elevations as discussed earlier in this document. However, this increase may take decades to be realized.

Outside of the levee setback area, juvenile fish would encounter the same altered aquatic habitat due to the continued presence of levees that currently exists into the foreseeable future. This alteration of aquatic habitat and its effects are described in section 2.5.1.5 *Perpetuation of Levee Presence*.

2.7.5.1.2.3 Effects to the CV Spring-run Chinook salmon ESU

Adults - Since few if any adult spring-run Chinook salmon would be impacted by the long-term habitat effects of the setback levee and floodplain, there will be little impact to the adult fraction of the spring-run ESU from this component of the Project. The ongoing presence of the armored levees and the changes to the aquatic environment they produce will continue to be a negative influence on the viability of the CV spring-run Chinook salmon ESU.

Juveniles – Those juveniles that are able to access the inundated floodplain associated with the setback levee should, overall, see mostly positive growth enhancements. As previously described, some fish may be lost to predation or stranding, but overall, effects should be beneficial to the San Joaquin River basin population. It is postulated that larger Chinook salmon smolts entering the marine environment from the freshwater environment have a higher probability of survival during this transitional phase. A higher rate of survival at this stage can carry through the ocean rearing phase and enhance the number of adults that migrate back into freshwater to spawn. By increasing the adult escapement of spring-run back into the San Joaquin River basin, the overall health of the ESU is enhanced by increasing the population of this diversity group (Southern Sierra Nevada). In contrast, the ongoing presence of the armored levees and the changes to the aquatic environment they produce will continue to be a negative influence on the viability of the CV spring-run Chinook salmon ESU.

2.7.5.2 California Central Valley Steelhead

2.7.5.2.1 Active Construction Related Effects

2.7.5.2.1.1 Temporal and Spatial Overlap

Adults - Adult CCV steelhead will be present in the waterways of the action area during the construction work window of July 1 through November 1. Adult steelhead begin to enter the Delta in July and peak in their abundance in September and October on the Sacramento River side of the Delta. Adult steelhead entering the San Joaquin River basin start to appear in September in low numbers and typically increase in numbers from October through January based on the Stanislaus River weir data. Migration trends after late December are compromised due to the removal of the weir by the end of December in many of the years in which it was operated.

Juveniles – Juvenile steelhead have a very low probability of being present in the action area during the construction work window of July 1 through November 1. Most emigration by juvenile steelhead through the action area occurs from March through May based on data from the Mossdale trawl.

2.7.5.2.1.2 Effects to Individual Fish

Adults - Only adult steelhead that are holding adjacent to or migrating past the levee repair sites will be directly exposed or affected by construction related noise and activities. Those fish that are exposed to the effects of construction activities will encounter short-term (i.e., minutes to hours) construction-related noise depending on how fast they move through the reach of river channel adjacent to the repair site. Although direct injury or harm is unlikely, behavioral avoidance may cause fish to delay their upstream migration or drop back downstream. Fish often respond to construction activities by quickly swimming away from the construction sites, resulting in the majority escaping direct physical injury. This effect is considered a form of harassment that results in take of exposed fish. The probability of an individual fish being present during construction actions in the affected river reaches increases after mid-September. Prior to mid-September, few adult steelhead have been observed passing the Stanislaus River fish weir. This information is used as a surrogate for when fish might be present in the San

Joaquin River system within the action area. Construction at the multiple repair sites is scheduled to occur from July 1 to November 1, giving approximately 45 days of overlap between the presence of adult steelhead and construction actions each year; for a duration of two years of construction. There is approximately 2.5 months (approximately 62 to 77 days) when adult steelhead are less likely to be present in the action area. Since certain construction actions will take place throughout an entire 24 hour period in a day (i.e., cutoff wall construction) there will be no “quiet period” for fish to move upstream without encountering the noise associated with construction actions (as well as night time illumination of the cutoff wall construction locations). Effects related to contaminants and turbidity are not expected to impact adults migrating through the action area due to the implementation of construction BMPs designed to limit these factors and the short duration of exposure anticipated for adults as they move through the action area.

Juveniles - There is a low probability of exposure of juvenile steelhead to the effects of the active construction activities during the work window. This is due to temporal and spatial separation of the Project’s actions with the migratory timing and presence of juvenile steelhead in the San Joaquin River and south Delta. If fish are present, they are unlikely to be exposed to conditions that will cause direct mortality or injury. It is expected that most of the responses of exposed fish will be behavioral in nature (harassment) although some individuals may be lost to predation associated with delays in migrating past the levee repair sites during construction. Predation would be considered a secondary consequence of the Project’s actions.

2.7.5.2.1.3 Effects to the CCV Steel head DPS

Adults - The majority of the currently existing populations of the CCV steelhead DPS originate in the Sacramento River basin (Northwestern California, Northern Sierra Nevada, and the Basalt and Porous Lava diversity groups) and are not expected to be present in the action area. Steelhead from the Southern Sierra Nevada diversity group are expected to be present in the action area, and thus will be affected by the Project’s actions. The majority of adult steelhead migrating upstream are expected to use the mainstem of the San Joaquin River as their migratory route, migrating past the locations of the Project’s repair sites. However, since most of the San Joaquin River basin population (Southern Sierra Nevada diversity group) will be migrating after the end of October when the construction work window ends, the majority of the population will not be exposed to the construction actions and their effects. Since no lethal take of adult steelhead is expected from exposure to the action’s activities and any non-lethal take is expected to be primarily due to harassment of fish by noise and activity, the CCV steelhead DPS will not be negatively impacted by the exposure of the San Joaquin River basin steelhead population to the construction related effects of the action.

Juveniles - As described for the adult steelhead above, the majority of the juvenile steelhead comprising the CCV steelhead DPS originate in the Sacramento River basin and will not be present in the action area. There is a low probability that some juvenile steelhead from the Southern Sierra Nevada diversity group originating in the San Joaquin River basin may emigrate early and be present in the action area during construction activities. These fish will have non-lethal exposures to construction actions associated with the levee repair sites and will continue migrating downstream, although some fish may experience migratory delays due to the effects of the action. A few of those individuals delayed may be predated upon due to an increase in their temporal exposure to predators in the action area. The small numbers of fish migrating during the work window coupled with the small percentage of fish actually lost to the Project's actions will not substantially affect the CCV steelhead DPS viability.

2.7.5.2.2 Long Term Effects

2.7.5.2.2.1 Temporal and Spatial Overlap

Adults - Returning steelhead adults from the Southern Sierra Nevada diversity group will migrate upstream in the San Joaquin River each year enroute to the San Joaquin River basin and its tributaries from approximately mid-September through early winter (January/ February) based on fish passage records from the Stanislaus River fish weir. It should be noted, however, that adult steelhead passage records are truncated artificially by the fish counting weir being removed at the end of December in most years. These fish will pass the location of the setback levee and new floodplain. Adults may potentially migrate into any one of the tributaries of the San Joaquin River such as the Stanislaus, Tuolumne, and Merced rivers to reach their spawning grounds. It is expected that adult steelhead will move through the lower reaches of the San Joaquin River where the Project actions took place relatively quickly, taking from a few hours to a few days to transit these reaches. Some adult steelhead will survive after spawning and return downstream as "kelts" through the action area. It is expected that kelts will migrate through the action area later in the year, typically in winter and spring.

Juveniles - Downstream emigration of juvenile steelhead will typically occur through the winter and spring each year within the mainstem San Joaquin River. A proportion of the juvenile population may leave the mainstem of the river at the Head of Old River and migrate through the Old River/ Middle River complex to the western Delta, avoiding the setback levee area. Most of the juvenile steelhead are expected to move downstream from March through May, peaking in April and May, when flows from the San Joaquin River basin tributaries are typically elevated. However, some fish may emigrate earlier than March, or later than May, if river flows are elevated during those periods of time.

2.7.5.2.2.2 Effects to Individual Fish

Adults – The majority of adult steelhead moving upstream towards spawning locations will pass the location of the setback levee and the new floodplain on the San Joaquin River. Only those fish which move through Old River will bypass the location. Fish will only be able to gain access to the floodplain when water elevations are sufficiently high to inundate the levee breach and those portions of the floodplain with the lowest elevations. These inundations must happen when the adults are migrating past the location of the levee breech. Since most adult steelhead are typically making their way upstream before there are sufficiently elevated flows in the San Joaquin River to inundate the breech and floodplain, the majority of adults will never be present when the floodplain is inundated and thus will not benefit from it. A smaller fraction of the adult population may move upstream in winter when there is the potential for elevated flood flows. As proposed, most of the floodplain is unlikely to become activated more than once every 3 to 6 years, based on the design elevations. Under lower flow conditions when the floodplain is not inundated, there would be no effect on individual fish. However, if the floodplain is inundated, individual fish could move onto the floodplain and take advantage of velocity refugia from the main river channel to rest and hold during their upstream migration. Kelts moving back downstream after spawning in winter and spring have a higher likelihood of encountering the floodplain when it is inundated, as higher river flows typically occur during this period of time. Although the activated floodplain is likely to provide enhanced forage base from increased invertebrate production, adult steelhead engage in minimal feeding during their upstream spawning migration and this benefit is unlikely to be used during their upstream spawning migration. However the floodplain can provide this benefit to kelts moving back downstream following spawning, when the adult fish begin to regularly feed again. In addition, native fish are likely to use the inundated floodplain to spawn if the duration of flooding is long enough, and this boost to native fish populations could in turn provide additional forage base for adult steelhead to feed upon while migrating through the system.

Outside of the levee setback area, adult fish would encounter the same altered aquatic habitat due to the continued presence of levees that currently exists. This alteration of aquatic habitat and its effects are described in section 2.5.1.5 *Perpetuation of Levee Presence*.

Juveniles – Juvenile steelhead from the San Joaquin River basin will typically migrate through the action area from January through June with the majority of the population emigrating from March through May. The peak of emigration, based on observations at the Mossdale trawl location near the Head of Old River, is during April and May. A fraction of the emigrating steelhead juveniles may take the Old River channel at the Head of Old River bifurcaton. These fish will not be exposed to those portions of the action area downstream of the bifurcation, including the setback levee and flood plain. For those fish that continue down the main channel of the San Joaquin River, they may be exposed to the effects of the new floodplain. Fish will only be able to gain access to the floodplain if the water elevations are sufficiently high enough to inundate the levee breach and those portions of the floodplain with the lowest elevations. As proposed, most of the floodplain is unlikely to become activated more than once every 3 to 6 years. Under these lower flow conditions, the floodplain would have no effect on individual fish. However, if the floodplain is inundated, individual fish could move onto the floodplain and take advantage of velocity refugia from the main river channel to rest and hold during their downstream migration.

Steelhead juveniles holding on the floodplain can also benefit from preying on both the increased invertebrate production associated with inundated floodplains and potentially larval fish from floodplain spawners using the floodplain habitat. These fish are expected to grow larger than those steelhead juveniles that remain in the main channel. Growing larger is expected to enhance survival of juvenile steelhead moving from the freshwater environment to the marine environment due to larger energy stores from the additional caloric intake gained from feeding on the floodplain.

Outside of the levee setback area, juvenile fish would encounter the same altered aquatic habitat due to the continued presence of levees that currently exists into the foreseeable future. This alteration of aquatic habitat and its effects are described in section 2.5.1.5 *Perpetuation of Levee Presence*.

2.7.5.2.2.3 Effects to the CCV Steelhead DPS

Adults – There will be a slight positive effect on the CCV steelhead DPS as a result of the setback levee and the newly created floodplain in regards to its use by adult steelhead from the San Joaquin River basin (Southern Sierra Nevada diversity group). The primary reason that there would not be a more positive response is the infrequent inundation of the floodplain by elevated river flows at a time when adult steelhead are present. As designed, the levee breech and floodplain will only be activated by floodwater inundation every ~3-6 years, and this would typically occur when most adult steelhead are not present during their upstream migration. Thus, benefits of the floodplains will not be available to every year's returning adult escapement population. The frequency of inundation may increase in the future due to climate change and projected increases in sea level elevations as discussed earlier in this document. However, this increase may take decades to be realized. The ongoing presence of the armored levees and the changes to the aquatic environment they produce will continue to be a negative influence on the viability of the CCV steelhead DPS.

Juveniles – It is expected that there will be an overall positive effect on the CCV steelhead DPS due to the utilization of the floodplain by juvenile steelhead. This benefit will occur only to the fish belonging to the Southern Sierra Nevada diversity group, the only diversity group which occupies the San Joaquin River basin. Benefits will be derived from using the floodplain as a refugia from high river flows, a place to rear, and a place to forage on the increased invertebrate and larval fish populations (i.e., native fish species that are floodplain spawners) expected from the created floodplain habitat. It is expected that these juvenile steelhead will be larger and have better overall survival when moving downstream to the marine environment. If the population of steelhead entering the ocean has better initial survival, then there may be more fish surviving to return to spawn in the San Joaquin River basin following their ocean residency phase. Increasing the population of the Southern Sierra Nevada diversity group aids in the recovery of the CCV steelhead DPS by increasing the viability of this diversity group, and hence the overall viability of the DPS. This positive effect on the DPS would be greater if the frequency and duration of the floodplain inundation increased, which may occur in the future due predicted climate change and projected increases in sea level elevations. In contrast, the ongoing presence of the armored levees and the changes to the aquatic environment they produce will continue to be a negative influence on the viability of the CCV steelhead DPS.

2.7.5.3 sDPS of North American Green Sturgeon

2.7.5.3.1 Active Construction Related Effects

2.7.5.3.1.1 Temporal and Spatial Overlap

Adults - Adult green sturgeon are expected to be present year-round in the Delta. Peak presence is during the upstream spawning migration into the Sacramento River from approximately February through June. Post-spawn adults move back downstream following spawning, but spend varying lengths of time resting upriver before returning downstream. Less is known regarding their potential use of the San Joaquin River basin upstream of the Delta, but CDFW sturgeon report card information and the observation of a live green sturgeon in the Stanislaus River in October 2017, indicate that there is opportunistic use of this watershed. The information provided in the CDFW sturgeon report cards indicates that green sturgeon have been caught during all seasons of the year in the San Joaquin River basin, but primarily from fall through spring. Few fish are caught during the summer period.

Juveniles - Juvenile green sturgeon may rear for up to three years in the Delta before finally emigrating to the marine environments along the continental shelf. It is believed that juveniles make use of all accessible waterways in the Delta to rear during this period, including all of the waters in the action area.

2.7.5.3.1.2 Effects to Individual Fish

Adults - For those adults that are in proximity to the levee repairs sites during active construction, NMFS believes that only non-lethal behavioral modifications will occur. NMFS does not anticipate that any lethal effects will occur to adults following exposure to noise, vibrations, nocturnal illumination from construction lights, or bank-side activities related to the construction activities. Exposed fish are expected to move away from the disturbance and noise to waters that are quieter and have less activity, resuming foraging or holding behavior. Any delays to movements are temporary. For most of the construction sites, fish can continue their movements during the night when construction activities cease until the next morning. For the two locations that will have continuous cutoff wall construction, fish will have their movements delayed or prevented. Some fish may eventually move past construction activities when their behavioral drive and needs supersedes their avoidance response to the disturbance.

NMFS does not expect any demonstrable effects to adult green sturgeon due to turbidity or contaminants related to Project activities. The Project will adhere to construction BMPs that will minimize the effects or potential release of turbidity plumes. Any turbidity associated with the Project’s actions is not anticipated to reach a magnitude that would adversely affect green sturgeon, a species that is typically found in the turbid waters of the Delta and San Francisco Bay estuary. The release of contaminants is also unlikely due to the spill prevention and clean up components of the Project’s BMPs. These components of the BMPs are designed to prevent spills or leaks before they can occur, and if they do occur, quickly containing them and cleaning them up before they can enter adjacent waterways.

Juveniles - Effects to juveniles are expected to be the same as those described for adult green sturgeon. NMFS does not anticipate any lethal effects from construction activities. Like the effects to adults, juveniles are most likely to have behavioral modifications. Fish are expected to move away from noise and disturbances to quieter areas of the adjacent waterways, and resume their normal behaviors. These effects are considered non-lethal and temporary in duration.

2.7.5.3.1.3 Effects to the sDPS of North American Green Sturgeon

Adults - No effects to the viability of the sDPS of green sturgeon are expected from the exposure to Project’s construction activities. Since exposure to the effects will result in only non-lethal responses, which are temporary in nature, there are no lasting effects to the individual fish and hence the DPS as a whole.

Juveniles - There are no effects to the viability of the sDPS of green sturgeon due to exposure of juveniles to the Project's construction activities. Since only non-lethal behavioral effects are expected, and individuals are anticipated to fully recover from these effects, there are no losses of any individual fish to the overall population. Thus there is no diminishment in abundance or any of the other elements that affect the viability of the DPS.

2.7.5.3.2 Long Term Effects

2.7.5.3.2.1 Temporal and Spatial Overlap

Adults - The temporal and spatial distribution of adult green sturgeon in relationship to the action area is the same as previously described for section 2.7.5.3.1.1. Since adult green sturgeon are present year-round in the action area, there is no discernable difference in the distribution of adults between the acute construction phase and the long-term project effects in the action area.

Juveniles – The temporal and spatial distribution of juvenile green sturgeon in the action area is the same as previously described for section 2.7.5.3.1.1. Since juvenile green sturgeon are present year-round in the action area, there is no discernable difference between the distribution of juveniles in the acute construction phase and the long-term project effects phase.

2.7.5.3.2.2 Effects to Individual Fish

Adults – Adult green sturgeon may benefit from the creation of the floodplain habitat through the increase in invertebrate biomass that will come off of the floodplain as it drains and which has the potential to provide additional forage base to adults. Some sturgeon may swim up onto the floodplain to forage if water depth is sufficient, but use of the floodplain by adults is uncertain. In addition, when the floodplain is activated by inundation, organic material and nutrients will come off the floodplain and provide benefits to downstream aquatic habitats. However, as previously described, the benefits of the floodplain will only occur when the floodplain is inundated, which will occur every 3 – 6 years based on the proposed elevations of the levee breech and floodplain. The frequency of inundation may increase in the future due to climate change and projected increases in sea level elevations as discussed earlier in this document. However, this increase may take decades to be realized.

Outside of the levee setback area, adult fish would encounter the same altered aquatic habitat due to the continued presence of levees that currently exists. This alteration of aquatic habitat and its effects are described in section 2.5.1.5 Perpetuation of Levee Presence.

Juveniles – Juveniles are also expected to benefit from the inundated floodplain in the same manner as adults. Juveniles are expected to make more use of the floodplain than adults due to their smaller size and the relative depth of water on the floodplain during inundation when compared to their size. The frequency of inundation is projected to be every 3 to 6 years, but may increase in the future due to climate change and projected increases in sea level elevations as discussed earlier in this document. However, this increase may take decades to be realized.

Outside of the levee setback area, juvenile fish would encounter the same altered aquatic habitat due to the continued presence of levees that currently exists. This alteration of aquatic habitat and its effects are described in section 2.5.1.5 Perpetuation of Levee Presence.

2.7.5.3.2.3 Effects to the sDPS of North American Green Sturgeon

Adults - There will be a slight positive effect on the sDPS of North American green sturgeon as a result of the setback levee and the newly created floodplain in regards to the increased food resources for adults that the floodplain can potentially provide. There would be more positive effects to the sDPS of green sturgeon if the inundation frequency of the floodplain was higher. The frequency of inundation may increase in the future due to climate change and projected increases in sea level elevations as discussed earlier in this document. However, this increase may take decades to be realized. The ongoing presence of the armored levees and the changes to the aquatic environment they produce will continue to be a negative influence on the viability of the sDPS of green sturgeon.

However, the overall magnitude of long term effects of the Project to the sDPS of green sturgeon are diminished due to the location of the action area in the southern Delta; a region of the Central Valley that is not used extensively by this species. It is anticipated that only a small fraction of the population of green sturgeon from this DPS will be present within the action area affected by the setback levee and thus be exposed to its impacts.

Juveniles – There will be beneficial effects to the sDPS of green sturgeon in relation to juvenile use of the floodplain. Increased invertebrate production originating on the floodplain should increase the forage base of juvenile green sturgeon. Increased flow of nutrients and organic matter from the floodplain should enhance downstream aquatic habitat which will in turn benefit juvenile green sturgeon rearing in those waters. But like adults, these benefits are less than what is possible due to the infrequent inundation of the floodplain and its activation by floodwaters. Benefits to the sDPS of green sturgeon are likely to occur only once every 3-6 years, but may increase due to climate change and more frequent inundation as discussed in previous sections of this opinion. In contrast, the ongoing presence of the armored levees and the changes to the aquatic environment they produce will continue to be a negative influence on the viability of the sDPS of green sturgeon.

As discussed above for adult green sturgeon in the sDPS, the overall magnitude of impacts to juvenile green sturgeon from the Project over the long term are minimized due to the Project's location in the southern Delta. A small fraction of the overall population of sDPS green sturgeon are expected to be found in this region compared to the Sacramento River watershed and remainder of the Delta.

2.7.6 Summary of Project Effects on CCV steelhead and sDPS Green Sturgeon Critical Habitat

Within the Project's action area, there is designated critical habitat for CCV steelhead, and sDPS green sturgeon. The action area does not include designated critical habitat for CV spring-run Chinook salmon.

The relevant PBFs of the designated critical habitat for steelhead are migratory corridors and rearing habitat, and for green sturgeon the six PBFs include food resources, substrate type/size, flow, water quality, migration corridor free of passage impediments, depth (holding pools), and sediment quality.

Migration may be temporarily delayed due to noise and bankside activities for CCV steelhead smolts in those rare cases when they may be present during the work window for construction. The PBF of migratory corridors for adult steelhead are expected to be impacted due to the timing of the adult migration. Although migrating adult steelhead are unlikely to use the nearshore habitat that will be most affected by this project, preferring to use the deeper water of the channel thalweg for migratory movements, the sound pressure waves and particle movement caused by construction will carry across the width of the channels at each repair location. These delays to migration will be temporary in most of the river reaches adjacent to construction sites as fish can move again at night when construction ceases. This occurs at most of the construction sites, but not at sites Va and VI a.1 where construction is anticipated to occur 24 hours a day, 7 days per week. On the other hand, fish can simply pass through the disturbances as it happens since the magnitude of sound energy will never reach the level of injury or mortality, but is only a behavioral deterrent to passage. Once the behavioral drive of the fish to move exceeds the avoidance behavior caused by the disturbance, the fish may choose to swim through the reach impacted by the sounds and vibrations. Furthermore, the construction related sound delays will last approximately four months each construction season (2 seasons total) at each repair site location, then cease with the end of construction. The Project did not install any features that are expected to permanently block or impede juvenile or adult migration.

The green sturgeon PBF of an unobstructed migratory corridor free of passage impediments is expected to be adversely affected by the project. Construction noise and activities may cause a delay in green sturgeon movements for both adult and juvenile fish. However, as described in the effects synthesis above, these delays are transitory as fish can move at night in most cases to avoid the noise or simply move to another area of the river to carry out their normal behaviors, including feeding and holding. Furthermore, the delays are of a temporary nature as the construction at each site will last only four months each construction season, and then the construction related sounds will cease with the conclusion of construction activities. Only two construction seasons are anticipated for this Project.

As previously described for the effects of the inundated floodplain on individual fish, the floodplain may benefit the functioning of the PBFs for both steelhead and green sturgeon by enhancing food resources which in turn enhance the quality of the rearing habitat. This benefit to the PBFs for steelhead and green sturgeon will be limited however by the low frequency of inundation of the floodplain. When the floodplain is not inundated, it does not provide the benefit to the PBFs of the steelhead and green sturgeon designated critical habitats in the action area.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of CV spring-run Chinook salmon, CCV steelhead, and sDPS of the North American green sturgeon. The project will not adversely modify designated critical habitat for CCV steelhead, or the sDPS of North American green sturgeon. Designated critical habitat for CV spring-run Chinook salmon does not occur within the action area of this Project.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1 Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

NMFS anticipates incidental take of CV spring-run Chinook salmon, CCV steelhead, and the sDPS of North American green sturgeon in the action area through the implementation of the proposed Project. Because of the proposed timing of the in-water work for the construction phase of the Project, actual numbers of fish adversely affected by the construction actions are expected to be low. Only adult CCV steelhead and juvenile and adult sDPS green sturgeon will be present in the action area in any substantial numbers during the construction period, but may not always be present at the levee repair sites during actual construction due to the variability in spatial and temporal distribution within the action area. Only very small numbers of individual juvenile steelhead from the CCV steelhead Southern Sierra Nevada diversity group are expected to be present in the action area during the construction period. Greater numbers of individuals from the three listed species are expected to be present in the action area over the long term, and will be present in the action area in greater numbers than during the construction phase. These fish will be exposed to the post-construction levee repair sites, including the setback levee and floodplain and take will occur.

However, while individual fish will be present in the action area, NMFS cannot, using the best available information, precisely quantify and track the amount or number of individuals that are expected to be incidentally taken (injure, harm, kill, etc.) per species as a result of the proposed action. This is due to the variability and uncertainty associated with the response of listed species to the effects of the proposed action, the varying population size of each species, annual variations in the timing of spawning and migration, individual habitat use within the action area, and difficulty in observing injured or dead fish. However, it is possible to estimate the extent of incidental take by designating as ecological surrogates, those elements of the project that are expected to result in incidental take, that are more predictable and/or measurable, with the ability to monitor those surrogates to determine the extent of take that is occurring.

The most appropriate threshold for incidental take, is an ecological surrogate of habitat disturbance, which includes the factors (construction area containing the Project actions) causing fish to relocate and rear in other locations and reduce the carrying capacity of the existing habitat. NMFS will describe (1) the causal link between the surrogate and take of the species; (2) why it is not practical to express the amount of anticipated take or to monitor take related impacts in terms of individuals of the listed species; and (3) sets a clear standard for determining when the amount or extent of the taking has been exceeded.

The behavioral modifications of fish responses that result from the habitat disturbance are described below. NMFS anticipates annual take during the 2 years of construction activities will be limited to the following forms:

Incidental take will be primarily in the form of harassment to migrating CCV steelhead adults and juvenile and adult sDPS green sturgeon due to the repair of a cumulative 26,000 linear feet of levee within the RD 17 levee system as proposed under the Project. Levee repairs will affect adult CCV steelhead and adult and juvenile sDPS green sturgeon through displacement of fish from preferred locations in the river channel used for holding, rearing, and feeding, and the delay of migratory behavior within the affected river reaches. Although their presence is unlikely due to their migratory timing, exposure of CCV steelhead smolts may occur in rare instances, and is included as part of the ITS for this Project. Juvenile steelhead that are displaced from preferred locations in the riverine channel or delayed in their migratory behaviors may also have an enhanced level of predation due to increased exposure to predators both spatially and temporally as they attempt to avoid the shore side disturbances.

Construction actions along the 26,000 linear feet of levee alignment in the RD 17 action area associated with the Project will be the cause of disturbances that will impact listed fish. Construction actions will create the noise, vibrations, and shore side activities that will cause the harassment of exposed fish that are adjacent to the locations of the Project's different elements. Construction actions along the levees within the action area are directly linked to the footprint of the repair elements and their associated river reaches. Levee repair construction actions associated with the Project will not occur outside of the Project element footprints as described in the BA.

Since it is unlikely that individual fish and their responses to the construction actions will be visible to shore side observation due to water depth and lack of water clarity, the physical footprint of each Project element serves as the proxy for the extent of Project related impacts to listed fish. Each of the Project's elements are described in Table 1, which provides the linear feet of remaining levee repairs to be completed under the Project. The following table (Table 9) describes these physical attributes. These physical attributes describe the length of aquatic habitat disturbance that represents the ecological surrogate of take at each Project element.

Table 9: Ecological Surrogates for the Incidental Take of Listed Species due to Phase 3 of the RD17 Levee Repair Project's Construction Elements

Site/Element	Project Related Actions to Complete Levee Rehabilitation		
	Seepage Berm (feet)	Chimney Drain (feet)	Cutoff Wall (feet)
I a	240*	590	0
I b	0	130	0
I e	0	590	0
II ab	0	0	2,600
III a	0	4,750	0
IV a	0	720	0
IV c	300	0	300
V a and VI a.1	0	0	9,500
VI a.4	0	0	70
VI b	0	0	2,00
VI c	0	300	0
VI d	0	150	0
VI e	0	250	0
VI b	0	350	0
VII e	0	0	2,500
VII g	400	0	0
Sum	940	8,280	17,020

*The 240 feet of seepage berm to be constructed overlaps with the 590 feet of chimney drain to be constructed.

Incidental take of listed fish will occur over the long term in response to the creation of the setback levee and the new floodplain. Even though the creation of floodplain habitat for native fish (including listed fish species) will be of great benefit to these populations, a small number of juvenile CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon are expected to be lost due to predation of juvenile fish while rearing or otherwise using the floodplain. Although unlikely for native fish such as Chinook salmon, steelhead, or green sturgeon, stranding of adult or juvenile fish in depressions or pools can occur when flood waters recede from the floodplain, particularly if the recession of floodwaters occurs quickly. The absolute magnitude of loss due to predation and stranding is expected to be related to the area of the floodplain that is inundated during each flooding event. Due to the variability in the numbers of listed fish and/or predators present on the floodplain at any given time, variations in inter-annual listed fish population size, and the inherent variability of listed fish behavior and usage of the different floodplain habitats, it is not possible to precisely quantify the numbers of listed fish that may be lost due to predation or stranding. The appropriate ecological proxy for quantifying the incidental take of listed fish due to stranding or predation on the floodplain is the area of floodplain that is expected to be inundated during flood flows. Since flood flows will vary from event to event both within years and between years, NMFS will use the maximum area of the floodplain habitat (6.1 acres) to arrive at an upper limit for the area of floodplain that may become inundated from the highest flood flows anticipated.

Incidental take will be exceeded if the amount of habitat disturbance related to construction is exceeded (26,000 linear feet of levee) or the area of the floodplain created by the setback levee exceeds 6.1 acres.

2.9.2 Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the CV spring-run Chinook salmon ESU, the CCV steelhead DPS, or the sDPS of North American green sturgeon or destruction or adverse modification of designated critical habitat of the CCV steelhead or sDPS of North American green sturgeon occurring within the action area.

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

1. Measures shall be taken by the USACE or their permittees to minimize or avoid deleterious effects of the Project on listed CV spring-run Chinook salmon, CCV steelhead and sDPS green sturgeon.

2. The USACE shall ensure that RD 17 or its agents, implements all avoidance and minimization measures described in the project description for Phase 3 of the RD 17 Levee Seepage Repair Project.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the USACE or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The USACE or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. Continuous construction operations shall be restricted to the period between July 1 and September 15 of each construction season. Between September 16 and November 1 of each construction season, work will cease for 1.5 hours before sunset or sunrise and resume 1.5 hours after sunrise or sunset. This will give a cumulative period of 6 hours free from construction related noise and a period of natural lighting conditions during the crepuscular period of fish movement.

    b. Illumination of night time work will require that construction lighting utilize diffusers to reduce the extent of back scatter and glare. All lighting will be directed away from the water's surface and directed landwards towards the ground. Artificial lighting on construction sites will comply with 1a above.

c. Floodplains associated with the setback levee will be inspected during the recession phase after each high water event that inundates the floodplain. The floodplain will be inspected for potential stranding sites that may entrap listed fish. Should stranding events occur, the USACE, RD 17, or its agents, shall engage in fish rescue actions to remove listed fish from the stranding locations and return them to the San Joaquin River. RD 17 shall develop a fish rescue protocol and submit it to NMFS for review 30 days prior to the initiation of construction at the address in 2(i) below. Upon approval by NMFS, the fish rescue protocol will be implemented by RD 17 or its agents to rescue any stranded listed fish.

d. Any locations identified as a fish stranding location shall be filled in or modified to prevent future stranding. This may include filling in any depressions or scour holes by grading or placing new soil fill materials.

e. Any pile driving of sheet piles for the cutoff wall at Element VII will use a vibratory pile driving hammer between September 16 and November 1 to install the sheet piles. Use of an impact pile driving hammer is permissible between July 1 and September 15 to install the sheet pile cutoff wall at this location. However NMFS prefers that vibratory pile driving hammers be used during the entire construction window to minimize or avoid negative effects to aquatic organisms in the adjacent river during pile driving actions.

2. The following terms and conditions implement reasonable and prudent measure 2:

a. The USACE shall ensure that RD 17 or its agents, through the terms of the issued permits, requires all contractors and personnel involved with this Project to be educated and informed of the Terms and Conditions of this biological opinion and the avoidance and minimization measures described in the project description.

b. The USACE shall ensure that RD 17 or its agents, develops and delivers a worker environmental awareness training program to NMFS prior to initiating project activities for NMFS approval. Following NMFS approval of the training program, RD 17 shall provide written documentation of environmental training of all personnel involved in the construction of the project to NMFS. This documentation shall be delivered to NMFS within 30 days of the completion of personnel training.

c. All biologists engaged in the implementation of the Project's avoidance and minimization measures shall be qualified to carry out their duties. All biologists shall present their qualifications to NMFS for approval at least 30 days prior to engaging in project activities.

d. The USACE shall ensure that copies of all permits required for the Project will be delivered to NMFS at least 30 days prior to initiation of construction actions. This shall include, but is not limited to, the USACE's permits issued under section 404 of the Clean Water Act, and sections 10 and 14 (section 408) of the Rivers and Harbor Act, as well as any permits issued by the State of California (i.e., Clean Water Act section 401 permit, NPDES permit, streambed alteration permit, etc.).

e. At least 30 days prior to initiation of construction, a full and complete copy of the Project's SWPPP will be delivered to NMFS. The SWPPP will also include the following requirements:

   i. RD 17 will report any spills over 5 gallons to NMFS immediately (within 24 hours) following their occurrence. This notification will include identifying the composition of the spilled materials, the volume of the spill, and the cleanup procedures implemented.

   ii. Within 15 working days, a summary report of the effectiveness of the cleanup efforts will be delivered to NMFS.

   iii. Within 60 days of the completion of the Project's construction actions, a summary report regarding the SWPPP's effectiveness and the final disposition of any spill responses will be delivered to NMFS.

f. At least 30 days before the initiation of construction, a finalized copy of the Conceptual MMP will be delivered to NMFS. This document will include the final floodplain and levee breech elevations for the setback levee area.

g. Within 60 days of completing the construction activities associated with the Project, RD 17 shall submit a report to the USACE and NMFS summarizing the work that was performed, the starting and ending dates of the construction actions, any observed adverse effects to aquatic habitats and their duration (i.e., increased suspended sediment levels or turbidity, instances of pollution, unusual animal behaviors in adjacent waters, etc.), any problems encountered during construction activities, and any adverse effects to Chinook salmon, steelhead, or green sturgeon associated with the construction activities that was not previously considered.

h. All reports and documents will be sent to the address provided in 2(i) to deliver materials to NMFS.

i. Any Chinook salmon, steelhead, or green sturgeon found dead or injured within 0.25 mile upstream or downstream of any individual construction sites during levee repairs shall be reported immediately to NMFS via fax or phone within 24 hours of discovery to:

Attention: Assistant Regional Administrator
NMFS California Central Valley Office
Fax at (916) 930-3623, or
Phone at: (916) 930-3600

A follow-up written notification shall also be submitted to NMFS which includes the date, time, and location that the carcass or injured specimen was found, a color photograph, the cause of injury or death, if known, and the name and affiliation of the person who found the specimen. Written notification shall be submitted within 72 hours of discovery to:

Assistant Regional Administrator
California Central Valley Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, California 95814

Any dead specimen(s) should be placed in a cooler with ice and held for pick up by NMFS personnel or an individual designated by NMFS to do so.

2.10 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

1. The Corps should minimize any potential for take whenever possible, and implement practices that avoid or minimize negative impacts to listed salmon, steelhead, and sturgeon and their critical habitat.

2. The Corps should support and promote aquatic and riparian habitat restoration within the Delta and other watersheds, especially those with listed aquatic species. Practices that avoid or minimize adverse effects to listed species should be encouraged.

3. The Corps should continue to work cooperatively with State and Federal agencies, private landowners, regional governments, and local watershed groups to identify opportunities for cooperative analysis and funding to support salmonid habitat restoration projects.

4. The Corps should make set-back levees integral components of their authorized bank protection or ecosystem restoration efforts.

5. The Corps should conduct or fund studies to identify set-back levee opportunities, at locations where the existing levees are in need of repair or where set-back levees could be built in the future. Removal of the existing riprap from the abandoned levee should be investigated in restored sites and anywhere removal does not compromise flood safety.

These conservation recommendations are complimentary to the needs described in the NMFS Recovery Plan for the Sacramento River winter-run Chinook salmon and CV spring-run Chinook salmon ESUs and the CCV steelhead DPS (NMFS 2014). In particular, these conservation recommendations support Delta Recovery Actions as described in the NMFS Recovery Plan. The restoration of riparian and floodplain habitat, tidal marshes, and the creation of setback levees are described in the Recovery Plan as actions that would substantially benefit the ecological functioning of waterways in the Delta region and thus improve the value of designated critical habitat for listed salmonid species in the Delta region.

Implementation of the conservation recommendations by the USACE will enhance nearshore, tidal marsh, and riparian habitat in the Delta where there is currently a considerable deficit of these types of habitats. As previously discussed in this opinion, these types of habitats have been extensively reduced or eliminated in the Delta region by anthropogenic related changes to the landscape. In particular, construction of armored levees along hundreds of miles of waterways in the Delta region and along tributaries and rivers entering the Delta to provide for flood control and to reclaim land for human use have disconnected the aquatic systems from their riparian and floodplain habitats. Loss of these riparian and floodplain habitats have been extremely detrimental to listed salmonid species, as well as most native fish species in the Delta region, which have evolved to use these types of habitats during one or more phases of their life histories. Restoring these habits and providing renewed access to them will benefit listed species as well as native species that depend upon them for their long term survival.

The following Delta Recovery Actions represent actions from the NMFS Recovery Plan which identified the USACE as a potential partner and collaborator and are compatible with the conservation recommendations provided above:

- Del 1.4 — Landscape level restoration of ecological functions in the Delta.
- Del 1.6 — Provide access to new floodplain habitat in the South Delta for salmonids from the San Joaquin River system.
- Del 1.7 — Restore, improve, and maintain salmonid rearing and migratory habitats in the Delta.
- Del 1.13 -1.17 — Restoration of tidal marsh habitat within the Delta at multiple locations.
- Del 2.1 — Flood control improvements on the McCormick-Williamson Tract.
- Del 2.2 – 2.11 — Riparian and tidal marsh habitat restoration actions throughout the Delta – sites with secondary priority action status.
- Del 2.15 — Use alternatives to rip-rap for providing bank stabilization along Delta waterways.
- Del 2.16 — Increase monitoring for and enforcement of illegal rip-rap applications in the Delta.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, NMFS requests notification of the implementation of any conservation recommendations.

2.11 Reinitiation of Consultation

This concludes formal consultation for the Phase 3 RD 17 Levee Seepage Repair Project.

As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the Action Agency to conserve EFH. For the purposes of interpreting the definition of EFH, "waters" includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means habitat required to support a sustainable fishery and a healthy ecosystem; and, "spawning, breeding, feeding, or growth to maturity" covers all habitat types used by a species throughout its life cycle.

This analysis is based, in part, on the EFH assessment provided by the United States Army Corps of Engineers (USACE) and descriptions of EFH for Pacific coast salmon as described in Amendment 18 to the Pacific Coast Salmon Plan (Pacific Fisheries Management Council [PFMC], 2014) contained in the fishery management plans (FMP) developed by the PFMC and approved by the Secretary of Commerce.

The proposed Project area is within the region identified as EFH for Pacific salmon in Amendment 18 of the Pacific Coast Salmon FMP. The USACE is receiving this consultation under the MSA for potential impacts to the EFH of Pacific salmon as a result of implementing the Phase 3 RD 17 Levee Seepage Repair Project (Project) in USGS Hydrologic Unit Code (HUC) 18040003 (San Joaquin Delta).

The PFMC has identified and described EFH, Adverse Impacts and Recommended Conservation Measures for salmon in Amendment 18 to the Pacific Coast Salmon FMP (PFMC 2014). Freshwater EFH for Pacific salmon in the California Central Valley includes waters currently or historically accessible to salmon within the Central Valley ecosystem as described in Myers et al. (1998). Sacramento River winter-run Chinook salmon (Oncorhynchus tshawytscha), Central Valley spring-run Chinook salmon (O. tshawytscha), and Central Valley fall-/late fall-run Chinook salmon (O. tshawytscha) are species managed under the Salmon Plan that occur in the USGS HUCs described in Amendment 18 and occur in the San Joaquin Delta HUC.

3.1 Essential Fish Habitat Affected by the Project

The geographic extent of freshwater EFH is identified as all water bodies currently or historically occupied by Council-managed salmon as described in Amendment 18 of the Pacific Coast Salmon Plan. In the estuarine and marine areas, salmon EFH extends from the extreme high tide line in nearshore and tidal submerged environments within state territorial waters out to the full extent of the Exclusive Economic Zone (EEZ) (200 nautical miles or 370.4 km) offshore of Washington, Oregon, and California north of Point Conception. The proposed Project occurs in the area identified as “freshwater EFH”, as it is above the tidal influence where the salinity is above 0.5 parts per thousand.

The implementing regulations for the EFH provisions of the MSA (50 CFR part 600) recommend that the FMPs include specific types or areas of habitat within EFH as “habitat areas of particular concern” (HAPC) based on one or more of the following considerations: (1) the importance of the ecological function provided by the habitat; (2) the extent to which the habitat is sensitive to human-induced environmental degradation; (3) whether, and to what extent, development activities are, or will be, stressing the habitat type; and (4) the rarity of the habitat type. Based on these considerations, the Council designated five HAPCs: (1) complex channels and floodplain habitats; (2) thermal refugia; (3) spawning habitat; (4) estuaries; and (5) marine and estuarine SAV. No HAPCs occur in the Project area or will be affected by the Project.

3.2 Adverse Effects on Essential Fish Habitat

The proposed Project is considered to have multiple non-fishing activities that affect EFH for Pacific salmon as described in Amendment 18 to the Pacific Coast Salmon FMP. The following actions are considered to have potential adverse effects on the freshwater EFH in the action area of the Project:

1) *Bank Stabilization and Protection* – The proposed Project has components that will entail bank stabilization and protection activities in the action area which includes freshwater EFH. The alteration of riverine and estuarine habitat from bank and shoreline stabilization, and protection from flooding events can result in varying degrees of change in the physical, chemical, and biological characteristics of existing shoreline and riparian habitat. Human activities removing riparian vegetation, armoring, relocating, straightening and confining stream channels and along tidal and estuarine shorelines influences the extent and magnitude of stream bank erosion and down-cutting in the channel. In addition, these actions have reduced hydrological connectivity and availability of off-channel habitat and floodplain interaction. Armoring of shorelines to prevent erosion and maintain or create shoreline real estate simplifies habitats, reduces the amount of intertidal habitat, and affects nearshore processes and the ecology of a myriad of species (Williams and Thom 2001).

2) *Flood Control Maintenance* - The protection of riverine and estuarine communities from flooding events can result in varying degrees of change in the physical, chemical, and biological characteristics of existing shoreline and riparian habitats. Managing flood flows with flood control structures such as levees can disconnect a river from its floodplain eliminating off-channel habitat important for salmon. Floodplains serve as a natural buffer to changes in water flow: retaining water during periods of higher flow and releasing it from the water table during reduced flows. These areas are typically well vegetated, lowering water temperatures, regulating nutrient flow and removing toxins. Juvenile salmon use these off channel areas because their reduced flows, greater habitat complexity and shelter from predators may increase growth rates and their chance of survival. Artificial flood control structures have similar effects on aquatic habitat as does the efforts to stabilize banks and remove woody debris. The function of natural

stream channels and associated riparian areas and the effects of flood control structures such as levees has been discussed in section 2.5.1.5 of this biological opinion.

3) *Wetland and Floodplain Alterations* – Pacific salmon evolved in the Central Valley with an extensive and complex floodplain adjacent to the river, with many channels and sloughs dissecting the plain and extensive wetlands and marshes fringing the waterways. Most of these floodplains and associated wetlands and marshes have been lost to anthropogenic causes. Floodplains, including side channels, and wetlands throughout the region have been converted through diking, draining, and filling to create agricultural fields, livestock pasture, areas for ports, cities, and industrial lands. The construction of dikes, levees, roads, and other structural development in the floodplain that confine the river have further effects on salmon habitat (PFMC 2014). As described in Amendment 18, a river confined by adjacent development and/or flood control and erosion control structures, can no longer move across the floodplain and support the natural processes that 1) maintain floodplain connectivity and fish access that provide velocity refugia for juvenile salmon during high flows; 2) reduce flow velocities that reduce streambed erosion, channel incision, and spawning redd scour; 3) create side channels and off-channel areas that shelter rearing juvenile salmon; 4) allow fine sediment deposition on the floodplain and sediment sorting in the channel that enhance the substrate suitability for spawning salmon; 5) maintain riparian vegetation patterns that provide shade, large wood, and prey items to the channel; 6) provide the recruitment of large wood and spawning gravels to the channel; 7) create conditions that support hyporheic flow pathways that provide thermal refugia during low water periods; and 8) contribute to the nutrient regime and food web that support rearing and migrating juvenile salmon in the associated mainstem river channels.

3.3 Essential Fish Habitat Conservation Recommendations

The USACE should implement the following conservation measures to offset the adverse effects described in section 3.2 above. In order to avoid or minimize the effects to EFH, NMFS recommends the following conservation measures described in Amendment 18 to the Pacific Coast Salmon FMP:

1) *Bank Stabilization and Protection*

- Minimize the loss of riparian habitats as much as possible.
- Bank erosion control should use vegetation methods or “soft” approaches (such as beach nourishment, vegetative plantings, and placement of IWM) to shoreline modifications whenever feasible. Hard bank protection should be a last resort and the following options should be explored (tree revetments, stream flow deflectors, and vegetative riprap.
- Re-vegetate sites to resemble the natural ecosystem community.
- Replace in-stream fish habitat by providing root wads, deflector logs, boulders, rock weirs and by planting shaded riverine aquatic cover vegetation.
- Use an adaptive management plan with ecological indicators to oversee monitoring and ensure mitigation objectives are met. Take corrective action as needed.

- Implement term and conditions 1(a-e), from the section 7 Opinion for this Project.

2) *Flood Control Maintenance*

Include the conservation measures from the *Bank Stabilization and Protection* section of the Opinion and:

- Retain trees and other shaded vegetation along earthen levees and outside levee toe.
- Ensure adequate inundation time for floodplain habitat that activates and enhances near-shore habitat for juvenile salmon.
- Reconnect wetlands and floodplains to channel/tides.

3) *Wetland and Floodplain Alterations*

- Minimize alteration of floodplains and wetlands in areas of salmon EFH.
- Determine cumulative effects of all past and current floodplain and wetland alterations before planning activities that further alter wetlands and floodplains.
- Promote awareness and use of the USDA's wetland and conservation reserve programs to conserve and restore wetland and floodplain habitat.
- Promote restoration of degraded floodplains and wetlands, including in part reconnecting rivers with their associated floodplains and wetlands and invasive species management.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in section 3.2, above, approximately 26,000 linear feet of shoreline of designated EFH for Pacific coast salmon along the San Joaquin River,

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the USACE must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the Action Agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the USACE. Other interested users could include the USFWS, CDFW, and DWR. Individual copies of this opinion were provided to the Corps and USFWS. This opinion will be posted on the Public Consultation Tracking System Website. The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes..

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6. APPENDIX 1 – FIGURES

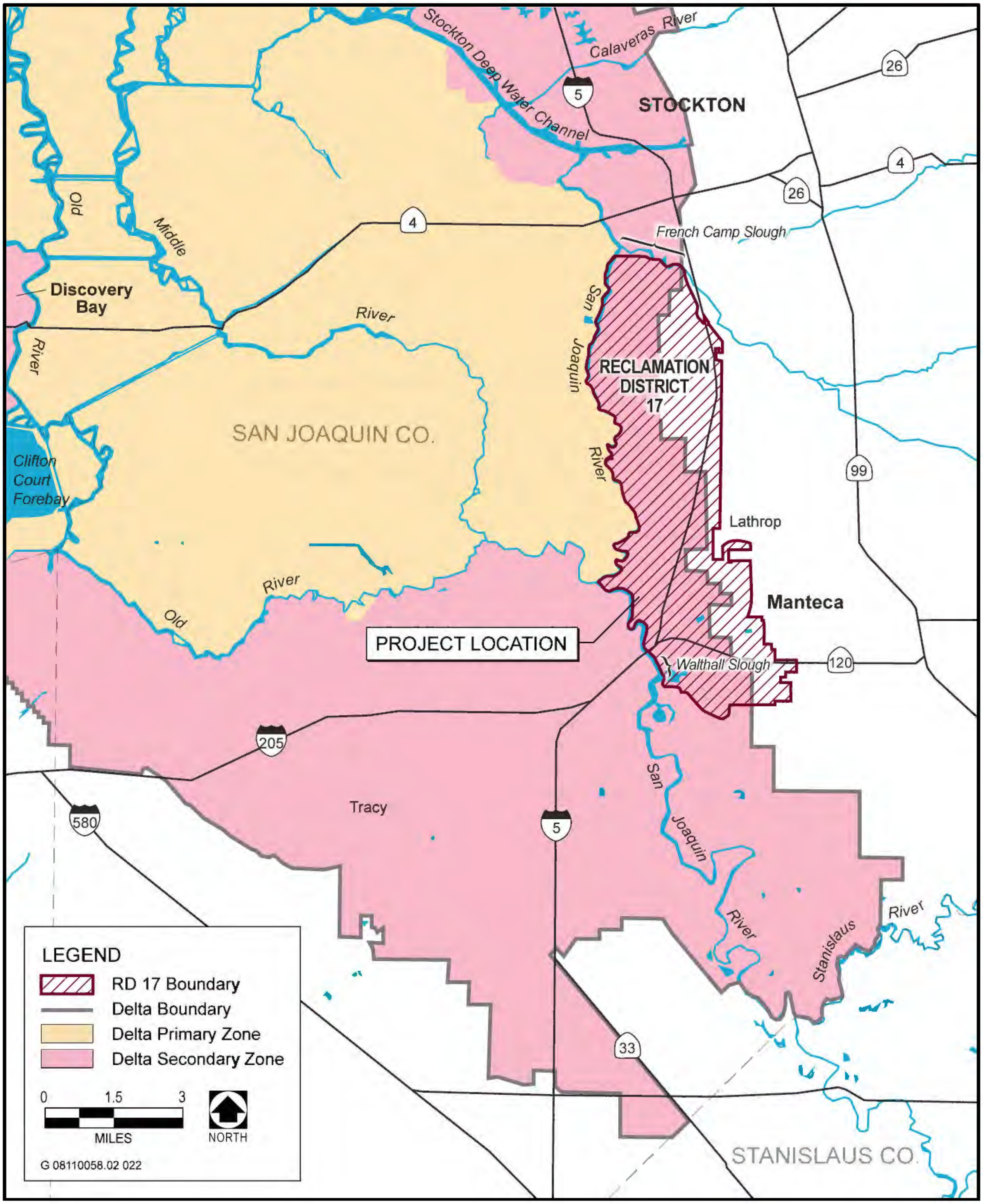


Figure 1: Project Vicinity and Boundaries of Reclamation District 17

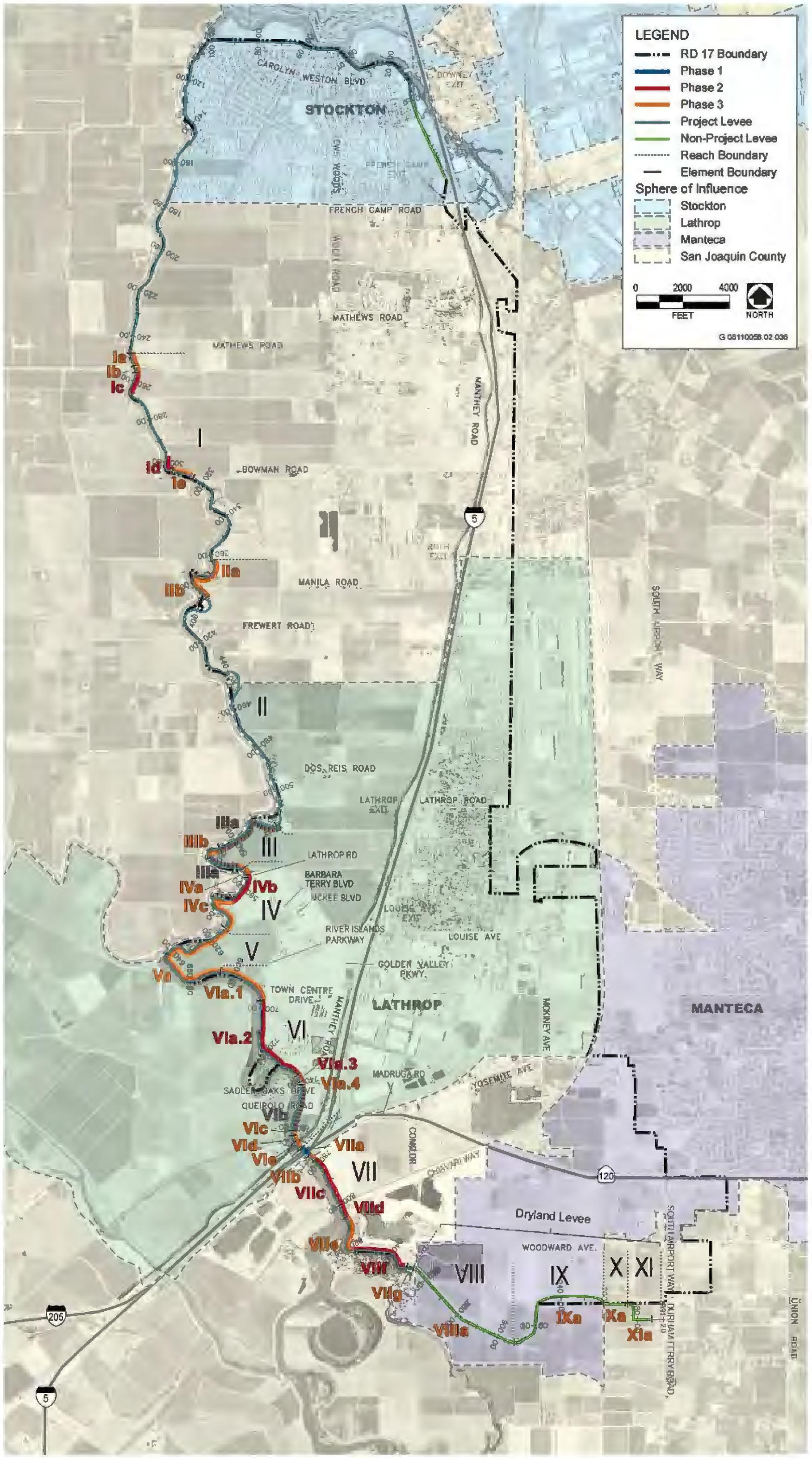


Figure 2: RD 17 Levee System and Levee Seepage Repair Project Phases

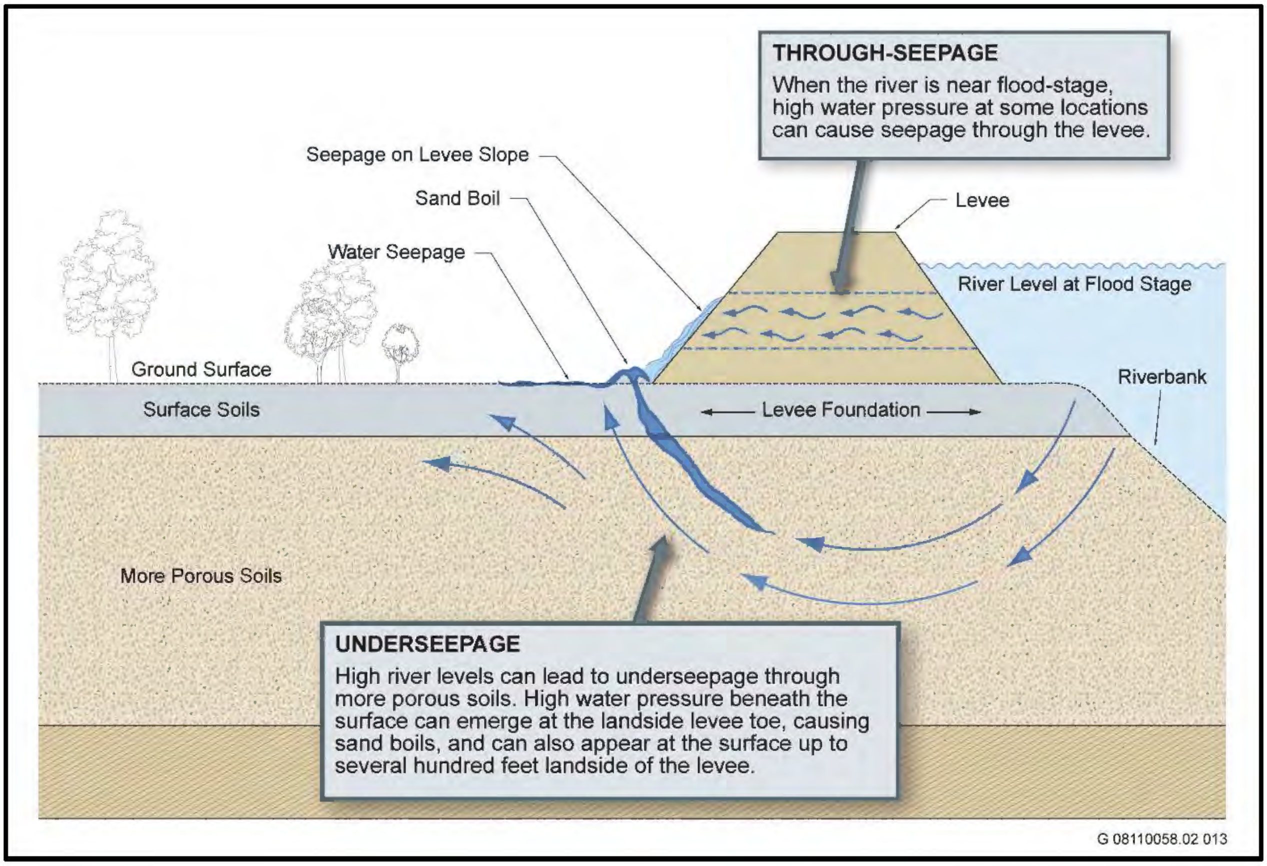


Figure 3: Under-seepage and Through Seepage Diagrams

Figure 4a: Locations of Project Levee Construction Elements

Figure 4b: Locations of Project Levee Construction Elements

Figure 4c: Locations of Project Levee Construction Elements

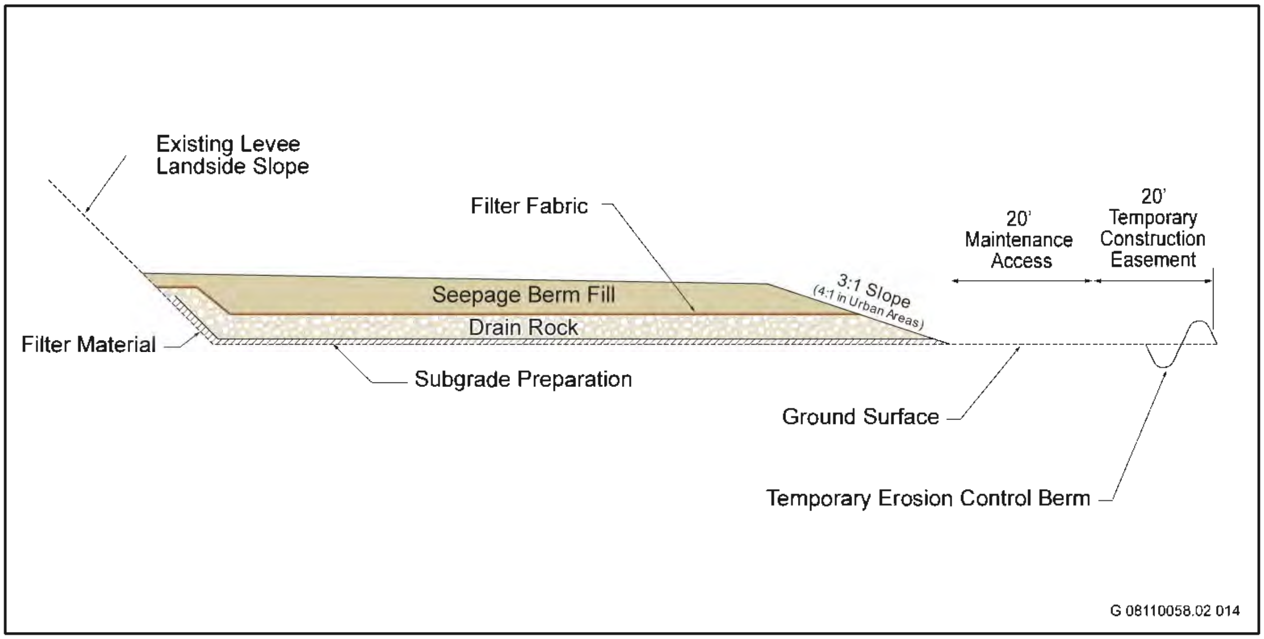


Figure 5: Typical Seepage Berm

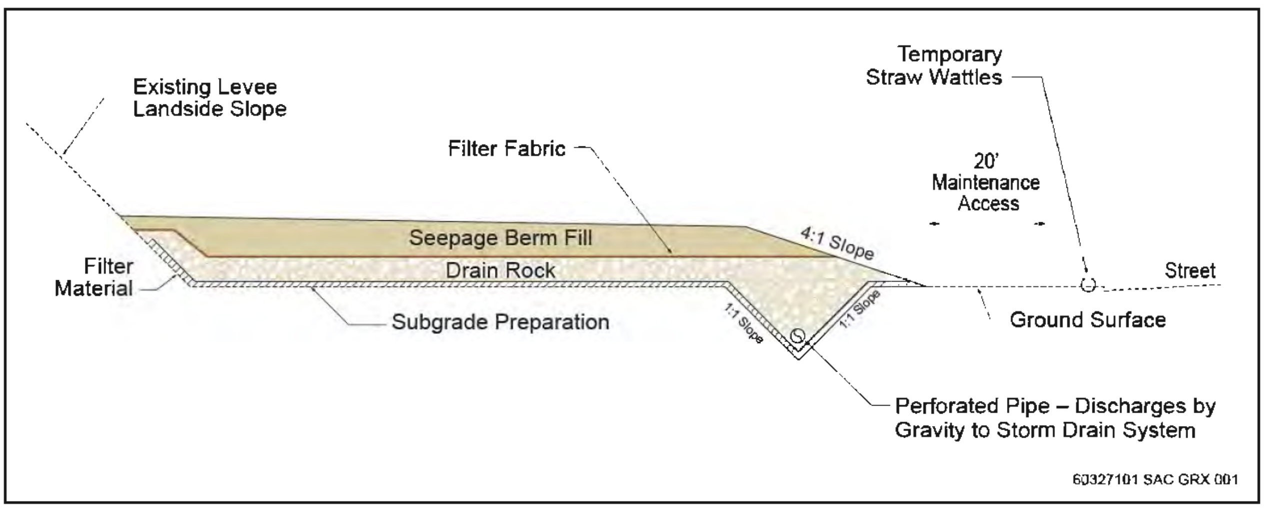


Figure 6: Typical Seepage Berm with a Toe Drain

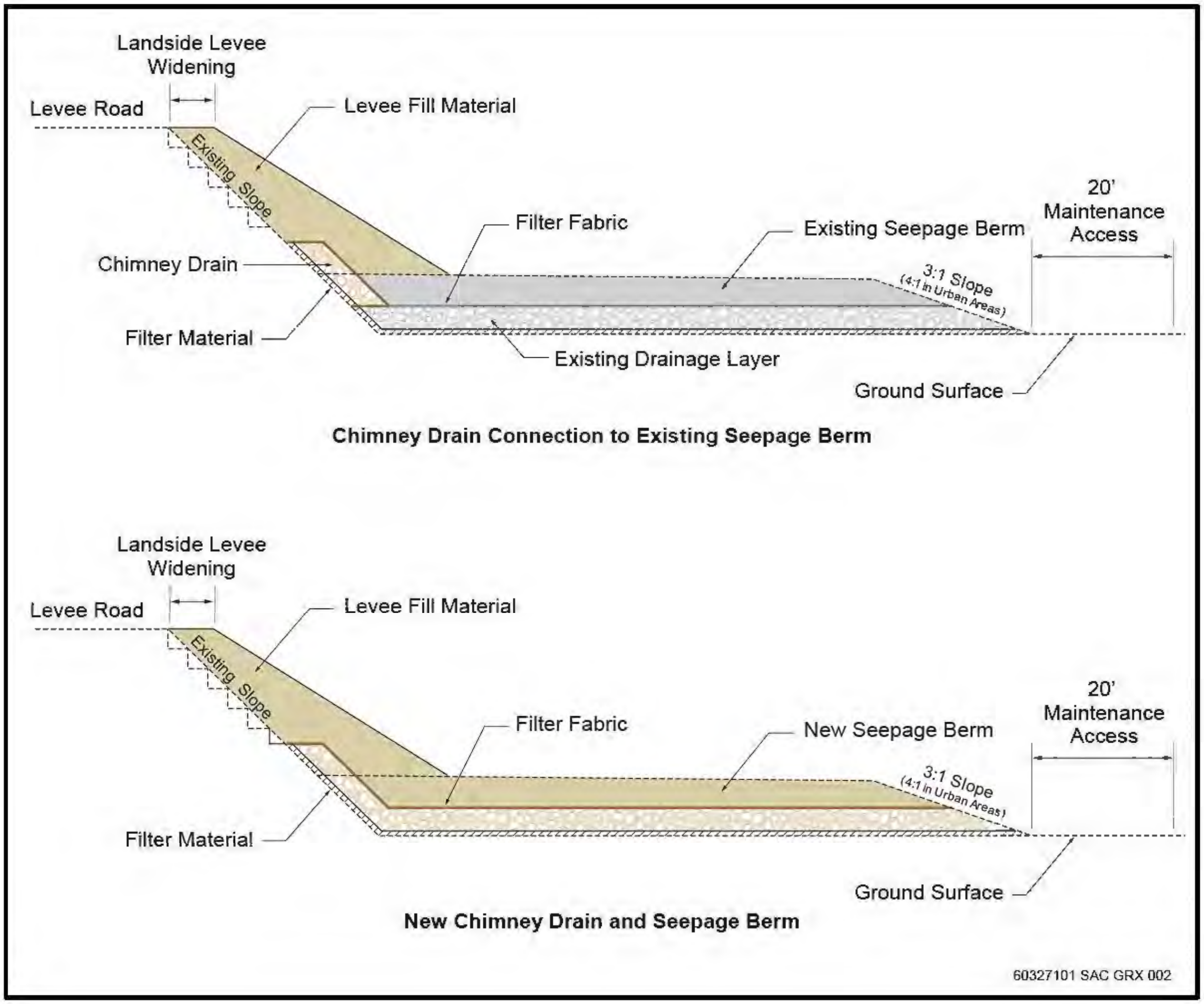


Figure 7: Typical Chimney Drain – existing and new constructions

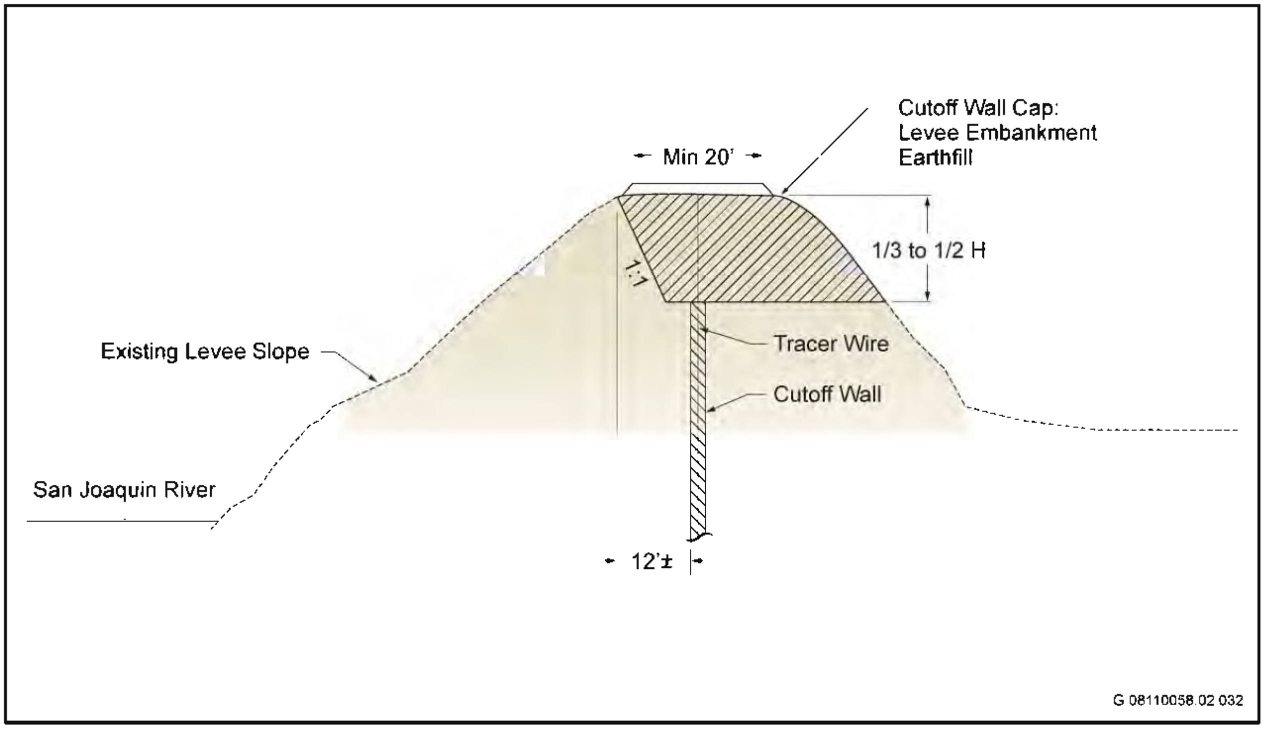


Figure 8: Typical Open Cut Method of Cutoff Wall Construction

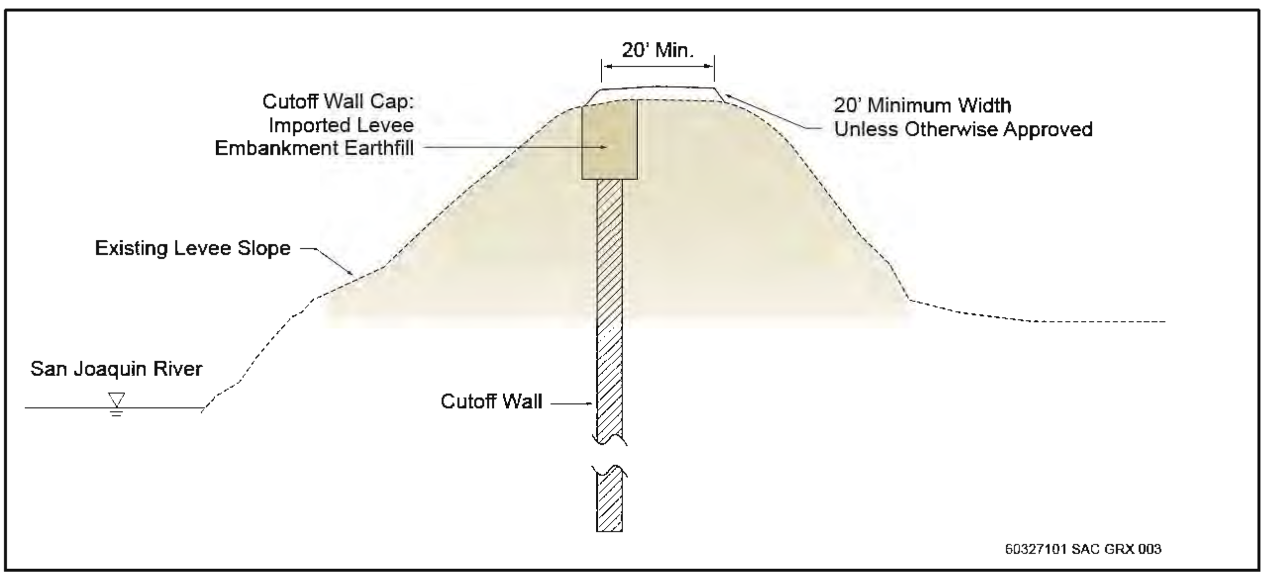


Figure 9: Typical Deep Slurry Mix Method of Cutoff Wall Construction

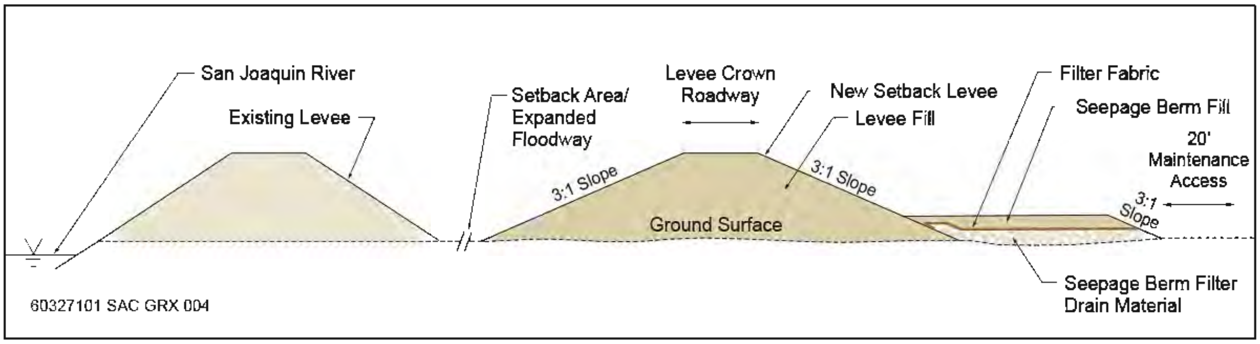


Figure 10: Typical Setback Levee

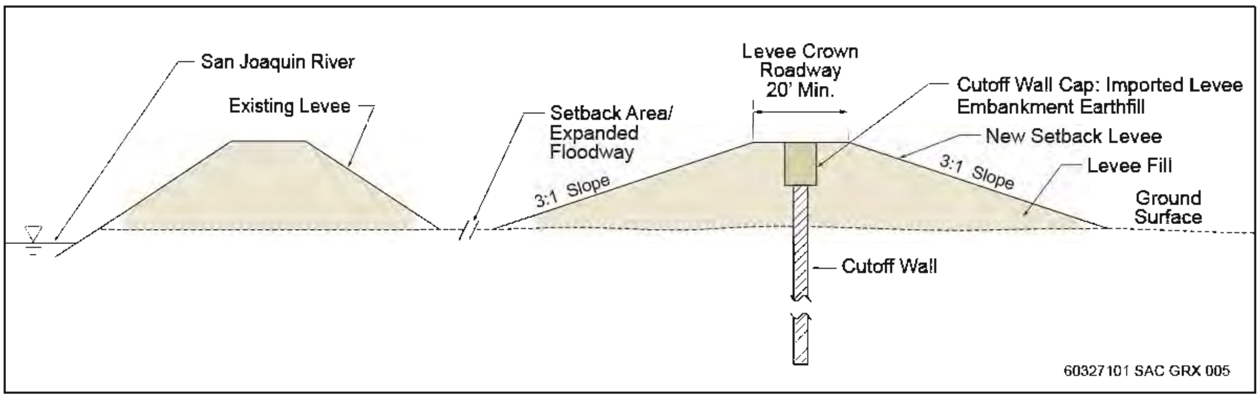


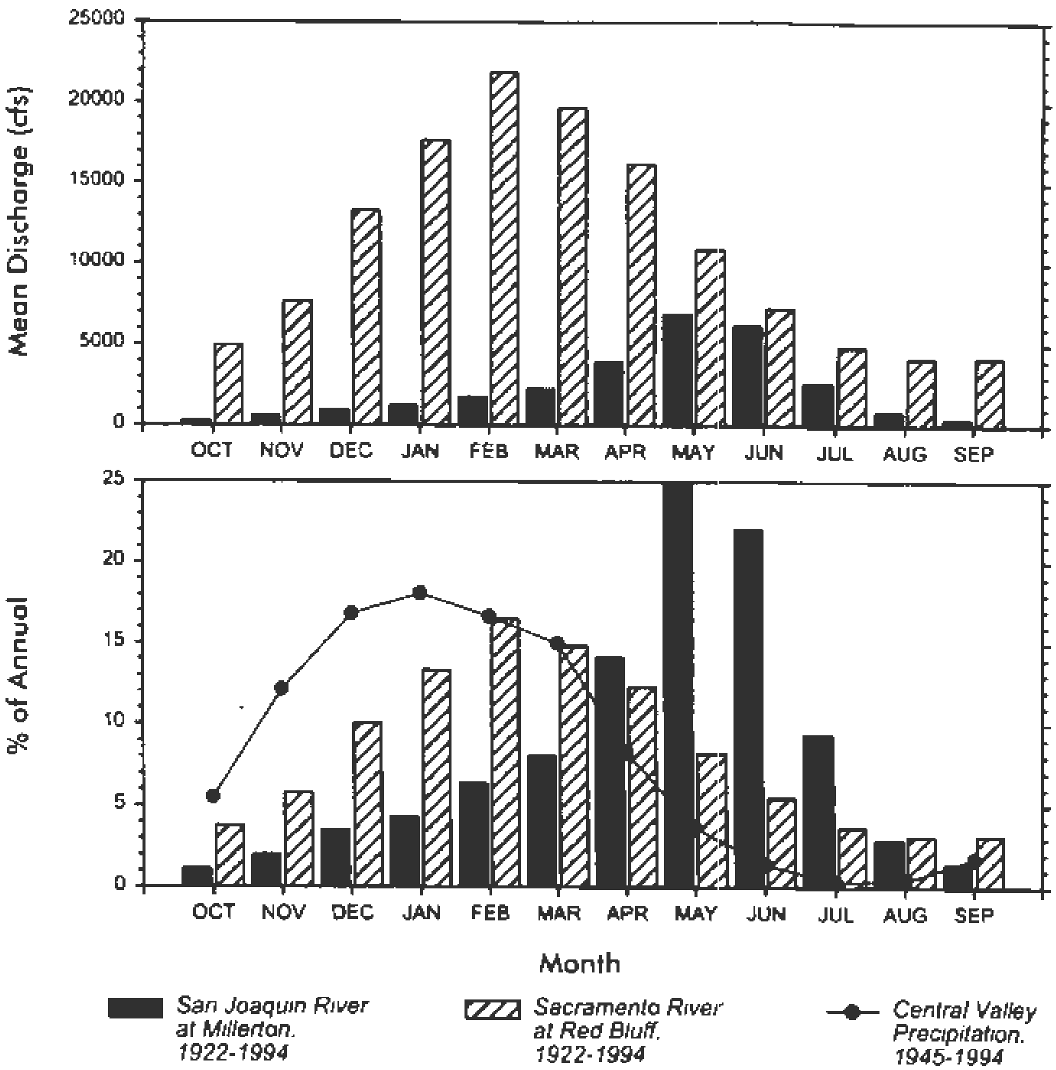
Figure 11: Typical Setback Levee with Cutoff Wall

Figure 12: Conceptual Habitat Restoration in Levee Setback Area at Element IVc.

Figure 13a: Habitat Types at Project Levee Construction Element Locations

Figure 13b: Habitat Types at Project Levee Construction Element Locations

Figure 13c: Habitat Types at Project Levee Construction Element Locations



The annnual Sacramento River runoff at Red Bluff is on average nearly four times greater than the San Joaquin River at Millerton. Temporal differences in the pattern of runoff of the two rivers is due to differences in the amount of precipitation received as rain (dominant on the Sacramento), versus snow (dominant on the San Joaquin) and differences in underlying geology. The lower graph also plots the pattern of Central Valley precipitation to illustrate how precipitation and runoff are out of phase.

Data from California Department of Water Resources.

Figures from The Bay Institute (1998)

Figure 14: Average monthly unimpaired (natural) discharge from the upland Sacramento and San Joaquin River watersheds.

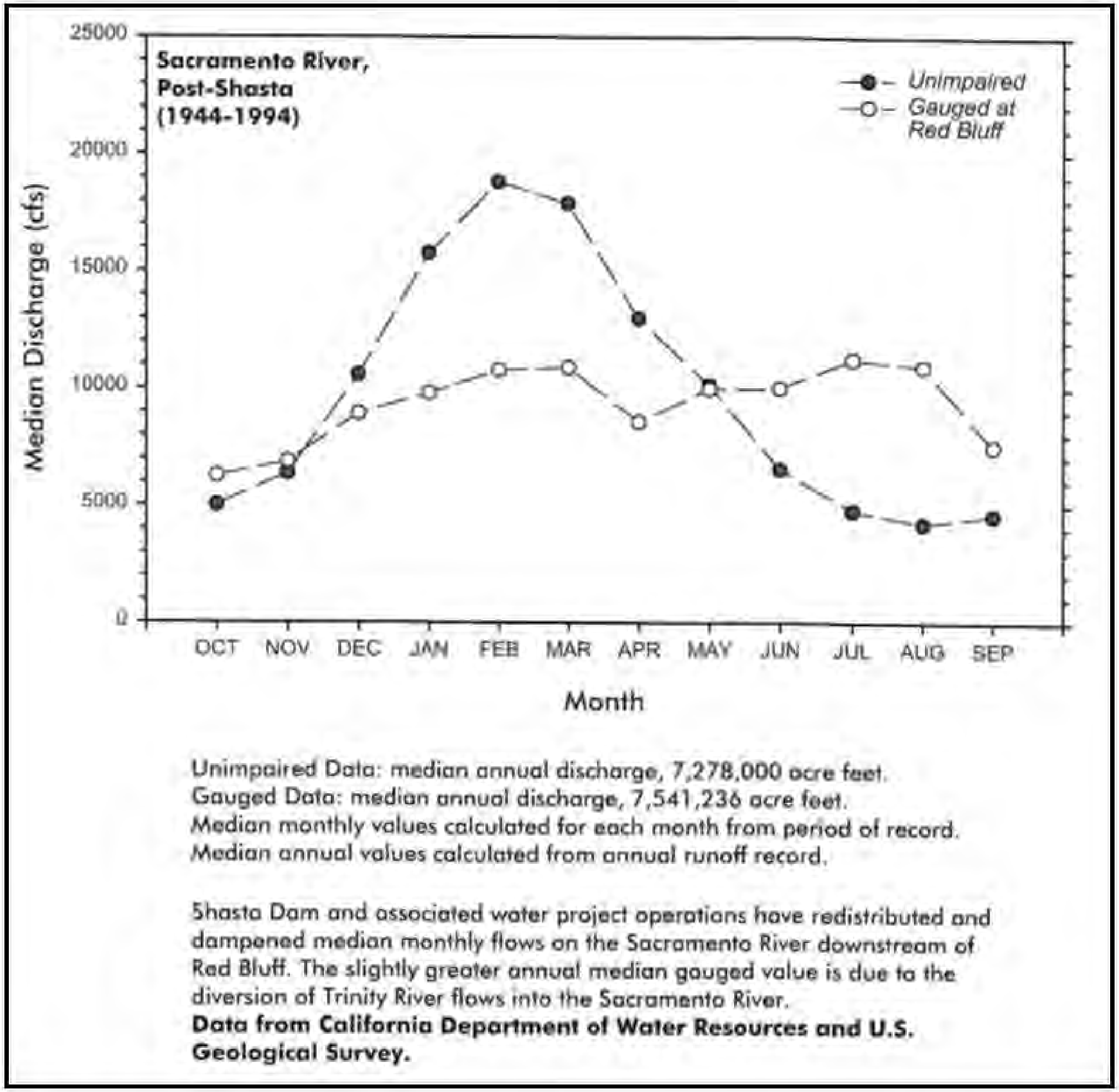
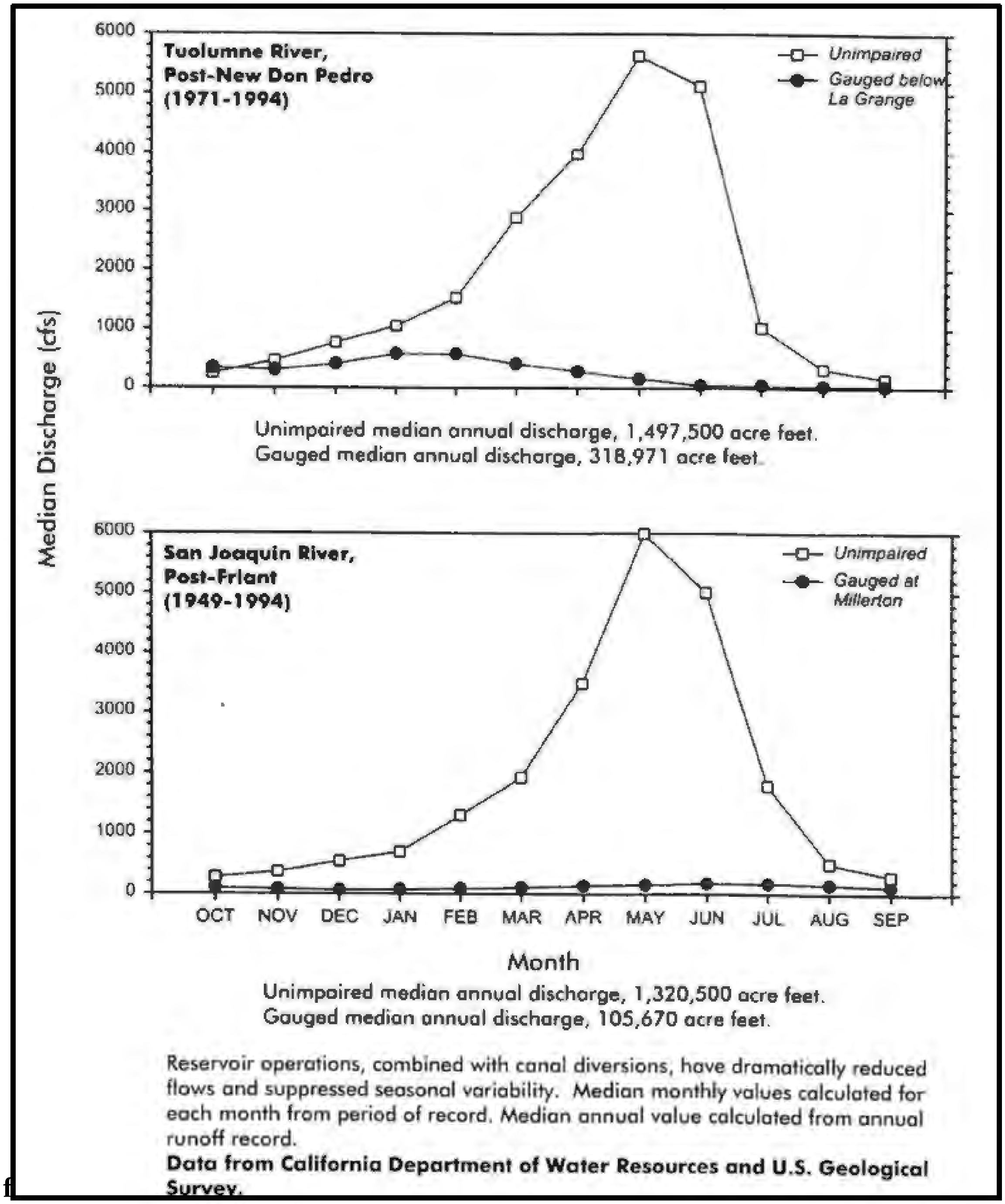


Figure from The Bay Institute (1998)

Figure 15: Alteration of median monthly inflow into the lowland Sacramento River at Red Bluff.



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Figures are from The Bay Institute (1998)

Figure 16: Alteration of median monthly inflow into the lowland Tuolumne and San Joaquin rivers.

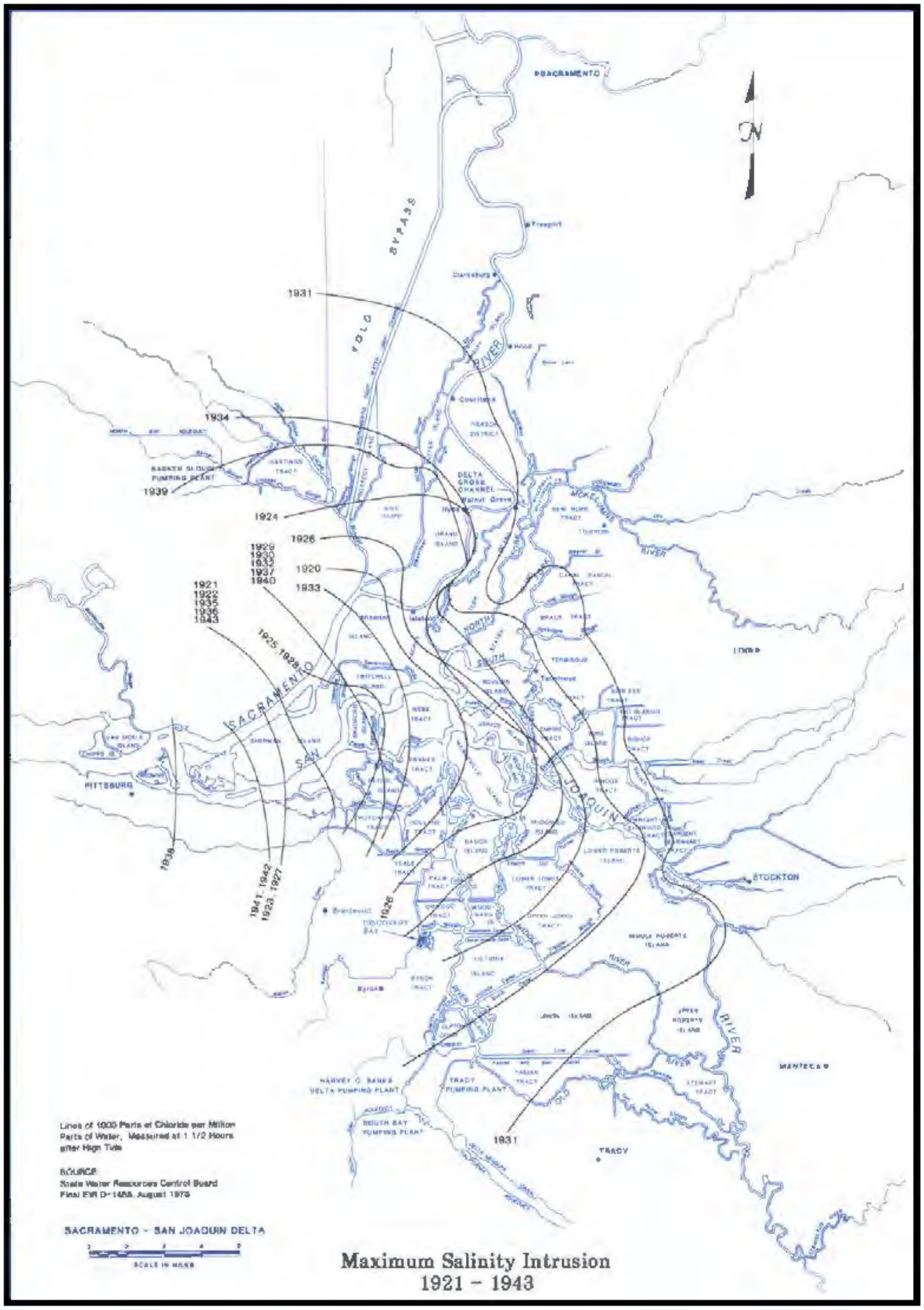

Figure 17: Maximum salinity intrusion for the years 1921 through 1943 (Pre-project conditions in Central Valley –Shasta and Friant Dams non-operational).

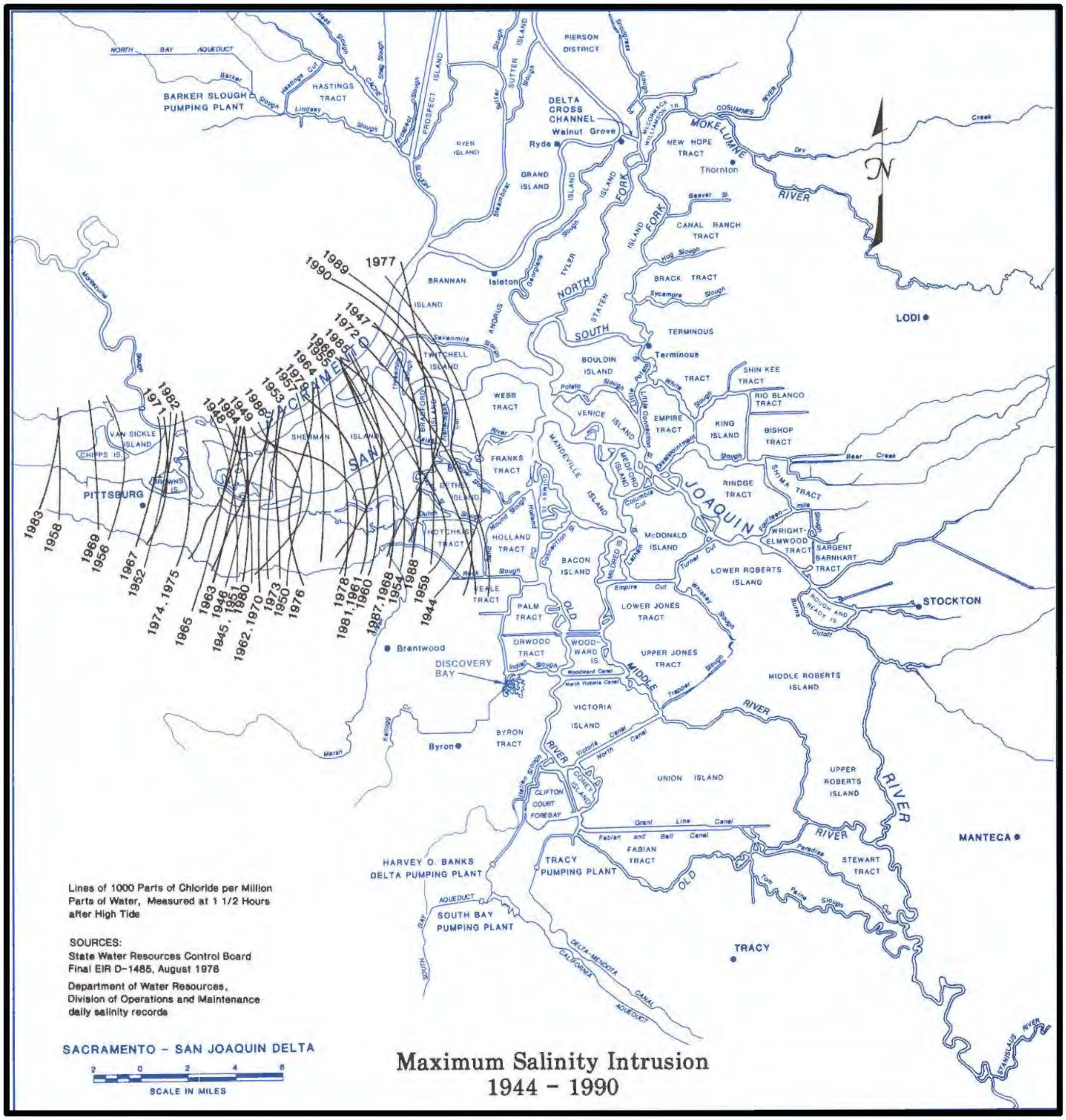

Figure 18: Maximum salinity intrusion for the years 1944 through 1990 (SWP and CVP era)

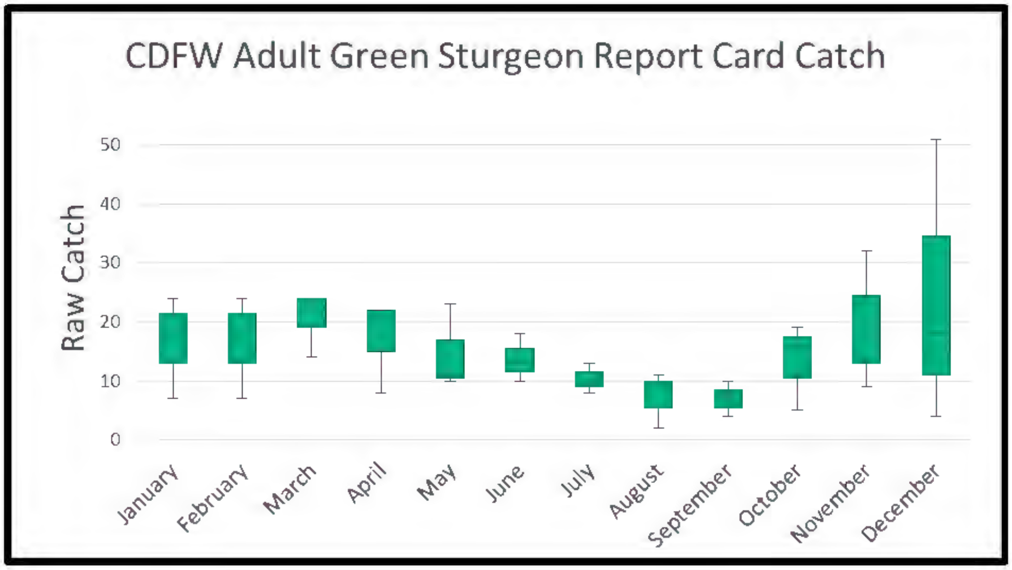

Figure 19: CDFW adult raw catch data for green sturgeon in the Delta from 2008-2014.

This data indicates presence year round (Gleason et al 2008, DuBois et al. 2009-2015). The monthly median is marked by a horizontal line splitting each box. The upper and lower whiskers show the maximum and minimum values for each month over all years.

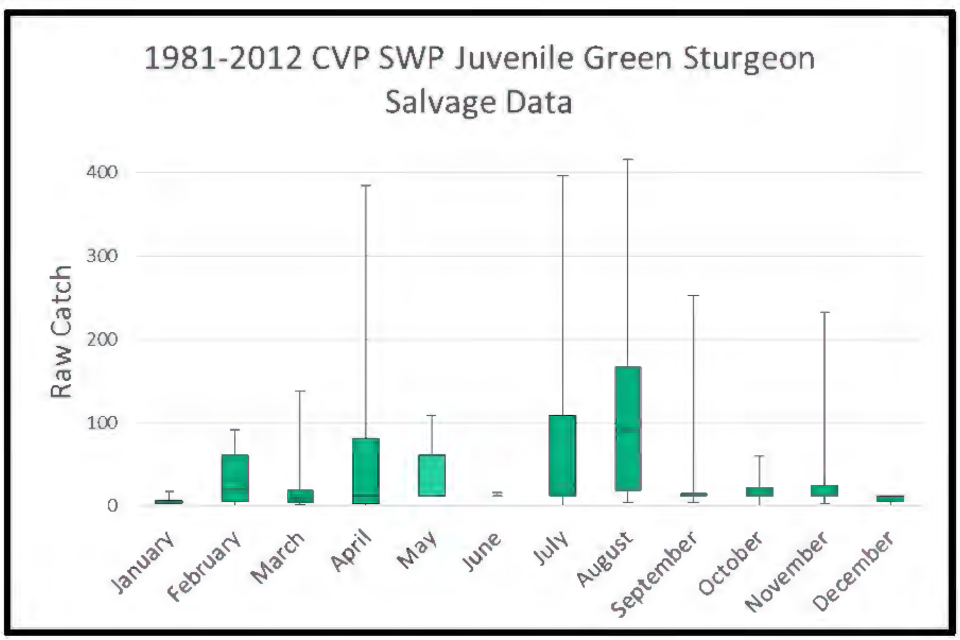

Figure 20: Monthly raw salvage data for juvenile green sturgeon by month at the SWP and CVP export facilities (1981-2012).

The monthly median is marked by a horizontal line splitting each box. The upper and lower whiskers show the maximum and minimum values for each month over all years.

20. USFWS Biological Opinion. April 16, 2019.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
San Francisco Bay-Delta Fish and Wildlife Office
650 Capitol Mall, Suite 8-300
Sacramento, California 95814

In Reply Refer To:
08FTBDT00-2015-F-0303

APR 16 2019

Mark Ziminske
Chief, Environmental Resources Branch
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814

Subject: Biological Opinion on Phase 3 of the Reclamation District 17 Levee Seepage Repair Project

Dear Mr. Ziminske:

This is in response to your letter requesting formal consultation with the U.S. Fish and Wildlife Service (Service) for Phase 3 of the Reclamation District 17 (RD 17) Levee Seepage Repair (project). At issue are the effects of the proposed project on the federally listed valley elderberry longhorn beetle (*Desmocerus californicus*) (beetle) and riparian brush rabbit (*Sylvilagus bachmanni riparius*) (rabbit). Your request was received on August 21, 2018. This response is provided under the authority of the Endangered Species Act of 1973, as amended (16.U.S.C. 1531 *et seq.*) (Act).

The Federal action on which we are consulting is the Corp of Engineers' (Corps) issuance of a combined Section 404 and Section 10 Department of Army permit and Section 408 permission to RD 17 for alterations of a Federal project, specifically, within the RD 17 levee system. The scope of this Biological Opinion (BiOp) includes emergency construction done in 2017 as a result of the volume and duration of flooding that year, and additional remaining work to be done to complete construction. The findings in this consultation are based on the Biological Assessment (BA) included with your letter, discussions and communications with Corps staff, and other information in our files.

Consultation History

May 14, 2010: Memorandum with attached preliminary wetland delineation from RD 17's consultant (AECOM) to the Service requesting technical assistance on the effects of the project to listed species, noting the need to remove vegetation on both sides of the project levees to comply with Corps vegetation management standards.

January 24, 2011: Service staff (Hansen, Schoenberg) meet with RD 17 consultant AECOM (Holland-Fitzgerald, Lehman) to discuss comments on draft Biological Assessment; included a presentation of habitat impacts (map and tabular summary).

March 1, 2011: Service staff (Schoenberg) attends a site visit to the project area.

September 13, 2011: Draft Environmental Impact Statement/Environmental Impact Report (DEIR/S) on the project is received.

October 24, 2011: Service transmits a comment letter on the DEIR/S, noting effects of maintenance, limited setbacks, effects on dispersal habitat for the listed rabbit, potential underestimation of habitat effects, growth-inducing effects, uncertainty regarding any variance request, and other remarks.

July 9, 2014: Email exchange; Service staff respond to Corps request regarding distance of the project to giant garter snake location records.

April 6, 2015: Service receives Corps' March 27, 2015, request for formal consultation on the project; the enclosed February 2015 BA indicates that, under the Corps interim policy dated March 21, 2014, waterside vegetation would be managed in accordance with RD 17 existing practices.

October 2, 2015: Service transmits a letter requesting additional information on current and future waterside maintenance, listed species habitat effects and compensation, management/monitoring of setback element IVc, future flood control projects, and other on-site compensation opportunities.

June 3, 2016: Service receives the Final Environmental Impact Report (FEIR) for the project including responses to Service comments (FEIR pp. B38-B43; also referencing pp. B1-B2). Therein, RD 17 states a preferred alternative to retain waterside slope vegetation.

March 13, 2017: Service receives the Corps' March 8, 2017, request for formal consultation; the enclosed revised BA dated February 2017 includes clarifications and responses to our additional information request, and an updated description of the proposed action. The revised BA (p. 18) states that RD 17 is not considering full compliance with the Corps' Engineering Technical Letter standards as an alternative because the requester of Section 408 permission is not required to bring portions of an existing project that are not impacted by an alteration up to Corps standards. Landside vegetation would be cleared from work areas, but no waterside woody or riparian vegetation would be removed. Long term vegetation management would be a continuation of current practices to maintain access and visibility.

March 22, 2017: Corps (Ha) transmits an email informing Service of receipt of a Regional General Permit #8 Emergency Action notification for RD 17 emergency construction project and requests comments (permit request and supportive materials provided).

March 23, 2017: Service (Kline) transmits an email responding to the Corps' March 22, 2017, email request for comments on emergency construction, recommending a 100-foot buffer around elderberry shrubs or transplantation to avoid effects on the beetle, and daytime work to avoid effects on the rabbit.

April 4, 2017: Corps issues a letter to RD 17 approving emergency work permit request.

January 12, 2018: Corps (Lee) emails the Service a request to review a conceptual mitigation/monitoring plan.

February 27, 2018: Service (Schoenberg) emails comments on the conceptual mitigation/monitoring plan.

August 21, 2018: Service receives Corps letter requesting formal consultation and a second revised BA dated May 2018; it identifies 3.31 acres of effects to landside woodlands suitable as rabbit habitat and states that 1.61 acres of such habitat were removed through emergency action.

November 30, 2018: Meeting of the Service, RD 17, Corps, and consultants (GEI, KSN) to discuss this consultation, responses to the information request, work done and remaining, and any further needs. The consultants provide exhibits showing locations and types of work done during emergency and remaining, as-built footprints where grading had occurred, and a conceptual planting plan for the setback mitigation area. Service requests a tabulation of impacts by cover type, emergency and remaining, for the project elements.

December 3, 2018: Service emails the Corps a request to clarify construction schedule and best estimate of timeframe for acquisition of lands for proposed setback levee/floodplain restoration element.

December 17, 2018: Corps transmits the requested tabulation of habitat impacts, showing the 3.31 acres of rabbit habitat and other cover types affected or to be affected by the project.

December 19, 2018: Corps forwards the consultants' response to requested clarification of construction schedule (i.e., 3 seasons for project [2019-2021], 2 for setback [no year specified]).

February 7, 2019: Corps forwards the consultants' response to the requested clarification of setback area acquisition schedule (i.e., RD 17 is moving forward with and is 100% committed to acquisition [no year indicated]).

March 14, 2019: Service transmits a draft BiOp project description for Corps review.

March 22, 2019: Corps transmits comments on the draft BiOp project description.

April 2, 2019: Phone communication between Service (Schoenberg) and Corps staff (Toland), The Corps clarifies construction sequencing, requiring existing elderberries to be transplanted to a bank rather than in the setback area, and that additional elderberry plantings would be included in the setback area after completion of element IVc and site preparation.

BIOLOGICAL OPINION

Description of the Action

The proposed project involves a third phase of intermittent work totaling 5.3 miles of the levee along the right (east) bank of the San Joaquin River bordering Reclamation District 17 (RD 17). This border of RD 17 extends from French Camp Slough, about 3 miles south of the city center of Stockton, south to Walthall Slough. The purpose of the project is to correct seepage deficiencies needed to meet current Corps standards. Nearly all of the work that has been done or will be done in all phases is considered "in place" and is almost entirely on the landside of existing levees. Phase I, completed in 2009, involved constructing seepage berms in elements III and VI; phase II, completed in 2010, was construction of drained seepage berms in 8 reaches and maintenance/cleanup at a 9th reach; phase III - the subject of this consultation - encompasses 19 elements, and would involve constructing a combination of seepage berms, chimney drains, cutoff walls, a landside grade raise, and a setback levee which includes limited waterside work to the existing levee. Appendix 1 (Figures) includes the location of work sites and cover types (Figures 1a-c), conceptual-level detail for the compensation site (Figure 2), schematics of the basic work types (Figures 3a-g), and locations of known elderberry shrubs (Figure 4). The basic work types and specific locations are described below.

Seepage Berm

A drained seepage berm is a structure built on the landside of a levee consisting of layers of sand filter material, drain rock, filter fabric, and soil fill (Figure 3a). It works by collecting and conveying seepage that moves under the levee and then away from the levee ("under seepage"), and reducing the potential for boils, piping, and failure. It is sized based on the underlying soil permeability and expected pressure head during high water. For the proposed project, berm widths of 60-120 feet are expected to be adequate. Some seepage berms have a toe drain (e.g., in element VIIg), which is an additional element at the landward margin of the seepage berm consisting of a below-grade perforated pipe surrounded by a trench filled with sand and drain rock (Figure 3b). This is used to collect and convey seepage water away from the berm.

Chimney Drain

A chimney drain collects and conveys seepage that flows through the levee itself ("through seepage"). It consists of a 1-3 foot thick layer of sand and drain rock placed against the lower landside slope of the levee, with filter fabric between the soil and rock layers. A layer of levee fill material is then keyed in over the levee slope and chimney drain, widening the levee landside. The chimney drain rock is tied into the existing or new seepage berm drain rock (Figure 3c).

Cutoff Wall

Cutoff walls are proposed for selected project locations. A cutoff wall involves installing a vertical layer of impermeable material (usually bentonite clay or bentonite/cement mixture) through the levee and underlying permeable soils as needed until low-permeability foundational soils are reached. Cutoff walls will intercept both under and through seepage. Two methods are used depending on the depth of foundational soils. The conventional open-trench method is used for depths up to 80 feet, and involves removing the top third to half of the levee height, excavating a trench, filling the trench with bentonite slurry, and rebuilding the removed portion with a cap of levee fill material (Figure 3d). The deep slurry mixing method can install cutoff walls up to 120 feet deep without degrading the levee crown (Figure 3e). Specialized equipment is used to excavate into the subsurface and mix soil in place with cement or bentonite. For the RD 17 phase III project, cutoff walls would overlap seepage berms by 300 feet, and slopes would be modified with added fill to achieve a 20-foot crown width and 3:1 landside slope.

Setback Levee

A setback levee is a levee which is built some distance to the landside of an existing levee. The proposed action includes a 1,100-foot-long setback levee in element IVc, portions with either a seepage berm or cutoff wall (Figures 3f-g). The setback levee would tie into the existing levee at the upstream and downstream ends. To accomplish the tie-in, the top one-third to one-half of the existing levee would be degraded, beginning with a 1:1 cut at the existing waterside crown. Where the existing levee intersects the new setback levee, the waterside of the existing levee above the high tide line would be stabilized with approximately 0.64 acres (740 linear feet) of riprap. The riprap would be handplaced around any trees/shrubs. Once the new setback levee is complete and certified, 400 linear feet of the existing levee above the high tide line would be removed to allow inundation of the expanded land in the floodway.

Floodplain Restoration

After the setback levee is complete, restoration of the oxbow area separated by the setback levee would proceed (Figure 2). About 400 linear feet of the existing levee above the high tide line on the downstream side of the oxbow would be degraded to a to-be-decided level to allow floodwater inundation (probably around 10 feet North American Vertical Datum). Some site preparation may be done such as grading, excavation, and/or ripping of the existing levee or other surfaces. It would be designed to drain after high water events. The existing levee would be planted with trees, shrubs (including blue elderberry), and herbs to create oak riparian forest habitat, the swale planted with wetland herbs, and the remainder of the site planted with a riparian scrub pallette. The current plan is conceptual and subject to refinement. A range of 9.9-11.1 acres combined of riparian forest (maximum 5 acres) and riparian scrub (maximum 6.1 acres) habitats will be restored, and is considered a compensation measure for effects to the beetle and rabbit.

Raise Landside Grade

At one site in element Ib, a 5-foot-deep depression next to the landside toe would be raised with fill.

A number of additional activities are considered as part of the proposed project, specifically:

- **Levee geometry corrections:** Fill material would be placed along the landside of existing levee slopes where needed to provide the minimum 3:1 slope and a minimum 20-foot-wide levee crown. All elements require some level of levee geometry correction.
- **Operations and Maintenance (O&M) access and utility corridors:** A 20-foot-wide permanent O&M access corridor would be established adjacent to the landside toe of seepage berms and levees (if not already present for levees). Any relocated power poles and other utility infrastructure would be located outside this easement.
- **Temporary construction easements:** Where needed, a 20-foot-wide temporary construction easement and construction turnaround area (up to 80 feet in diameter) would be included adjacent to the inland side of the permanent O&M access corridor, to provide access to the site during construction. These features would be removed and the site(s) would be returned to pre-project conditions following completion of construction.
- **Stormwater /irrigation controls:** Drainage/irrigation swales would be constructed around the outside boundaries of levee repairs, where needed, and other stormwater best management practices would be implemented to manage stormwater runoff and/or irrigation during and after construction. These swales would be located so that they would not drain to/from wetlands or other waters of the United States.
- **Right-of-way acquisition:** Lands within the project footprint would be acquired as needed, to accommodate levee repairs (e.g., seepage berms, setback levees) and establish the minimum 20-foot-wide O&M access corridor at the landside toes of all the improved levees, to prevent encroachment. Privately owned lands would be acquired in fee preferably, but may be taken as easements if needed. Where the project footprint overlies land owned and managed by other agencies (i.e., the City of Lathrop, San Joaquin County, Union Pacific Railroad), either the land would have to be acquired in fee or easements would have to be obtained and secured.
- **Hauling:** An estimated 700,000 cubic yards of imported material (i.e., soil, aggregate, and cement) would be used in construction. Materials would be hauled to the work sites from commercial sources up to 11 miles away. Personnel, equipment, and imported materials would be transported to the Phase 3 Repair Project area using various surface roads that connect with Interstate 5 or State Route 120. The primary corridors where construction activity would take place would be public roadways, on and within 300 feet of the levees, on existing unpaved roads used for access to work areas, and on levee patrol roads atop the levee crown.
- **Vegetation removal:** Landside vegetation within the footprint of the proposed levee work, including maintenance roadway corridors and temporary access easements, would be removed to prepare for levee repair work. Any elderberry shrubs that cannot be avoided will be transplanted, either to the setback area or to an approved mitigation bank, which is considered a compensation measure for effects to the beetle. The proposed action would involve performing limited work on the waterside of the levee above the high tide line (e.g., installing riprap and degrading a portion of the existing levee in element IVc where a setback levee would be constructed). However, no waterside

woody or riparian vegetation would be removed; the areas where riprap would be placed and the levee degraded are characterized by ruderal land cover.

- **Encroachment management:** Several features, including power poles, vegetation, and a variety of agricultural-related facilities (e.g., irrigation infrastructure, fences), are within the Phase 3 Repair Project footprint. Utility infrastructure would be relocated as needed to accommodate the levee repairs, and any pipelines or other underground utility crossings would be replaced as needed. Other encroachments in the Phase 3 Repair Project area would be removed or relocated as required to meet the criteria of the Corps, the Central Valley Flood Protection Board, and the Federal Emergency Management Agency. No waterside woody or riparian vegetation would be removed. Areas where riprap would be placed and the levee degraded are characterized by ruderal land cover.

- **Long-Term Vegetation Management:** Vegetation on the levees and within the access easements would be managed by RD 17 continuing its current O&M practices to maintain access and visibility. These practices include: mechanical trimming of existing trees and removal of large dead and downed trees annually; regular summer and winter application of herbicides for weed control; and summer application of berbicides to control woody plants and berries. The zone where trees would be trimmed includes the levee prism on both landside and waterslide slopes, and beyond the levee prism within 15 feet of the landside and waterside toes. The vertical extent of trimming would be from the ground up to 5 feet above the ground (except roads), and from the surface up to 12 feet above the crown road. Trees would be trimmed only and not removed. However, no waterside or landside vegetation outside of the project footprint would be removed because of future vegetation management activities (BA p. 56; see Effects, below, for details).

Conservation Measures

The following general, avoidance and minimization, and compensation measures shall be implemented:

General

- A qualified biologist will be on-site to ensure compliance with these measures.

- A worker awareness training program will be conducted for construction crews before start of construction, including an overview of special-status species and sensitive resources (including riparian habitats) in the project area, measures to avoid and minimize effects on these resources, and conditions of relevant regulatory permits.

- Vehicle speeds on unpaved surfaces will be limited to 15 miles per hour.

Valley Elderberry Longhorn Beetle

Avoidance and Minimization Measures

- Elderberry shrubs near construction areas that can be avoided will be protected by temporary fencing 20 feet from the shrub dripline where possible; if closer than 20 feet, k-rails will be placed at the shrub dripline. This will be done before any constuction. Fences will be inspected weekly during construction.

- No insecticide/herbicide/chemicals that could harm the beetle or its host plant will be used within 100 feet of elderberry shrubs.

- Where avoidance is not possible elderberry shrubs will be transplanted to a Service approved site from November 1 - February 15 only.[1]

- Elderberry shrubs affected by transplantation and any associated riparian habitat that would be removed will be replaced by additional plantings to the levee setback area in element IVc.

Compensation Measure

- RD 17 proposes to offset the impacts from the removal of 3.28 acres of landside riparian vegetation considered beetle habitat and the transplantation of associated elderberry shrubs with stems >1 inch, with the creation of at last 9.9 acres (and up to 11.1 acres) of riparian forest and riparian scrub habitat within a setback area created by construction of element IVc. The restoration design would include elderberry seedlings and associated species plantings.

Riparian Brush Rabbit

Avoidance and Minimization Measures

- Potential rabbit habitat will be identified and avoided whenever possible. Contractors will coordinate with a Service-approved biologist to ensure that construction will minimize disturbance to rabbit habitat to the extent feasible.

- Temporary fencing will be installed to prevent disturbance of potential rabbit habitat adjacent to construction areas, and construction personnel, vehicles, and equipment will not enter these areas. In addition, a silt fence or other suitable temporary barrier (either incorporated into the temporary fence, or separate) will be installed to deter entry of

[1] The specified location for transplants in the BA (p. 54) is the setback area created by element IVc, however, that area may not be available to accept transplants if construction sequencing requires removal of elderberries before element IVc and other setback area site preparations including grading are complete. In that circumstance, this project description assumes transplanting the affected shrubs to a Service-approved mitigation bank.

rabbits into construction areas. Signage will be posted warning workers to stay within construction areas and outside of habitat. The fencing, barrier, and signage will be removed after work is completed.

- If rabbit habitat must be removed, it will be done by hand 2 weeks before construction, and overseen by a qualified biologist. Areas of temporary disturbance will be revegetated with native plants and restored to pre-project conditions.

Compensation Measure

- RD 17 proposes to offset the effect of removal of 3.31 acres of landside riparian vegetation considered rabbit habitat by the restoration of at least 9.9 acres (and up to 11.1 acres) of riparian habitats within the setback area of construction element IVc.

Emergency and remaining work by location:

At those elements where a cutoff wall was not indicated, some or all of the seepage berm part of construction was installed during emergency work in 2017. However, these emergency sites all require additional work to complete (chimney drains, levee fill material, and/or remaining seepage berms). No work has yet been done at sites with cutoff walls, chimney drains only, setback levee, and at one seepage berm site. Table 1 shows the proposed work for each site, emergency work done in 2017, and remaining work to be done, for each element location.

Construction Schedule

The emergency work was done from February-November, 2017. The remaining construction is expected to span up to 3 seasons, starting in May 2019; two seasons may be sufficient and a third season is included for contingency purposes. Actual levee work is seasonal (July 1 - November 1), however, variances outside this window may be requested and approved, and there is other work such as utility relocation which could be done outside this window. The setback levee and floodplain restoration, which is a compensation measure, would take two seasons to complete. The construction sequence includes advance work involving relocation of power poles, site preparation (including vegetation removal and elderberry shrub relocation), and removal of landside structures.

Action Area

The action area is defined in 50 CFR §402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the proposed project, this means all areas directly or indirectly affected by construction of the 19 elements of the proposed RD 17 phase 3 project, including the levee work, the floodplain created by the setback levee, and the subsequent long term vegetation management as defined in the project description of this BiOp.

Table 1. Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)

Element	Type of Remediation	Phase 3 Project Major Features	Phase 3 Project Features Constructed as 20-17 Emergency Response Actions	Phase 3 Project Features Remaining To be Constructed
Ia	under seepage and through seepage	Construct approximately 590 feet of seepage berm (approximately 110 feet wide) and approximately 590 feet of chimney drain to meet required exit gradients. Construct PG&E high voltage tower footing raisings. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 350 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 110 feet.	Construct approximately 240 feet of additional seepage berm (approximately 110 feet wide) and approximately 590 feet of chimney drain to meet required exit gradients. Construct PG&E high voltage tower footing raisings. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
Ib	under seepage and through seepage	Fill existing depression to approximately 300 feet from toe of existing levee. Construct approximately 130 feet of seepage berm (approximately 80 feet wide) and approximately 130 feet of chimney drain on top of fill to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Filled existing depression to approximately 300 feet from toe of existing levee. Constructed approximately 130 feet of seepage berm on top of fill to meet required exit gradients. The constructed seepage berm width is approximately 80 feet.	Construct approximately 130 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
Ie	under seepage and through seepage	Construct approximately 590 feet of seepage berm (approximately 70 feet wide) and approximately 590 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 590 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 70 feet.	Construct approximately 590 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.

Table 1. Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)

Element	Type of Remediation	Phase 3 Project Major Features	Phase 3 Project Features Constructed as 20-17 Emergency Response Actions	Phase 3 Project Features Remaining To be Constructed[1]
IIab	under seepage and through seepage	Construct approximately 2,600 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.	*None.*	Construct approximately 2,600 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 40–60 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width.
IIIa	Through seepage	Construct approximately 4,750 feet of chimney drain in existing seepage berm to meet required exit gradients Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths.	*None*	Construct approximately 4,750 feet of chimney drain in existing seepage berm to meet required exit gradients Place levee fill material along landside of existing levee slopes where feasible to provide minimum 3:1 slopes and 20-foot levee crown widths.
IIIb	under seepage and through seepage	Construct approximately 720 feet of seepage berm (approximately 90 feet wide) and approximately 720 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 720 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 90 feet.	Construct approximately 720 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.

Table 1. Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)

Element	Type of Remediation	Phase 3 Project Major Features	Phase 3 Project Features Constructed as 20-17 Emergency Response Actions	Phase 3 Project Features Remaining To be Constructed1
IVa	under seepage and through seepage	Construct approximately 450 feet of seepage berm (approximately 90 feet wide) and approximately 450 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 450 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 90 feet.	Construct approximately 450 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
IVc	under seepage and through seepage	Construct approximately 1,100-foot-long setback levee containing approximately 300 feet of seepage berm and approximately 300 feet of cutoff wall to meet required exit gradients. Depth of the cutoff wall will be approximately 60 feet. Cutoff wall will involve degrading the top 1/3 to 1/2 of the levee crown and will begin with a 1:1 cut at the waterside crown. Seepage berm would be a minimum of 65 feet wide. Install riprap on waterside of existing levee above the high tide line where it would intersect setback levee. After setback levee is completed, remove 400 linear feet of the existing levee above the high tide line on the downstream side of oxbow. Grade approximately 8 acres of setback area, to drain to the river through the downstream opening in the remnant levee, and restore at least 9.9 acres, and up to 11.1 acres, of riparian scrub and Great Valley oak woodland in the area between the landside toe of the setback levee and the river. For more information about habitat restoration in IVc, see the Conceptual Mitigation and Monitoring Plan for the Riparian Brush Rabbit in **Appendix E** of the BA.	*None*	Construct approximately 1,100-foot- long setback levee containing approximately 300 feet of seepage berm and approximately 300 feet of cutoff wall to meet required exit gradients. Depth of the cutoff wall will be approximately 60 feet. Cutoff wall will involve degrading the top 1/3 to 1/2 of the levee crown and will begin with a 1:1 cut at the waterside crown. Seepage berm would be a minimum of 65 feet wide. Install riprap on waterside of existing levee above the high tide line where it would intersect setback levee. After setback levee is completed, remove 400 linear feet of the existing levee above the high tide line on the downstream side of oxbow. Grade approximately 8 acres of

Table 1. Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)

Element	Type of Remediation	Phase 3 Project Major Features	Phase 3 Project Features Constructed as 20-17 Emergency Response Actions	Phase 3 Project Features Remaining To be Constructed:
				setback area, to drain to the river through the downstream opening in the remnant levee, and restore at least 9.9 acres, and up to 11.1 acres, of riparian scrub and Great Valley oak woodland in the area between the landside toe of the setback levee and the river. For more information about habitat restoration in IVc, see the Conceptual Mitigation and Monitoring Plan for the Riparian Brush Rabbit in **Appendix E** of the BA.
Va and VIa.1	under seepage and through seepage	Construct approximately 5,900 feet of seepage berm (approximately 60 feet wide) to meet required exit gradients. Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width. Construct 9,500 feet of continuous cutoff wall to meet required exit gradients. Depth of cutoff walls would vary from 60–85 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls. The existing levee will be widened where necessary as part of cutoff wall construction.	Constructed approximately 5,900 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 60 feet.	Where feasible, place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width. Construct 9,500 feet of continuous cutoff wall to meet required exit gradients. Depth of cutoff walls would vary from 60–85 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Open-cut method would be used for all cutoff walls. The existing levee will be widened where necessary as part of cutoff wall construction.

Table 1. Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)

Element	Type of Remediation	Phase 3 Project Major Features	Phase 3 Project Features Constructed as 20-17 Emergency Response Actions	Phase 3 Project Features Remaining To be Constructed1
VIa.4	under seepage and through seepage	Construct approximately 70 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 90–100 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.	*None.*	Construct approximately 70 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 90–100 feet. Cutoff wall would involve degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown. Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 26-foot levee crown width.
VIb	under seepage and through seepage	Construct approximately 2,050 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 70–80 feet. Cutoff wall in levee prism would involve both deep slurry mix construction as well as degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown.	*None.*	Construct approximately 2,050 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 70–80 feet. Cutoff wall in levee prism would involve both deep slurry mix construction as well as degrading top 1/3 to 1/2 of levee crown and would begin with 1:1 cut at waterside crown.

Table 1. Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)

Element	Type of Remediation	Phase 3 Project Major Features	Phase 3 Project Features Constructed as 2017 Emergency Response Actions	Phase 3 Project Features Remaining To be Constructed1
VIcde	under seepage and through seepage	At element, VIc, construct approximately 300 feet of seepage berm (approximately 100 feet wide) and approximately 300 feet of chimney drain to meet required exit gradients and construct a new earthen railroad embankment to replace the existing wooden trestle bridge. At element VId, construct approximately 150 feet of seepage berm (approximately 100 feet wide) and 150 feet of chimney drain to meet required existing gradients and raise grade. At element VIe, construct approximately 250 feet of subgrade seepage collection drain system and 250 feet of chimney drain to meet required exit gradients, raise approximately 200 feet of parking lot grade, and levee widening.	At element VIc, constructed approximately 300 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 100 feet. At element VId, constructed approximately 150 feet of seepage berm to meet required exit gradients and raised grade. The constructed seepage berm width is approximately 100 feet. At element VIe, constructed approximately 250 feet of subgrade seepage collection drain system to meet required exit gradients and raised approximately 200 feet of parking lot grade.	At element VIc, construct approximately 300 feet of chimney drain to meet required exit gradients and construct a new earthen railroad embankment to replace the existing wooden trestle bridge. At element VId, construct approximately 150 feet of chimney drain to meet required exit gradients. At element IVe, construct approximately 250 feet of chimney drain to meet required exit gradients and levee widening.
VIIb	under seepage and through seepage	Construct approximately 350 feet of seepage berm (approximately 135 feet wide) and 350 feet of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	Constructed approximately 350 feet of seepage berm to meet required exit gradients. The constructed seepage berm width is approximately 135 feet.	Construct approximately 350' of chimney drain to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.
VIIe	under seepage and through seepage	Construct approximately 2,500 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 60–120 feet. Deep slurry mixing method would be used.	*None.*	Construct approximately 2,500 feet of cutoff wall to meet required exit gradients. Depth of cutoff wall would vary from 60–120 feet. Deep slurry mixing method would be used.

Table 1. Comparison of all Major RD 17 Phase 3 Levee Repair Project Features with Those Features Completed as Emergency Actions in 2017 and Those Features Remaining to be Completed (and which are the subject of this consultation)

Element	Type of Remediation	Phase 3 Project Major Features	Phase 3 Project Features Constructed as 2017 Emergency Response Actions	Phase 3 Project Features remaining be to Constructed[1]
		Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Repair Project.		Place levee fill material along landside of existing levee slope where feasible to provide minimum 3:1 slope and 20-foot levee crown width. Soil removed during levee degradation would be stockpiled on adjacent RD 17 property and used for rebuilding the levee at these locations or used for fill at other locations in the Phase 3 Repair Project.
VIIg	under seepage and through seepage	Construct approximately 400 feet of seepage berm (approximately 65 feet wide) to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.	*None.*	Construct approximately 400 feet of seepage berm (minimum 65 feet wide) to meet required exit gradients. Place levee fill material along landside of existing levee slope where needed to provide minimum 3:1 slope and 20-foot levee crown width.

Source: Data provided by Kjeldsen, Sinnock & Neudeck, Inc. in 2014, updated 2017; August 21, 2018 Biological Assessment

Analytical Framework for the Jeopardy Determination

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund or carry out, is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of..." means to engage in an action that would reasonably be expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing reproduction, numbers, or distribution of that species (50 CFR §402.02).

The jeopardy analysis in this biological opinion considers the effects of the proposed Federal action and any cumulative effects on the rangewide survival and recovery of the listed species being consulted on. There are four components of this analysis for each species: (1) the *Status of the Species*, which evaluates the species' range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the species; and (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the species.

Status of the Valley Elderberry Longhorn Beetle

The Service designated the beetle as threatened and proposed critical habitat on August 8, 1980 (Service 1980) and approved a final Recovery Plan on June 28, 1984 (Service 1984). This wood-boring beetle is a subspecies of the California elderberry longhorn beetle, which persists in small isolated populations in the California Central Valley in riparian areas which have a component of elderberry savannah. The listed subspecies is typified by sexual dimorphism, in which the male shows a predominantly red elytra. The primary threat to the species is habitat loss, particularly along major river systems that are known to bave supported the species, often as a result of urban or agricultural development and flood control actions (both construction and operation and maintenance). Additional major threats are that of extinction due to small population size, predation from alien species such as the Argentine ant, inadequate protections (other than the Endangered Species Act), pesticides, non-native plants of various types that compete with native riparian vegetation including elderberries, and other factors. The beetle itself is rarely seen, and the vast majority of its detections reported in the California Natural Diversity Database have been inferred from the presence of exit holes in host elderberry plant stems.

The period since the beetle's listing to the present has witnessed considerable population and urban growth in California at the expense of remaining riparian habitat and adjacent upland habitat near river systems that supported elderberry. Elderberry plants can colonize and persist on levees and nearby lands as well, and some beetle and exit hole records have been reported in this type of habitat. In floodways, this form of habitat is often the result of deferred maintenance. However, Federal flood control improvements including the currently proposed project, as well as State-wide initiatives to improve the standard of flood control in urban systems generally, have resulted in levee improvements and more rigorous maintenance that has limited floodway habitat. Mitigation for beetle habitat losses is typically done off-site in mitigation or conservation banks, and habitat enhancement has been almost entirely limited to Federal and State refuge lands in the north Central Valley. Since its 1980 listing continuing to the present time, there has been a progressive further decline in beetle habitat amount and distribution with increasing discontinuity between remaining habitat fragments, reduced frequency of sightings, and likely curtailment of the range of this species.

Valley Elderberry Longhorn Beetle Environmental Baseline in the Action Area

Most of the records of adult beetles date from the 1980s and 1990s or earlier. With the exception of recent pheromone trials on a Service refuge that yielded ~20+ captures in 2014, only about a dozen other beetle specimens have been seen anywhere in the last 15 years, and the majority of these were in conservation areas on Federal or State lands or conservation banks in the North Central Valley. The nearest to the proposed projectis a sighting of adult beetles (including a male) in 1984 from Middle River, <4 miles west of project element Va. In the region of the proposed project, there were several beetle exit holes detected along the Calaveras River and Bear Creek 15-20 miles northeast of the project area. Upon re-examination in 1989 by Barr (1991), these particular vicinity locations no longer supported beetles nor live elderberry plants. Occasional exit holes have been seen in elderberry plants along the Stanislaus River 12-20 miles to the southeast of the project area as well. Other studies of formerly occupied areas of both South and North Central Valleys have shown complete loss of elderberry plants, negative surveys for beetle holes, or very low occupancy (Collinge et al. 2001; Kucera et al. 2006; River Partners 2007; Holyoak and Graves 2010).

The project area includes potential habitat for the species which will be affected by the proposed action, but no critical habitat. Patches of riparian vegetation are present in scattered, limited amounts, throughout the project area, depending on the extent and intensity of maintenance of the current levees. A total of 18 elderberry shrubs, none with exit holes, were observed during surveys of project reaches in 2011 and 2014, of which there were 9 shrubs on the land side that would be affected by project construction (Figure 4). Eight of these elderberry shrubs to be affected have stems greater than 1 inch diameter (in elements IVa, IVc, and V-VIa.1). The presence of elderberry shrubs, their location in or near riparian habitats, and records of beetles or exit holes in the region lead us to conclude that the beetle is present in the project area.

Status of the Riparian Brush Rabbit

The Service designated the rabbit as endangered on February 23, 2000 (Service 2000) and included it in a final Recovery Plan for upland species on September 30, 1998, which preceded the listing decision (Service 1998). We have since drafted a 5-year review which is not yet published (Service 2012), but was used for this BiOp to update this narrative of the status of the species. It is a medium-to-small cottontail with a relatively pale color, distinguishable from other species and subspecies by its outwardly protruding cheeks, smaller tail, and uniformly colored ears. It lives in riparian communities of willow thickets, California wild rose, Pacific blackberry, and other shrubs and grasses. Habitat components of suitable rabbit habbit include large patches of dense brush, ecotonal edges of grass and forbs next to brushy cover, scaffolding plants for the blackberry and rose to grow tall enough to withstand flood events, an open overstory (if trees are present), and vegetated high-ground to surve as flood refugia. There are three population centers: Caswell Memorial State Park (MSP), a fragmented metapopulation in the South Delta on both sides of the San Joaquin River that includes the proposed project area and Paradise Cut, and a new population within San Joaquin River National Wildlife Refuge (NWR) established by the release of captive-bred individuals. Population size at these centers varies widely from a few individuals to perhaps several hundred, with very few individuals being trapped recently at Caswell MSP. The two natural populations (Caswell MSP and South Delta) show substantial genetic differentiation, while rabbits in other locations (South Delta, east compared to west sides of the San Joaquin River) were not distinct from each other.

The primary threat to the rabbit is habitat loss, originally through the widespread destruction of riparian forest which greatly reduced its range, and continuing today through various activies such as levee maintenance, fire-hazard maintenance, and urban development, all of which further reduce and/or preclude the restablishment of habitat. A variety of other natural and manmade factors also threaten the rabbit, particularly severe flooding (especially in the absence of adequate high water refugia), and effects of small population size (e.g., inbreeding, genetic drift, local extinction events), but also predation (including feral cats and dogs), pesticides, competition and climate change. The combination of small population size, restricted distribution, fluctuation of numbers, and extreme level of threat lead us to conclude that the species remains at a high risk of loss of genetic diversity and extinction at this time.

The remaining range of the rabbit is subject to periodic flooding during wet years and especially from longer-duration snowmelt flooding. Post-flood surveys conducted in Caswell MSP and the San Joaquin NWR since listing indicate high mortality of rabbits from floods; populations can rebound after the flood, but this did not happen in Caswell MSP after consecutive floods in the 1990s. At the refuge, the rabbits were wiped out by the 2006 flood, restored only by additional captive-bred released individuals together with creation of refugia mounds. Although there have been very few rabbit captures from the South Delta population, the regularity of such captures before and after flood events suggests persistence, possibly as a consequence of adequate high water refugia such as existing levees and woody vegetation which the rabbits can climb.

Riparian Brush Rabbit Environmental Baseline in the Action Area

In the region, there are 20+ known observations of the rabbit along the San Joaquin River from about De Lima Road south to Paradise Cut, which includes the project area, and along Paradise Cut itself to the south and west of the project area, generally from the early 2000s and later. In the immediate vicinity of work sites of the project, trapping in 2003 and 2004 detected rabbits adjacent to elements IIIa and IIIb, and between elements Va-VIa.1 and V1a.4 where there is an oxbow with a significant patch of rabbit habitat between these two work elements. Similar habitat is present adjacent to elements IIab, IVc, and Va-VIa.1. The presence of small patches of rabbit habitat in the form of riparian scrub in several project elements, relatively recent and repeated records of rabbit captures within the project area, and potential for rabbits to disperse along the levee margin, lead us to conclude that the rabbit is present in the project area.

Effects of the Proposed Action

Valley Elderberry Longhorn Beetle

Habitat for the beetle will be directly affected by removal of elderberry bushes during construction and maintenance of the project. Beetle habitat consists of elderberry bushes as well as associated riparian plants. An estimated 9 existing bushes, 8 with stems >1 inch diameter, would need to be removed and transplanted elsewhere because they are within the construction footprint or maintenance easements (Figure 4). The emergency response work did not result in effects to the beetle because no elderberry shrubs were within 100 feet of project activities. For the remaining work, shrubs would only be transplanted from November 1 to February 15. Any work scheduled for the remainder of the 2019 construction season, before transplantation, would avoid impacts by staying at least 100 feet away from elderberry shrubs.

A total of 4.04 landside acres of riparian woodland, including the 9 elderberry plants, would be removed by project activities (Table 2; sum of totals for Great Valley Cottonwood Riparian and Great Valley Oak Riparian Forest). Of this, 1.95 acres has already been affected by emergency action, mostly through the construction of seepage berm in elements IIIb-IVa. This 1.95 acres of loss did not remove elderberry plants, but did affect the beetle through its removal of riparian woodland associated with elderberry plants. Another 2.09 acres, including the aforementioned elderberry plants, will be affected by future activities beginning in 2019, primarily through the construction of cutoff wall and levee fill placement in element Va-VIa.1.

The BA (p.54) notes that 3.03 acres of riparian habitat associated with elderberry plants would be removed due to the project in elements IIIa, IIIb, IVa, and Va-V1a.1, but did not provide reasoning for exclusion of riparian impacts in other elements, and this total did not precisely match the total for these elements provided later (2.99 acres; Table 2). It may be that the Corps considered some riparian to the north (elements 1a-b, fragments of natural scrub) and south (elements VIIe-g; oak trees) less likely to support beetles due to a fragmented nature, absence of elderberries, and/or distance or disconnection between those fragments and the areas with elderberries. Nevertheless, fragmentation is typical of the regional landscape, and the distance from the excluded elements to other elderberries (1-2 miles) is not so great as to preclude their occurrence at some point in the project life, or use by beetles. Our 2017 Framework did not provide specific distances or guidance for the current circumstance in which beetle habitat is in the form of occasional shrubs within disconnected riparian fragments. Element IVc, which was not identified in the BA as an element with beetle habitat, has three elderberry shrubs on-site, two of which would be removed as part of the 0.29 acre of riparian impact in remaining construction. It is our best judgement to treat the sum of riparian impacts within elements IIIa, IIIb, IVa, IVc, and Va-V1a.1 (3.28 of the 4.04 acres of riparian impact) as the quantity of impacted beetle habitat for this project.

All woody plants including elderberries would be suppressed on portions of the project area through future long-term vegetation management practices (trimming, herbicide application) similar to practices without the project. According to the BA (p. 56), however, no additional area of landside or waterside woodlands beyond the impacted landside woodlands and included 9 elderberry shrubs would be removed due to future vegetation management activities associated

Table 2. Impact areas affected by RD 17 phase 3 seepage area project by cover-type divided into that conducted under emergency action in 2017 and remaining to be done; both are covered under this consultation. The shaded values are considered suitable riparian brush rabbit habitat (from RD17, see Consultation History, December 17, 2018). See text for determination of suitable beetle habitat.

RD 17 Habitat Impacts

12/17/2018

TOTAL ACRES OF IMPACT

Reach	Agricultural Cropland		Developed Area[a]		Drainage Ditch		Freshwater Marsh Depression		Great Valley Cottonwood Riparian[b,d]		Great Valley Oak Riparian Forest[b,d]		Non-Native Trees		Ruderal[a]		TOTAL	
	Emergency	Remaining	Emergency	Remaining	Emergency	Remaining	Emergency	Remaining	Emergency	Remaining	Emergency	Remaining	Emergency	Remaining	Emergency	Remaining	Emergency	Remaining
Element Ia	0.73	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.12	0.30	0.00	0.00	0.00	0.00	0.50	0.44	1.35	1.09
Element Ib	0.00	0.00	0.64	0.00	0.00	0.00	0.55	0.00	0.22	0.00	0.00	0.00	0.03	0.00	0.27	0.27	1.71	0.27
Element Ie	0.98	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.00	0.41	0.41	1.95	0.41
Elements IIab	N/A	0.32	N/A	6.14	N/A	0.00	N/A	0.00	N/A	0.01	N/A	0.00	N/A	0.11	N/A	0.01	N/A	6.58
Element IIIa	N/A	0.00	N/A	1.39	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.04	N/A	0.00	N/A	9.47	N/A	10.90
Element IIIb	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.75	0.50	1.56	0.50
Element IVa	0.00	0.00	0.16	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.37	1.00	1.36	1.00
Element IVc - Setback Area/New Setback Levee	N/A	0.00	N/A	1.59	N/A	0.00	N/A	0.00	N/A	0.29	N/A	0.00	N/A	0.00	N/A	7.29	N/A	9.17
Element IVc - Waterside of Existing Levee[c]	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.75	N/A	0.75
Elements Va-VIa.1	1.00	2.24	1.00	5.97	0.07	0.00	0.00	0.00	0.00	1.36	0.18	0.00	0.55	0.00	1.50	9.39	4.30	18.96
Element VIa.4	N/A	0.00	N/A	0.15	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.23	N/A	0.38
Element VIb	N/A	0.00	N/A	1.00	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.00	N/A	3.36	N/A	4.36
Elements VIcde	0.00	0.00	0.71	0.71	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.05	0.00	1.01	0.50	1.79	1.21
Element VIIb	1.17	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.55	2.67	0.55
Element VIIe	N/A	0.00	N/A	3.70	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.03	N/A	0.09	N/A	1.46	N/A	5.29
Element VIIg	N/A	0.00	N/A	0.18	N/A	0.00	N/A	0.00	N/A	0.00	N/A	0.06	N/A	0.33	N/A	0.70	N/A	1.27
TOTAL	3.88	2.56	3.57	21.18	0.22	0.00	0.55	0.00	0.36	1.96	1.59	0.13	1.15	0.52	5.36	36.33	16.68	62.69

Notes:

(a) Some project components were constructed during 2017 emergency response actions in Elements Ia, Ib, Ie, IIIb, IVa, Va-VIa.1, VIcde, and VIIb. Ruderal acreage impacts were duplicated between Emergency and Remaining project components for Elements Ib, Ie, VIcde, and VIIb. Developed acreage impacts were duplicated between Emergency and Remaining project components for Elements VIcde.

(b) Suitable riparian brush rabbit habitat is characterized as Great Valley cottonwood riparian and Great Valley oak riparian forest. Most of the landside riparian vegetation is sparse and lacks understory and is not suitable for this species. However, any landside riparian habitat is considered to be suitable where it is adjacent to waterside riparian habitat that is known to be occupied by or highly suitable for riparian brush rabbit (e.g., Elements IIab through VIe). North of Elements IIab, riparian habitats are limited to isolated patches of blackberry and shrubs, isolated small trees and shrubs, and isolated groves of large valley oak trees that lack understory vegetation; thus, these areas are not expected to support suitable habitat for this species. Similarly, the woodlands in the area south of the Union Pacific Railroad tracks (i.e., elements VIIe and VIIg) are characterized by nonnative and ornamental trees associated with residential development; thus, these areas are not expected to support suitable habitat for this species.

(c) Riprap would be installed on the waterside of the existing levee above the high tide line where it would intersect with the new setback levee. No riparian vegetation would be removed; only ruderal habitat would be disturbed.

[illegible]

with this project. These removed shrubs represent half of the 18 shrubs present in the surveyed project area. Nearly all of the shrubs would be removed in consecutive elements IVa, IVc, and Va-V1a.1, but the remaining shrubs are mostly just north in the vicinity of elements IIIa-b. The distribution of shrubs and any associated beetles, as well as movement of beetles, could be incrementally affected by the loss of shrubs and reduced continuity of habitat. These effects would be offset through on-site plantings (in the setback area of element IVc), and the transplantation of elderberries to a mitigation bank.

The project will include restoration of at least 9.9 acres of riparian habitat in element IVc, which is roughly three times the affected beetle habitat. Elderberry plants would be included in the form of transplants and additional plantings in to-be-determined and -approved final quantities and locations appropriate to site conditions (*see* Term and Condition #1).

Riparian Brush Rabbit

According to information provided by RD 17, there are 4.04 acres of total impact to landside riparian cover types that would be removed by project construction, of which 3.31 acres is considered rabbit habitat, consisting of roughly equal parts cottonwood forest and valley oak (Table 2). The lower value for rabbit habitat reflects the exclusion of some habitat as unsuitable for rabbit which has been or will be affected by the project to the north (elements 1a-b; fragments of natural scrub) and south (elements VIIe, g; oak trees). These excluded areas are not considered rabbit habitat due to a fragmented nature, either isolated from rather than adjacent to other rabbit habitat, or considered disturbed by nearby residential development. About 1.61 acres of the rabbit habitat loss occurred as a result of emergency action, primarily through the removal of landside oaks when seepage berm material was placed in elements IIIb and IVa. The remaining losses would be largely cottonwood forest for additional seepage berm construction in Element Va-VIa.1. All of this removed habitat is generally sparse and sometimes lacking understory vegetation that would act as cover for the rabbit. However, this habitat could be used by the rabbit because it is adjacent to waterside habitat known to be occupied or of higher suitability for occupation. Waterside habitat would not be removed by the project, nor maintained differently from current practices after the project is complete. Nevertheless, the project habitat losses have occurred or will occur in an area very close to recent rabbit record locations, so it is likely that some loss or isolation of rabbit populations will result. The project will include restoration of at least 9.9 acres of riparian scrub habitat nearby, in a setback area associated with element IVc, which is three times the area of lost habitat. This restored habitat would include a section of existing levee which would serve as refugium during high water events. This larger block of restored habitat would be available for rabbit occupation and could support more rabbits than the removed habitat, offsetting the impact of the proposed project.

About 42 acres of ruderal grassland will be affected by the project, all of which is temporary and assumed to re-establish (Table 2). Rabbits generally have a small home range and rarely venture more than a few feet from shrub cover into small openings to forage. However, this disturbance could affect rabbits by deterring their dispersal movements.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. The Lower San Joaquin River Feasibility Study is another levee improvement project just north of the proposed project that encompasses 24 miles of levees in Central and North Stockton. This project will likely affect about 21 elderberry shrubs that need to be removed from levees to achieve initial compliance with Corps vegetation standands, and elderberry shrubs that re-establish would be variably affected during future maintenance. These effects would be covered and compensated under another BiOP (Service File # 08ESMF00-2015-F-0206). This project is outside the range of the rabbit.

Conclusion

After reviewing the current status of valley elderberry longhorn beetle and riparian brush rabbit, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed project is not likely to jeopardize the continued existence of these species. This conclusion is based on:
(1) implementation of the conservation measures to minimize adverse effects on listed species during construction, (2) compensation measures which offset the effects on listed species that cannot be minimized; and (3) the expectation that the Corps granting of permission to construct the project, and its construction or subsequent certification, does not directly or indirectly affect or change current waterside maintenance practices, so that the amount and distribution of such waterside woody vegetation will not change in the future as a result of this Federal action.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require an applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to any permit or grant document related to the proposed project, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Amount or Extent of Take

Valley Elderberry Longhorn Beetle

The Service anticipates that incidental take of valley elderberry longhorn beetle will be difficult to detect due to its life history and ecology. Specifically, valley elderberry longhorn beetles can be difficult to locate due to the fact that a majority of their life cycle is spent in the elderberry shrub and finding a dead or injured individual is unlikely due to their relatively small size. There is a risk of harm, harassment, injury and mortality as a result of the proposed construction activities. Therefore, the Service is authorizing take incidental to the proposed action as harm, harassment, injury, and mortality of all valley elderberry longhorn beetles within 8 currently known shrubs with stems > 1 inch, and encompassing 3.28 acres of landside riparian deemed beetle habitat which will be removed due to project construction and maintained free of woody vegetation. Beetle holes or specimens are not known from the project area. We estimate the level of take in the form of harm, harass, or kill to be no more than two (2) beetles killed or injured by contact with construction equipment or motor vehicles during all project activities. The cumulative detection of two adult beetles (i.e., live or dead specimens, not exit holes) over the period of construction is to be used to determine when take is close to being exceeded. Detection of two beetles will indicate that the beetle is being affected by the project at a level where avoidance and minimization measures and project implementation need to be re-evaluated and possibly modified.

Riparian Brush Rabbit

The Service anticipates that incidental take of the rabbit will be difficult to detect or quantify for the following reasons: rabbits primarily inhabit brush from which they are difficult to observe directly, are present in low numbers, and known to be sensitive to human presence. Most close-range observations represent chance encounters that are difficult to predict, or planned trapping surveys that are not routinely done. For the proposed project, we expect incidental take to be associated with (1) harassment, through disturbance associated with project actions; (2) injury or death, due to direct contact with construction equipment or vehicles; or (3) loss of population viability due to loss or fragmentation of habitat to a point where rabbits cannot reproduce or leave an area. It is not possible to make an accurate estimate of the number of rabbits that will be harassed during construction activities, including in staging areas, roads carrying vehicular traffic, and disturbed annual grasslands, all of which could be occasionally used by the rabbit during dispersal. In instances when take is difficult to detect, the Service may estimate take in numbers of species per acre of habitat lost or degraded as a result of the action as a surrogate measure for quantifying individuals. For the proposed project, we estimate take as all rabbits within 3.31 acres of landside woodland considered rabbit habitat. The effect of the project depends on the number of rabbits actually present and harmed. Based on these factors and our best judgment, the Service expects the level of take in the form of harm, harass, or kill to be no more than one (1) rabbit killed or injured by contact with construction equipment or motor vehicles during all project activities. Detection of one dead rabbit will indicate that the rabbit is being affected by the project at a level where avoidance and minimization measures need to be re-evaluated and possibly modified.

Effect of the Take

In the accompanying biological opinion, the Service determined that the level of anticipated take is not likely to result in jeopardy to the valley elderberry longhorn beetle and riparian brush rabbit.

Reasonable and Prudent Measure

1. The Corps shall minimize the impact of take of valley elderberry longhorn beetle and riparian brush rabbit.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply with, or ensure compliance with, the following terms and conditions, which implement the reasonable and prudent measure described above and outline required reporting/monitoring requirements. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement the Reasonable and Prudent Measure:

1. The Corps must condition its Section 408 permission for the project on RD 17 providing a planting plan for the element IVc setback area and gaining Service written approval of it prior to impacts to or within 100 feet of the driplines of elderberry shrubs. The planting plan should include the numbers and approximate locations of elderberry transplants, elderberry plantings, and associated species, appropriate to site conditions and consistent with the need to compensate for impacts to both beetle and rabbit habitat. To achieve this, the planting plan is to be considered exempt from two of the numerical goals in the Service's 2017 Framework to maximize elderberry plantings (i.e., 240 stem/acre; 1 native associate:3 elderberry plantings; p. 16 *in* Service 2017). Instead, the planting plan shall include at least 50 initial elderberry plantings, which we assume will result in the long term survival of at least thirty (30) elderberry plants with stems >1 inch. Those minimum surviving 30 plants are deemed sufficient to offset impacts to the 8 affected shrubs considered beetle habitat, and up to 2 additional shrubs with stems >1 inch which may be detected in the required pre-construction survey (Reporting Requirement 2, below). The majority of the plantings shall include other riparian scrub species comparable to known riparian brush rabbit habitat. Additional elderberry plants above the 50 plantings minimum and 30 surviving may be included if this does not signficantly affect the functioning of rabbit habitat. This modified guidance is applicable for the sole use in the proposed setback area for this project and is not to be substituted by bank purchase for this

project or used as guidance in other projects. If the Corps is unable to fully comply with this condition within the proposed on-site compensation area, it must reinitiate consultation.

Reporting Requirements

In order to monitor whether the amount or extent of incidental take anticipated from implementation of the project is approached or exceeded, the Corps shall adhere to the following monitoring requirements. Should this anticipated amount or extent of incidental take be exceeded, the Corps must reinitiate formal consultation as per 50 CFR §402.16.

1. The Service must be notified within one (1) working day of the finding of any injured or dead listed species or any unanticipated damage to its habitat associated with the proposed project. Notification will be made to the Assistant Field Supervisor of the Endangered Species Program at the Bay Delta Fish and Wildlife Office at (916) 930-2664, and must include the date, time, and precise location of the individual/incident clearly indicated on a U.S. Geological Survey 7.5 minute quadrangle or other maps at a finer scale, as requested by the Service, and any other pertinent information. When an injured or dead individual of the listed species is found, the Corps (during construction) or the local sponsor (during maintenance) shall follow the steps outlined in the Disposition of Individuals Taken section below.

2. The Corps must condition its Section 408 permission for the project on RD 17 conducting a pre-construction resurvey for elderberry shrubs prior to work for each construction season in which there is an expected impact to them, of both the number of shrubs total, the number of shrubs with stem diameters > 1 inches, the size classes of those stems > 1 inch, and the presence or absence of beetle exit holes, in the work areas for that construction season. The results of the resurvey shall be used to verify or revise as necessary the quantities of removed shrubs. The survey information and any revised quantities of affected shrubs shall be transmitted to the Corps, who shall then report it to the Service at least seven (7) days prior to the onset of work; RD 17 may proceed with the work in accordance with the resurveyed quantities and compensation provided that the cumulative total shrubs affected does not exceed those in this BiOP by more than two (2) shrubs (i.e., does not exceed ten (10) shrubs). If the difference is more than two (2) shrubs, work should not be initiated and the Corps should reinitiate consultation. The Service shall seek to respond with an appropriate amendment of this BiOP within 14 calendar days to limit the impact to construction schedules.

3. The Corps will document, monitor, and report the actual amount of take of beetle and rabbit habitat for project construction in a monitoring report to be submitted within 120 days of completion of the last year of construction activities. This document will include: a summary table of the cumulative areas of disturbance of beetle and rabbit habitat by project element and the number of elderberry shrubs removed, noting any differences from that described in the BA; representative photographs before and after construction; and monitoring methods.

Disposition of Individuals Taken

Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-approved biologist. Dead individuals must be sealed in a resealable plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen must be frozen in a freezer located in a secure site, until instructions are received from the Service regarding the disposition of the dead specimen. The Service contact persons are the Assistant Field Supervisor of the Endangered Species Program at the Bay Delta Fish and Wildlife Office at (916) 930-2664; and the Resident Agent-in-Charge of the Service's Office of Law Enforcement, 5622 Price Way, McClellan, California 95562, at (916) 569-8444.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following actions:

1. Develop and implement restoration measures in areas designated in the Recovery Plan for Upland Species of the San Joaquin Valley, California (Service 1998) and the Valley Elderberry Longhorn Beetle Recovery Plan (Service 1984).

REINITIATION—CLOSING STATEMENT

This concludes formal consultation on the proposed project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; (4) a new species is listed or critical habitat designated that may be affected by the action; or (5) the status of the beetle or rabbit changes. In instances where the amount or extent of incidental take is exceeded, any additional take will not be exempt from the prohibitions of section 9 of the Act, pending reinitiation.

If you have any questions regarding this biological opinion, please contact Steven Schoenberg of my staff at (916) 930-5672.

Sincerely,

Kaylee Allen
Field Supervisor

cc:

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Dante Nomellini, Nomellini, Grilli, and McDaniel, Stockton, CA
Andrea Shepard, GEI, Rancho Cordova, CA

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APPENDIX 1 - FIGURES

Figure 1a. Work element locations and cover types for RD 17 phase 3 consultation.

Figure 1b. Work element locations and cover types for RD 17 phase 3 consultation.

Figure 1c. Work element locations and cover types for RD 17 phase 3 consultation.

Figure 2. Element IV setback levee/restoration area (rose-upland; yellow - riparian scrub).

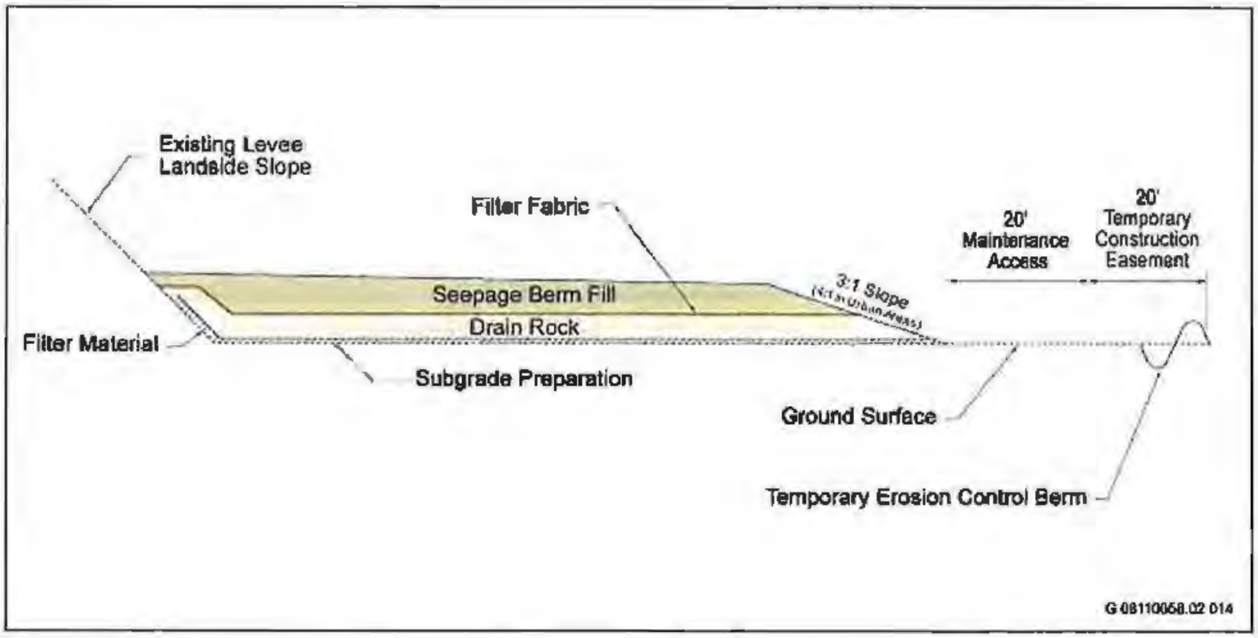

Figure 3a. Typical seepage berm.

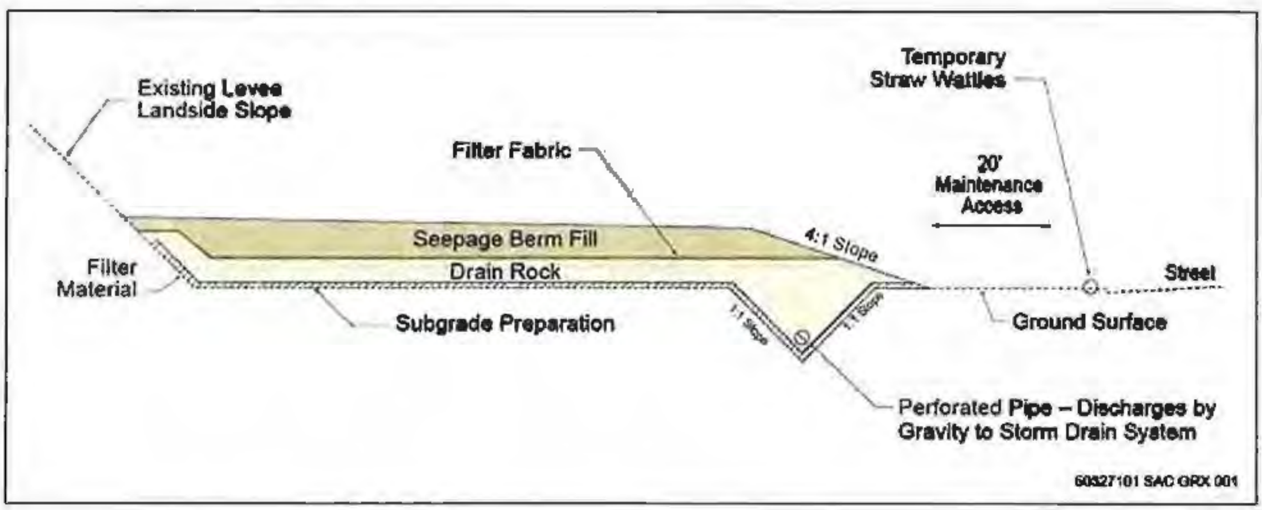

Figure 3b. Typical seepage berm with toe drain.

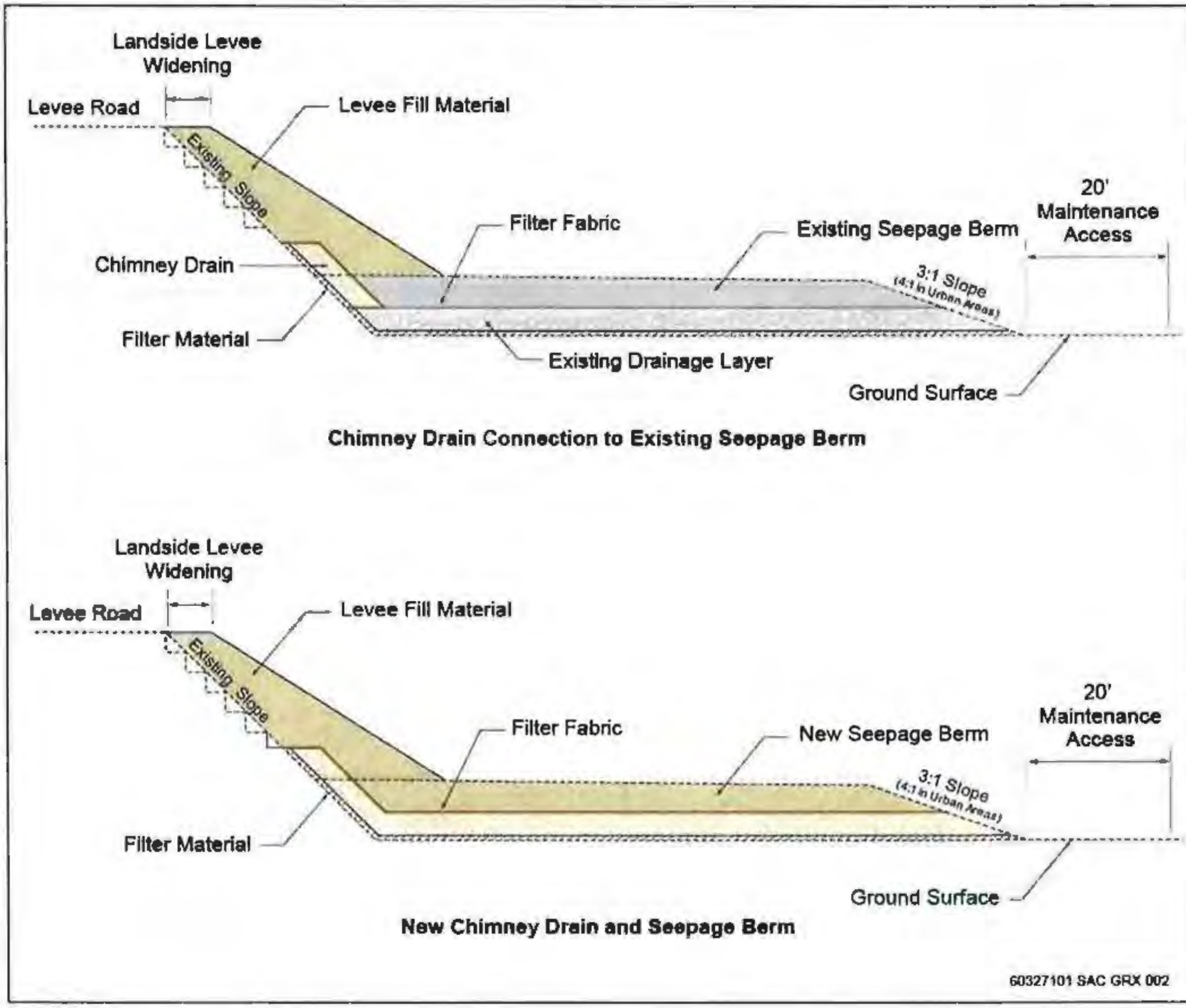

Figure 3c. Typical chimney drain with existing or new seepage berm.

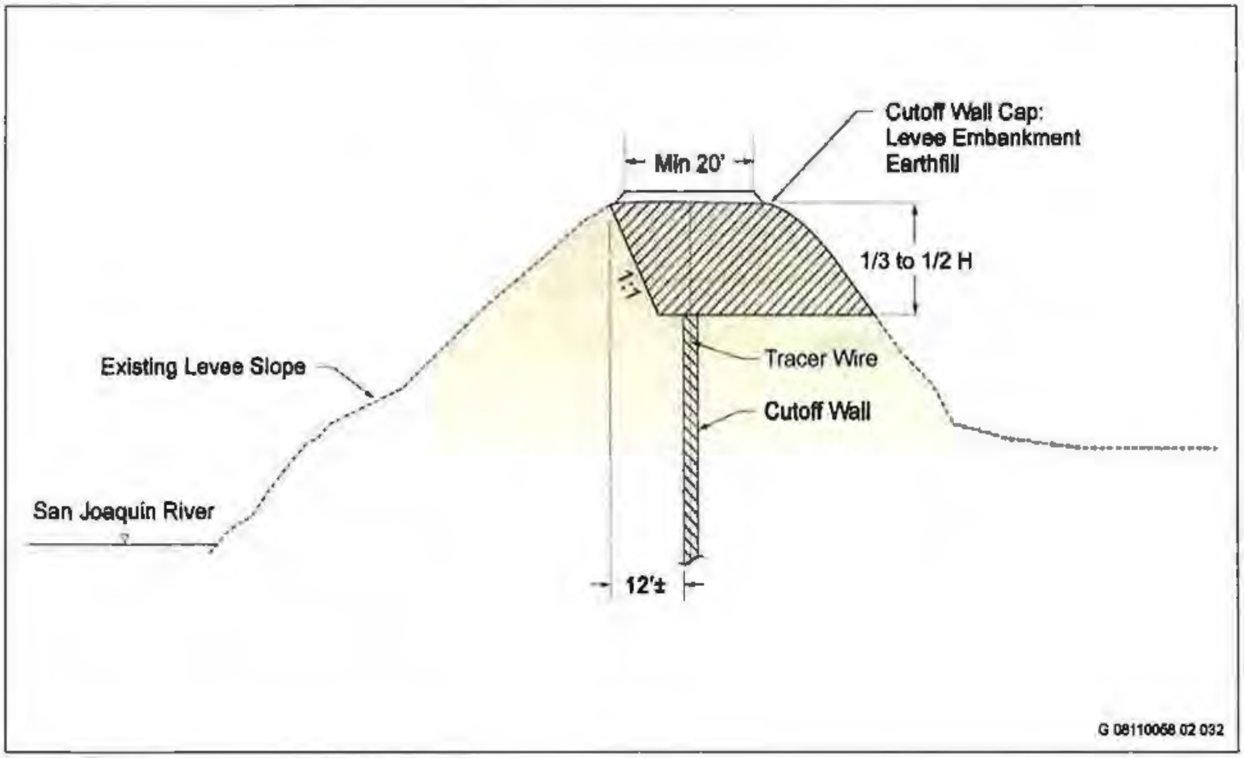

Figure 3d. Typical open cut method cutoff wall.

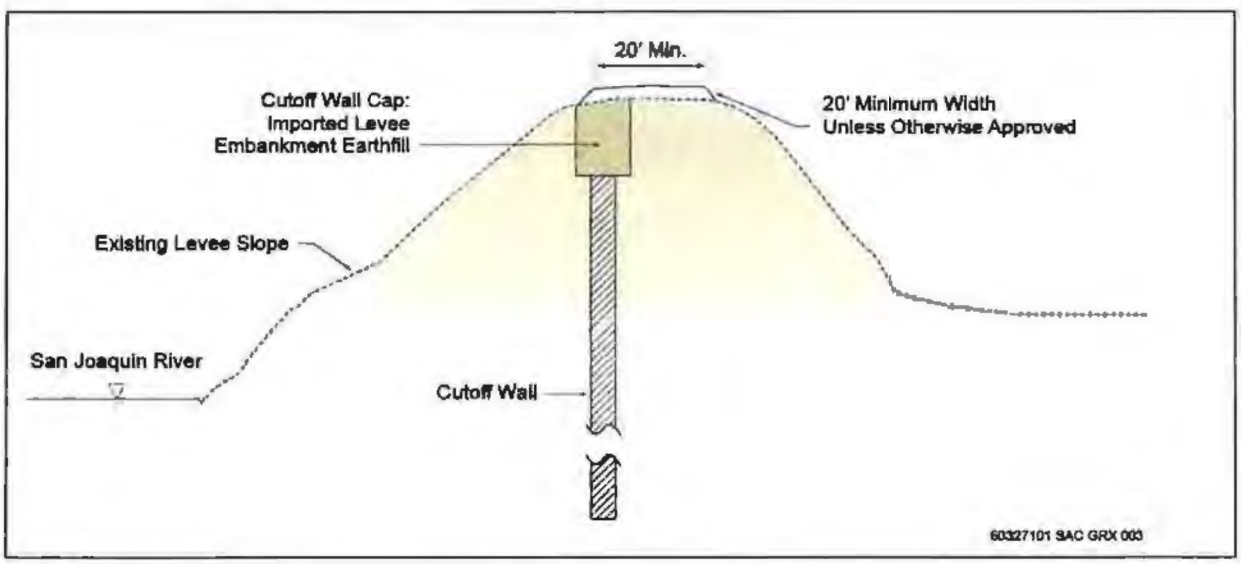

Figure 3e. Typical deep slurry mix method cutoff wall.

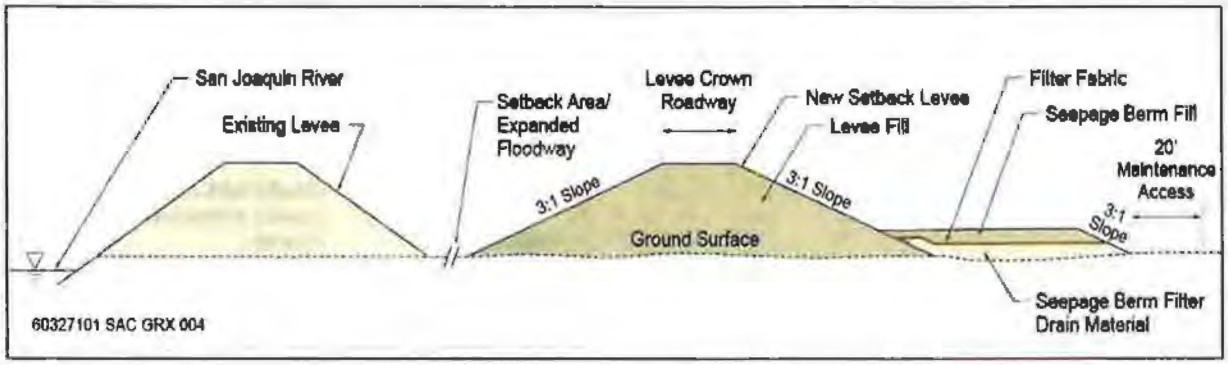

Figure 3f. Typical setback levee.

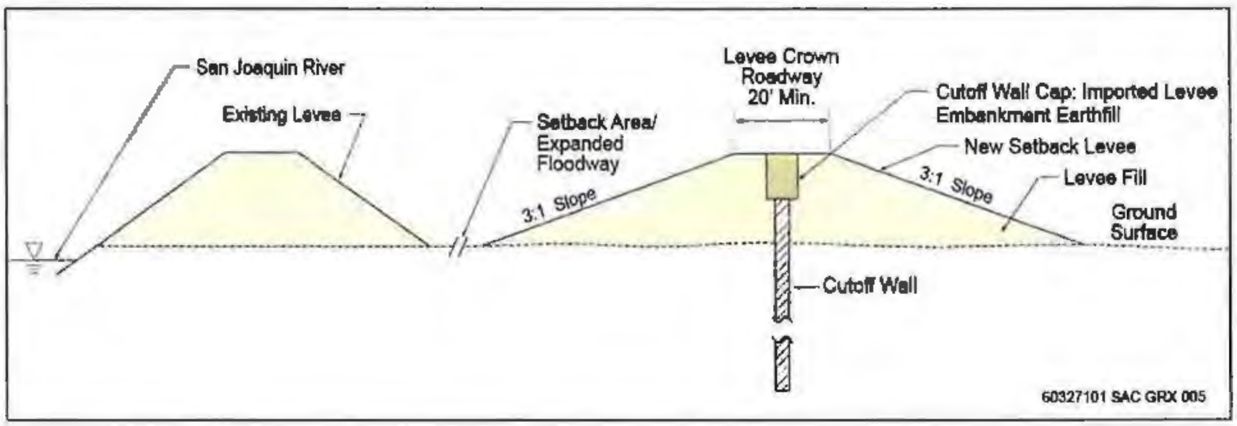

Figure 3g. Typical setback levee with cutoff wall.

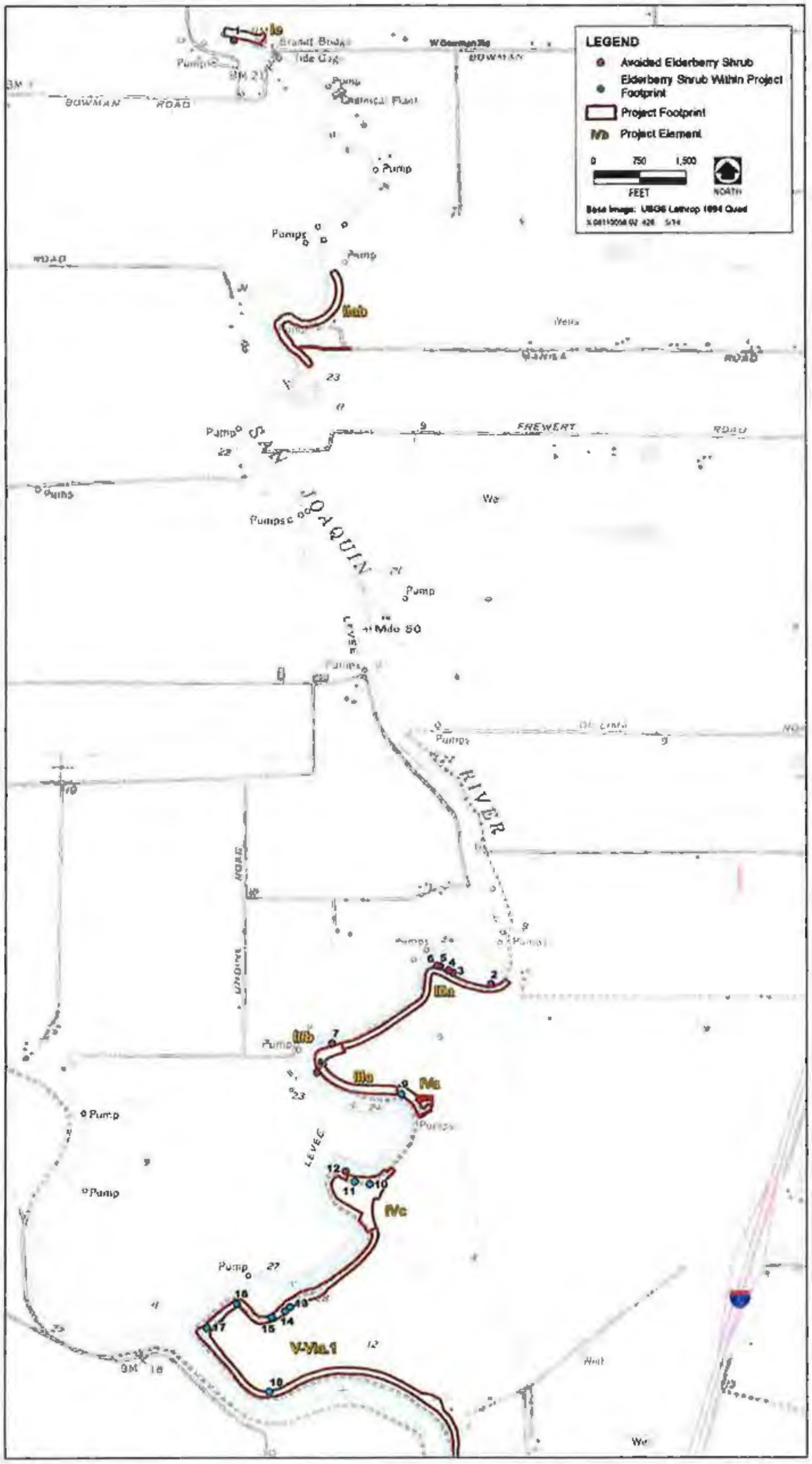

Figure 4. Locations of known elderberry shrubs in RD 17 phase 3 project area.