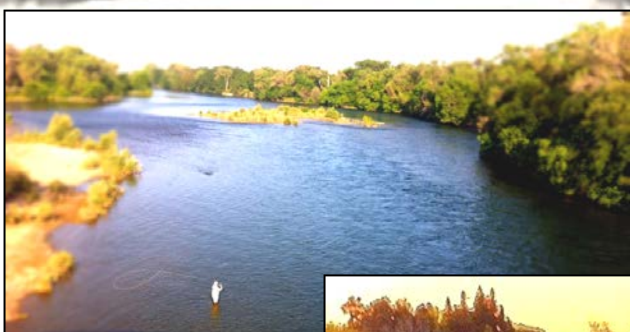
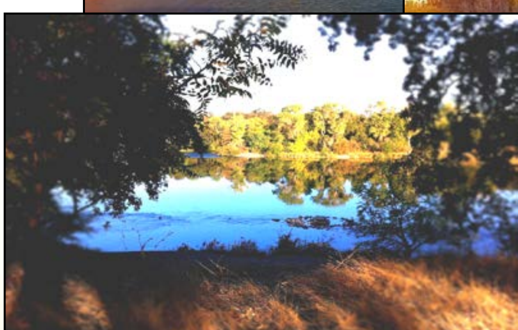
American River Watershed

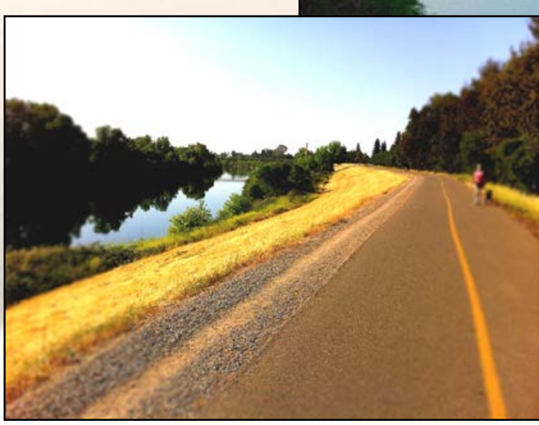
Common Features
General Reevaluation Report

Draft
Environmental Impact Statement
Environmental Impact Report

March 2015







State Clearing House Number
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Central Valley Flood Protection Board
Public Safety and Flood Management
State of California

SAFCA
Sacramento Area Flood Control Agency

US Army Corps of Engineers ®
Sacramento District

Cover Photos: American River Parkway

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AMERICAN RIVER, CALIFORNIA
COMMON FEATURES PROJECT
GENERAL REEVALUATION REPORT

Draft Environmental Impact Statement/

Environmental Impact Report

U.S. Army Corps of Engineers
Sacramento District

March 2015

AMERICAN RIVER COMMON FEATURES GENERAL REEVALUATION REPORT

SACRAMENTO COUNTY, CALIFORNIA

DRAFT ENVIRONMENTAL IMPACT STATEMENT/ ENVIRONMENTAL IMPACT REPORT

March 2015

Type of Statement: Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR)

Lead NEPA Agency: U.S. Army Corps of Engineers, Sacramento District

Lead CEQA Agency: State of California, Central Valley Flood Protection Board

Cooperating Agency: Sacramento Area Flood Control Agency

Abstract: The U.S. Army Corps of Engineers and its non-Federal partners, the State of California Central Valley Flood Protection Board and the Sacramento Area Flood Control Agency, propose to provide flood risk management to the city of Sacramento by improving the levees that surround the city. This draft EIS/EIR describes the environmental resources in the project area; evaluates the direct, indirect, and cumulative environmental effects of the three alternative plans; and identifies avoidance, minimization, and mitigation measures. Most potential adverse effects would be either short term, or would be avoided or reduced using best management practices. However, there are some significant and unavoidable impacts associated with this project. Beneficial effects from the proposed alternative plans are also discussed.

Public Review and Comment: The public review period will begin on March 13, 2015 and the official closing date for receipt of comments on the draft EIS/EIR will be April 27, 2015. All comments received will be considered and, as appropriate, incorporated into the final EIS/EIR. Written comments or questions concerning this document should be directed to the following: U.S. Army Corps of Engineers, Sacramento District; Attn: Ms. Anne Baker; 1325 J Street; Sacramento, California 95814-2922, or by e-mail: Anne.E.Baker@usace.army.mil or California Department of Water Resources; Attn: Ms. Erin Brehmer; 3464 El Camino Avenue Suite 200; Sacramento, California 95821, or by e-mail: Erin.Brehmer@water.ca.gov.

EXECUTIVE SUMMARY

ES.1 Introduction

This draft environmental impact statement/draft environmental impact report (DEIS/DEIR) has been prepared by the U.S. Army Corps of Engineers (Corps), Sacramento District and the Central Valley Flood Protection Board (CVFPB) in accordance with the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), respectively. The Corps is the Federal lead agency for NEPA, and the CVFPB is the California lead agency for CEQA.

The purpose of the American River Common Features (ARCF) General Reevaulation Report (GRR) project is to reduce the overall flood risk within the study area. The study area includes the city of Sacramento and surrounding areas. An unacceptably high risk of flooding from levee failure threatens the public safety of approximately 530,000 people, as well as property and critical infrastructures throughout the study area. Additionally, the State Capitol and many state agencies reside within the study area. Historic flooding events have caused loss of life and extensive economic damages. Approximately 83,000 structures throughout the study area are at risk of flooding in a 100-year event (1% annual change of flooding). This DEIS/DEIR evaluates the potential significant environmental impacts of the alternatives discussed in the ARCF GRR. If the ARCF GRR is authorized by Congress, the Corps would begin construction to implement the project.

ES.2 Purpose and Intended Uses of This DEIS/DEIR

The purpose of this DEIS/DEIR is to evaluate the potential significant environmental impacts of the alternatives proposed in the GRR. This DEIS/DEIR will be used to support Congressional approval of the ARCF GRR. The CVFPB will consider whether or not to certify the EIR and approve the ARCF GRR in late 2014. This decision will be based on numerous factors, including the potential environmental impacts and mitigation measures addressed in this DEIS/DEIR, permitting requirements, Federal and state authorizations, funding and financing mechanisms, and implementation schedule.

This DEIS/DEIR will also be used by CEQA lead agencies, such as the CVFPB and Central Valley Regional Water Quality Control Board (RWQCB), Sacramento Area Flood Control Agency (SAFCA), and trustee agencies, such as the California Department of Fish and Wildlife (CDFW), to ensure that they have met the requirements of CEQA before deciding whether to issue discretionary permits over which they have authority. It may also be used by other state, regional, and local agencies, which may have an interest in resources that could be affected by the project.

ES.3 Study Area

The proposed project is located in and around the city of Sacramento, California. Sacramento is the state capital of California, located at the confluence of the Sacramento and American Rivers in the northern portion of California's Central Valley. The Sacramento Metropolitan area, is the fourth largest in California, and includes seven counties and seven incorporated cities.

The ARFC Project area includes: (1) approximately 12 miles of the north and south banks of the American River immediately upstream from the confluence with the Sacramento River; (2) the east bank of the Natomas East Main Drainage Canal (NEMDC), Dry, Robla, and Arcade Creeks and the Magpie Creek Diversion Channel (collectively referred to as the East Side Tributaries); (3) the east bank of the Sacramento River downstream from the American River to Freeport, where the levee ties into Beach Lake Levee, the southern defense for Sacramento; and (4) the Sacramento Weir and Bypass, located along the north edge of the city of West Sacramento (Plate 2).

ES.4 Project Background

Following the 1986 flood, Congress directed the Corps to investigate additional means to reduce flood risk to the city of Sacramento. The Corps completed this investigation in 1991, recommending a concrete gravity flood detention dam at the Auburn Dam site and levee improvements downstream of Folsom Dam. Congress directed the Corps to conduct supplemental analysis of the flood management options considered in the 1991 study. The resulting *Supplemental Information Report, American River Watershed Project, California* (March 1996) recommended a similar combination of a gravity flood detention dam at the Auburn Dam site with downstream levee work. It considered, but did not advance, plans for Folsom Dam improvements and a stepped release plan for Folsom Dam accompanied by downstream levee improvements. Congress recognized that levee improvements were "common" to all candidate plans in the report and that there was a Federal interest in participating in these "common features". Thus, the ARCF Project was authorized in the Water Resources Development Act of 1996, Pub. L. No. 104-303, § 101(a)(1), 110 Stat. 3658, 3662-3663 (1996) (WRDA 1996), and the decision on Auburn Dam was deferred. Major construction components for the ARFC Project in the WRDA 1996 authorization included construction of seepage remediation along approximately 22 miles of American River levees, and levee strengthening and the raising of 12 miles of the Sacramento River levee in the Natomas Basin. Meanwhile, improvements to other levees adjacent to the Natomas Basin were authorized in the Department of Defense Appropriations Act of 1993, Pub. L. No. 102-396, § 9159, 106 Stat. 1876, 1944-46 (1992). SAFCA constructed these latter improvements between 1995 and 1998.

Under the Water Resources Development Act of 1999, Pub. L. No. 106-53, § 366, 113 Stat. 269, 319-320 (1999) (WRDA 1999), Congress authorized improvements to Folsom Dam to control a 200-year flood event with a peak release of 160,000 cfs. WRDA 1999 also authorized the Folsom Dam Modification Project to modify the existing outlets to allow for higher releases earlier in flood events. At the same time, Congress also directed the Corps to review additional modifications to the flood storage of Folsom Dam, indicating that Congress was looking at maximizing the use of Folsom Dam to reduce flood risk prior to consideration of any additional upstream storage on the American River. The Folsom Dam Raise Project was subsequently authorized by Congress in 2004.

The ARCF Project was modified by WRDA 1999 to include improvements to safely convey an emergency release of 160,000 cubic feet per second (cfs) from Folsom Dam. These improvements included construction of seepage remediation and levee raises along four stretches of the American River, and construction of levee strengthening and raising of 5.5 miles of the Natomas Cross Canal levee in Natomas. Additional construction components for both WRDA 1996 and WRDA 1999 were authorized and have been constructed by the Corps. However, the Natomas Basin features authorized in WRDA 1996 and WRDA 1999 were deferred and later analyzed in the Natomas Post Authorization Change Report (PACR). The Natomas PACR was authorized in the Water Resources Reform and Development Act (WRRDA) of 2014, Pub. L. No. 113-121, § 7002, 128 Stat. 1193, 1366 (2014).

Following the flood of 1986, significant seepage was experienced on the Sacramento River from Verona (upstream end of Natomas) at river mile (RM) 79 to Freeport at RM 45.5 and on both the north and south bank of the American River. Seepage on the Sacramento River was so extensive that soon after the 1986 flood event, Congress funded levee improvements as part of the Sacramento Urban Levee Improvement Project (Sac Urban). The Sac Urban Project constructed shallow seepage cutoff walls from Powerline Road in Natomas at approximately RM 64 down to Freeport. At the time, seepage through the levees was considered to be the only significant seepage problem affecting the levees in the Sacramento area.

After construction of the Sac Urban project, the Sacramento Valley experienced a flood event in 1997. The seepage from this event led to a geotechnical evaluation of levees in the vicinity of the city of Sacramento which showed that deep underseepage was of concern. Considerable seepage occurred on the Sacramento River as well as on the American River. Seepage on the American River was expected because levee improvements had yet to be constructed. However, the occurrence of significant seepage on the Sacramento River in the reach where levees had been improved as part of the Sac Urban project confirmed that deep underseepage was a significant concern in this area, a conclusion later confirmed by the Levee Seepage Task Force in 2003.

Following the recognition of deep underseepage as a major concern, recommendations to address seepage on the American River needed to be redesigned to address both through- and deep underseepage. The redesign led to considerable cost increases over what was originally authorized by Congress. The WRDA 1996 authorized cost of $56 million increased to $91.9 million under WRDA 1999, and to $205 million under the Energy and Water Development Appropriations Act of 2004,Pub. L. No. 108-137, § 129, 117 Stat. 1827, 1839 (2003).

Because of the considerable cost increase of levee improvements to address seepage on the American River, all funds appropriated by Congress for the project in the late 1990s and the early part of the 2000s were used for construction activities on the American River instead of for design efforts in the Natomas Basin. Combining this with the recognition that all work in the Natomas Basin would also require significantly more effort than was anticipated at the time of authorization, it was decided in 2002 that a reevaluation study would be required for at least the Natomas portion of the ARCF Project. Congress was notified in 2004 that additional authorized cost increases would be required for study, design, and construction of levee improvements in the Natomas Basin.

While the reevaluation study was beginning for the ARCF Project, the Folsom Dam PACR was being completed by the Sacramento District. The results of this study, and of the follow-on Economic Reevaluation Report for Folsom Dam improvements, showed that additional levee improvements were needed on the American River and on the Sacramento River below the confluence in order to truly capture the benefits of the Folsom Dam projects. The levee problems identified in these reports consisted primarily of the potential for erosion on the American River and seepage, stability, erosion, and height concerns on the Sacramento River below the confluence with the American River. Because of this, additional reevaluation needed to include the two remaining basins comprising the city of Sacramento: American River North and American River South.

In December 2010, the Natomas PACR and Interim GRR were completed, which focused on the problems associated with the existing levees in the Natomas Basin. The Natomas PACR and Interim GRR recommended improving levee performance by addressing seepage and stability problems, but did not address measures to raise the height of the levees. The recommendations in the Natomas PACR and Interim GRR were authorized in WRRDA 2014. The Natomas PACR and Interim GRR were accompanied by an EIS/EIR produced in compliance with NEPA and CEQA. The Natomas EIS/EIR evaluated the entire project, including levee raises. This was done so that the non-Federal partner (CVFPB and SAFCA) could move forward with implementation of the project in the event of no Federal authorization.

To date CVFPB and SAFCA have constructed levee improvements on the Natomas Cross Canal and the Sacramento River from the Natomas Cross Canal down to RM 66 (Phase 1 – Phase 4a). The Phase 4b project, which was the area covered in the Natomas PACR, Interim GRR, and the Phase 4b EIS/EIR, is currently in the design phase.

ES.5 Need for Action

The purpose of the ARCF GRR is to reduce the flood risk in the greater Sacramento area. The Sacramento Metropolitan area is one of the most at risk areas for flooding in the United States. There is a high probability that flows in either the American or Sacramento Rivers will stress the network of levees protecting the study area to the point that levees could fail. The consequences of such a levee failure would be catastrophic since the inundated area is highly urbanized and the flooding could be up to 20 feet deep.

NEPA evaluation is required when a major Federal action is under consideration and may have significant impacts on the quality of natural and human environment. The Corps has determined that the proposed project may have significant affects on the environment and, therefore, an EIS is required. The DEIS/EIR is intended to evaluate the potential significant environmental impacts of the alternatives presented in the GRR.

The Sacramento metropolitan area has a high probability of flooding due to its location at the confluence and within the floodplain of two major rivers. Both of these rivers have large watersheds with very high potential runoff which has overwhelmed the existing flood management system in the past. The existing levee system was designed and built many years ago, before modern construction methods were employed. These levees were constructed close to the river to increase velocities which would flush out hydraulic mining debris. This debris is essentially gone now and the high velocities associated with flood flows are eroding the levees, which are critical components of the flood management system needed to reduce the flood risk in the study area.

In addition to the high probability of flooding, the consequences of flooding in the study area would be catastrophic. The flooding would rapidly inundate a highly urbanized area with minimal warning or evacuation time. As the Capital of California, the Sacramento metropolitan area is the center of State government and many essential statewide services are located here. The study area is also at the crossroads of four major highway/interstate systems that would be impassable should a flood occur. The effects of flooding within the study area would be felt not only at the local level, but at the regional, State, and National level as well.

ES.6 Alternatives

ES.6.1 No Action Alternative

The No Action Alternative, under NEPA, is the expected future without-project condition. Under CEQA, the No Action Alternative is the existing condition at the time the notice of preparation was published (February 28, 2008) as modified by what would reasonably be expected to occur in the foreseeable future if the project were not approved. The No Action Alternative assumes that no work would be completed by the Corps and the study area would continue to be at a very high risk of levee failure and subsequent flooding of the Sacramento Metropolitan area. This area includes the California State Capitol and many other State and Federal Agencies.

ES.6.2 Alternative 1 – Improve Levees

Alternative 1 involves the construction of fix-in-place levee remediation measures to address seepage, slope stability, erosion, and overtopping concerns identified for the American and Sacramento River, NEMDC, Arcade, Dry/Robla, and Magpie Creek levees. A vegetation variance would be sought to allow for vegetation to remain on the lower portion of the waterside levee slope. A complete summary of the measures proposed under Alternative 1 is shown on Table ES-1 below.

ES.6.3 Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (Tentatively Selected Plan)

Alternative 2 would include all of the levee improvements discussed in Alternative 1, except levee raises along the Sacramento River would be included to a lesser extent. Instead of the full extent of levee raises, the Sacramento Weir and Bypass would be widened to divert more flows into the Yolo Bypass. The levees along the American River, NEMDC, Arcade, Dry/Robla, and Magpie Creeks, would be improved to address identified seepage, stability, erosion, and height concerns. The levees along the Sacramento River would be improved to address identified seepage, stability, and erosion concerns. A small amount of levee raising would still be required on the Sacramento River. Due to environmental, real estate, and hydraulic constraints within the study area, the majority of the levees would be fixed in place. A complete summary of the proposed measures is shown on Table ES-1 below.

Table ES-1. Proposed Measures for the ARCF Project.

Waterway/Location	Extent of Action	Proposed Measures
American River	North and south levees from the Sacramento River upstream for approximately 12 miles.	Construct bank protection or launchable rock trenches
Sacramento River	East levee from the American River to the North Beach Lake levee.	Install cutoff walls Construct bank protection Construct levee raise (Alternative 1 – 7 miles Alternative 2 – 1 mile) Construct geotextile reinforced soil embankment levee near the town of Freeport
NEMDC	East levee from Dry/Robla Creek to the American River.	Install cutoff walls Construct floodwalls
Arcade Creek	North and south levees from NEMDC to Marysville Boulevard.	Install cutoff walls Raise floodwalls Construct geotextile reinforced soil embankment levee in steep areas on the south levee
Dry/Robla Creek	All levees.	Construct floodwalls
Magpie Creek Diversion Canal	Downstream of Raley Boulevard	Raise levees
Magpie Creek area	West side of Raley Boulevard	Construct new levee Install floodgates at two properties
Magpie Creek area	East of Raley Boulevard	Acquire property to create a flood detention basin Widen the Raley Boulevard/Magpie Creek bridge and raise the elevation of the roadway Remove the Don Julio Creek culvert
Magpie Creek area	Sacramento Northern Bike Trail	Install culvert beneath bike trail embankment Excavate new channel connecting culvert to Robla Creek

Waterway/Location	Extent of Action	Proposed Measures
		Install stone erosion protection in new channel
Sacramento Weir and Bypass (Alternative 2 only)	North bypass levee to 1,500 feet north.	Widen the Sacramento Weir and Bypass by approximately 1,500 feet Construct a new section of weir and levee remove the existing Sacramento Bypass north levee

ES.7 Environmental Effects and Mitigation Measures

The affects to the human and natural environment have been considered throughout the planning phase of the study and opportunities have been evaluated to reduce affects to resources within the project area. A vegetation variance will be sought for the Sacramento River reach of the project which will allow vegetation to remain on the lower one third of the waterside levee slope. The waterside vegetation on the Sacramento River is valuable Shaded Riverine Aquatic (SRA) habitat for many State- and Federally listed fish species and State-listed Swainson's hawk. Because the ARCF GRR alternatives would affect Federally listed fish species, consultation under Section 7 of the Endangered Species Act (ESA) is required with the National Marine Fisheries Service (NMFS). Additionally, during the next phase of the project, design refinements will minimize affects to the American River Parkway where feasible.

A summary of the environmental commitments coordinated with the U.S. Fish and Wildlife Service (USFWS), NMFS, and CDFW, is included in the following paragraph. In addition, Table ES-2 at the end of this section includes a full summary of the expected environmental effects that could result from implementation of the proposed alternatives, and the measures proposed to avoid, minimize, or mitigate for those effects.

A biological assessment has been prepared and coordinated with the resource agencies (Appendix G). Section 7 consultation has been on-going as part of the ARCF GRR. The biological assessment is being sent to both USFWS and NMFS upon release of this DEIS/DEIR to initiate consultation. A biological opinion has not been issued by USFWS or NMFS at this time, however a biological opinion will be required prior to release of the final EIS/EIR.

This project is being coordinated with USFWS under the Fish and Wildlife Coordination Act (the draft Fish and Wildlife Coordination Act Report (CAR) is included as Appendix A). Mitigation recommended in the CAR for the Tentatively Selected Plan is included in Table ES-2 which displays the potential impacts and mitigation proposed for each alternative. This mitigation reflects the recommendations presented in the Draft CAR, and has been coordinated with USFWS, NMFS, and CDFW.

A significant and unavoidable impact is one that would result in a substantial or potentially substantial adverse effect on the environment and that could not be reduced to a less-than-significant level even with implementation of applicable feasible mitigation.

Table ES-2. Environmental Impacts and Proposed Mitigation/Compensation for the ARCF GRR.

Habitat Type	Potential Impacts	Duration of Impact	Mitigation/Compensation (Acres/Linear Feet)
Alternative 1 Improve Levees[1]			
Riparian	157 Acres	Permanent	300 Acres
Grasslands	2.5 Acres	Single Construction Season	Restore 2.5 Acres
Shaded riverine aquatic habitat (ESA fish species)	100,000 Linear Feet	Single Construction Season	100,000 Linear Feet Self Mitigating with on-site planting[2]
Elderberry Shrubs Transplants	263 Shrubs	Permanent	108 Acres
Alternative 2 Improve Levees and Widen the Sacramento Weir and Bypass[1]			
GGS Rice Fields	300 Acres	Permanent	620 Acres
Riparian	118 Acres	Permanent	250 Acres
Grasslands	2.5 Acres	Single Construction Season	Restore 2.5 Acres
Shaded riverine aquatic habitat (ESA fish species)	100,000 Linear Feet	Single Construction Season	100,000 Linear Feet Self Mitigating with on-site planting[2]
Elderberry Shrubs	215 Shrubs	Permanent	94 Acres

Notes: [1] Assumes vegetation variance is granted for Sacramento River waterside levee compliance and a SWIF for the landside
[2] The SRA habitat being impacted would be minimal due to the assumed approval of a vegetation variance. Trees providing SRA will be left in place and the sites will be planted with an approved planting pallet that provides additional SRA habitat once established.

ES.8 Cumulative Impacts

Cumulative impacts associated with the proposed alternatives are summarized in Table ES-4 below.

ES.9 Areas of Controversy and Unresolved Issues

Based on the comments received during the public scoping period and the history of the NEPA and CEQA processes undertaken by the Corps, CVFPB, and SAFCA, the major areas of public controversy associated with the project area:

- Temporary construction related effects on residents and businesses adjacent to the project levees.
- Construction related impacts on cultural and biological resources.
- Vegetation and tree removal.
- Impacts to recreation facilities.
- Impacts to endangered species and their habitat.
- Conversion of private property to flood risk management features.

ES.10 Public Involvement

The Corps published the notice of intent (NOI) to prepare the ARCF GRR EIS in the Federal Register (Vol. 73, No. 41) on February 29, 2008. A series of public scoping meetings were held in March 2008 to present information to the public and to receive public comments on the scope of the EIS. There is no mandated time limit to receive written comments in response to the NOI under NEPA. Appendix F contains the NOI, the one comment letter received in 2008, and copies of the posters for the March 2008 scoping meetings.

The Central Flood Protection Board published the notice of preparation (NOP) to prepare the ARCF GRR EIR with the State of California Clearinghouse on February 27, 2008. The public comment period extended for 30 days until March 28, 2008. A copy of the NOP is included in Appendix F.

This DEIS/DEIR will be circulated for a 45 day public review period to Federal, State, and Local agencies, organizations, and individuals who have an interest in the project. A notice of availability of the DEIS/DEIR will be published in the Federal Register and local newspaper circulation when the document is released for public review. Public workshops will be held during the review period to provide additional opportunities for comments on the draft document. Public notices will be sent providing public workshop details. All comments received during the public review period will be considered and incorporated into the final EIS/EIR, as appropriate. A comment and response appendix will be included with the final document.

ES.11 Tentatively Selected Plan

Alternative 2, Improve Levees and Widen the Sacramento Weir and Bypass has been identified as the Tentatively Selected Plan (TSP). This alternative would include widening the Sacramento Weir and Bypass to divert more flows into the Yolo Bypass and alleviate the need for most of the raises along the Sacramento River downstream of the bypass. This alternative would also include the levee improvements identified in Alterative 1, namely the construction of levee improvement measures to address seepage, stability, and erosion, identified for the Sacramento River, NEMDC, Arcade, Dry/Robla, and Magpie Creeks. Alternative 2 would also include erosion measures for specific locations along the American River.

The TSP is also the least environmentally damaging alternative as it results in less riparian habitat removal along the Sacramento River. Additionally, habitat could be created in the expanded Sacramento Bypass. The exact location and amount of habitat to be created in the expanded Bypass would be evaluated during the design phase of the project.

Table ES.3 Summary of Environmental Effects and Mitigation Measures.

	No Action Alternative	**Alternative 1 – Improve Levees**	**Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (TSP)**
Land Use			
Effect	Inconsistent with local land use policies to protect existing urban area.	Acquisition of properties for flood control easements along the Sacramento River and Arcade Creek.	Acquisition of properties for flood control easements along the Sacramento River and Magpie Creek. Conversion of agricultural lands to floodway.
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None required.	Federal Relocation Act compliance. Payment of Sacramento County Habitat Restoration Program fees in the American River Parkway.	Federal Relocation Act compliance. Payment of Sacramento County Habitat Restoration Program fees in the American River Parkway.
Hydrology and Hydraulics			
Effect	Emergency repairs during a flood event could result in the loss of channel capacity and alternation of current geomorphic processes.	No effect.	Reduce water surface elevation in the Sacramento River downstream of the confluence of the American River without significantly increasing water surface elevation in the Yolo Bypass downstream of the confluence of the Sacramento Bypass.
Significance	Significant.	Not applicable.	Less than significant.
Mitigation	None possible.	Not applicable.	None required.
Water Quality			
Effect	In a flood event, there is high risk of contaminants entering the water from utilities, stored chemicals, septic systems, and flooded vehicles. In addition, flood flows would increase bank erosion,	Potential impacts include increased turbidity during bank protection construction, runoff of exposed soils, and cement, slurry, or fuel spills during construction.	Potential impacts include increased turbidity during bank protection construction, runoff of exposed soils, and cement, slurry, or fuel spills during construction.

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (TSP)
	increasing turbidity in the waterways.		
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None possible.	Preparation of a Stormwater Pollution. Protection Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan. Implementation of BMPs listed in Section 3.5.6.	Preparation of a Stormwater Pollution. Protection Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan. Implementation of BMPs listed in Section 3.5.6.
Vegetation and Wildlife			
Effect	Erosion during a flood event could cause significant vegetation loss and wildlife habitat loss. Flood fighting activities could prevent future vegetation growth on river banks.	Construction of levee improvements and vegetation removal would result in significant loss of vegetation and wildlife habitat on the landside of the Sacramento River levees, in the American River Parkway, and along Arcade Creek.	Construction of levee improvements and vegetation removal would result in significant loss of vegetation and wildlife habitat on the landside of the Sacramento River levees, in the American River Parkway, and along Arcade Creek. Construction of the Sacramento Weir extension would require the removal of riparian vegetation. Widening of the Sacramento Weir and Bypass would result in a reduced affect to landside vegetation.
Significance	Significant.	Significant.	Significant.
Mitigation	Compensation would likely occur after the fact, but there would still be significant direct impacts due to the temporal loss of vegetation.	When possible, in-kind compensation would be planted on planting berms, on top of launchable rock trenches, or on other lands within the Parkway. Additional mitigation sites are identified in Section 3.6.6.	When possible, in-kind compensation would be planted on planting berms, on top of launchable rock trenches, or on other lands within the Parkway. A hydraulic evaluation will be conducted to determine whether mitigation could occur in the Sacramento Bypass. Additional mitigation sites are identified in Section 3.6.6.

	No Action Alternative	**Alternative 1 – Improve Levees**	**Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (TSP)**
Fisheries			
Effect	Flood fighting could prevent growth of vegetation on levee slopes, and increase turbidity, thus impacting migration, spawning, or rearing habitat.	Indirect effects to fish habitat from the removal of vegetation from the levee slopes. Direct effects from the placement of rock at bank protection sites, causing an increase in turbidity.	Indirect effects to fish habitat from the removal of vegetation from the levee slopes. Direct effects from the placement of rock at bank protection sites, causing an increase in turbidity. Widening the Sacramento Bypass creates floodplain, which could provide a benefit to fish species.
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	Compensation would likely occur after the fact, but there would still be significant direct impacts due to the temporal loss of vegetation.	Vegetation variance would allow waterside vegetation to remain on the lower one-third of the waterside slope along the Sacramento River. Bank protection sites and launchable rock trenches would be revegetated following construction. BMPs would be implemented to address turbidity, and are discussed in Section 3.5.6.	Vegetation variance would allow waterside vegetation to remain on the Sacramento River. Bank protection sites and launchable rock trenches would be revegetated following construction. BMPs would be implemented to address turbidity, and are discussed in Section 3.5.6.
Special Status Species			
Effect	Flood event or flood fight could cause loss of habitat and fatality to species.	Direct affects to Giant Garter Snake (GGS), Fish Species, and Swainson's Hawks during construction. Indirect effects due to loss of habitat. Vegetation Variance for the waterside levee slopes would significantly limit the effects to endangered fish species.	Direct affects to GGS, Fish Species, and Swainson's Hawks during construction. Indirect effects due to loss of habitat. Vegetation Variance for the waterside levee slopes would significantly limit the effects to endangered fish species.
Significance	Significant.	Less than Significant with mitigation	Less than Significant with mitigation
Mitigation	None proposed.	Replace habitat for species either on-site or in close proximity to lost habitat. Implement BMPs discussed in Section	Replace habitat for species either on-site or in close proximity to lost habitat. Implement BMPs discussed in Section

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (TSP)
		3.5.6 during construction to prevent mortality.	3.5.6 during construction to prevent mortality.
Cultural Resources			
Effect	Damage to historic and prehistoric resources during a flood event.	Adverse effects to historic properties from construction of levee improvements.	Adverse effects to historic properties from construction of levee improvements and the bypass widening.
Significance	Potentially significant.	Less than significant with mitigation under NEPA. Significant and unavoidable under CEQA.	Less than significant with mitigation under NEPA. Significant and unavoidable under CEQA.
Mitigation	None possible.	Preparation and implementation of a Programmatic Agreement, Historic Properties Management Plan, and Historic Properties Treatment Plans.	Preparation and implementation of a Programmatic Agreement, Historic Properties Management Plan, and Historic Properties Treatment Plans.
Transportation and Circulation			
Effect	Potential for flooded roadways in a flood event. Damage to roadways from flooding and clean-up. Flood clean-up would create large volumes of truck traffic to remove flood debris.	Increased traffic on public roadways.	Increased traffic on public roadways.
Significance	Significant.	Significant.	Significant.
Mitigation	None possible.	Preparation of a Traffic Control and Road Management Plan and other BMPs listed in Section 3.10.6.	Preparation of a Traffic Control and Road Management Plan and other BMPs listed in Section 3.10.6.
Air Quality			
Effect	Increased emissions during flood fighting activities without BMPs in place. Increased emissions during clean-up and reconstruction of the urban	Emissions of criteria pollutants from construction equipment, haul trucks, and barges.	Emissions of criteria pollutants from construction equipment, haul trucks, and barges.

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (TSP)
	area including; homes, businesses, public facilities.		
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None possible.	Implementation of SMAQMD's Basic Construction Emission Control Practices and other BMPs, as listed in Section 3.11.6.	Implementation of SMAQMD's Basic Construction Emission Control Practices and other BMPs, as listed in Section 3.11.6.
Climate Change			
Effect	Increased GHG emissions during flood fighting activities without BMPs in place. Increased GHG emissions caused by clean-up efforts from a flood event.	Increased GHG emissions from construction equipment, haul trucks, and barges.	Increased GHG emissions from construction equipment, haul trucks, and barges.
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None possible.	Implementation of SMAQMD's Basic Construction Emission Control Practices and other BMPs, as listed in Section 3.12.6.	Implementation of SMAQMD's Basic Construction Emission Control Practices and other BMPs, as listed in Section 3.12.6.
Noise			
Effect	Increased noise during flood fighting.	Increased noise in proximity to sensitive receptors due to construction activities.	Increased noise in proximity to sensitive receptors due to construction activities.
Significance	Less than significant.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	Not applicable.	Coordination with local residents, compliance with noise ordinances, and other BMPs, as listed in Section 3.13.6.	Coordination with local residents, compliance with noise ordinances, and other BMPs, as listed in Section 3.13.6.
Recreation			
Effect	Damage to recreation facilities, particularly in the Parkway, would be impacted by flooding and potentially loss due to erosion.	Temporary closure of recreation facilities in the American River Parkway during construction, including bike trail, walking trails, and boat launches.	Temporary closure of recreation facilities in the American River Parkway during construction, including bike trail, walking trails, and boat launches. Possible closure of the Sacramento Bypass during portions

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (TSP)
			of hunting season.
Significance	Significant.	Significant.	Significant.
Mitigation	None possible.	Notification and coordination with recreation users and bike groups. Flaggers, signage, detours, and fencing to notify and control recreation access and traffic around construction sites.	Notification and coordination with recreation users and bike groups. Flaggers, signage, detours, and fencing to notify and control recreation access and traffic around construction sites.
Aesthetics and Visual Resources			
Effect	A flood event would damage the visual character in the study area.	Vegetation loss and construction activities would disrupt the existing visual conditions in the Parkway and along the Sacramento River.	Vegetation loss and construction activities would disrupt the existing visual conditions in the Parkway and along the Sacramento River.
Significance	Significant.	Significant.	Significant.
Mitigation	None possible.	Trees would be planted after construction is completed on planting berms and on top of launchable rock trenches, however there would still be a temporal loss of vegetation. Disturbed areas would be reseeded with native grasses.	Trees would be planted after construction is completed on planting berms and on top of launchable rock trenches, however there would still be a temporal loss of vegetation. Disturbed areas would be reseeded with native grasses.
Public Utilities and Services			
Effect	In a flood event there could be significant damage to utility systems. Debris from flooded homes and properties could overwhelm solid waste disposal facilities.	Temporary disruptions to utility services possible, particularly during relocation of utilities that penetrate the levee.	Temporary disruptions to utility services possible, particularly during relocation of utilities that penetrate the levee.
Significance	Significant.	Less than significant.	Less than significant.
Mitigation	None possible.	Notification of potential interruptions would be provided to the appropriate agencies and to landowners.	Notification of potential interruptions would be provided to the appropriate agencies and to landowners.
Hazardous, Toxic, and Radiological Wastes			

	No Action Alternative	**Alternative 1 – Improve Levees**	**Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (TSP)**
Effect	Flooding could release potential household chemicals and cause damage to sewage treatment plants.	No effect from construction activities. HTRW sites encountered would be removed and properly disposed of prior to construction.	No effect from construction activities. HTRW sites encountered would be removed and properly disposed of prior to construction, including the Old Bryte Landfill.
Significance	Significant	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None Possible.	Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.	Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.
Socioeconomics, Population, and Environmental Justice			
Effect	Flooding of residential areas and displacement of populations during a flood event. Flooding of the State Capitol's government centers also possible.	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for flood control easements.	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for flood control easements.
Significance	Significant.	Less than significant.	Less than significant.
Mitigation	None possible.	Federal Relocation Act compliance.	Federal Relocation Act compliance.

Table ES-4. Summary of Potential Cumulative Effects and Mitigation

Resource	Effect	Significance	Mitigation
Water Quality	Regional water quality could be diminished by construction of multiple projects at the same time.	Less than significant.	Implementation of Best Management Practice (BMP'S) on all active construction projects would reduce the risk of effects to water quality.
Vegetation and Wildlife	Multiple projects could impact vegetation and wildlife through the removal of vegetation and wildlife habitat during construction.	Significant.	All projects would implement their own mitigation measures, however, the temporal loss of vegetation and wildlife habitat would remain a significant effect until the time when compensatory planting have fully matured.
Fisheries	Multiple projects could affect fish habitat through construction of bank protection sites and the removal of vegetation to comply with the Engineering Technical Letter (ETL) 1110-2-583.	Less than significant with mitigation.	While there would be a short-term effect to vegetation, any projects removing vegetation would be required to provide compensatory plantings, including planting berms in the bank protection sites, when feasible. In addition, some projects, such as the Folsom Dam Water Control Manual Update, could potentially benefit fish migration and spawning. Overall, these projects should provide a cumulative net benefit to fish species.
Special Status Species	Multiple projects could affect endangered species through construction occurring at the same time. Additionally, if multiple projects remove habitat at the same time the temporal loss could be larger due to duration a greater area would take to establish and provide similar value to that removed.	Significant.	All projects would implement their own mitigation measures, however, the temporal loss of habitat would remain a significant effect until the time when compensatory planting have fully matured. There is potential for the multiple projects to combine mitigation in a single location which could provide cost savings and higher value habitat for listed species.

Table ES-4. Summary of Potential Cumulative Effects and Mitigation

Resource	Effect	Significance	Mitigation
Cultural Resources	Multiple projects would likely impact cultural resources in a manner consistent with the ARCF project.	Less than significant with mitigation.	Each project would be expected to implement mitigation, such as preparation and implementation of a Programmatic Agreement, Historic Properties Management Plan, and Historic Properties Treatment Plans.
Transportation and Circulation	None of the related projects are anticipated to be in close enough proximity to the ARCF construction sites to cause a cumulative effect.	No effect.	None required.
Air Quality	Construction of multiple projects at the same time that result in emissions of criteria pollutants would cause a regional cumulative effect.	Significant.	Each project would be coordinating with the local air quality management district to ensure that project emissions comply with Federal, State, and local thresholds. The Corps would ensure that construction sites in close proximity, such as ARCF and West Sacramento, would not be constructing adjacent sites at the same time.
Climate Change	Construction of multiple projects at once could result in cumulative GHG emissions above the reporting requirements.	Less than significant with mitigation.	Each project would be required to implement mitigation measures to reduce GHG emissions to less than significant. In addition, flood risk management projects would reduce potential future emissions from flood fighting and emergency activities.
Noise	None of the related projects are anticipated to be in close enough proximity to the ARCF construction sites to cause a cumulative effect.	No effect.	None required.

Table ES-4. Summary of Potential Cumulative Effects and Mitigation

Resource	Effect	Significance	Mitigation
Recreation	None of the related projects are anticipated to be in close enough proximity to the ARCF construction sites to cause a cumulative effect.	No effect.	None required.
Visual Resources	Construction of multiple projects along the waterways in the Sacramento region would result in a cumulative impact to visual resources due to the removal of vegetation along these waterways and disturbance from construction activities.	Significant.	Each project would implement mitigation measures to assist with the revegetation in the region. Disturbed areas would be reseeded with native grasses following construction. Regardless, there would be a short-term significant effect.

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ACRONYMS AND ABBREVIATIONS

ACE	annual chance of exceedance
ACHP	Advisory Council on Historic Preservation
AEP	annual exceedance probability
APE	area of potential effect
APN	assessor parcel number
ARCF	American River Common Features
ARFCD	American River Flood Control District
BAAQMD	Bay Area Air Quality Management District
BACT	best available control technology
BDCP	Bay Delta Conservation Plan
BMPs	best management practices
BO	biological opinion
BOD	biochemical oxygen demand
BP	before present
BSSCP	bentonite slurry spill contingency plan
°C	degrees Celsius
CAR	Coordination Act Report
CAA	Federal Clean Air Act
CAAQS	California ambient air quality standards
CalTrans	California Department of Transportation
CARB	California Air Resources Board
CDC	California Department of Conservation
CDEC	California Data Exchange Center
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CH_4	methane
CHP	California Highway Patrol
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
CVFPB	Central Valley Flood Protection Board
CVFPP	Central Valley Flood Protection Plan
CVP	Central Valley Project
Corps	United States Army Corps of Engineers
County Parks	Sacramento County Department of Parks and Recreation
CSUS	California State University, Sacramento
CWA	Clean Water Act
cy	cubic yards

dB	decibel
dBA	A-weighted decibel
DEIS/EIR	draft environmental impact statement/environmental impact report
DO	dissolved oxygen
DPM	diesel particulate matter
DPS	distinct population segment
DSM	deep soil mixing
DTSC	California Department of Toxic Substance Control
DWR	California Department of Water Resources
EC	electrical conductivity
EFH	essential fish habitat
EIS/EIR	environmental impact statement/environmental impact report
EO	executive order
ESA	Endangered Species Act
ETL	Engineering Technical Letter
°F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Maps
FRAQMD	Feather River Air Quality Management District
FWCA	Fish and Wildlife Coordination Act
GGS	giant garter snake
GHG	greenhouse gas
GRR	general reevaluation report
HPMP	Historic Properties Management Plan
HPTP	Historic Properties Treatment Plan
HRP	habitat restoration program
HTRW	hazardous, toxic, or radioactive waste
I-5	Interstate 5
I-80	Interstate 80
IPCC	Intergovernmental Panel on Climate Change
IWM	instream woody material
JFP	Joint Federal Project
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
lf	linear feet
LMA	local maintaining agency
L_{max}	maximum sound level
L_{min}	minimum sound level
LOS	level of service
L_{xx}	exceedance sound level (xx = percentage of sound)
M	magnitude
MIAD	Mormon Island Auxiliary Dam
MOA	memorandum of agreement
NAAQS	national ambient air quality standards
NCIC	North Central Information Center
NEMDC	Natomas East Main Drainage Canal

NEPA	National Environmental Policy Act
NF_3	nitrogen trifluoride
NFIP	National Flood Insurance Program
NGA	Next Generation Attenuation
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NO_x	nitric oxide
NO_2	nitrogen dioxide
NOA	naturally occurring asbestos
NOI	notice of intent
NOP	notice of preparation
N_2O	nitrous oxide
NPDES	National Pollution Discharge Elimination System
NRCS	U.S. National Resources Conservation Service
NRHP	National Register of Historic Places
NTUs	nephelometric turbidity units
O_3	ozone
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
PA	programmatic agreement
PACR	post authorization change report
Parkway	American River Parkway
pB	lead
PCB	polychlorinated biphenyl
PG&E	Pacific Gas and Electric Company
pH	potential of hydrogen
Phase 1 ESA	Phase 1 Environmental Site Assessment
$PM_{2.5}$	fine particulate matter
PM_{10}	inhalable particulate matter
ppm	parts per million
ppt	parts per thousand
ppv	peak particle velocity
PRC	California Public Resources Code
PSHA	Probabilistic Seismic Hazard Analysis
RCEM	SMAQMD Road Construction Emissions Model
RM	river mile
ROD	record of decision
ROG	reactive organic gases
RWQCB	Central Valley Regional Water Quality Control Board
SAFCA	Sacramento Area Flood Control Agency
SAM	Standard Assessment Methodology
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Officer
SIP	state implementation plan
SMAQMD	Sacramento Metropolitan Air Quality Management District
SMARA	Surface Mining and Reclamation Act of 1975
SMUD	Sacramento Municipal Utility District

SO_2	sulfur dioxide
SPCCP	Spill Prevention Control and Countermeasures Plan
SRA	Shaded Riverine Aquatic (habitat)
SRBPP	Sacramento River Bank Protection Project
SRCSD	Sacramento Regional County Sanitation District
SRFCP	Sacramento River Flood Control Project
SVAB	Sacramento Valley Air Basin
SWA	Sacramento Regional Solid Waste Authority
SWIF	System Wide Improvement Framework
SWP	State Water Project
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	California State Water Resources Control Board
TAC	toxic air contaminates
TCP	traditional cultural properties
TDS	total dissolved solids
TMDL	total maximum daily load
TSP	tentatively selected plan
TSS	total suspended solids
UC Davis	University of California, Davis
UPRR	Union Pacific Railroad
U.S. 50	U.S. Highway 50
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
VELB	valley elderberry longhorn beetle
WCM	water control manual
WRDA	Water Resources Development Act
WRRDA	Water Resources Reform and Development Act
YSAQMD	Yolo-Solano Air Quality Management District

1.0 INTRODUCTION

This document is a joint draft environmental impact statement/draft environmental impact report (DEIS/DEIR) prepared by the U.S. Army Corps of Engineers (Corps), Sacramento District as the Federal Lead Agency under the National Environmental Policy Act (NEPA) and the State of California Central Valley Flood Protection Board (CVFPB) as the State Lead Agency under the California Environmental Quality Act (CEQA). The Sacramento Area Flood Control Agency (SAFCA) is the local sponsor and has a Local Cooperation Agreement with the CVFPB.

This DEIS/DEIR has been prepared to evaluate the potential environmental impacts of the alternatives proposed in the American River Common Features Project General Reevaluation Report (ARCF GRR). This document evaluates project alternatives, and includes mitigation measures to reduce, minimize, or avoid, where feasible, any significant and potentially significant adverse impacts.

1.1 Scope of the Environmental Analysis

The ARCF GRR is being prepared by the Corps to consider the level of Federal participation in flood risk management for the Sacramento Metropolitan area. This DEIS/DEIR will analyze the environmental effects of the proposed alternatives using the largest footprint that is expected to be constructed. While it is not anticipated, if the level of significance changes during the design refinements phase, additional NEPA and CEQA documentation will be completed to disclose these changes.

The alternatives being analyzed assume a vegetation variance would be obtained for the lower one half of the waterside levee slope on all waterways. This would allow vegetation to remain in place unless required for construction. Additionally, the No Action alternative assumes that the non-Federal sponsor would prepare a System Wide Implementation Framework (SWIF) to bring the levees into compliance with Corps' Engineer Technical Letter (ETL) 1110-2-583 Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures over the next 20 to 40 years. The SWIF involves committing to an approach for addressing operation and maintenance (O&M) issues in the levee system, including vegetation and other encroachments impacting the levees. Details of the alternatives are presented in Section 2.0 Alternatives below.

1.2 Project Location and Study Area

1.2.1 Project Location

The project is located in Sacramento, California. Sacramento is the state capital, located at the confluence of the Sacramento and American Rivers in the northern portion of California's Central Valley. The fourth largest metropolitan area in California, the Sacramento Metropolitan area includes six counties (Sacramento, El Dorado, Placer, Sutter, Yolo, and Yuba) and seven incorporated cities (Sacramento, Rancho Cordova, Elk Grove, Roseville, Citrus Heights, Rocklin, and Folsom).

The project area includes the lower portion of the Sacramento and American River Watersheds. The Sacramento River Watershed covers approximately 27,000 square miles in northern California. Major tributaries of the Sacramento River include the Feather, Yuba, and American Rivers. The American River Watershed covers about 2,100 square miles northeast of the city of Sacramento and includes portions of Placer, El Dorado, Alpine, and Sacramento counties. The American River watershed includes Folsom Dam and Reservoir; inflowing rivers and streams, including the North, South, and Middle forks of the American River; and the American River downstream to its confluence with the Sacramento River in the city of Sacramento. The Sacramento and American Rivers, in the Sacramento area, form a flood plain covering roughly 110,000 acres at their confluence. The flood plain includes most of the developed portions of the city of Sacramento. Plate 1 shows the American and Sacramento River watersheds.

1.2.2 Study Area

The ARCF Project study area includes: (1) approximately 12 miles of the north and south banks of the American River immediately upstream from the confluence with the Sacramento River; (2) the east bank of the Natomas East Main Drainage Canal (NEMDC), Pleasant Grove Creek Canal, Dry, Robla, and Arcade Creeks and the Magpie Creek Diversion Channel (collectively referred to as the East Side Tributaries); (3) the east bank of the Sacramento River downstream from the American River to Freeport where the levee ties into Beach Lake Levee, and (4) the Sacramento Weir and Bypass, located along the north edge of the city of West Sacramento in Yolo County, California (Plate 2).

Within the greater study area, there are three subbasins that are defined by either levees or high ground: (1) the American River North Basin; (2) the American River South Basin; and (3) the Natomas Basin. These basins are described in greater detail below and shown on Plate 2. The Sacramento Bypass is an additional geographic area under analysis, and is described separately below. For the purposes of the impact analyses in Chapter 3, the majority of the resources will be discussed by the waterways described in the paragraph above.

American River North Basin

This basin is located east of Natomas and north of the American River, and includes the North Sacramento and Arden Arcade areas of Sacramento. The levees in this basin include the north bank of the American River, the east bank of the NEMDC, Arcade Creek, the Dry/Robla Creek basin, and the Magpie Creek Diversion Channel.

American River South Basin

This basin is located south of the American River. It is bounded by the American River to the north and the Sacramento River to the west. The Downtown Sacramento, Land Park-Pocket-Meadowview, East Sacramento, South Sacramento, and Rancho Cordova areas are included in this basin.

Sacramento Bypass

The Sacramento Bypass is located in Yolo County approximately 4 miles west of Sacramento along the northern edge of the city of West Sacramento. The Sacramento Weir runs along the west bank of the Sacramento River and separates the river from the Bypass. The Sacramento Bypass is located in a rural area owned by the State of California and operated as the Sacramento Bypass Wildlife Area.

1.3 Background and History of the American River Common Features Project

Following the 1986 flood, Congress directed the Corps to investigate additional means to reduce flood risk to the city of Sacramento. The Corps completed this investigation in 1991, recommending a concrete gravity flood detention dam at the Auburn Dam site and levee improvements downstream of Folsom Dam. Congress directed the Corps to conduct supplemental analysis of the flood management options considered in the 1991 study. The resulting *Supplemental Information Report, American River Watershed Project, California* (March 1996) recommended a similar combination of a gravity flood detention dam at the Auburn Dam site with downstream levee work. It considered, but did not advance, plans for Folsom Dam improvements and a stepped release plan for Folsom Dam accompanied by downstream levee improvements. Congress recognized that levee improvements were "common" to all candidate plans in the report and that there was a Federal interest in participating in these "common features". Thus, the American River Common Features Project was authorized in the Water Resources Development Act (WRDA) of 1996, Pub. L. No. 104-303, §101(a)(1), 110 Stat. 3658, 3662-3663 (1996), and the decision on Auburn Dam was deferred. Major construction components for ARFC Project included construction of seepage remediation along approximately 22 miles of American River levees, and levee strengthening and the raising of 12 miles of the Sacramento River levee in the Natomas Basin (Table 1). Meanwhile, improvements to other levees adjacent to the Natomas Basin were authorized in the Department of Defense Appropriations Act of 1993, Pub. L. No. 102-396, § 9159, 106 Stat. 1876, 1944-1946 (1992). SAFCA constructed these latter improvements between 1995 and 1998.

In WRDA 1999, Pub. L. No. 106-53, § 366, 113 Stat. 269, 319-320 (1999), Congress authorized improvements to Folsom Dam to control a 200-year flood event with a peak release of 160,000 cfs. WRDA 1999 also authorized the Folsom Dam Modification Project to modify the existing outlets to allow for higher releases earlier in flood events, WRDA 1999, Pub. L. No. 106-53, § 366, 113 Stat. 269, 319-320 (1999). At the same time, Congress also directed the Corps to review additional modifications to the flood storage of Folsom Dam, indicating that Congress was looking at maximizing the use of Folsom Dam to reduce flood risk prior to consideration of any additional storage on the American River. The Folsom Dam Raise Project was subsequently authorized by Congress in 2003. EWDAA 2004, Pub. L. No. 108-137, § 129, 121 Stat. 1844, 1947 (2003)

The ARCF Project was modified by WRDA 1999 to include improvements to safely convey an emergency release of 160,000 cubic feet per second (cfs) from Folsom Dam. These improvements included construction of seepage remediation and levee raises along four stretches of the American River, and construction of levee strengthening and raising of 5.5 miles of the Natomas Cross Canal levee in Natomas. Additional construction components for both WRDA 1996 and 1999 were authorized, but are not described here.

Construction will be completed on all of the American River levee features authorized in WRDA 1996 and WRDA 1999 by fall 2015, with the exception of the Natomas features. The Natomas features were deferred for further analysis, and are further discussed below. Design and construction of the WRDA 1996 and WRDA 1999 sites were conducted through a Project Cooperation Agreement with the California Reclamation Board (now known as the Central Valley Flood Protection Board [CVFPB]), which was executed on July 13, 1998. Cost sharing for these features is 75% Federal and 25% non-Federal.

In February 1986, a series of storms led to severe flooding in central and northern California. In many areas, precipitation from this 10-day storm delivered more than half of the normal annual precipitation for the area. The Sacramento River flood control system was overloaded and reservoirs in the system were filled beyond their design capacity. Record flow releases from the reservoirs produced river flows that exceeded the design capacity of downstream levees: water came within inches of overtopping levees protecting Sacramento. The timely cessation of the storm event prevented overtopping of the American River levees. At the runoff peak, an estimated 650,000 cfs flowed past the Sacramento metropolitan area into either the Sacramento River or Yolo Bypass and out to the Sacramento Delta.

Emergency levee work and flood fighting prevented catastrophic flooding. However, the extended high water caused boils, slips, sloughing, seepage, flood flow erosion, and wave erosion that required emergency work to minimize or prevent further damage during the flood. Several levees upstream from Sacramento failed during this flood. At the conclusion of the storm, the Governor declared emergencies in 39 counties, with damages totaling more than $500 million. Sacramento County had damages estimated at $49 million (1986 dollars).

Following the flood of 1986, significant seepage was experienced on the Sacramento River from Verona (upstream end of Natomas) at River Mile (RM) 79 to Freeport at RM 45.5 and on both the north and south bank of the American River. Seepage on the Sacramento River was so extensive that soon after the 1986 flood event, Congress funded remediation in the Sacramento Urban Levee Improvement Project (Sac Urban). The Sac Urban Project constructed shallow seepage cutoff walls from Powerline Road in Natomas at approximately RM 64 down to Freeport. At the time, seepage through the levees was considered to be the only significant seepage problem affecting the levees in the Sacramento area.

After construction of the Sac Urban project, the Sacramento Valley experienced a flood event in 1997. The seepage from this event led to a geotechnical evaluation of levees in the vicinity of the city of Sacramento which showed that deep underseepage was of concern. Considerable seepage occurred on the Sacramento River as well as on the American River. Seepage on the American River was expected because remediation had yet to be constructed. However, the occurrence of significant seepage on the Sacramento River in the reach remediated as part of the Sac Urban project confirmed that deep underseepage was a significant concern in this area, a conclusion later confirmed by the Levee Seepage Task Force in 2003.

Following the recognition of deep underseepage as a major concern, seepage remediation on the American River needed to be redesigned to remediate both through and deep underseepage. The redesign led to considerable cost increases over what was originally authorized by Congress. The WRDA 96 authorized cost of $56 million increased to $91.9 million under WRDA 1999, and again increased to $205 million under the Energy and Water Development Appropriations Act of 2004 (Pub. L. 108-137).

Because of the considerable cost increase of seepage remediation on the American River, all funds appropriated by Congress for the project in the late 1990s and the early part of the 2000s were used for construction activities on the American River instead of for design efforts in the Natomas Basin. Combining this with the recognition that all work in the Natomas Basin would also require significantly more effort than was anticipated at the time of authorization, it was decided in 2002 that a reevaluation study would be required for at least the Natomas portion of the ARFC Project. Congress was notified in 2004 that additional authorized cost increases would be required for study, design, and construction of levee improvements in the Natomas Basin.

While the reevaluation study was beginning for the ARFC Project, the Folsom Dam Post Authorization Change Report (PACR) was being completed by the Sacramento District. The results of this study, and of the follow-on Economic Reevaluation Report for Folsom Dam improvements, showed that additional levee improvements were needed on the American River and on the Sacramento River below the American River in order to truly capture the benefits of the Folsom Dam projects. These levee problems consisted primarily of erosion concerns on the American River and seepage, stability, erosion, and height problems on the Sacramento River below the confluence with the American River. However, the full extent of these levee problems was not known. Because of this, it was realized that additional reevaluation studies were also needed to include the two remaining basins comprising the city of Sacramento: American River North and American River South. The reevaluation was begun in 2006. The reevaluation of American and Sacramento River levees began in 2006, non-federal interests initiated the Natomas Levee Improvement Program to address severe seepage, underseepage, erosion and levee overtopping issues affecting the levees protecting the Natomas Basin. This non-federal program involving improvements to approximately 18 miles of the basin's 42 mile perimeter levee system was permitted by the Corps under a series of Section 408 permissions and was substantially completed by the non-federal partners in 2012.

In December 2010, the Natomas Basin PACR and Interim GRR were completed, which focused on the problems associated with the existing levees in the Natomas Basin. The Natomas PACR and Interim GRR recommended improving levee performance by addressing seepage and stability problems. The recommendations included in the Natomas PACR and Interim GRR were authorized by the Water Resources Reform and Development Act of 2014 (WRRDA 2014), Pub. L. No. 113-121, § 7002, 128 Stat. 1193, 1366, (2014).

Table 1. Authorized Project Features.

1996 Authorization
Approximately 24 miles of slurry walls along the lower American River
Approximately 12 miles of levee modifications along the east bank of the Sacramento River downstream from the NCC
Three telemeter stream gauges upstream from Folsom Reservoir
Modification of the flood warning system on the American River
1999 Authorization
Raising the left bank of the non-Federal levee upstream of the Mayhew Drain for a distance of 4,500 feet by an average of 2.5 feet
Raising the right bank of the American River levee from 1,500 feet upstream to 4,000 feet downstream of the Howe Avenue Bridge by an average of 1 foot
Modifying the south levee of the NCC for a distance of 5 miles to ensure that the south levee is consistent with the level of protection provided by the authorized levee along the east bank of the Sacramento River.
Modifying the north levee of the NCC for a distance of 5 miles to ensure that the height of the levee is equivalent to the height of the south levee as authorized
Installing gates to the existing Mayhew Drain culvert and pumps to prevent backup of floodwater on the Folsom Boulevard side of the gates
Installing a slurry wall in the north levee of the American River from the east levee of the NEMDC upstream for a distance of approximately 1.2 miles
Installing a slurry wall in the north levee of the American River from 300 feet west of Jacob Lane north for a distance of approximately 1 mile to the end of the existing levee
2004 Folsom Dam Raise
Raising the height of Folsom Dam by 7 feet. In addition, temperature control shutters for the inlets to the Folsom Dam penstock would be mechanized to better regulate the American River Water temperature to increase native salmon and steelhead populations downstream of the dam.
2006 Chief's Discretionary Authority
Installing a total of 3.6 miles of discontinuous slurry wall at nine levee sites beginning at Levee Mile 2.9 and ending at Levee Mile 10.3 on the Sacramento River in the Pocket Area
Installing six relief wells and collector drains and appurtenant features and a landside berm on the levee toe on the Sacramento River in the Pioneer Reservoir area
2010 Natomas PACR and Interim General Reevaluation Report*
Widen 2.0 miles of levee in place and install seepage cutoff wall through levee and foundation on the Lower American River
Widen 18.3 miles of existing levee by construction of an adjacent levee, install 12.3 miles of deep seepage cutoff walls, and install 8.3 miles of seepage berm, all on east bank of Sacramento River below Natomas Cross Canal
Widening of the existing levee in place and installation of a soil bentonite cutoff wall that ranges in depth between 65 and 70 feet on the Pleasant Grove Creek Canal.
Widening of 12.8 miles of the existing levee and installation of 10.7 miles of soil bentonite cutoff wall on the Natomas East Main Drain Canal
Widening of 5.5 miles of existing levee using in-place construction and install deep seepage cutoff walls on south bank of Natomas Cross Canal

*For the purposes of this report, it is assumed that the recommended plan contained in the Natomas PACR and Interim General Reevaluation Report is authorized and its features are in place. Congressional authorization will be required. (This includes those areas already constructed by SAFCA)

1.4 Project Purpose and Need for Action

The purpose of the ARCF GRR is to reduce the overall flood risk within the study area. An unacceptably high risk of flooding from levee failure threatens the public safety of approximately 530,000 people as well as property and critical infrastructures throughout the study area. Additionally, the State Capitol and many state agencies reside within the study area. Historic flooding events have caused loss of life and extensive economic damages. Approximately 83,000 structures throughout the study area are at risk of flooding in a 100-year event (1% annual change of flooding).

NEPA evaluation is required when a major Federal action is under consideration that may have significant impacts on the quality of natural and human environment. The Corps has determined that the proposed project may have significant affects on the environment and, therefore, an EIS is required. The DEIS/DEIR is intended to evaluate the potential significant environmental impacts associated with potential implementation of alternatives presented in the ARCF GRR.

The Sacramento Metropolitan area is one of the most at risk areas for flooding in the United States. There is a high probability that flows in either the American or Sacramento Rivers will stress the network of levees protecting the study area to the point that levees could fail. The consequences of such a levee failure would be catastrophic since the inundated area is highly urbanized and the flooding could be up to 20 feet deep. Plate 3 shows where problems occur throughout the study area.

The Sacramento Metropolitan area has a high probability of flooding due to its location at the confluence and within the floodplain of two major rivers. Both of these rivers have large watersheds with very high potential runoff which has overwhelmed the existing flood management system in the past. The existing levee system was designed and built many years ago, before modern construction methods were employed. These levees were constructed close to the river to increase velocities which would flush out hydraulic mining debris. This debris is essentially gone now and the high velocities associated with flood flows are eroding the levees which are critical components of the flood management system necessary to reducing the flood risk in the study area. In addition to the high probability of flooding, the consequences of flooding in the study area would be catastrophic.

The following sections describe in detail the factors which contribute to the high probability of flooding in the study area.

1.4.1 Seepage and Underseepage

Seepage beneath and through segments of the levee systems around Sacramento have been identified as a significant risk to the stability and reliability of the system. Through-seepage is seepage through a levee embankment that can occur during periods of high river stages. Depending on the duration of high water and the permeability of embankment soil, seepage may exit the landside face of the levee. Seepage can also pass directly through pervious layers in the levee if such layers are present. Under these conditions, the stability of the landside levee slope may be reduced. Underseepage problems occur in locations where levees are constructed on low-permeability foundation soil (silt and clay) underlain by higher-permeability layers (sand and gravel). Excessive underseepage makes the affected levee segment susceptible to failure during periods of high river stage. Under these conditions, seepage travels horizontally under the levee and then is forced vertically upward through the low-permeability foundation layer, often referred to as the “blanket.” Failure of the blanket can occur either by uplift, a condition in which the blanket does not have enough weight to resist the confined pressure acting upon the bottom of the blanket, or by piping (internal erosion) caused by water flowing under high vertical gradients through the erodible blanket and carrying fine soil particles out of the foundation materials.

1.4.2 Levee Erosion

Because of the deposits of hydraulic mining debris that washed into the American and Sacramento River valleys, early levee builders constructed the flood management features by dredging material from the river beds and placing it on the bank near the river. This served several purposes. First, the resulting levee provided a degree of protection from flooding. Second, it removed material from the river bed, allowing it to convey more water. And finally, by placing the levees close to the river’s edge, the river flow was confined, speeding its flow, and causing it to erode away the material that had been deposited by hydraulic mining, further increasing the river’s capacity.

The levees continue to confine the flow into a relatively narrow channel, still eroding and degrading the river channel. However, by now, most of the sediment deposited in the river channels has been removed. Both the Sacramento River and the American River are confined by levees and have very little sediment in the water. Additionally, on the American River, Folsom Dam blocks sedimentation from upstream sources. Therefore, the energy of the flow tends to erode riverbanks and levees. This channel erosion and degradation could have detrimental effects on the levees by undercutting the foundation materials beneath the levees, particularly if the riverbank consists of easily erodible materials. The erosion of the riverbank adjacent to levee embankments may increase the underseepage through the foundation soils. It can also reduce the stability of the levee slopes by undermining the levee embankment and eroding the levees themselves. Significant erosion can lead to the failure of the levee.

Empirical evidence and prototype experiments indicate that stream bank erosion in the area can be gradual or episodic. That is to say, some erosion occurs almost every year. This is primarily due to the fact that materials have been placed on the banks by landowners in an effort to halt erosion. These materials are generally random materials, placed without regard to engineering standards. The Sacramento District is currently evaluating erosion trends as part of the WRDA 2007 authorization for Sacramento River Bank Protection Project (SRBPP).

1.4.3 Levee Stability

Stability problems were observed during high water stages on both the landside and waterside slopes. The materials used to construct the levees were not selected for their suitability, merely their availability, and dredged from the riverbed. The construction methods were also not adequate, the levee material not being compacted but constructed with clamshells or dredged with assorted objects indiscriminately buried in the levee embankments, such as dead trees. Seepage through the levee embankment and underseepage through its foundation would raise the water pore pressure at the landside levee toe leading to sloughing and sliding of the landside levee slope. Landside slope failures have been observed during high river stages in areas where impervious soils cover the sandy and gravelly layers in the levee foundation due to high gradients at the levee toe. These slope failures have also been observed in areas where water was seeping through the levee embankment above the toe of the levee.

There are no active faults running through the project area. There are, however, faults that run along the foothills east of Folsom Dam and near Vacaville and Dixon (outside of the project area). Potential of liquefaction of the saturated sandy material in the foundation of levees is also a concern, but considering the very low probability that an earthquake may occur during high river stages, the levees are not designed to resist a seismic event. However, the liquefaction assessment is included in the Geotechnical Appendix to the GRR, and it considers that the damages on the levee from a seismic event may be repaired to a temporary condition to assure a protection for a minimum flood event of 25 years.

1.4.4 Levee Overtopping

Fortunately, the levees in the Sacramento area have not been overtopped in recent flood events, although several floods have come close. However, it is possible that a large enough flood event could occur that would overtop the Sacramento River levees. Because these levees were not built to modern engineering standards and levee failures upstream are assumed not to occur, levee overtopping would potentially lead to failure of the levee and cause devastating flooding.

The State has established a preliminary draft of a standard for urban flood protection in California. This standard would require levees to have a top elevation equal to the mean 200-year water surface profile, plus three feet of freeboard, plus an allowance for wave run-up, plus one foot to account for climate change.

1.4.5 Vegetation and Encroachment Compliance

The Corps' Engineering Technical Letter (ETL) 1110-2-583, Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures, calls for the removal of wild growth, trees, and other vegetation, which might impair levee integrity or flood-fighting access in order to reduce the risk of flood damage. In certain instances, to further enhance environmental values or to meet state or Federal laws and/or regulations, a variance can be requested from the standard vegetation guidelines set forth in this ETL.

The American River Common Features GRR has identified significant and extensive seepage, stability, overtopping and erosion problems with the levees that reduce the risk of flooding for the Sacramento area. Due to the potential for catastrophic consequences associated with a levee failure in this urban area, all identified problems, including vegetation and encroachment issues require correction in order to reduce the flood risk to an acceptable level. However, risk reduction measures must be implemented in a "worst first" manner in order to immediately maximize the amount of risk reduction realized for each increment of investment.

The engineering analysis conducted to date generally indicates that seepage and erosion concerns pose a significantly higher risk of levee failure than those associated with vegetation and encroachments. However, specific instances of vegetation and encroachment problems have been identified as high risk and require resolution concurrent with other high risk issues.

In the case of construction associated with the recommended plan, vegetation and encroachment removal is secondary to the primary flood risk management measures (i.e. seepage cutoff barrier, levee raise, slope flattening). In an effort to modernize the levee system to meet current engineering standards, vegetation and encroachment issues (including landside levee access) in the study area will be resolved through a combination of construction actions associated with implementation of the recommended plan and formal agreements. The formal agreements involve the integrated use of a SWIF agreement with the local maintaining agency (LMA) and a variance from vegetation standards in ETL 1110-2-583, Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures.

The ARCF GRR project description (Section 2.0 below) assumes that the variance and SWIF agreements are both in place. The variance is included as a part of the proposed alternatives, while the SWIF would be a part of the future condition, both with or without the project in place. Effects to vegetation and encroachments are assumed to occur in the footprint of all proposed construction activities, to include the upper waterside slope of the levee per the variance. Landside vegetation and encroachments outside of the construction footprint would be addressed through the SWIF process by the LMA.

System Wide Improvement Framework

The SWIF is an agreement between the Corps and the non-Federal sponsor that allows the LMA to defer compliance with ETL 1110-2-583. Under the SWIF agreement, the LMA would address landside vegetation and encroachment issues (including landside levee access) through the implementation of their standard operation and maintenance (O&M) actions over time. Therefore, vegetation not impacted by project construction would be addressed by the LMA in accordance with the State's Levee Vegetation Management Strategy in the Central Valley Flood Protection Plan (CVFPP) over the next 20 to 40 years. The SWIF will be planned and implemented by the non-Federal sponsor and includes the following criteria:

- An engineering inspection and evaluation shall be conducted to identify trees and other woody vegetation (alive or dead) on the levee and within 15 feet of the levee toe that pose an unacceptable threat to the integrity of the levee. Identified trees shall be removed and associated root balls and roots shall be appropriately remediated. Based on the engineering inspection and evaluation, trees and other woody vegetation that do not pose an unacceptable threat need not be removed.
- In cases of levee repair or improvement projects, vegetation within the project footprint shall be removed as part of construction activities.
- Trees and other woody vegetation that are not removed must be monitored as part of routine levee maintenance to identify changed conditions that cause any of these remaining trees and other woody vegetation to pose an unacceptable threat to levee integrity. Otherwise, such trees and woody vegetation are to be maintained according to the levee vegetation management criteria included in the CVFPP which establish a vegetation management zone (including the landside levee slope, crown and upper 1/3 of the waterside slope) in which trees are trimmed up to 5 feet above the ground (12-foot clearance above the crown road) and thinned for visibility and access while brush, trees and other woody vegetation less than four inches in diameter at breast height, weeds or other such vegetation over 12 inches high are to be removed in an authorized manner.

Vegetation Variance

A vegetation variance will be sought by the Sacramento District to comply with ETL 1110-2-583 on the waterside of the levee. The vegetation variance request requires the Corps to show that the safety, structural integrity, and functionality of the levee would be retained if the vegetation were to remain in place. An evaluation of underseepage and waterside embankment slope stability was completed for this study by Corps geotechnical engineers.

This analysis was completed for the section/index point at levee mile (LM) 5.92 on the Sacramento River. This index point was chosen for the variance analyses because it was considered to be representative of the most critical channel and levee geometry, underseepage and slope stability conditions, and vegetation conditions. The cross-section geometry of the index point incorporated tree fall and scour by using maximum potential diameter at breast height (dbh) of cottonwoods (12.0 feet) projected horizontally at a depth of 11.0 feet below the existing ground profile. The results show that the tree fall and scour did not significantly affect levee performance and that the levee meets Corps seepage and slope stability criteria considering the seepage and stability improvement measures are in place ("with project" conditions). Therefore, it is a reasonable conclusion that by allowing vegetation to remain as stated above, the safety, structural integrity, and functionality of the Sacramento River levee would be retained.

The vegetation variance request would be developed during the design phase to allow for vegetation to remain on the lower portion of the waterside levee slope (Figures 2 to 4). Vegetation on the upper waterside levee slope would be removed as part of project construction. If a variance is not approved, the recommendations for this portion of the project will be reformulated and further environmental compliance efforts would be required.

1.4.6 Releases from Folsom Dam

The Folsom Dam Water Control Manual (WCM) is being updated to reflect authorized changes to the flood management and dam safety operations at Folsom Dam to reduce flood risk in the Sacramento area. The WCM update will utilize the existing and authorized physical features of the dam and reservoir, specifically the auxiliary spillway and submerged tainter gates currently under construction and scheduled to be completed in 2016.

Along with evaluating operational changes to utilize the additional operational capabilities created by the auxiliary spillway and tainter gates, the WCM Update will assess the use of available technologies to enhance the flood risk management performance of Folsom Dam to include a refinement of the basin wetness parameters and the use of real time forecasting operation. Further, the WCM Update will evaluate options for the inclusion of creditable flood control transfer space in

Folsom Reservoir in conjunction with Union Valley, Hell Hole, and French Meadows Reservoirs (also referred to as Variable Space Storage). The study will result in an Engineering Report as well as a revised Water Control Manual.

It should be noted that the initial WCM Update effort will focus on additional operational capabilities created by the auxiliary spillway. The WCM will be further revised in the future to reflect the capabilities to be provided by the Dam Raise and additional ARFC Project improvements as appropriate.

1.4.7 Flood Management System

Flood flows from the north are split between the Sacramento River and the Yolo Bypass. Under the current design of the Sacramento River Flood Control Project (SRFCP), diversions to the Yolo Bypass at the Fremont Weir account for 70% of the Sacramento River flow at Verona. The Sacramento River downstream of the Fremont Weir has a channel capacity of 110,000 cfs and this will not change with the implementation of authorized improvements to the ARCF Project.

Evaluation and determination of the extent of flood damages due to levee overtopping and/or levee failure were performed with numerical floodplain models using FLO-2D. The without project evaluations all assume that authorized projects in the watershed, other than the recommendations in the ARCF GRR, are in place.

1.5 Environmental Regulatory Framework and Authority

1.5.1 National Environmental Policy Act

NEPA provides an interdisciplinary framework for Federal agencies to develop information that will help them to take environmental factors into account in their decision-making (42 U.S.C. § 4321 et seq. and 40 C.F.R. § 1500.1 et seq.). To comply with 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 natural and human environment (42 U.S.C. § 4332[2][C]; 40 C.F.R. § 1508.18[a]).

1.5.2 California Environmental Quality Act

According to the State CEQA Guidelines (14 CCR Section 15064[f][1]), preparation of an EIR is required whenever a project may result in a significant environmental impact. An EIR is an informational document used to inform public agency decision makers and the general public of the significant environmental effects of a project, identify possible ways to mitigate, reduce, or avoid the significant effects, and describe a range of reasonable alternatives to the project that could feasibly attain most of the basic objectives of the project while substantially lessening or avoiding any of the significant environmental impacts. Public agencies are required to consider the information presented in the EIR when determining whether to approve a project.

CEQA requires that state and local government agencies consider the environmental effects of projects over which they have discretionary authority before taking action on those projects (California Public Resources Code [PRC] Section 21000 et seq.). CEQA also requires that each public agency avoid or reduce to less-than-significant levels, wherever feasible, the significant environmental effects of projects it approves or implements. If a project would result in significant environmental impacts that cannot be feasibly mitigated to less-than-significant levels, the project can still be approved, but the lead agency's decision makers must issue a "statement of overriding considerations" explaining in writing the specific economic, social, or other considerations that they believe, based on substantial evidence, make those significant and unavoidable effects acceptable.

1.5.3 State and Local Planning

Many state and local plans and zoning regulations regulate activities within the project area. These plans and regulations were considered during the preparation of this DEIS/EIR. Following is a list of the plans and regulations.

- Sacramento City General Plan
- Sacramento County General Plan
- Sacramento County Zoning Ordinance
- Sacramento County Tree Ordinance
- Sacramento City Zoning Ordinance
- American River Parkway Plan
- Central Valley Flood Protection Plan
- Bay Delta Conservation Plan
- Delta Plan

1.5.3 Study Authority

The basic authority for the Corps to study water resource related issues in the American and Sacramento Rivers is Section 209 of the Flood Control Act of 1962 which authorizes studies for flood control in northern California (Flood Control Act of 1962, Pub. L. No. 87-875, § 209, 76 Stat. 1180, 1196-

98 (1962). This DEIS/DEIR was prepared as an interim general reevaluation study of the ARCF Project, which was authorized by Section 106(a)(1) of WRDA 1996, Pub. L. No. 104-303 § 106(a)(1), 110 Stat. 3658, 3662-3663 (1996), as amended by Section 130 of the Energy and Water Development and Related Agencies Appropriations Act of 2008, Pub. L. No. 110-161, § 130, 121 Stat. 1844, 1947 (2007). Additional authority was provided in Section 366 of WRDA of 1999. WRDA 1999, Pub. L. No. 106-53, § 366, 113 Stat. 269, 319-320 (1999). Significant changes to the project cost were recommended in the Second Addendum to the Supplemental Information Report of March 2002. This report was submitted to the Assistant Secretary of the Army for Civil Works, but before it could be forwarded to Congress, authorized total cost of the project was increased to $205,000,000 by Section 129 of the Energy and Water Development Appropriations Act of 2004, Pub. L. No. 108-137, § 129, 117 Stat. 269, 1839 (2003). The current estimated cost of the authorized project is $305,340,000. The allowable cost limit is $307,071,000.

1.6 Intended Uses of this Document

This DEIS/DEIR is a public document prepared to disclose potential impacts of the GRR alternatives. Impacts are determined by looking at the environmental conditions in the future with and without the project. This document will also propose mitigation measures, which would be implemented to avoid, reduce, and compensate for impacts to the environment. The public will be provided a copy of the DEIS/DEIR to review and provide comments to the Corps and CVFPB for consideration prior to finalizing the EIS/EIR. Once finalized, the EIS/EIR will be used to support Congressional approval of the Corps' proposed project.

1.7 Related Documents and Resources Relied on in Preparation of this DEIS/DEIR

The following documents, previously prepared by the Corps, were reviewed by Corps staff in the analysis of the project and preparation of the DEIS/DEIR.

- April 1991, Draft American River Watershed Investigation California Feasibility Report: Part I—Main Report and Part II—Draft Environmental Impact Statement/Environmental Impact Report;
- December 1991, American River Watershed Investigation California Feasibility Report: Part I—Main Report and Part II—Environmental Impact Statement/Environmental Impact Report;
- December 1991, American River Watershed Investigation California Feasibility Report, Volume 2, Appendix G: Section 404 Evaluation;

- March 1996, Supplemental Information Report, American River Watershed Project, California: Part I—Main Report and Part II—Final Supplemental Environmental Impact Statement (FSEIS)/Environmental Impact Report;
- June 27, 1996, Chief's Report on FSEIS, signed by Acting Chief of Engineers, Major General Pat M. Stevens; and
- July 1, 1997, ROD on FSEIS, signed by Director of Civil Works, Major General Russell L. Furman.
- November 2008, Final Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento CA. Prepared by EDAW/AECOM, Sacramento, CA
- August 2009, Final Environmental Impact Statement on the Natomas Levee Improvement Project Phase 3 Landside Improvement Project, Sacramento CA. Prepared by AECOM, Sacramento, CA
- February 2010, Final Environmental Impact Statement on the Natomas Levee Improvement Project Phase 4a Landside Improvement Project, Sacramento CA. Prepared by AECOM, Sacramento, CA
- October 2010, Final Environmental Impact Statement on the Natomas Levee Improvement Project Phase 4b Landside Improvement Project, Sacramento CA. Prepared by AECOM, Sacramento, CA

Additional reference documents used to prepare this DEIS/DEIR are listed in Chapter 7, "References."

1.8 Application of NEPA and CEQA Principles and Terminology

NEPA and CEQA are similar in that both laws require the preparation of an environmental study to evaluate the environmental effects of proposed activities. However, there are several differences between the two regarding terminology, procedures, content of the environmental documents, and substantive mandates to protect the environment. NEPA language is primarily used in this document but can be interchanged with CEQA language. 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.

Table 2. Terminology of NEPA and CEQA for Common Concepts

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

1.9 Organization of the DEIS/DEIR

The content and format of this DEIS/DEIR are designed to meet the requirements of NEPA, as set forth by the CEQ and the Corps' NEPA policy and guidance, and CEQA and the State CEQA Guidelines. The DEIS/DEIR is organized as follows:

- The Executive Summary summarizes the purpose and intended uses of the DEIS/DEIR, lead agencies, project location, project background and phasing, need for action, and project purpose/objectives; presents an overview of the proposed alternatives under consideration, as well as the major conclusions of the environmental analysis; documents the known areas of controversy and issues to be resolved; and ends with a summary table that lists the environmental impacts, mitigation measures, and significance determinations for the alternatives under consideration.
- Chapter 1, "Introduction and Statement of Purpose and Need," explains the NEPA and CEQA processes; lists the lead, cooperating, and responsible agencies that may have discretionary authority over the project, including non-Federal partners; specifies the underlying project purpose/objectives and need for action, to which the lead agencies are responding in considering the proposed project and project alternatives; summarizes required permits, approvals, and authorizations; outlines the organization of the document; and provides information on public participation.
- Chapter 2, "Alternatives," presents the proposed alternatives under consideration. This chapter constitutes the project description and describes the project components for each action alternative as well as the No-Action Alternative. This chapter also describes alternatives considered but eliminated from further consideration and provides a summary matrix that compares the environmental consequences of the alternatives under consideration.

- Chapter 3, “Affected Environment, and Environmental Consequences” describes the baseline or existing environmental and regulatory conditions and provides an analysis of the impacts of each alternative under consideration, and identifies mitigation measures that would avoid or eliminate significant impacts or reduce them to a less-than-significant level, where feasible. In addition, compensation is discussed for significant, adverse effects that cannot be reduced to a less than significant level.
- Chapter 4, “Cumulative and Growth-Inducing Impacts and Other Statutory Requirements,” describes the cumulative impacts of the project when combined with other past, present, and reasonably foreseeable future projects within the study area. In addition, it analyzes the growth-inducing impacts of the proposed action. The remainder of this chapter includes the following requirements of NEPA and CEQA that are not addressed elsewhere in this DEIS/DEIR: relationship between short-term uses of the environment and long-term productivity, significant and unavoidable environmental impacts, and irreversible and irretrievable commitments of resources.
- Chapter 5, “Compliance with Applicable Laws and Regulations,” summarizes the Federal and State laws and regulations that apply to the project and describes the project’s compliance with them.
- Chapter 6, “Consultation and Coordination,” summarizes public involvement activities under NEPA and CEQA; Native American consultation; and coordination and with other Federal, state, regional, and local agencies. A list of organizations and individuals receiving a copy and/or notice of this DEIS/DEIR is also included.
- Chapter 7, “References,” provides a bibliography of sources cited in this DEIS/DEIR.
- Chapter 8, “List of Preparers,” lists individuals who were involved in preparing this DEIS/DEIR.
- Chapter 9, “Index,” contains the NEPA-required index for easy reference of topics and issues.

Appendices contain background information that supports this DEIS/DEIR and can be found on the disc located in the back cover of this DEIS/DEIR.

2.0 ALTERNATIVES

2.1 Introduction

The ARCF GRR identifies a number of problems associated with the flood risk management system protecting the city of Sacramento and surrounding areas. There is a high probability that flows in the American and Sacramento Rivers will stress the network of levees protecting Sacramento to the point that levees could fail. The consequences of such a levee failure would be catastrophic, since the area inundated by flood waters is highly urbanized and the flooding could be up to 20 feet deep.

2.1.1 Alternative Formulation and Screening

A wide variety of measures were developed to address the planning objectives. These measures were evaluated and then screened using the Corps planning process. Formulation strategies were then developed to address various combinations of the planning objectives and planning constraints. Based upon these strategies, various combinations of the measures were assembled to form an array of preliminary plans. The preliminary plans were then evaluated, screened and reformulated, resulting in a final array of alternatives.

The formulation strategies used to address the objectives and constraints includes:

- Combine measures that improve levee performance;
- Improve conveyance;
- Improve levees in place by various methods;
- Combine measures that reduce flood stages;
- Improve upstream storage;
- Reduce flow which reaches study area;
- Combine measures which improve levee performance and reduce flood stages; and
- Identify measures which together provide optimal storage and conveyance opportunities.

Approximately 35 different measures were developed to address these strategies. The measures were then screened prior to combing them into alternatives. This screening was done by evaluating the measures for completeness, efficiency, effectiveness, and acceptability.

Future Without Project Condition

The future without-project condition is the most likely condition expected to exist in the future in the absence of a proposed Federal water resources project. Proper definition and forecast of the future without-project condition are critical to the success of the planning process. While all the alternatives considered in this EIS/EIR must be compared to existing conditions, the future without project condition constitutes the benchmark against which these alternatives must be compared for Federal planning purposes. Thus, proper definition and forecast of the future without project condition are critical to the success of the planning process. Other adopted plans in the planning area and local planning efforts with high potential for implementation or adoption shall be considered as part of the forecasted without-project condition.

Under the future without project condition, depending on the location of a levee failure, significant loss of life would be expected, as well as injuries, illnesses, and other health and safety problems. Because the flood season in Sacramento is in the winter, residents face additional dangers from hypothermia. Flooding in the Sacramento area could trigger releases of hazardous and toxic contaminants into the waterways surrounding the flood plain and the failure of liquid petroleum gas tanks and underground storage tanks. Post-flood cleanup of these substances could be a major undertaking.

Transportation through the area would be severely hampered by a major flood. Major transportation corridors transect the area, and flooding would cripple movement of people and goods across the region. Sacramento International Airport could be under water, and would have to relocate operations to Mather Field, which is located outside of the floodplain.

Critical infrastructure would be rendered nonfunctional for an extended period of time after a flood. Power and water supply could be interrupted for a substantial period of time. Emergency costs associated with evacuation, flood fighting, fire and police, and government disruptions would occur.

After floodwaters have receded, debris cleanup would be a substantial undertaking. After the flooding in New Orleans resulting from Hurricane Katrina, debris removal included general household trash and personal belongings, construction and demolition debris, vegetative debris, household hazardous waste, appliances, and electronic waste. Curbside debris was in excess of 51 million cubic yards. There were nearly 900,000 units of appliances and over 600,000 units of electronic goods. More than 350,000 cars were abandoned.

The following general assumptions have been made in regard to the future without-project condition for this study:

- In 2017, the Joint Federal Project auxiliary spillway with six submerged tainter gates at Folsom Dam will be completed and a new water control manual will be adopted (Folsom Dam Modifications project).
- In 2019, the 3.5-foot mini-raise of the Folsom Dam will be completed (Folsom Dam Raise project).
- The Levee Vegetation Management Strategy presented in the Central Valley Flood Protection Plan (CVFPP) will be in place.
- The elements of the ARCF Project that have been authorized by WRDA 1996 and WRDA 1999 are assumed to be in place.
- The levee modifications recommended in the Natomas PACR are assumed to be in place (including those already constructed by SAFCA).
- Improvements recommended as part of the West Sacramento GRR are not in place.

While these projects are assumed to be either implemented or not, critical flood risk reduction would not be provided to the city of Sacramento without implementation of this project. People would continue to be at risk of flooding with the study area.

2.1.2 Measures and Alternatives Considered, But Eliminated From Future Consideration

Some measures originally identified that could contribute to addressing Sacramento's flood problems and needs were reviewed and dropped from further consideration. These measures, which are described in the subsections below, include upstream transitory storage, Yolo Bypass improvements, reoperation of upstream reservoirs, a diversion structure on the Sacramento River, and non-structural measures. The downstream levee repairs remain the common element between all alternatives and remain the primary focus of the remaining alternatives detailed in Sections 2.3 through 2.5 below.

Upstream Storage on the American River (Auburn Dam)

This preliminary measure included construction of a dam on the North Fork of the American River near the town of Auburn. This measure was not carried forward because it does not address the high frequency flood risk associated with the poor performance of levees in the study area and does not substantially reduce risk for the highest risk area along the Sacramento River since this area is dominated by Sacramento River flows. In addition, this measure would have adverse impacts on environmental resources through the loss of about 500 to over 2,000 acres of oak woodland, chaparral and coniferous forests. However, this alternative could be considered in a follow-on study to consider ways to reduce the residual risk in the study area.

Transitory Storage in Upstream Basins

Various upstream transitory storage measures were evaluated as part of the Common Features Project. A full analysis of this measure and the various sites along the Sacramento River that were considered is included in the GRR. Initial evaluation indicates that these measures would not be cost-effective. In addition, the analysis indicated that these measures would not be effective in reducing the water surface elevations on the levees that protect the Sacramento area. As a result, the need to correct seepage and stability problems for the levees in the study area would need to be addressed regardless of any use of upstream storage measures. When the cost of the transitory storage measures is added to the cost of the urban levee improvements, the combined cost of these measures makes this option less efficient than other potential plans that would focus on measures within the study area. However, further evaluation of this alternative may be considered as part of the State's Central Valley Flood Protection Plan or the State's Regional Plans.

Yolo Bypass Improvements

This measure would consist of lengthening the Fremont Weir, and widening the Yolo and Sacramento Bypasses to increase the amount of flood water conveyed through these facilities and reduce the amount of flood water conveyed through the Sacramento River channel downstream of the Fremont Weir. This measure would consist of the following features:

- Redesign and reconstruction of the Fremont Weir.
- Construction of a new setback levee along the eastern edge of the Yolo Bypass extending from the Fremont Weir to the north levee of the Sacramento Bypass.
- Construction of a weir and closure structure in the Sacramento Deep Water Ship Channel south of Interstate 80 (I-80).
- Removal of existing Sacramento River Flood Control Project levees in the lower reach of the Yolo Bypass.

With the Yolo Bypass Improvements, all of the levee improvements proposed for the ARCF GRR are still necessary, because the Yolo Bypass Improvements do not reduce water surface elevations to a low enough level to eliminate the need for levee improvements. In addition, the Yolo Bypass improvements do not provide nearly enough economic benefit to justify the very large cost. Therefore, for purposes of this study, it was screened out. It is important to note that the Yolo Bypass widening does potentially provide benefits elsewhere and is being looked at by the State of California as part of the CVFPP, and this feature is still being analyzed by others but would not affect the need for levee improvement in the greater Sacramento urban area.

Reoperation of Upstream Reservoirs

Reoperation of reservoirs upstream of the study area in the Sacramento River basin was considered. Reoperation of Folsom Dam was eliminated from further consideration as part of this GRR because the Folsom Water Control Manual Update, a segment of the overall American River Watershed Investigation, is currently studying reoperation of Folsom Lake. This study takes into account the potential changes to the watershed from all associated American River Watershed projects, including the Folsom JFP, the Folsom Dam Raise, and the ARCF GRR alternatives.

Major reservoirs upstream of the study area include Shasta Lake, Lake Oroville, Folsom Lake, and New Bullards Bar Reservoir. These reservoirs control approximately 11,000 square miles of the 27,000 square mile Sacramento River basin. This is about 40% of the drainage area. The flood storage is a small component of these dams' storage, since they are also water supply reservoirs. These dams were completed prior to the largest floods in Sacramento; therefore, their designs are based on hydrology that does not take these large floods into account. Reoperation of these upstream reservoirs would not substantially reduce the flood risk to the Sacramento area.

Sacramento River I Street Bridge Diversion Structure

This measure would include the construction of a diversion structure just upstream of the existing I Street Bridge on the Sacramento River. This diversion structure would restrict flows going down the Sacramento River past the cities of Sacramento and West Sacramento, and would cause a portion of the flows from the Sacramento and American Rivers to be backed upstream through the widened Sacramento Weir and Bypass out to the Yolo Bypass. The Sacramento Bypass and Weir would be widened to accommodate the increased flows to the bypass system. The effect of this diversion structure would be to reduce the water surface elevation of the Sacramento River downstream of the structure to the point at which seepage, stability, height, and erosion improvements would not be needed in order to safely convey the 200 year design event.

The I Street Bridge diversion structure was evaluated during the planning phase to limit flood flows through the city of Sacramento and push excess flows into the Yolo Bypass in order to limit the need for levee repairs on the Sacramento River downstream of the structure. This measure was not carried forward for the following reasons:

- The initial cost identified for addressing Yolo Bypass hydraulic mitigation was not adequate. A physical modification to the bypass would be needed to reduce the water surface elevation to effectively mitigate for the additional flows redirected to the bypass by the diversion structure. The costs for this physical modification greatly increase the overall alternative cost to the point that the alternative is more costly than the other alternatives.

- The implementation time (likely 20 years) for this alternative to be implemented would leave the densely populated areas of Sacramento at risk of flooding for an unacceptable period of time.
- This Diversion Structure is not consistent with the CVFPP and it is unlikely that the State would partner with the Corps on a structure that is not consistent with the CVFPP.

Non-Structural Measures

Some non-structural measures were considered and eliminated, including flood proofing individual structures, relocating residents out of the flood plain, and raising structures to above the floodplain. These non-structural measures were eliminated because the sheer number of residents in the floodplains, particularly in the American River South Basin in the Pocket and Meadowview neighborhoods, made this alternative cost prohibitive. Additionally, raising commercial structures is impractical due to loss of business during raises, functionality of the business after raising the building, and size of structures. Flood proofing individual structures cannot exceed 3 feet, and in many parts of the study area, flood depths are predicted to be greater than 3 feet, making this measure impractical. Some non-structural elements carried forward, such as flood plain management and risk notification, can be included in any of the alternatives carried forward. Further analysis of the non-structural measures is included in the GRR and Economic Appendix to the GRR.

2.2 No Action Alternative

The Corps is required to consider "No Action" as one of the alternatives for selection in order to comply with the requirements of NEPA. With the No Action Alternative, it is assumed that no additional features would be implemented by the Federal Government or by local interests to achieve the project purpose, over and above those elements of the previously-authorized ARCF Project.

Under the No Action plan the Corps would not conduct any additional work to address seepage, slope stability, overtopping, or erosion concerns in the Sacramento metropolitan area. The LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system, but it would be speculative to assume that any additional work would be conducted to address the seepage, slope stability, overtopping, or erosion concerns in the study area. As a result, if a flood event were to occur, the Sacramento area would remain at risk of a possible levee failure.

The urban development within the project area would continue to be at risk of flooding and lives would continue to be threatened. The levees within the study area could fail and result in a catastrophic disaster. If a levee failure were to occur, major government facilities would be impacted until flood waters recede. Workers would be unable to perform their duties until the buildings are restored and could be occupied. This could cause a temporary shutdown or slowdown of many State and local government functions. Also, there are many transportation corridors within the study area that could be flooded if levees were to fail.

2.3 Alternative 1 – Improve Levees

Alternative 1 involves the construction of fix-in-place levee improvement measures to address seepage, slope stability, erosion, and overtopping concerns identified for the American and Sacramento River, NEMDC, Arcade, Dry/Robla, and Magpie Creek levees (Plate 3). The purpose of this alternative would be to improve the flood risk management system to safely convey flows to a level that maximizes net benefits. Table 3 summarizes the levee problems discussed in Section 1.4 and the proposed measure for each waterway. The designs for these improvements are detailed in Sections 2.3.1 through 2.3.3.

Table 3. Alternative 1 – Proposed Levee Improvement Measures by Waterway.

Waterway	Seepage Measures	Stability Measures	Erosion Protection Measures	Overtopping Measures
American River[1]	---	---	Bank Protection, Launchable Rock Trench	---
Sacramento River	Cutoff Wall	Cutoff Wall, Geotextile, Slope Flattening	Bank Protection, Launchable Rock Trench	Levee Raise
NEMDC	Cutoff Wall	Cutoff Wall	---	Floodwall/Levee Raise
Arcade Creek	Cutoff Wall	Cutoff Wall, Geotextiles	---	Floodwall/Levee Raise
Dry/Robla Creeks	---	---	---	Floodwall
Magpie Creek[2]	---	---	---	Floodwall/New Levee/Detention Basin

Notes: [1]American River seepage, stability, and overtopping measures were addressed in the ARCF WRDA 1996 and 1999 construction projects. [2]In addition to the listed measures, some improvements would need to occur on Raley Boulevard, including widening of the Magpie Creek bridge, raising the elevation of the roadway, and removing the Don Julio Creek culvert.

In addition to the proposed levee improvements measures shown in Table 3, the following measures and policies would be addressed during the design phase:

- During construction of structural levee improvements, the cross section geometry would be improved to meet minimum Corps' and State standards, if they currently do not. The standard levee footprint consists of:
    - A 20 foot crown width for the Sacramento and American Rivers, and
    - A 12-foot crown width for NEMDC, Arcade, Dry/Robla, and Magpie Creeks, and
    - Either 2:1 or 3:1 landside and waterside slopes (depending on the channel, past performance, and engineering analysis).

- Utility encroachments and penetrations will be brought into compliance with applicable Corps policy or removed depending on the type and location. Utilities replacements would occur via one of two methods: (1) utility placement over the design levee prism, or (2) a through-levee conduit equipped with positive closure devices.
- Private encroachments shall be removed by the non-federal partner or property owner prior to construction. Landside encroachments outside the construction footprint will be brought into compliance by the LMA under the SWIF process.

It is estimated that a maximum of 1 million cubic yards (cy) of borrow material could be needed to construct the project. Because this project is in the preliminary stages of design, detailed studies of borrow material needs for each alternative have not been completed. For the purposes of NEPA/CEQA a worst case scenario is being evaluated for the volume of borrow material needed. Actual volumes exported from any single borrow site would be adjusted to match demands for fill.

To identify potential locations for borrow material, soil maps and land use maps were obtained for a 25-mile radius surrounding the project area. These potential borrow locations are shown on Plate 6. Borrow sites would be lands that are the least environmentally damaging and would be obtained from willing sellers. The criteria used to determine potential locations were based on current land use patterns, soil types from Natural Resources Conservation Service (NRCS), and Corps' criteria for material specifications. The data from land use maps and NRCS has not been field verified, therefore, to ensure that sufficient borrow material would be available for construction the Corps looked at all locations within the 25 miles radius for 20 times the needed material. This would allow for sites that do not meet specifications or are not available for extraction of material.

The excavation limits on the borrow sites would provide a minimum buffer of 50 feet from the edge of the borrow site boundary. From this setback, the slope from existing grade down to the bottom of the excavation would be no steeper than 3H:1V. Excavation depths from the borrow sites would be determined based on available suitable material and local groundwater conditions. The borrow sites would be stripped of top material and excavated to appropriate depths. Once material is extracted, borrow sites would be returned to their existing use whenever possible, or these lands could be used to mitigate for project impacts, if appropriate.

Construction of Alternative 1 is proposed to take approximately 10 years. The construction reaches have been prioritized based on a variety of factors, including the condition of the levee, the potential damages that would occur due to levee failure, availability of real estate, and construction feasibility considerations, such as the availability of equipment at any given time. The tentative schedule of construction is shown in Table 4.

There would be no proposed measures under Alternative 1 for the Sacramento Bypass. The following sections contain more detailed information on the specific measures proposed under this alternative by waterway.

Table 4. Tentative Construction Schedule for Alternative 1.

PRIORITY	WATERWAY	REACH	YEAR OF PROJECT CONSTRUCTION									
			1	2	3	4	5	6	7	8	9	10[1]
1	Sacramento River	ARS F										
2	Sacramento River	ARS E										
3	American River	ARS A										
4	Sacramento River	ARS G										
5	Sacramento River	ARS D										
6	American River	ARS B										
7	American River	ARN A										
8	American River	ARS C										
9	American River	ARN B										
10	Arcade Creek	ARN D										
11	NEMDC	ARN F										
12	Arcade Creek	ARN E										
13	NEMDC	ARN C										
14	Dry/Robla Creek	ARN G										
15	Magpie Creek	ARN I										

2.3.1 American River

Levees along the American River under Alternative 1 require improvements to address erosion. The proposed measures for these levees consist of waterside armoring to prevent erosion of the river bank and levee, which, if unaddressed, could potentially undermine the levee foundation. Plate 3 identifies the reaches where erosion protection measures would be required. There are two measures proposed for the American River levees: (1) bank protection, and (2) launchable rock trench. Both of these measures are described in detail in the subsections below. These measures would be implemented for both of the proposed alternatives discussed in this document.

Bank Protection

This measure consists of placing rock revetment on the river's bank, and in some locations on the levee slope, to prevent erosion (Figure 1). When necessary, the eroded portion of the bank would be filled and compacted prior to the rock placement. The sites would be prepared by clearing and stripping the site prior to construction. Small vegetation and loose materials would be removed. In most cases, large vegetation would be permitted to remain at these sites. Temporary access ramps would be constructed, if needed, using imported borrow material that would be trucked on site.

Revetment would be imported from an offsite location via haul trucks and temporarily stored at a staging area located in the immediate vicinity of the construction site. A loader would be used to move revetment from the staging area to an excavator that will be placing the material. The excavator would place a large rock berm in the water up to an elevation slightly above the mean summer water surface. A planting trench would be established on this rock surface for revegetation purposes. The excavator would either be working from the top of the bank placing revetment on the bank beneath it and in the water, or from on top of the rock berm that it established.

The placement of rock onto the levee slope would occur from atop the levee. Rock placement from atop the levee would require one excavator and one loader for each potential placement site. The loader would then bring the rock from a staging area to the excavator and the excavator then places it on the waterside of the levee slope.

The revetment would be placed on the existing bank at a slope varying from 2V:1H to 3V:1H depending on site specific conditions. After revetment placement has been completed, a small planting berm would be constructed in the rock where feasible to allow for some revegetation of the site, outside of the vegetation free zone as required by ETL 1110-2-583. This vegetation will be designed on a site specific basis to minimize the O&M responsibility of the LMA and in such a way to not impact the hydraulic conveyance of the channel.

<u>Launchable Rock Trench</u>

This measure includes construction of a launchable rock filled trench, designed to deploy once erosion has removed the bank material beneath it (Figure 1). All launchable rock trenches would be constructed outside of the natural river channel. The vegetation would be removed from the footprint of the trench and the levee slope prior to excavation of the trench. The trench configuration would include a 2:1 landside slope and 1:1 waterside slope and would be excavated at the toe of the existing levee. All soil removed during trench excavation would be stockpiled for reuse or disposal. The bottom of the trench would be constructed close to the summer mean water surface elevation in order to reduce the rock launching distance and amount of rock required.

After excavation, the trench would be filled with revetment that would be imported from an offsite location. After rock placement the trench would be covered with a minimum of 3 feet of the stockpiled soil to allow for planting over the trench. Rock placed on the levee slope would be covered with the stockpiled soil. All disturbed areas would be reseeded with native grasses and small shrubs where appropriate. Some vegetation could be permitted over the trench if planted outside the specified vegetation free zone required by ETL 1110-2-583. This vegetation would likely be limited to native grasses, shrubs, and trees with shallow root systems to ensure that they do not limit the functionality of the trench during a flood event. This vegetation would only be permitted if they establish in a way that does not put undue burden on the maintaining agency and in locations that do not interfere with the conveyance capacity of the channel

2.3.2 Sacramento River

Levees along the Sacramento River require improvements to address seepage, slope stability, and erosion (Plate 3). In addition, these levees would be raised to address overtopping concerns. Private property acquisition would be required along the approximately 7 miles of levee raise. Where levee raise is required a 10-foot landside construction easement would be cleared in order to allow for equipment movement and placement of fill on the levee crown and slope. The measures proposed for the Sacramento River levees include: (1) levee geometry measures, (2) cutoff walls, (3) bank protection (4) 8 miles of levee raise, and (5) launchable rock trench. These measures are described in detail in the subsections below. These measures would be implemented for both of the proposed alternatives discussed in this document.

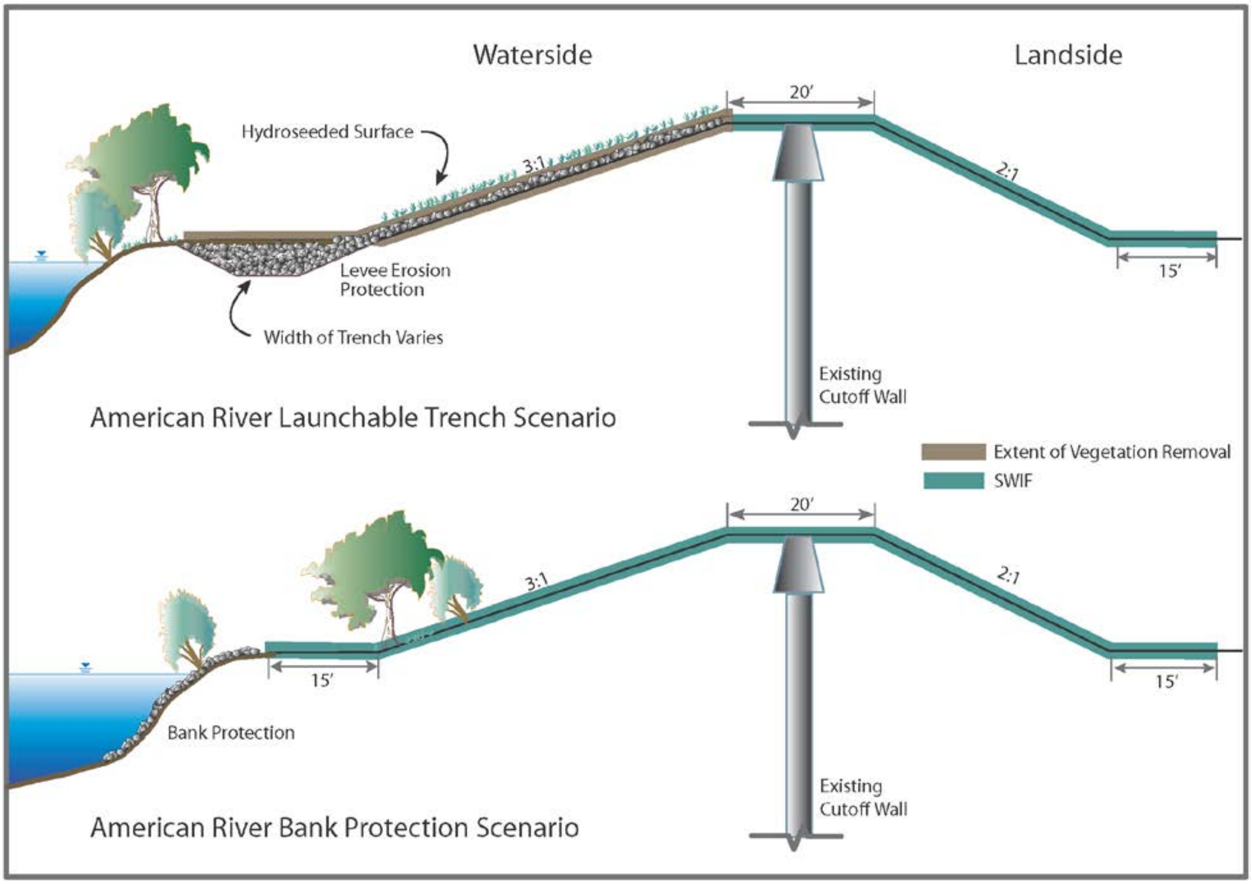

Figure 1. Bank Protection and Launchable Rock Trench Typical Design.

Levee Geometry

Where the existing levee cross section does not meet the levee design requirements, slope flattening, crown widening, and/or a levee raise is required. This improvement measure addresses problems with slope stability, geometry, overtopping, and levee toe and crest access and maintenance. The levee geometry would be adjusted to meet the minimum standards, as described in Section 2.3 above. To begin levee embankment grading, the area would be cleared, grubbed, stripped, and, where necessary, portions of the existing embankment would be excavated to allow for bench cuts and keyways to tie in additional embankment fill. Excavated and borrow material (from nearby borrow sites) would be stockpiled at staging areas. Haul trucks or scrapers would bring borrow materials to the site, which would then be spread evenly and compacted according to levee design plans.

The existing levee centerline would be shifted landward, where necessary in order to meet the Corps' standard levee footprint requirements. The levee crown patrol road would be re-established and a new toe access corridor would be added 10 feet landward of the levee toe in areas where levee raises are required.

In the lower reach of the Sacramento River, near the town of Freeport, the steepness of the levee slope has created a slope stability problem. To address this problem, the levee would be partially degraded and reconstructed with a geotextile material to reinforce the levee slope. Landside access will likely be required to construct this feature from the levee toe upwards.

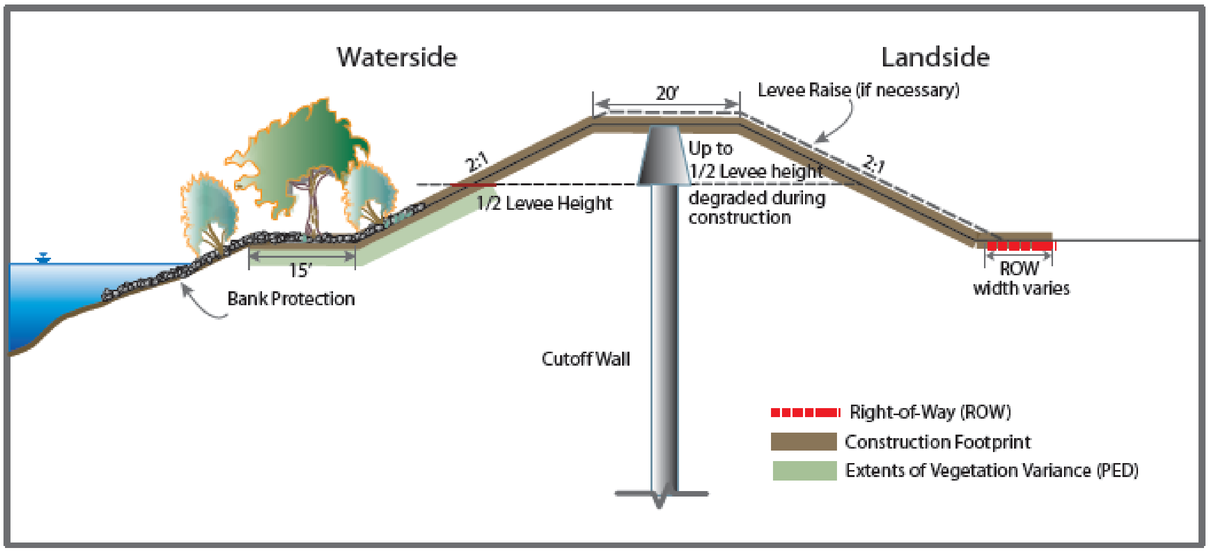

Figure 2. Fix-in-place with Cutoff Wall and Levee Raise.

Cutoff Walls

To address seepage concerns, a cutoff wall will be constructed through the levee crown (Figure 3). The cutoff wall would be installed by one of two methods: (1) conventional open trench cutoff walls, or (2) deep soil mixing (DSM) cutoff walls. The method of cutoff wall selected for each reach would depend on the depth of the cutoff wall needed to address the seepage. The open trench method can be used to install a cutoff wall to a depth of approximately 80 feet. For cutoff walls of greater depth, the DSM method would be utilized.

Prior to construction of either method of cutoff wall, the construction site and any staging areas would be cleared, grubbed, and stripped. The levee crown would be degraded up to half the levee height to create a large enough working platform (approximately 30 feet) and to reduce the risk of hydraulically fracturing the levee embankment from the insertion of slurry fluids.

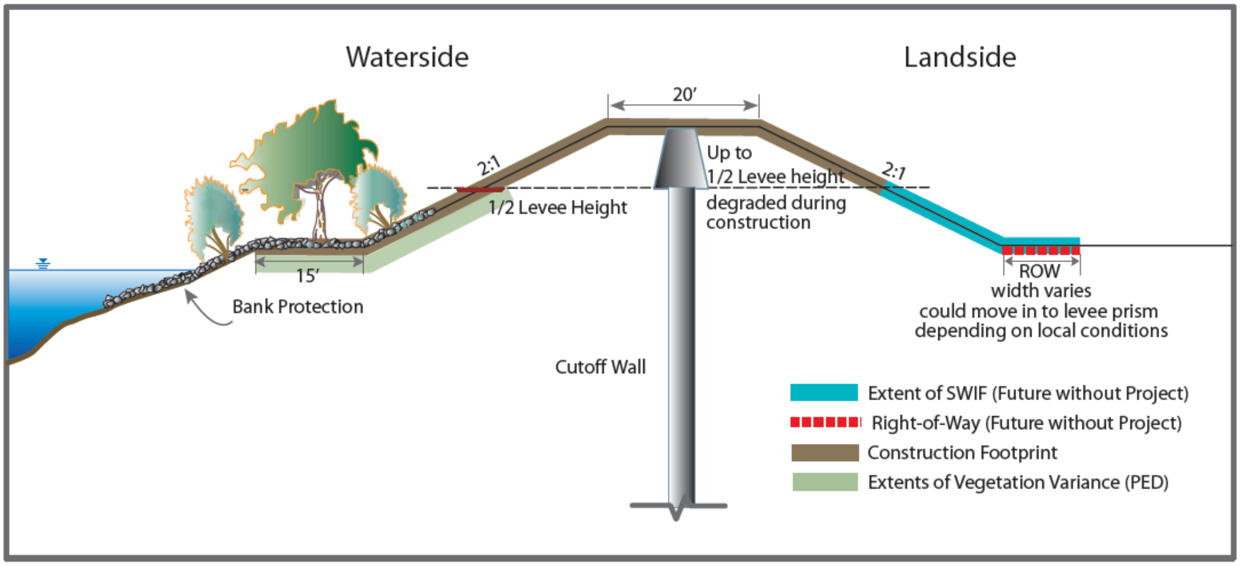

Figure 3. Fix-in-place with Cutoff Wall and No Levee Raise.

Conventional Open Trench Cutoff Wall

Under the open trench method, a trench approximately 3 feet wide would be excavated with a long boom excavator at the top of levee centerline and into the subsurface materials up to 80 feet deep. As the trench is excavated, it will be filled with low density temporary bentonite water slurry to prevent cave in. The soil from the excavated trench is mixed nearby with hydrated bentonite, and in some applications cement. The soil bentonite mixture is backfilled into the trench, displacing the temporary slurry. Once the slurry has hardened, it would be capped and the levee embankment would be reconstructed with impervious or semi-impervious soil.

DSM Cutoff Wall

The DSM method involves a crane supported set of two to four mixing augers used to drill through the levee crown and subsurface to a maximum depth of approximately 140 feet. As the augers are inserted and withdrawn, a cement bentonite grout would be injected through the augers and mixed with the native soils. An overlapping series of mixed columns would be drilled to create a continuous seepage cutoff barrier. Once the slurry has hardened, it would be capped and the levee embankment would be reconstructed with impervious or semi-impervious soil.

Bank Protection

Some rock erosion protection was previously placed along the Sacramento River to reduce the risk of erosion on the levee slopes. The majority of the existing bank protection used a reactive approach as part of ongoing maintenance activities or as part of the Sacramento River Bank Protection Project. While some recent designs and construction of rock erosion protection are expected to provide adequate localized erosion protection, other locations may not deliver the same performance during a flood event. Some previous rock erosion protection does not meet current design standards, is past its intended design life, and is in need of repair and/or replacement.

Bank protection on the Sacramento River would be addressed via either the launchable rock trench method described for the American River in Section 2.3.1 above, or by standard bank protection. The standard bank protection measure for the Sacramento River consists of placing rock protection on the bank to prevent erosion. This measure entails filling the eroded portion of the bank, when necessary, and installing revetment along the waterside levee slope and streambank from streambed to a height determined by site-specific analysis. If needed, a temporary access ramp would be constructed by removing vegetation along the levee slopes and using borrow material that would be trucked on site.

The placement of rock onto the levee slope would occur from atop the levee and/or from the water side by means of barges. Rock required within the channel, both below and slightly above the water line at the time of placement, would be placed by an excavator located on a barge. Construction would require two barges: one barge would carry the excavator, while the other barge would hold the stockpile of rock to be placed on the channel slopes. Rock required on the upper portions of the slopes would be placed by an excavator located on top of the levee. Rock placement from atop the levee would require one excavator and one loader for each potential placement site. The loader brings the rock from a permitted source and stockpiles it near the levee in the construction area. The excavator then moves the rock from the stockpile to the water side of the levee.

The revetment would be placed via the methods discussed above on existing bank at a slope varying from 2V:1H to 3V:1H depending on site specific conditions. After revetment placement has been completed, a small planting berm would be constructed in the rock when feasible to allow for some revegetation of the site (Figure 4). This vegetation will be designed on a site specific basis to minimize the O&M responsibility of the LMA and in such a way to not impact the hydraulic conveyance of the channel.

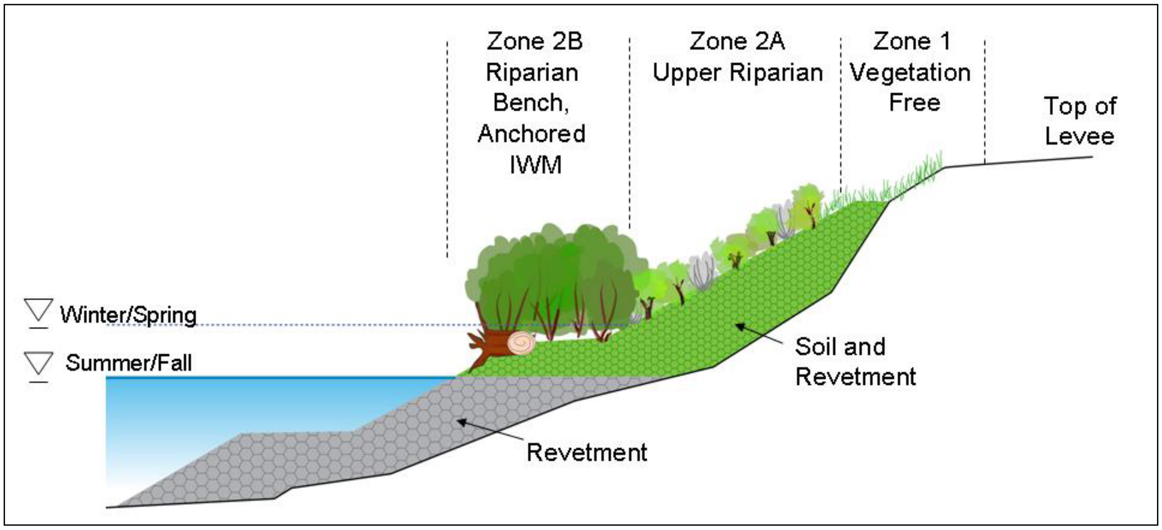

Figure 4. Planting Berm with Vegetation and Woody Material.

<u>Launchable Rock Trench</u>

This measure includes construction of a launchable rock filled trench, designed to deploy once erosion has removed the bank material beneath it (Figure 1). All launchable rock trenches would be constructed outside of the natural river channel. The vegetation would be removed from the footprint of the trench and the levee slope prior to excavation of the trench. The trench configuration would include a 2H:1V landslide slope and 1H:1V waterside slope and would be excavated at the toe of the existing levee. All soil removed during trench excavation would be stockpiled for reuse or disposal. The bottom of the trench would be constructed close to the summer mean water surface elevation in order to reduce the rock launching distance and amount of rock required.

After excavation, the trench would be filled with revetment that would be imported from an offsite location. After rock placement the trench would be covered with a minimum of 3 feet of the stockpiled soil to allow for planting on top of the trench. Rock placed on the levee slope would be covered with the stockpiled soil. All disturbed areas would be reseeded with native grasses and small shrubs where appropriate. Some vegetation could be permitted over the trench if planted outside the specified vegetation free zone required by ETL 1110-2-583. This vegetation would likely be limited to native grasses, shrubs, and trees with shallow root systems to ensure that they do not limit the functionality of the trench during a flood event. This vegetation would only be permitted if they establish in a way that does not put undue burden on the maintaining agency and in locations that do not interfere with the conveyance capacity of the channel

2.3.3 East Side Tributaries

Natomas East Main Drain Canal

The east levee of the NEMDC requires improvements to address seepage and stability at locations where historic creeks had intersected the current levee alignment. A conventional open trench cutoff wall would be constructed at these locations to address the seepage and stability problems. The open trench cutoff walls would be constructed as described for the Sacramento River levee in Section 2.3.2 above.

The NEMDC east levee would be raised or a floodwall constructed to address overtopping concerns. The levee raise would be constructed in a similar manner to that described for the Sacramento River. The floodwall would be placed at the waterside hinge point of the levee and would be designed to disturb a minimal amount of waterside slope and levee crown for construction (Figure 5). The height of the floodwalls varies from 1 to 2 feet, as required by water surface elevations. The waterside slope would be re-established to its existing slope and the levee crown would grade away from the wall and be surfaced with aggregate base.

Arcade Creek

The Arcade Creek levees require improvements to address seepage, slope stability, and overtopping when the event exceeds the current design. A cutoff wall would be constructed to address seepage in Reaches D and E (Plate 3). There is a ditch adjacent to the north levee at the landside toe which provides a shortened seepage path, and could affect the stability of the levee. The ditch would be replaced with a conduit or box culvert and then backfilled. This would lengthen the seepage path and improve the stability of the levee. The Arcade Creek south levee has a slope stability problem in some areas due to the steepness of the levee slope. To address this problem, the levee would be partially degraded and reconstructed with a geotextile material to reinforce the levee slope.

The Arcade Creek levees upstream of Norwood Avenue have existing floodwalls, however there remains an overtopping issue in this reach. A new 1 to 4-foot floodwall and levee raise would allow the levees to pass flood events greater than the current design level. Constructing the floodwall raise would require doweling into the existing concrete floodwall and adding reinforced concrete to the floodwall section. Construction of the floodwall would be consistent with the description for NEMDC, and construction of the levee raise would be consistent with the description for the Sacramento River.

In addition to the measures discussed above, in areas where the current levee geometry does not meet current Corps standards, measures would be implemented to bring these levees into compliance. These measures include widening the crown to 12 feet, when necessary, and flattening slopes that are steeper than 2H:1V.

Dry and Robla Creeks

The Dry and Robla Creeks levees require improvements to address overtopping that may occur when flood events exceed the design level. Potential overtopping would be addressed with a floodwall raise. The floodwall would be placed at the waterside hinge point of the levee and would be designed to disturb a minimal amount of waterside slope and levee crown for construction (Figure 5). The height of the floodwall varies from 1 to 4 feet, as required by water surface elevations. Construction of the floodwall would be consistent with the description for NEMDC, above. The waterside slope would be re-established to its existing slope. The levee crown would grade away from the wall and be surfaced with aggregate base.

In addition to the measures discussed above, in areas where the current levee geometry does not meet current Corps standards, measures would be implemented to bring these levees into compliance. These measures may include widening the crown to 12 feet and flattening slopes that are steeper than 2H:1V.

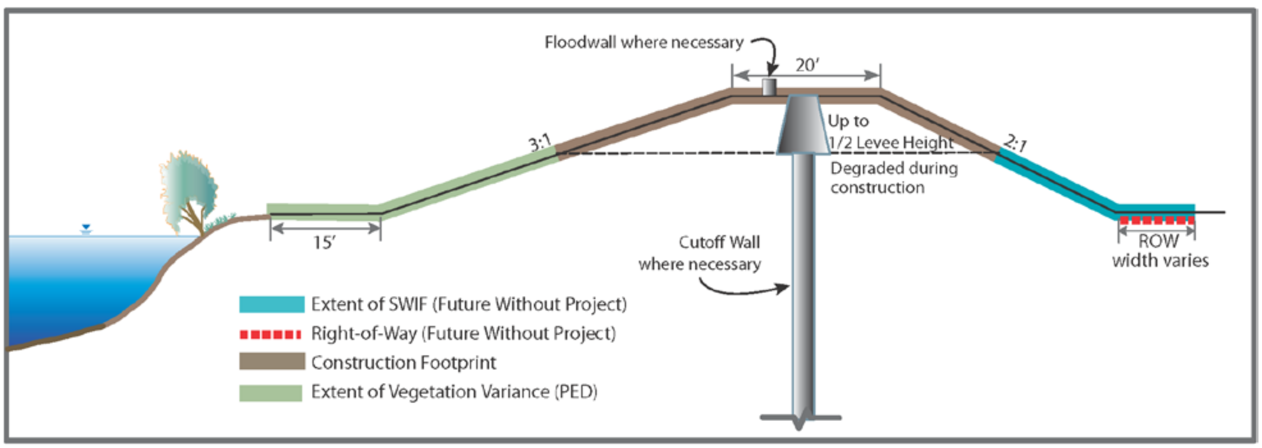

Figure 5. NEMDC, Arcade, Dry/Robla Creek Scenario.

Magpie Creek Diversion Canal

A number of features are proposed for the Magpie Creek Diversion Canal. This includes raising approximately 2,100 feet of the existing left bank levee of the Magpie Creek Diversion Canal. The levee raise would begin just downstream from Raley Boulevard and continue to about 100 feet south of Vinci Avenue Bridge. A new approximately 1,000 foot levee would be constructed along the west side of Raley Boulevard south from the bridge down to Santa Ana Avenue (Figure 6).

In addition, a new 10-foot-wide maintenance road would be graded at the landside base of the new raised Magpie Creek Diversion Canal levee. A new aggregate base maintenance road would be constructed between Vinci Avenue and Dry Creek Road adjacent to the left bank (looking downstream) of the Magpie Creek Diversion Canal for a distance of approximately 2,700 feet.

A 5-foot high floodgate would be installed across the driveway of the Kelly-Moore Paint Store. An additional 4-foot high floodgate would be required at the driveway of a new development just south of the Kelly-Moore Paint Store property.

In addition, a culvert would be constructed under the Sacramento Northern Railway Bike Trail embankment. The culvert would be a triple 5-foot by 5-foot reinforced concrete box. A new channel would be excavated upstream and downstream from the culvert, connecting the culvert with Robla Creek. The new channel would be slightly above the existing channel invert to allow low flows to continue through the existing bridge. Stone protection would be placed in the bed and sides of the new channel to minimize erosion.

The area inundated by a 250-year event without the project in place is estimated to be 76 acres (excluding roadways and channels, the inundated land would be 73 acres). Construction of the proposed improvements would slightly increase the water surface elevation during all flood events greater than a 5-year frequency. During the 250-year event, the increase in water surface is projected to be 0.5 feet at Raley Boulevard and 0.1 feet at the western boundary of McClellan Business Park. This would increase the inundated area to 79 acres (excluding roadways and channels, 76.5 acres). This area will be purchased and preserved as floodplain in perpetuity.

Figure 6. Floodwall and New Levee along Magpie Creek.

2.3.4 Operation and Maintenance

Operation and maintenance (O&M) of the levees in the Sacramento area are the responsibility of the local maintaining agencies, including the American River Flood Control District, DWR's Maintenance Area 9, and the City of Sacramento. The applicable O&M Manual is the Standard Operation and Maintenance Manual for the Sacramento River Flood Control Project. Typical levee O&M currently includes the following actions:

- Vegetation maintenance up to four times a year by mowing or applying herbicide.
- Control of burrowing rodent activity monthly by baiting with pesticide.
- Slope repair, site-specific and as needed, by re-sloping and compacting.
- Patrol road reconditioning up to once a year by placing, spreading, grading, and compacting aggregate base or substrate.
- Visual inspection at least monthly, by driving on the patrol road on the crown and maintenance roads at the base of the levee.

Following construction, the O&M manual would be adjusted to reflect the change in conditions in the study area, including the vegetation variance and the SWIF. Under the adjusted O&M manual, large trees that were protected in place under the variance would be allowed to remain on the waterside slopes, but smaller shrubs would be removed and grasses would be regularly mowed to allow for inspection and access. Vegetation that remains on the landside of the slope under the SWIF would be maintained according to the SWIF plan, which will be prepared by the State of California and the local maintaining agency.

American River Flood Control District

Operation and maintenance would be in accordance with the adjusted O&M manual, as discussed above. This would result in the trimming of up to 50 elderberry shrubs each year and up to 2,500 over the 50 year life of the project. The shrubs are located throughout the American River Parkway, Dry/Robla Creek, Arcade Creek, Magpie Creek, and NEMDC. Trimming consist of cutting overhanging branches along the levee slopes on both the landside and waterside. Some shrubs may be located adjacent to the levee with branches hanging over the levee maintenance road. All shrubs would be trimmed in accordance with the 1999 USFWS approved Conservation Guidelines for the Valley Elderberry Longhorn Beetle. Trimming would occur during the elderberry shrubs dormant season, approximately November through the first two weeks in February, after they have lost their leaves.

Maintenance Area 9

Operation and maintenance would be in accordance with the adjusted O&M manual, as discussed above. This would result in the trimming of up to 20 elderberry shrubs each year and up to 1,000 over the 50 year life of the project. The shrubs are located along the Sacramento River east levee. Trimming consist of cutting overhanging branches along the levee slopes on both the landside and waterside. Some shrubs may be located adjacent to the levee with branches hanging over the levee maintenance road. All shrubs would be trimmed in accordance with the 1999 USFWS approved Conservation Guidelines for the Valley Elderberry Longhorn Beetle. Trimming would occur during the elderberry shrubs dormant season, approximately November through the first two weeks in February, after they have lost their leaves.

City of Sacramento

Operation and maintenance would be in accordance with the adjusted O&M manual, as discussed above. This would result in the trimming of up to 20 elderberry shrubs each year and up to 1,000 over the 50 year life of the project. The shrubs are located along the Sacramento River east levee between the confluence with the American River and Sutterville Road. Trimming consist of cutting overhanging branches along the levee slopes on both the landside and waterside. Some shrubs may be located adjacent to the levee with branches hanging over the levee maintenance road. All shrubs would be trimmed in accordance with the 1999 USFWS approved Conservation Guidelines for the Valley Elderberry Longhorn Beetle. Trimming would occur during the elderberry shrubs dormant season, approximately November through the first two weeks in February, after they have lost their leaves.

2.4 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Alternative 2 would include all of the levee improvements discussed in Alternative 1, except for the extent of the levee raises along the Sacramento River would be significantly less (Plate 4). Instead of implementing the majority of levee raises included in Alternative 1, the Sacramento Weir and Bypass would be widened to divert more flows into the Yolo Bypass. The levees along the American River, NEMDC, Arcade, Dry Creek, Robla Creek, and Magpie Creek, would be improved to address identified seepage, stability, erosion, and height concerns through the methods described under Alternative 1. The levees along the Sacramento River would be improved to address identified seepage, stability, and erosion concerns though the measures described under Alternative 1. Due to environmental, real estate, and hydraulic constraints within the American River North and South basins, the majority of the levees would be improved within the existing levee footprint to the extent practicable.

Table 5. Alternative 2 - Proposed Levee Improvement Measures by Waterway.

Waterway	Seepage Measures	Stability Measures	Erosion Protection Measures	Overtopping Measures
American River[1]	---	---	Bank Protection, Launchable Rock Trench	---
Sacramento River	Cutoff Wall	Cutoff Wall, Geotextile, and Slope Flattening	Bank Protection, Launchable Rock Trench	Sacramento Bypass and Weir Widening
NEMDC	Cutoff Wall	Cutoff Wall	---	Floodwall/Levee Raise
Arcade Creek	Cutoff Wall	Cutoff Wall, Geotextile	---	Floodwall/Levee Raise
Dry/Robla Creeks	---	---	---	Floodwall
Magpie Creek[2]	---	---	---	Floodwall/New Levee/Detention Basin

Note: [1] American River seepage, stability, and overtopping measures were addressed in the American River Common Features, WRDA 1996 and 1999 construction projects.
[2]In addition to the listed measures, some improvements would need to occur on Raley Boulevard, including widening of the Magpie Creek bridge, raising the elevation of the roadway, and removing the Don Julio Creek culvert.

In addition to the proposed levee improvements measures shown in Table 5, the following measures and policies would be addressed during construction:

- During construction of structural levee improvements, the cross section geometry of any levees that currently do not meet Corps' and State standards would be improved. The Corps standard levee footprint consists of:
  - A 20 foot crown width for the Sacramento River and American River, or
  - A 12-foot crown width for NEMDC, Arcade Creek, Dry Creek, Robla Creek, and Magpie Creek, and
  - Either 2H:1V or 3H:1V landside and waterside slopes (depending on the channel, past performance, and engineering analysis).
- Utility encroachments and penetrations within the construction area will be brought into compliance with applicable Corps policy or removed depending on the type and location. Utilities replacements would occur via one of two methods: (1) a surface line over the levee prism, or (2) a through-levee line equipped with positive closure devices.
- Private encroachments shall be removed by the non-federal partner or property owner prior to construction. Encroachments outside the construction footprint will be brought into compliance under the SWIF process as part of O&M.

It is estimated that more than of 1 million CY of borrow material could be needed to construct the project. For the purposes of NEPA/CEQA a worst case scenario is being evaluated for the volume of borrow material needed. Actual volumes exported from any single borrow sites would be adjusted to match demands for fill. Borrow sites for Alternative 2 would be identified and excavated in a manner consistent with the description for Alternative 1 in Section 2.3 above.

Construction of Alternative 2 is proposed to take approximately 10 years. The construction reaches have been prioritized based on a variety of factors, including the condition of the levee, the potential damages that would occur due to levee failure, and construction feasibility considerations, such as the availability of equipment at any given time. The tentative schedule of construction is shown in Table 6.

The following sections contain more detailed information on the specific features and reaches included in this alternative.

2.4.1 Sacramento Weir and Bypass

Alternative 2 includes all of the fix-in-place methods proposed in Alternative 1, with a reduced amount of levee raising on the Sacramento River (less than 1 mile total). The Sacramento Bypass and Weir currently allow excess flood waters to spill out of the system into the Yolo Bypass thereby reducing the loading on the levee system below. Alternative 2 leverages this existing structure by extending the current weir structure 1,500 feet north along with relocating the bypass levee. The weir, combined with the increased bypass width and operations change, will allow more water to be released out of the system eliminating the need for most of the height improvements along the ARS sub-basin, Reaches D to G. However, this alternative does not reduce the need for seepage, stability and erosion improvements within those reaches.

For this alternative, the existing north levee of the Sacramento Bypass would be degraded and a new levee constructed approximately 1,500 feet to the north. A new weir would be extended north of the existing Sacramento Weir without impacting the existing structure. The new weir will be extended approximately 1,500 feet and include a seepage cutoff wall below. The increase in Bypass flows through the new weir would occur during high water events only, when the flow released from Folsom Dam on the American River exceeds 115,000 cfs. The existing Sacramento Weir and Bypass would be operated consistent with current conditions based on the stage at the I Street gage.

The new north levee of the Sacramento Bypass will be constructed per new levee construction standards, including 3H:1V waterside and landside slopes and a minimum crest width of 20 feet. As both the existing north and south levees have experienced underseepage and slope stability related distress, the new north levee would include a 300-foot wide drained landside seepage berm (5 feet thick at the landside levee toe tapering to 3 feet thick at the berm toe and constructed of random fill with a 1.5-foot thick drainage and filter layer at the base) with a system of relief wells located at least 15 feet landward of the berm toe and spaced at 200-foot intervals. Existing infrastructure, including roads, railways, canals, and pump stations will be relocated to maintain current operation.

2.4.2 American River

Measures for the American River levees under Alternative 2 would address erosion. These measures were identified under Alternative 1, and would also be included in Alternative 2. These measures were described in detail in Section 2.3.1. Implementation of these measures under Alternative 2 would be consistent with the description in Alternative 1.

2.4.3 Sacramento River

The measures for the Sacramento River levees would be consistent with Alternative 1, with one exception. Under Alternative 1, Sacramento River levee remediation measures were proposed to address seepage, stability, erosion control, and levee height problems. Under Alternative 2, less than one mile of levee raise would be required instead of the approximately 7 miles required under Alternative 1. The remaining measures from Alternative 1 that would also be implemented under Alternative 2 for the Sacramento River levee include the following: (1) installation of cutoff walls to address seepage concerns; (2) slope reshaping to address stability concerns; and (3) bank protection/launchable rock trench measures to address erosion. The description of these three measures can be found in Section 2.3.2 above.

2.4.4 East Side Tributaries

Measures for the east side tributary levees under Alternative 2 would address seepage, slope stability, and height issues. These measures were identified under Alternative 1, and would also be included in Alternative 2. These measures were described in detail in Section 2.3.3. Implementation of these measures under Alternative 2 would be consistent with the description in Alternative 1.

Table 6. Tentative Construction Schedule for Alternative 2.

PRIORITY	WATERWAY	REACH	YEAR OF PROJECT CONSTRUCTION									
			1	2	3	4	5	6	7	8	9	10[1]
1	Sacramento River	ARS F										
2	Sacramento River	ARS E										
3	American River	ARS A										
4	Sacramento River	ARS G										
5	Sacramento River	ARS D										
6	American River	ARS B										
7	American River	ARN A										
8	American River	ARS C										
9	American River	ARN B										
10	Sacramento Weir & Bypass	--										
11	Arcade Creek	ARN D										
12	NEMDC	ARN F										
13	Arcade Creek	ARN E										
14	NEMDC	ARN C										
15	Dry/Robla Creek	ARN G										
16	Magpie Creek	ARN I										

2.4.5 Operation and Maintenance

O&M of the levee system under Alternative 2 would be consistent with the description for Alternative 1 in Section 2.3.4. In addition, Alternative 2 would include future O&M of the expanded Sacramento Weir and Bypass. The Sacramento Weir and Bypass is currently operated and maintained by the State of California Department of Water Resources (DWR). O&M associated with the expanded Sacramento Weir and Bypass is described below.

<u>Department of Water Resources</u>

The operation of the expanded Sacramento Weir and Bypass would be similar to that of the existing weir. Releases into the weir will occur at the same intervals and durations as currently occur. The expanded weir however, would allow for larger volumes of water to be moved off the urban levees and into the bypass system in a large flood event.

2.5 Comparison of Alternatives

Table 7 shows the overall level of significance for each issue area, and provides a comparison of significance determinations among the No-Action Alternative, Improve Levees, and Sacramento Bypass and Improve Levees (TSP). These three alternatives are analyzed in this DEIS/EIR as the final array of alternatives considered. Other alternatives have been screened out due to various reasons described in Section 2.1.2.

Table 7. Comparison of the Environmental Impacts (After Mitigation Implementation) of the Common Features Project Alternatives.

	No Action Alternative	**Alternative 1 – Improve Levees**	**Alternative 2 – Sacramento Bypass and Improve Levees (TSP)**
Land Use			
Effect		Acquisition of properties for flood control easements along the Sacramento River and Arcade Creek.	Acquisition of properties for flood control easements along the Sacramento River and Arcade Creek (fewer properties impacted than Alternative 1). Conversion of agricultural lands to floodway.
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None required.	Federal Relocation Act compliance. Payment of Sacramento County Habitat Restoration Program fees.	Federal Relocation Act compliance. Payment of Sacramento County Habitat Restoration Program fees.
Hydrology and Hydraulics			
Effect	Emergency repairs during a flood event could result in the loss of channel capacity and alternation of current geomorphic processes.	No effect.	Reduce water surface elevation in the Sacramento River downstream of the confluence of the American River without significantly increasing water surface elevation in the Yolo Bypass downstream of the confluence of the Sacramento Bypass.
Significance	Significant.	Not applicable.	Less than significant.
Mitigation	None possible.	Not applicable.	None required.
Water Quality			
Effect	In a flood event, there is high risk of contaminants entering the water from utilities, stored chemicals, septic systems, and flooded vehicles. In addition, flood flows would increase erosion of the banks, increasing turbidity in the waterways.	Potential impacts include increased turbidity during bank protection construction, runoff of exposed soils, and cement, slurry, or fuel spills during construction.	Potential impacts include increased turbidity during bank protection construction, runoff of exposed soils, and cement, slurry, or fuel spills during construction.
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Sacramento Bypass and Improve Levees (TSP)
Mitigation	None possible.	Preparation of a Stormwater Pollution Protection Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan. Implementation of BMPs listed in Section 3.5.6.	Preparation of a Stormwater Pollution Protection Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan. Implementation of BMPs listed in Section 3.5.6.
Vegetation and Wildlife			
Effect	Erosion during a flood event could cause significant vegetation loss and wildlife habitat loss. Flood fighting activities could prevent future vegetation growth on river banks.	Construction of levee improvements would result in significant loss of vegetation and wildlife habitat on the landside of the Sacramento River levees, in the American River Parkway, and along Arcade Creek.	Construction of levee improvements would result in significant loss of vegetation and wildlife habitat on the Sacramento River levees, in the American River Parkway, and along Arcade Creek. Construction of the Sacramento Weir extension would require the removal of riparian vegetation.
Significance	Significant.	Significant.	Significant.
Mitigation	Compensation would likely occur after the fact, but there would still be significant direct impacts due to the temporal loss of vegetation.	When possible, compensation would be planted on planting berms, on top of launchable rock trenches, or on other lands within the Parkway. Additional mitigation sites are identified in Section 3.6.6.	When possible, compensation would be planted on planting berms, on top of launchable rock trenches, or on other lands within the Parkway. A hydraulic evaluation will be conducted to determine whether mitigation could occur in the Sacramento Bypass. Additional mitigation sites are identified in Section 3.6.6.
Fisheries			
Effect	Flood fighting could prevent growth of vegetation on levee slopes, and increase turbidity, thus impacting migration, spawning, or rearing habitat.	Indirect effects to fish habitat from the removal of vegetation from the levee slopes. Direct effects from the placement of rock at bank protection sites, causing an increase in turbidity.	Indirect effects to fish habitat from the removal of vegetation from the levee slopes. Direct effects from the placement of rock at bank protection sites, causing an increase in turbidity. Widening the Sacramento Bypass creates floodplain,

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Sacramento Bypass and Improve Levees (TSP)
			which could provide a benefit to fish species.
Significance	Significant.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	Compensation would likely occur after the fact, but there would still be significant direct impacts due to the temporal loss of vegetation.	Vegetation variance would allow waterside vegetation to remain on the Sacramento River. Bank protection sites and launchable rock trenches would be revegetation following construction. BMPs would be implemented to address turbidity, and are discussed in Section 3.5.6.	Vegetation variance would allow waterside vegetation to remain on the Sacramento River. Bank protection sites and launchable rock trenches would be revegetation following construction. BMPs would be implemented to address turbidity, and are discussed in Section 3.5.6.
Special Status Species			
Effect	Flood event or flood fight could cause loss of habitat and fatality to species.	Direct affects to GGS, Fish Species, and Swainson's Hawks during construction. Indirect effects due to loss of habitat. Vegetation Variance for the waterside levee slopes would significantly limit the effects to endangered fish species.	Direct affects to GGS, Fish Species, and Swainson's Hawks during construction. Indirect effects due to loss of habitat. Vegetation Variance for the waterside levee slopes would significantly limit the effects to endangered fish species.
Significance	Significant	Less than Significant with Mitigation	Less than Significant with Mitigation
Mitigation	None proposed	Replace habitat for species either on-site or in close proximity to lost habitat. Implement BMPs discussed in Section 3.5.6 during construction to prevent mortality.	Replace habitat for species either on-site or in close proximity to lost habitat. Implement BMPs discussed in Section 3.5.6 during construction to prevent mortality.
Cultural Resources			
Effect	Damage to historic and prehistoric resources during a flood event.	Adverse effects to historic properties from construction of levee improvements.	Adverse effects to historic properties from construction of levee improvements and the bypass widening.
Significance	Potentially significant.	Less than significant with mitigation under NEPA. Significant and unavoidable under CEQA.	Less than significant with mitigation under NEPA. Significant and unavoidable under CEQA.
Mitigation	None possible.	Preparation and implementation of a	Preparation and implementation of a

	No Action Alternative	**Alternative 1 – Improve Levees**	**Alternative 2 – Sacramento Bypass and Improve Levees (TSP)**
		Programmatic Agreement, Historic Properties Management Plan, and Historic Properties Treatment Plans.	Programmatic Agreement, Historic Properties Management Plan, and Historic Properties Treatment Plans.
Transportation and Circulation			
Effect	Potential for flooded roadways in a flood event.	Increased traffic on public roadways.	Increased traffic on public roadways.
Significance	Potentially significant.	Significant.	Significant.
Mitigation	None possible.	Preparation of a Traffic Control and Road Management Plan and other BMPs listed in Section 3.10.6.	Preparation of a Traffic Control and Road Management Plan and other BMPs listed in Section 3.10.6.
Air Quality			
Effect	Increased emissions during flood fighting activities without BMPs in place.	Emissions of criteria pollutants from construction equipment, haul trucks, and barges.	Emissions of criteria pollutants from construction equipment, haul trucks, and barges.
Significance	Significant	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None possible.	Implementation of SMAQMD's Basic Construction Emission Control Practices and other BMPs, as listed in Section 3.11.6.	Implementation of SMAQMD's Basic Construction Emission Control Practices and other BMPs, as listed in Section 3.11.6.
Climate Change			
Effect	Increased GHG emissions during flood fighting activities without BMPs in place.	Increased GHG emissions from construction equipment, haul trucks, and barges.	Increased GHG emissions from construction equipment, haul trucks, and barges.
Significance	Significant	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	None possible.	Implementation of SMAQMD's Basic Construction Emission Control Practices and other BMPs, as listed in Section 3.12.6.	Implementation of SMAQMD's Basic Construction Emission Control Practices and other BMPs, as listed in Section 3.12.6.
Noise			
Effect	Increased noise during flood fighting.	Increased noise in proximity to sensitive receptors due to construction activities.	Increased noise in proximity to sensitive receptors due to construction activities.

	No Action Alternative	**Alternative 1 – Improve Levees**	**Alternative 2 – Sacramento Bypass and Improve Levees (TSP)**
Significance	Less than significant.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	Not applicable.	Coordination with local residents, compliance with noise ordinances, and other BMPs, as listed in Section 3.13.6.	Coordination with local residents, compliance with noise ordinances, and other BMPs, as listed in Section 3.13.6.
Recreation			
Effect	During a flood event, recreation facilities, particularly in the Parkway, would be impacted by flooding and potentially loss due to erosion.	Temporary closure of recreation facilities in the American River Parkway during construction, including bike trail, walking trails, and boat launches.	Temporary closure of recreation facilities in the American River Parkway during construction, including bike trail, walking trails, and boat launches. Possible closure of the Sacramento Bypass during portions of hunting season.
Significance	Significant.	Significant.	Significant.
Mitigation	None possible.	Notification and coordination with recreation users and bike groups. Flaggers, signage, and fencing to notify and control recreation access and traffic around construction sites.	Notification and coordination with recreation users and bike groups. Flaggers, signage, and fencing to notify and control recreation access and traffic around construction sites.
Aesthetics and Visual Resources			
Effect	A flood event would damage the visual character in the study area.	Vegetation loss and construction activities would disrupt the existing visual conditions in the Parkway and along the Sacramento River.	Vegetation loss and construction activities would disrupt the existing visual conditions in the Parkway and along the Sacramento River.
Significance	Significant.	Significant.	Significant.
Mitigation	None possible.	Trees would be planted after construction is completed on planting berms and on top of launchable rock trenches, however there would still be a temporal loss of vegetation. Disturbed areas would be reseeded with native grasses.	Trees would be planted after construction is completed on planting berms and on top of launchable rock trenches, however there would still be a temporal loss of vegetation. Disturbed areas would be reseeded with native grasses.
Public Utilities and Services			
Effect	In a flood event there could be	Temporary disruptions to utility services	Temporary disruptions to utility services

	No Action Alternative	**Alternative 1 – Improve Levees**	**Alternative 2 – Sacramento Bypass and Improve Levees (TSP)**
	significant damage to utility systems. Debris from flooded homes and properties could overwhelm solid waste disposal facilities.	possible, particularly during relocation of utilities that penetrate the levee.	possible, particularly during relocation of utilities that penetrate the levee.
Significance	Significant.	Less than significant.	Less than significant.
Mitigation	None possible.	Notification of potential interruptions would be provided to the appropriate agencies and to landowners.	Notification of potential interruptions would be provided to the appropriate agencies and to landowners.
Hazardous, Toxic, and Radiological Wastes			
Effect	No effect.	No effect from construction activities. HTRW sites encountered would be removed and properly disposed of prior to construction.	No effect from construction activities. HTRW sites encountered would be removed and properly disposed of prior to construction, including the Old Bryte Landfill.
Significance	Not applicable.	Less than significant with mitigation.	Less than significant with mitigation.
Mitigation	Not applicable.	Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.	Borrow material would be tested prior to use to ensure that no contaminated soils are used for this project.
Socioeconomics, Population, and Environmental Justice			
Effect	Flooding of residential areas and displacement of populations during a flood event. Flooding of the State Capitol's government centers also possible.	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for flood control easements.	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for flood control easements (fewer properties impacted than Alternative 1).
Significance	Significant.	Less than significant.	Less than significant.
Mitigation	None possible.	Federal Relocation Act compliance.	Federal Relocation Act compliance.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

The baseline environmental conditions assumed in this DEIS/DEIR for analyzing the effects of the ARCF Project consist of the existing physical environment as of 2008, the date when the State of California Department of Water Resources published the notice of preparation (NOP) to prepare an EIS/EIR with the State Clearinghouse. The 2008 existing physical environment is consistent with the current conditions in the project area because no major changes to resources have occurred within the last several years in the project area. The Corps published the Notice of Intent (NOI) in the Federal Register for this DEIS/DEIR concurrent with issuance of the State's NOP.

This chapter describes the methodology and threshold of significance for each resource, analyzes the significant environmental impacts of the project, and presents mitigation measures.

Geological resources have been presented for the existing conditions. However, because there is no effect to geological resources as a result of implementing the alternatives, it is not evaluated further in this document.

3.2 Geological Resources

This section describes the affected environment for geological resources in the ARCF project area.

Regulatory Setting

Federal

The following Federal regulation related to geology, soils, and mineral resources may apply to the implementation of the ARCF project

- Clean Water Act Section 402 (National Pollutant Discharge Elimination System Program)

State

The following State regulations related to geology, seismicity, soils, and mineral resources may apply to implementation of the ARCF GRR project.

- Alquist-Priolo Earthquake Fault Zoning Act
- California Seismic Hazards Mapping Act
- California Building Standards Code
- California Surface Mining and Reclamation Act

<u>Existing Conditions</u>

The following conditions are relevant to geology, seismicity, soil, and mineral resource conditions in the proposed ARCF GRR project area.

Geology

The ARCF GRR project area lies in the central portion of the Sacramento Valley which lies in the northern portion of the Great Valley Geomorphic Province of California. The Great Valley is a narrow, elongated topographic depression that is approximately 450 miles long and 40 to 70 miles wide. The Sacramento Valley lies between the northern Coast Ranges to the west and the northern Sierra Nevada to the east, and has been a depositional basin throughout most of the late Mesozoic and Cenozoic time. A large accumulation of sediments, estimated at over two vertical miles in thickness in the Sacramento area, were deposited during cyclic transgressions and regressions of a shallow sea that once inundated the valley (Hackel, 1966). This thick sequence of clastic sedimentary rock units was derived from adjoining easterly highlands erosion during the Late Jurassic period with interspersed Tertiary volcanics. They form bedrock units now buried in mid-basin valley areas. These bedrock units were covered by coalescing alluvial fans during Pliocene-Pleistocene periods by major ancestral west-flowing Sacramento Valley rivers (Feather, Yuba, Bear, and American). These rivers funneled large volumes of sediment into the Sacramento basin. Late Pleistocene and Holocene (Recent) alluvial deposits now cover low-lying areas. These deposits consist largely of reworked fan and stream materials deposited by meandering rivers prior to construction of existing flood control systems.

The Sacramento River is the main drainage feature of the region flowing generally southward from the Klamath Mountains to its discharge point into the Suisun Bay in the San Francisco Bay area. Located in central northern California, the Sacramento River is the largest river system and basin in the state. The 27,000 square mile Sacramento River Basin includes the eastern slopes of the Coast Ranges, Mount Shasta, and the western slopes of the southernmost region of the Cascades and the northern portion of the Sierra Nevada. The Sacramento River, stretching from the Oregon border to the Bay-Delta, carries 31% of the state’s total runoff water. Primary tributaries to the Sacramento River include the Pit, McCloud, Feather, and American Rivers. Within the Sacramento area, the Sacramento and American Rivers have been confined by man-made levees since the turn of the century. The confluence with the Sacramento River, only 20 feet above sea level, is subject to tidal fluctuation although more than 100 miles north of the Golden Gate and San Francisco Bay. Within the study area, these levees were generally constructed on Holocene age alluvial and fluvial sediments deposited by the current and historical Sacramento River and its tributaries. Pleistocene deposits underlie the Holocene deposits.

The major source of sediments deposited in the ARCF GRR project area is from the erosion of the Sierra Nevada mountain range and foothills to the east of the Sacramento Valley. Naturally occurring asbestos (NOA) is known to occur in the foothill metamorphic belt. Therefore, NOA may be present; however, the likelihood of project area soils containing significant concentrations of NOA is low due to the long distance from the source rock.

Seismicity

The ARCF GRR project area has experienced relatively low seismic activity in the past and does not contain any Alquist-Priolo Earthquake Fault Zones (California Geological Survey, 1999; Hart and Bryant, 1999). Numerous earthquakes of magnitude (M) 5.0 or greater have occurred on regional faults, primarily those within the San Andreas Fault System. The west side of the Central Valley is a seismically active region. The nearest known active (Holocene or Historic) fault trace to the project area is the Dunnigan Hills fault, approximately 30 miles northwest of downtown Sacramento (Jennings, 2010).

Three pre-Quaternary faults/fault zones are located within an approximately 20-mile radius of the ARCF GRR project area. The Willows fault zone runs northwest to southeast of the project area; the East Valley fault runs to the west of the project area; and the Midland fault zone runs to the southeast of the project area (Jennings 2010). None of these faults/fault zones are within an Alquist-Priolo Special Studies Zone. The active fault nearest to the project area is the Dunnigan Hills fault, which is 30 miles to the northwest and is within an Alquist-Priolo Special Studies Zone (California Geological Survey, 2007).

Probabilistic Seismic Hazard Analysis (PSHA) based on the 2008 Next Generation Attenuation (NGA) relationships was used to develop the seismic loading parameters used in the ARCF GRR. The deaggregations are from the United States Geologic Survey's (USGS) 2008 Interactive Deaggregations web program. The mean magnitude or the weighted average considering the percent contribution to the total hazard for the study levees is 6.7. Peak horizontal ground horizontal acceleration outputs from the USGS deaggregation program for 20% exceedance in 50 years (224-year average return period) ranged between 0.17 and 0.20 with an average of 0.18 for the project area.

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is fault ground rupture, also called surface faulting. Because there are no active faults mapped in the ARCF GRR project area by the California Geological Survey or the U.S. Geological Survey, and the area is not located within an Alquist-Priolo Earthquake Fault Zone, fault ground rupture is unlikely. Common secondary seismic hazards include ground shaking, liquefaction, subsidence, and seiches.

Liquefaction and Settlement

Liquefaction is the liquefying of certain sediments during ground shaking of an earthquake, resulting in temporary loss of support to overlying sediments and structures. Differential settlement occurs when the layers that liquefy are not of uniform thickness, a common problem when the liquefaction occurs in artificial fills. Poorly consolidated, water-saturated fine sands located within 30 to 50 feet of the surface typically are considered the most susceptible to liquefaction. Soils and sediments that are not water-saturated and that consist of finer grained materials are generally not susceptible to liquefaction.

The ARCF GRR performed liquefaction triggering analyses and found liquefiable material at several locations within the project area. Static limit equilibrium stability analyses were performed for locations with liquefiable material. Based on those analyses the flood protection ability after a 200-year seismic event for American River North Reach A, and American River South Reaches C through G (Plate 3). This shows the potential for lateral spreading or differential settlement, which in turn could result in structural degradation of flood management structures. If a large regional earthquake occurred during a major flood event, these potential effects would be magnified, and the potential for levee breach would be increased.

Regardless, implementation of the project would not substantially alter the composition of the subject levees or foundation soils or change their susceptibility to liquefaction. Because of the relative small likelihood of coincidence flood event and a major earthquake, and because the expected magnitude of ground shaking from large regional earthquakes is relatively low in the project area, the potential for failure or significant damage of project structures is low.

Soils

The Sacramento County soil survey identified a variety of soil map units in the ARCF GRR project area. Most of the soils in the project area are shallow to moderately deep, sloping, well-drained soils with very slowly permeable subsoils underlain with hardpan. These soils have good natural drainage, slow subsoil permeability, and slow runoff.

The project area generally consists of deep soils derived from alluvial sources, which range from low to high permeability rates and low to high shrink-swell potential. Soils range from low to high hazard ratings for construction of roads, buildings, and other structures related to soil bearing strength, shrink-swell potential, and the potential for cave-ins during excavation. Soils immediately adjacent to the Sacramento River are dominated by deep, nearly level, well-drained loamy and sandy soils. The natural drainage is good, and the soils have slow to moderate subsoil permeability. The river terraces consist of very deep, well-drained alluvial soils (NRCS, 2007-2012). The porous nature of the soils underneath the existing levee system is an important consideration for the design of levee improvements within the ARCF GRR project area.

Minerals

Sacramento and Yolo Counties protect aggregate (i.e., sand and gravel) from land uses that could preclude or inhibit a timely mineral extraction to meet market demand. According to the California Department of Conservation (CDC), Division of Mines and Geology, the majority of the ARCF Project area is classified as either MRZ-1, meaning that no significant mineral deposits are present in this area or that little likelihood exists for their presence, or as MRZ-3, meaning it is an area containing mineral deposits, the significance of which cannot be evaluated from existing data (California Division of Mines and Geology, 1988a). Portions of the American River Parkway have been classified as MRZ-2, meaning that it is an area where adequate information indicates that significant mineral deposits are present or it is judged that a high likelihood to be present. There are no MRZ-designated areas within the Sutter County portion of the ARCF project area.

Lands classified as MRZ-1 or MRZ-3 are not affected by state policies pertaining to the maintenance of access to regionally significant mineral deposits under the California Surface Mining and Reclamation Act of 1975. As such, the proposed use would not result in the loss or availability of a known mineral resource that would be of value to the region and the residents of the state. The MRZ-2 sectors are all within the American River Parkway, which is a public regional recreational resource that have been designated a Wild and Scenic River by the Federal Government and State of California. Because of this designation it is unlikely that permitting would occur in the future in this area of the project sectors (California Division of Mines and Geology, 1988a).

3.3 Land Use

3.3.1 Environmental Setting

Regulatory Setting

The following land use plans were used to determine impacts on land use if the project were implemented:

- American River Parkway Plan
- Sacramento County General Plan
- Sacramento City General Plan
- Yolo County General Plan
- SAFCA Joint Powers Agreement

<u>Existing Conditions</u>

Much of the study area has been developed and is at or near build out. The geographic boundaries of Sacramento County include seven incorporated cities, four of which are within the study area. Portions of the cities of Citrus Heights, Elk Grove, Rancho Cordova, and Sacramento are located within the study area. While the alternatives considered provide reduced risk of flooding to the unincorporated areas of Sacramento and Sutter Counties, construction activities would be located along the river systems and not within these unincorporated areas. No future development economic benefits have been included as part of the justification for this project. Since the project area is at or near build out and only minimal infill development is expected to occur with the implementation of the project, Executive Order 11988 will not be discussed further in this analysis.

American River North

This portion of the study area contains portions of Sacramento County, and the city of Sacramento. Most of the area has changed from agricultural to urban uses over time. The former McClellan Air Base, which is now the McClellan Business Air Park, is located in this portion of the study area. Since the conversion from a military airfield to a public/commercial facility, non-military operations have steadily increased at this facility. Housing, employment, and recreation are equally dispersed throughout the area.

The American River Parkway (Parkway) is an open space greenbelt which extends approximately 29 miles from Folsom Dam at the northeast to the American River's confluence with the Sacramento River southwest. The lower American River is classified as a "Recreation" river within the State and Federal Wild and Scenic River Systems. The American River is the central focus of the Parkway which provides enjoyment to residents and visitors of the region. The land uses in the Parkway are defined in the 2008 American River Parkway Plan (Parkway Plan). The Parkway Plan acts as the management plan for the Federal and State Wild and Scenic Rivers Act.

The goal of the plan is to provide, protect, and enhance a continuous open space greenbelt along the American River for public use. Human developments and facilities are prohibited in the "Open Space Preserve Areas", except as necessary to protect the public health, safety, welfare, or for the purposes of habitat restoration.

The American River Parkway Plan flood control policies include:

- Flood management agencies should continue to maintain, and improve, when required, the reliability of the existing public flood control system along the lower American River to meet the need to provide a high level of flood protection to the heavily urbanized floodplain along the lower American River consistent with other major urban areas. This effort is expected to include raising and strengthening the levees as necessary to safety contain very high flows in the river (up to 160,000 cfs) for a sustained period.
- Flood control projects, including levee protection projects and vegetation removal for flood control purposes, shall be designed to avoid or minimize adverse impacts on the Parkway, including impacts to wildlife and wildlife corridors. To the extent that adverse impacts are unavoidable, appropriate feasible compensatory mitigation shall be part of the project. Such mitigation should be close to the site of the adverse impact, unless such mitigation creates other undesirable impacts.
- Where feasible, multi-use buffers should be created on the land side of the levees, including additional access points from public streets that enhance levee operation and maintenance activities, improve flood fight capabilities, provide opportunities to relocate or expand levees or supporting stability berms, if required, and support recreational opportunities.
- Vegetation in the Parkway should be appropriately managed to maintain the structural integrity and conveyance capacity of the flood control system, consistent with the need to provide a high level of flood protection to the heavily urbanized floodplain along the lower American River and in a manner that preserves the environmental, aesthetic, and recreation quality of the Parkway.
- Flood control berms, levees, and other facilities should be, to the extent consistent with proper operation and maintenance of these facilities, open to the public for approved uses, such as hiking, biking and other recreational activities.
- Public facilities and private encroachments that inappropriately constrain the operation and maintenance of the flood control systems should be redesigned or relocated.
- The flood control system should be maintained in a condition that ensures adequate flood fighting capability, consistent with the demands of protecting a heavily developed floodplain.
- Bank scour and erosion shall be proactively managed to protect public levees and infrastructure, such as bridges, piers, power lines habitat and recreational resources. These erosion control projects which may include efforts to anchor berms and banks with rock revetment, shall be designed to minimize damage to riparian vegetation wildlife habitat, and should include a revegetation program that screens the project from public view, provides for a naturalistic appearance to the site, and restores affected habitat values.

- Projects to address bank stabilization and erosion that are threatening privately-owned structures shall secure appropriate permits. The engineering of these projects should give preference to biotechnical or non-structural alternatives, where feasible, over alternative involving revetments, bank re-grading, or installation of river training structures. Use of rubble, gunnite, bulkheads, or similar material in these projects is prohibited.
- It is recognized that flood control agencies have the authority to take action(s) to prevent or respond to flood emergencies occurring in or adjacent to the Parkway. In the event that these action(s) have an adverse impact on biological resources in excess of the estimated impacts of the projected flood damage to such resources, the agency(ies) undertaking the emergency work will implement feasible compensatory mitigation measures pursuant to Policies. Nothing in the Policy shall be construed to interfere with the existing authority of flood control agencies to prevent or respond to an emergency situation occurring in or adjacent to the Parkway.

American River South

This part of the study area contains portions of Sacramento County and the cities of Sacramento, Rancho Cordova, and Elk Grove. Most of the area has changed from agricultural to urban uses over time. Mather Airport, located in this portion of the study area, houses many commercial businesses and air cargo facilities. The southern end of this area has not been urbanized and includes the Sacramento County water treatment plant and the surrounding buffer lands, which are open fields, creeks, and ponds. The Fish and Wildlife Service Beach Stone Lakes Wildlife Refuge is located across Interstate 5 (I-5) from the buffer lands and is open space land with large grazing fields and various waterways.

Downtown Sacramento is located in this area of the project, along with the State Capitol. Many people live and work in the downtown area and there is very little vacant land remaining. Outside of the downtown area is primarily residential development with small shopping areas intermixed. The Sacramento Executive Airport, a general aviation airport, is also located in this area along with a rail corridor that aligns with the light rail system.

Sacramento Bypass

The Sacramento Bypass is a 360 acre floodway between the Sacramento River and the Yolo Bypass. The area is used for fishing, wildlife viewing, and bird watching. Just to the north of the Bypass are various agricultural lands currently in cultivation for rice and other row crops. There is also an abandoned landfill at the western end of the landside of the Bypass. This site is the Old Bryte Landfill (West Sacramento Landfill). The site is approximately 17 acres and is under continued investigation by the California Integrated Waste Management Board for clean-up.

3.3.2 Methodology and Basis of Significance

Methodology

Local land use plans were looked at to determine the effects to land use if the project were to be constructed. Each alternative was evaluated based on land use designations within the project area. This section also describes any changes to existing land use that would result if the project were to be implemented. This section evaluates the consistency of the project alternatives with local land use plans and policies. Local land use plans include Sacramento County General Plan and zoning code, the City of Sacramento General Plan and zoning code, Yolo County General Plan and zoning codes, and the American River Parkway Plan.

Basis of Significance

The thresholds of significance encompass the factors taken into account under NEPA and CEQA to determine the significance of an action in terms of its context and intensity. Under NEPA and CEQA consideration is given to determine possible conflicts between the proposed action and the objectives of Federal, State, Regional, and local land use plans, policies, and controls for the study area. Alternatives under consideration were determined to result in a significant impact to land use if they would do any of the following:

- Conflict with any applicable land use plan, policy, or regulation;
- Conflict with approved Habitat Conservation Plans or Natural Community Conservation Plan;
- Physically divide an established community; or
- Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

3.3.3 No Action Alternative

Under the No Action Alternative the project would not be constructed and the area would continue to be at risk of flooding due to levee failure or overtopping. The City of Sacramento's Resource Protection Policy states; "The City shall seek to minimize or avoid adverse impacts to historic and cultural resources from natural disasters. To this end, the City shall promote seismic safety, flood protection, and other building programs that preserve, enhance, and protect these resources." The No Action Alternative is inconsistence with this policy because it fails to improve flood protection.

The LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system, but it would be speculative to assume that any additional work would be conducted to address the seepage, slope stability, overtopping, or erosion concerns in the study area. As a result, if a flood event were to occur, the Sacramento area would remain at risk of a possible levee failure.

The high potential for flooding would result in continued threat to property, lives, and economic damages for Sacramento. Homes and businesses within the floodplain would continue to be at risk of flooding. Thousands of people could be displaced and houses destroyed, requiring the replacement of commercial buildings and housing. For a flood event that has a 1% chance of happening in any given year, the Corps estimated $22.5 billion in damages to structures and its contents could result.

Along with the potential for loss of lives is the ability for the study area to recover from a flood event. The study area contains many government agencies and the California State Capitol. While the City and County of Sacramento, and the State of California have emergency plans in place, recovery would be slowed due to the damage anticipated to government facilities within the study area. The slower recovery or lack of recovery would result in lower land, housing, and overall property value.

The waterside berms within the Parkway would erode over time resulting in the loss of Parkway lands. The exact timing of this is unknown due to the fact that each storm event could remove small amounts of berm or a larger event could result in a loss of a significant amount of berm. The American River Parkway Plan designates most of the lands within the project area for natural, recreational, or habitat enhanced uses. This alternative would be inconsistent with the American River Parkway Plan and would be considered a significant effect.

3.3.4 Alternative 1 – Improve Levees

Borrow Sites

To identify potential locations for borrow material, soil maps and land use maps were obtained for a 20-mile radius surrounding the project area. Borrow sites would be lands that are the least environmentally damaging and would be obtained from willing sellers. The criteria used to determine potential locations were based on current land use patterns and soil types from the NRCS. The data from land use maps and NRCS has not been field verified, therefore, to ensure that sufficient borrow material would be available for construction the Corps is considering all locations within the 20 miles radius for 20 times the needed material. This would allow for sites that do not meet specifications or are not available for extraction of material. It is estimated that a maximum of 1 million cubic yards of borrow material could be needed to construct the project. Because this project is in the preliminary stages of design, detailed studies of each alternative borrow needs have not been completed. For the purposes of NEPA/CEQA a worst case scenario is being evaluated for the volume of borrow material needed. Actual volumes exported from any single borrow sites would be adjusted to match demands for fill.

The excavation limits on the borrow sites would provide a minimum buffer of 50 feet from the edge of the borrow site boundary. From this setback, the slope from existing grade down to the bottom of the excavation would be no steeper than 3H:1V. Excavation depths from the borrow sites would be determined based on available suitable material. The borrow sites would be stripped of top material and excavated to appropriate depths. After excavation, disturbed areas would be finish graded in compliance with criteria for drainage of reclaimed land uses. Once details of borrow locations have been finalized, coordination with the California Department of Conservation would occur to ensure compliance with the Surface Mining and Reclamation Act of 1975 (SMARA). Once material is extracted, borrow sites would be returned to their existing use whenever possible. If it is determined that borrow sites can be used to mitigate for project impacts and it would be an appropriate use of that land it could be a land use change. Land use changes in borrow sites is not expected to be significant because these sites would be returned to their pre-borrow conditions or used for mitigation. Once the borrow locations and reclamation of the sites has been finalized, a determination will be made if additional NEPA/CEQA documentation is needed. This would occur only if the changes in land use are determined to be substantial, or if there are significant new circumstances or information relevant to environmental concerns that have bearing on the proposed action or its impacts.

American River

The American River Parkway Plan policies address flood risk reduction and levee protection activities with the overall aim of facilitating these activities as necessary to achieve established flood risk reduction objectives in a manner which provides optimum protection to the open space, recreation, and fish and wildlife resources of the Parkway. Consistent with these policies, bank protection improvements and to a lesser extent launchable rock trench improvements have been constructed at various locations in the Parkway over the past 20 years. In selecting which of these methods of protection should be deployed, the Corps will coordinate closely with the Sacramento County Department of Parks and Recreation, the National Park Service, the other Federal and State agencies responsible for managing the resources of the Parkway, and non-governmental stakeholders. In carrying out this effort, the Corps will coordinate through the formal and informal processes that have been created to facilitate management of the Parkway. Where erosion protection is needed to meet established flood risk reduction objectives, the selection of the method of protection will be based on a determination of which method would do the most to protect valuable Parkway land, fish and wildlife resources, and recreational facilities considering both the short term impacts of construction and the long term effects of any mitigation measures included in the design of the project.

Launchable Rock Trench

Minimum land use changes would occur along the 11 miles of erosion protection proposed for the American River under this alternative. Erosion protection could consist of either launchable rock trench or bank protection. Construction activities could cause temporary changes to the land use within the levee structure, adjacent waterside berm or river bank. These changes include the use of Parkway land for staging areas and the actual construction footprint. As construction progresses along the levee, staging areas no longer needed would be returned to their prior use. Construction footprints would be returned to the prior use, with the exception of the 15-foot wide vegetation free zone on waterside of the levee.

The levee structure would be changed by placing a launchable trench into the adjacent levee toe. The width of the toe trench would be a maximum of 70 feet resulting in a temporary disturbance to approximately 65 acres within the Parkway. In much of the Parkway there is an existing 15 foot maintenance road along the waterside levee toe. Outside of this 15 foot area, the land contains riparian habitat intermixed with recreation facilities and open space. Under this alternative the 15 foot maintenance road would be replaced over the toe trench and the riparian area would be replanted with vegetation. Recreation facilities affected would be replaced to the pre-construction condition in coordination with the Sacramento County Parks Department (County Parks). Any riparian area within the 15 foot landside toe would not be replanted in this location. The levee slope would be planted with native grasses to prevent erosion and to maximize the natural environment as defined in the Parkway Plan. Re-establishment of the riparian habitat would take many years; however, the land use designation would not change except for the 15 foot maintenance road and vegetation free zone.

Existing maintenance roads would be used for construction access whenever possible. Temporary construction access roads and ramps could also be built at various locations. Roads not needed for long term maintenance would be removed and returned to the pre-construction use. Some ramps may be left in place to allow for easier waterside maintenance access in coordination with County Parks and the American River Flood Control District (ARFCD). This alternative is in compliance with the Parkway Plan Flood Control Policy and land use impacts are considered to be less than significant and no mitigation is required.

Bank Protection

To reduce the impacts to riparian habitat within the Parkway, bank protection may be installed along the river channel instead of the rock trench. At this stage in the planning process approximately 11 miles of erosion protection has been identified. Erosion protection could consist of either launchable rock trench or bank protection. No long term change in land use would occur if Alternative 1 were constructed. Access to the construction sites would be from existing maintenance roads and ramps whenever possible. However, additional ramps and roads could be required to access the river channel and for the placement of rock. Rock would be trucked on existing roads to staging areas and transported to the channel using smaller off road vehicles. Roads and ramps would be returned to pre-construction condition as areas are completed. The exact location of the bank protection is unknown; however roads and ramps to the sites would be designed to minimize impacts to the natural environment of the Parkway. This design would not change existing land use designation and therefore effects to land use are considered to be less than significant. No mitigation would be required. Mitigation for the removal of the riparian habitat is discussed in the Vegetation and Wildlife Section.

Sacramento River

Changes to land use along the Sacramento River would occur primarily on the landside in the Pocket and Little Pocket area of Sacramento (Reaches E, F and G) where levee raises are required (Plate 3). Many homes in this area back up to the levee with little to no land between the levee toe and the fence or backyard. Flood protection levee easements extending over private parcels have not yet been determined, but it is assumed that some takings of private property would be required. No land surveys have been conducted at this stage in the project. For planning purposes, a general assumption was made that a levee easement exists from toe to toe and extends 10 feet beyond the toe landside and waterside. The taking would be required to allow for construction equipment to move material into the site and to construct the embankment fill required for levee raising. After construction of levee raises, where needed, the landside construction access would be converted to a landside maintenance easement. Both State and Corps policy require a 10 to 20 foot landside easement for maintenance. The maintenance corridor is used during high waters to patrol for potential levee failures and for flood fighting. Areas beyond the approximately 7 miles of levee raise would be brought into compliance by the local maintaining agency over the next 20 to 40 years under the SWIF.

All property acquisitions would be conducted in compliance with Federal and State relocation law, and relocation services would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1960. These laws require that appropriate compensation be provided to displaced residential and nonresidential landowners and tenants, and that residents are relocated to comparable replacement housing and receive relocation assistance. This law applies to farms and businesses if they would be displaced for any length of time. With compliance with these relocation laws, and appropriate compensation to impacted landowners, this effect would be less than significant, with mitigation required.

East Side Tributaries

Changes in land use along the East Side Tributaries would be minimal. Construction activities would be within the existing levee footprint. This land is already in flood control easement and would continue to be in flood control easement. There would be a change in land use at Magpie Creek. A vacant parcel of vernal pools and grasslands would be acquired and protected in perpetuity as a flood control easement. This land already floods during high water events and there would be no impact on land use from the acquisition of this land.

3.3.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Impacts for Alternative 2 are the same for borrow sites and the American River as Alternative 1.

Sacramento River

Under this alternative levee raises along the Sacramento River would be reduced from 7 miles to approximately 1 mile compared to Alternative 1 (Plate 4). This would significantly reduce the amount of private property taking required to construct the project. Within the 1 mile of levee raise, private property would need to be acquired to allow for construction of the levee raise. A landside construction access area would also be included in the construction footprint. Once construction of levee raises is complete the landside construction access area would be transitions into a landside maintenance easement. The extent of levee easements extending over private parcels have not yet been determined. No land surveys have been conducted at this stage in the project. For planning purposes, a general assumption was made that a levee easement exists from toe to toe and extends 10 feet beyond the toe landside and waterside. Areas beyond the approximately 1 mile of levee raise would be brought into compliance by the local maintaining agency over the next 20 to 40 years under the SWIF.

All property acquisitions would be conducted in compliance with Federal and State relocation law, and relocation services would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1960. These laws require that appropriate compensation be provided to displaced residential and nonresidential landowners and tenants, and that residents are relocated to comparable replacement housing and receive relocation assistance. This law applies to farms and businesses if they would be displaced for any length of time. With compliance with these relocation laws, and appropriate compensation to impacted landowners, this effect would be less than significant, with mitigation required.

Sacramento Weir and Bypass

The existing Sacramento Weir would remain in place and would have no change in land use designation. This alternative would add an additional 1,500 feet of weir along the Sacramento River and approximately 300 acres of additional bypass space. Approximately 370 acre (bypass space plus levee and berm) of land within the expanded bypass is designated as Prime or Unique Farmland, and is currently being farmed as row crops or rice. This land would be converted to floodway and could be managed as open space and wildlife area or continue as farmland. Yolo County has approximately 250,000 acres of prime farmland. Prime farmland has the best combination of physical and chemical features able to sustain long-term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Coordination with the land owner would occur to determine whether the rice fields would remain in production within the expanded bypass, or whether they would be permanently converted to floodway. If the rice fields remain in production, there would be approximately 1 season of impact to the rice fields, due to the relocation of the levee. The rice fields would not be able to be farmed during the year of the levee construction. Appropriate coordination would occur to ensure that the landowners are compensated for this loss of production. With the implementation of required compensation, and compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1960 for any land acquired in this area, effects to land use would be less than significant, with the required mitigation.

3.3.6 Avoidance, Minimization, and Mitigation Measures

American River Parkway

According to the Parkway Plan Flood Control Policies:

> *Mitigation is defined as any project-related action taken to minimize or avoid an impact to the physical environment, or any action designed to replace, repair, or restore a resource that was physically affected by a project.*
>
> *Construction projects on the Parkway should be designed to first, avoid adverse environmental impacts; second, minimize adverse environmental impacts; and third, replace, repair, or restore adversely impacted resources as close as feasible in time and place to the impact.*
>
> *Impacts are defined as any physical change to the environment, including but not limited to aesthetics, recreational facilities and access points, water quality, soils, and all biological resources, such as native and non-native vegetation, aquatic habitat, fisheries, and special-status species. Noise, air quality (including fugitive dust), artificial lighting, and other impacts associated with construction activities are also considered to be impacts to avoid, minimize, and mitigate.*

The plan continues to state in the Flood Control Policy Section:

> *Flood control projects, including levee protection projects and vegetation removal for flood control purposes, shall be designed to avoid or minimize adverse impacts on the Parkway, including impacts to wildlife and wildlife corridors. To the extent that adverse impacts are unavoidable, appropriate feasible compensatory mitigation shall be part of the project. Such mitigation should be close to the site of the adverse impact, unless such mitigation creates other undesirable impacts.*

Mitigation for the lands converted from parkway land to flood control uses will be mitigated by paying fees to the County under the Habitat Restoration Program Fees (HRP). HRP funds are to be used for natural resource protection or enhancement as well as for land acquisition.

Sacramento River

Alternatives 1 and 2 would require the acquisition of property under the Federal Relocation Act, which compensates people for the taking of their land for the project. No additional mitigation would be required for effects to land use under this alternative.

East Side Tributaries

Any private property that is required for the project will be mitigated through payment for property under the Federal Relocation Act, which compensates people for the taking of their land. No additional mitigation would be required for effects to land use under this alternative.

3.4 Hydrology and Hydraulics

3.4.1 Environmental Setting

Regulatory Setting

Federal

- Clean Water Act of 1972
- Safe Drinking Water Act of 1974
- National Flood Insurance Program

State

- Porter-Cologne Water Quality Control Act of 1970

Existing Conditions

The project area is divided into two basins – American River North and American River South – and has an upstream boundary at Verona and a downstream boundary at Freeport on the Sacramento River (Plate 2). These basins include the leveed portions of the American River, the Natomas East Main Drain Canal (NEMDC), Magpie Creek, and the leveed portions of Dry and Arcade creeks.

Flood control channels and other features in the Sacramento area are part of a much larger flood management system known as the Sacramento River Flood Control Project (SRFCP). The SRFCP in the Sacramento Valley consists of a series of levees and bypasses, constructed to protect urban and agricultural areas and take advantage of several natural overflow areas. See Plate 1 for a graphic depiction of the system layout. The SRFCP system includes levees along the Sacramento River south of Ord Ferry Road; levees along the lower portion of the Feather River, Bear River, and the Yuba River; and levees along the American River. The system benefits from three natural overflow areas – Butte, Sutter, and Yolo. These areas run parallel to the Sacramento River and receive excess flows from the Sacramento River, Feather River, and the American River via natural overflow channels and constructed weirs. During floods, the three overflow areas form one continuous waterway.

Geomorphic Conditions

The present-day Sacramento River system has been shaped by thousands of years of complex river processes. These processes include channel migration, erosion, and flood-stage deposition. During most of Holocene time (since the last ice age, generally defined as the last 11,000 years), sediments from the Sierra Nevada and Klamath Mountains were carried by the Sacramento River and its tributaries and deposited into the Central Valley. Natural levees were built up along the riverbanks that frequently overflowed during flood stages, depositing sediments into low-lying basins and wide floodplains.

Recent changes in the lower Sacramento River basin that have affected channel morphology in the project reach include land reclamation, levee construction, dredging, hydraulic mining, impoundment of water and sediment by upstream dams and other diversions, and the construction of water diversion facilities and consequent alteration of flow and sedimentation patterns. The effects of these changes on channel morphology in the project reach are summarized below.

- Waterways in the project reach and vicinity are largely confined by levees and able to convey significantly greater flow and sediment discharges than during historical times.
- Water regulation, diversions, and the impoundment of water and sediment by dams have resulted in a decline in the total annual water and sediment outflows to the Delta from the Central Valley, a trend that is expected to continue into the future (NHC 2003)..

- Since the late 1800s the planform geometry of the Sacramento River through the project reach essentially has been fixed in place by levees and riprap and has not changed significantly to date. Localized changes in depositional bars and other in-channel sedimentation features have been observed over time (cbec, inc. eco engineering 2011).
- In the early 1900s large amounts of sediment were deposited in the Sacramento River as a result of hydraulic mining practices in Sierra foothill rivers and streams. This raised the channel bed of the Sacramento River substantially. Subsequently, the channel incised and widened, leading to its current planform, as a result of upstream anthropogenic impacts, such as reservoir and dam construction and urbanization (cbec, inc. eco engineering 2011). As a result, the channel may be experiencing a net sediment loss over time.

Present geomorphic conditions of the lower Sacramento River basin are a function of the intensity of water management in each of the tributary rivers, local farming practices, water transfers, and an extensive human-made levee system. Today, the channel alignment is largely fixed by artificial levees and erosion control measures. Flooding, except when levees fail, no longer occurs under most flows. Instead, flow and sediment remain confined to the existing channel network.

Sedimentation

Hydrologic regime, channel pattern, and sediment transport in the Sacramento River system have been significantly affected by historic human activities which included hydraulic and dredge mining for gold, building of levees for land reclamation and flood control, bank protection works, land use changes, construction and operation of upstream reservoirs, water export projects, and dredging of alluvium for navigation and levee maintenance purposes. Following a massive influx of sediment from hydraulic mining activities in the mid- and late 1800s, the lower Sacramento River and its major tributaries significantly aggraded (by up to 10 to 25 feet) and then began to gradually degrade into residual mining debris. The transportation of residual mining debris into the Delta of the Sacramento River and further to the bay system probably continued until the mid-1900s. Many researchers believe that present sediment loading on the Sacramento River is approaching its pre-gold rush (i.e., pre 1900) value.

A sedimentation analysis was not completed for this study. However, a Sacramento basin-wide sediment study has been conducted under the Sacramento River Bank Protection Project (NHC, 2012). The main objective of this sediment study was to investigate sediment transport processes and geomorphic trends along the lower Sacramento River and its major tributaries and distributaries. A HEC-6T sediment transport model was developed for the study reaches of the Sacramento, Feather, and American Rivers. HEC-6T is a one-dimensional (1-d) model that computes aggradation and degradation of the streambed profile over the course of a hydrologic event.

For the entire ARCF study reach of the Sacramento River (RM 79 to 46), the average bed elevation decreases by 0.02 foot for the 50-year simulation period and decreases by 0.10 foot for the 100-year simulation period. Despite significant (by a few feet) localized vertical adjustments in the channel geometry (mostly associated with infilling of deep pools and scour of elevated riffles), the study reach of the Sacramento River have a slight degradational trend. The potential for lateral movement of the river is of greater concern due to the possibility for river bank and levee erosion in this narrow channel. Some rock erosion protection has been placed along the Sacramento River to protect the levees from erosion. Often this rock was placed using the reactive approach, such as part of ongoing maintenance activities or under the Sacramento River Bank Protection Project (SRBPP). While some recent designs and construction of rock erosion protection are expected to provide adequate localized erosion protection, other locations may not deliver the same performance during a flood event. Some previous rock erosion protection does not meet current design standards, is past its intended design life, and is in need of repair and/or replacement.

The long-term simulation results indicate that most of the 22 miles long study reach of the lower American River is actively degrading. Upstream sediment supply on the American River is interrupted by Folsom and Nimbus Dam, which results in "sediment-hungry" waters and channel degradation below the dams. Up to 9 to 10 feet of channel degradation is simulated between RMs 22 and 12 for both the 50- and 100-year periods. About 3 to 4 feet of channel aggradation is simulated between RMs 12 and 11. Downstream of RM 11, maximum channel degradation is 15 to 16 feet for the 50-year simulation and 19-20 ft for the 100-year simulation. For the entire study reach of the American River, reach-average thalweg degradation is 5.39 feet for the 50-year simulation and 6.42 feet for the 100-year simulation. Average bed degradation is 4.83 feet and 5.84 feet, respectively. It should be noted that the channel of the lower American River is highly irregular at many locations (especially in braided reaches upstream of RM 8). These irregular reaches may not be adequately represented in the 1-d HEC-6T model. Therefore, the application of the generalized results for the entire reach to the irregular reaches may be subject to simulation errors and should be treated with caution. Further site specific analysis could potentially reduce this error. In general, however, degradational trends predicted by the model for the lower American River agrees with the stage-discharge records obtained for the American River gage at the Fair Oaks Bridge which shows ongoing channel degradation. In general, however, degradational trend predicted by the model for the lower American River agrees with the stage-discharge records obtained for the American River gage at the Fair Oaks Bridge which shows ongoing channel degradation.

Potential implications of the simulated long-term changes in bed profiles can be increased stress along the toe of the project levees or overbank berms in the degradational reaches, which may result in increased scour along unrevetted channel sections. In the aggradational reaches, an increase in bed elevations may result in higher flood stages and reduced flood conveyance.

To evaluate trends in channel planform evolution and changes in overbank berms (floodplain terraces), a series of historical bankline shift maps were produced for the study reach of the Sacramento River for the 1949-1952 to 2005 period using historical aerial photographs and maps. For most of the study reach, the river channel is closely bordered by extensively revetted levees and lateral channel evolution is limited.

The results of the long-term HEC-6T simulations show that the longitudinal bed profile in the study reach of the Sacramento River is generally stable, as has been observed by small changes in stage discharge rating curves over the previous few decades. Future trends in the river planform evolution are not expected to change from those identified in this study, measured over the same multi decadal time period. Assuming persistence of present day climatic conditions and the generally stable to slightly degradational longitudinal profile determined in this modeling study, the potential future loss in overbank berm area in the study reach of the Sacramento River is estimated to be similar to the historic loss, i.e. on the order of 84 acres (or 4.0% of the total overbank berms area) over the next 50 years.

American River Channel Stability

Recognizing that significant efforts have been completed and that current studies are not yet finished, existing information from the 2012 Ayres Report, "Lower American River – Erosion Susceptibility Analysis for Infrequent Flood Events" 2-D hydraulic model results of velocity, shear stress and water depth was developed for the American River for flows of 115,000 cfs, 130,000 cfs, 145,000 cfs, and 160,000 cfs. Additional information on erosion design can be found in the Civil Design and Geotechnical appendices.

Specific to the American River, multiple analyses have been completed and many are still underway to better understand the overall channel stability. These efforts are ongoing and are expected to be incorporated into the design of the tentatively selected plan. The pending research will not affect the following conclusions from the Ayres 2012 report:

> *Based upon our modeling efforts, field review and overall experience with the Lower American River system, we offer the following conclusions:*
>
> *1. Geomorphic principles, the thalweg profile, and the field review all agree that the river system is degradational under present operating conditions.*
>
> *2. The Lower American River is starved of sediments by Folsom and Nimbus dams. Bedrock has been reached in the channel bottom as far downstream as Guy West Bridge, and this bedrock is slowing further degradation. With the river starved for sediments and without significant bed slope reduction, it will now tend to erode laterally to satisfy the need for sediment.*

3. The hydraulic modeling shows areas of riverbank and levees where allowable velocities for vegetative cover and soil materials are exceeded. These sites need to be evaluated in more detail to determine if a levee failure is likely to occur.

4. The field review verified that erosion of the riverbank is occurring (RM 9.0R) even at low flow conditions of 7,000 cfs, which was the peak flow from the 2003 runoff season. Erosion on the American River is continually occurring. This condition is leaving the channel banks scarred and susceptible to further erosion, especially during a high flow event. In addition, this condition is further reducing the amount of berm separating the main channel from the levee. The loss of underlying vegetation is leaving bare soil, which is susceptible to erosion at a lower velocity.

Climate

Sacramento has a mild, Mediterranean-type climate. Average annual precipitation is about 18 inches, with approximately 80% of the total rainfall occurring between November and March. Cloud-free skies generally prevail throughout the summer months, and in much of the spring and fall. Thunderstorms occasionally occur in the late summer and other times of the year when unstable air masses are situated over the region. The highest rainfall generally occurs in January, when the average is about 4.2 inches of precipitation. The driest month is July, during which rainfall is rare.

Surface Water Hydrology

The Sacramento River drainage basin covers approximately 27,000 square miles. Total annual precipitation within the Sacramento River watershed falls as both rain and snow. Precipitation in winter falls primarily as snow in the higher elevations. Annual, monthly, and daily precipitation varies widely within the watershed, with the highest precipitation totals generally falling in winter, in the Sierra Nevada, and in the northern part of the watershed. The high variability in precipitation, snowfall, and snowmelt results in highly variable runoff patterns each year and month during late fall, winter, and spring.

Two major tributaries, the American River and the Feather River, produce about 90% of the flood flows approaching Sacramento from the north and the east. Both historically and as part of the design of the SRFCP, flood flows approaching from the north are split between the Sacramento River and the Yolo Basin. Under the current design of the SRFCP, the Yolo Bypass absorbs about 70% of this flow at the latitude of Verona and 80% at the latitude of Sacramento. To the east, the entire flow of the American River must be passed through the urban core of Sacramento. Improved flood protection for the Sacramento area is thus dependent on the strength of the levee system along the lower Sacramento and American Rivers and on the capability of Folsom Dam to limit American River flows to the design capacity of the American River levee system.

Hydrology from the Sacramento-San Joaquin Comprehensive Study was used with several updates. This includes greater detail and refinement of the tributaries streams on the east side of the Natomas Basin and an update on Outflows releases through Folsom with the new Joint Federal Project (JFP) in place. For details regarding all hydrologic inputs, see the Hydrology Appendix of the GRR. As described in that hydrologic appendix, a hypothetical storm centering method was developed in the Comprehensive Study to position an n-year flood event at a particular location in the river system. Inflow hydrographs were generated for use at several frequencies including the 2-year through 500-year events.

Existing and Future Without Project Condition Assumptions

The future without project condition assumptions include construction and operation of all previously authorized work on the American River as part of the WRDA 1996 and 1999 Common Features authorizations, levee repairs as described in the Natomas PACR authorized in WRRDA 2014, the new JFP spillway under construction at Folsom Dam, and the future planned raise of Folsom Dam. The work proposed as part of this GRR, is considered part of the with-project condition.

The existing condition for ARCF is different than the future without project condition. The existing condition describes the existing releases from Folsom Dam and is compared to the future without project condition to assess the no action alternative. The existing condition assumes the Bureau of Reclamation and SAFCA reservoir operation agreement is in place which allows for greater flood storage in the reservoir beyond what the original operations manual designated.

The future without project condition assumes the JFP and dam raise are in place and are operated as intended. All alternatives developed as part of this GRR were then compared to the future without-project condition for evaluation. The major hydrologic/hydraulic difference between the existing condition as compared to both the future without project condition (FWOP) and the with-project condition is that the peak flow on the American River is higher for the FWOP for the more frequent events (10- and 25-years) but lower for the FWOP for the less frequent events (100- and 200-years) due to Folsom Dam operational changes. Table 8 displays the different flow releases from Folsom Dam for the Existing and the Future Without Project (with JFP and dam raise in place).

Table 8. Comparison of Existing and Future Without Project Flow Releases from Folsom Dam.

Frequency (Year Event)	Existing Condition (Existing Releases, cfs)	Future Without Project Condition (with JFP, cfs)
10	43,000	72,000
25	100,000	115,000
50	115,000	115,000
100	145,000	115,000
200	320,000	160,000
500	520,000	530,000

Figure 7 compares the flow releases from Folsom Dam for the existing and future without project condition with the JFP. The graph shows the flow releases will be higher with the JFP in place for frequent events as compared to the existing conditions. However, flow releases will be lower for the less frequent events with the JFP in place as compared to the existing condition. The advantage of the JFP is that it allows the dam operators to have greater flexibility to release more water from Folsom Dam in advance of storm peaks. The intent of the JFP is to be able to release larger magnitude flows when the reservoir stage is lower which artificially creates additional storage because it has been evacuated.

The effect of the modifications at Folsom Dam will be most noticeable for the frequent flood events. As shown above, the 10-year and 25-year events have increases in flow release because of the Folsom Dam improvements as compared to the existing; the 10-year release increases by about 29,000 cfs and the 25-year release increases 15,000 cfs. As a trade off however, for larger flood events, peak releases drop, in some cases significantly; the 100-year release decreases by about 30,000 cfs, and the 200-year release decreases by 160,000 cfs. The Folsom Dam improvements are intended to control up to a 200-year event, beyond which, control is lost, and which is why there is little change for the 500-year event.

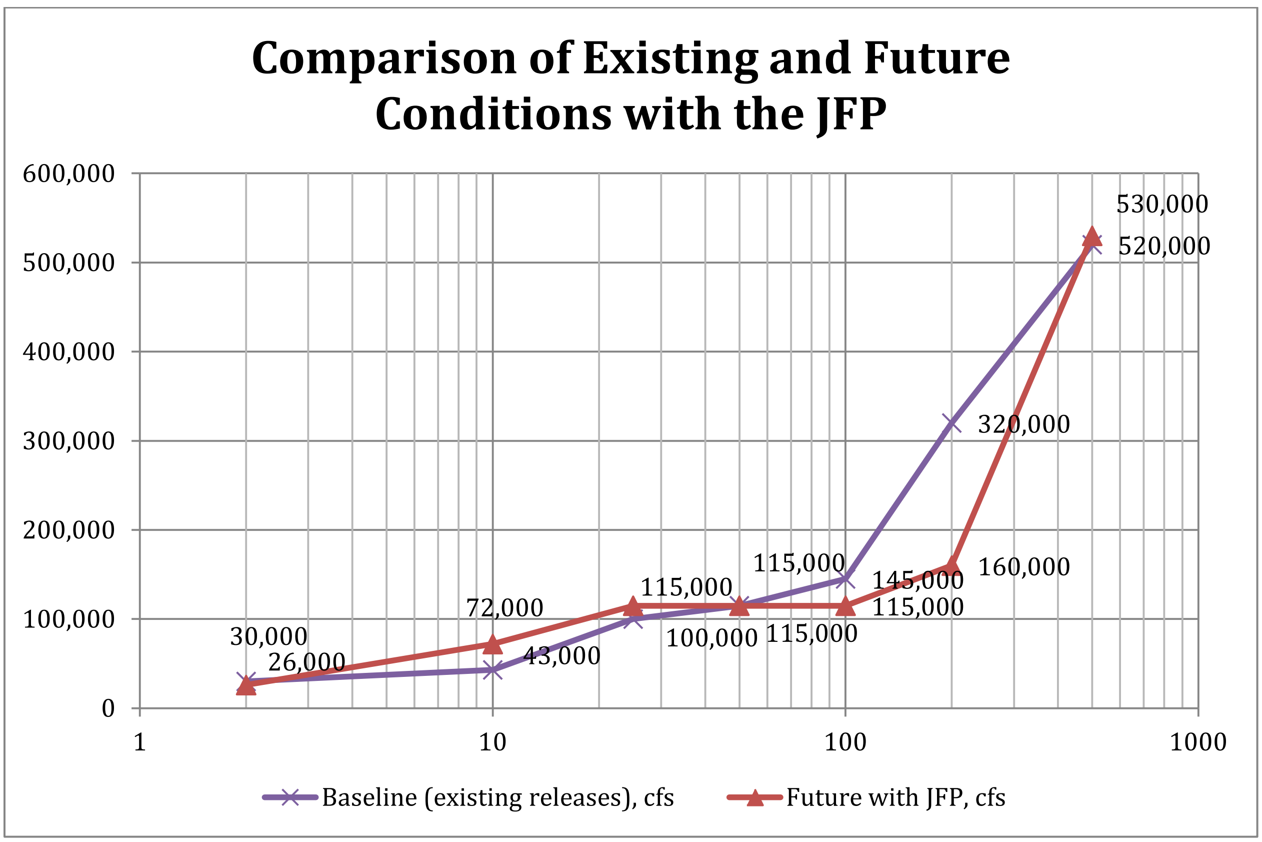

Figure 7. Comparison of Existing and Future Folsom Dam Releases.

3.4.2 Methodology and Basis of Significance

Methodology

The hydraulic analysis evaluates the potential flood-related impacts of the action alternatives on water surface elevations in the stream and river channels in the project area and in the larger watershed within which the project is situated. Specifically, a HEC-RAS hydraulic computer model was used to compare existing conditions to the alternatives in the waterways surrounding each of the basins and within the Sacramento River Watershed. Additional information can be found in the Hydraulic Appendix to the GRR.

The study area was divided into 25 river reaches according to the geotechnical similarity of their levees. For the purposes of the economic analysis, a single point is needed to represent each reach and is often referred to as an index point. In an effort to support SMART Planning, the project area was determined to be adequately represented by index points at five key locations. The five index points represent the three basins (including Natomas, which is no longer a part of this study). The index points are listed in Table 9.

Table 9. Index Points.

Index Point	Basin	Index Point	Project Reach	River Mile
American River North Levee	ARN	A	American River	7.8
Arcade Creek North Levee	ARN	E	Arcade Creek	0.9
American River South Levee	ARS	A	American River	8.9
Sacramento River South	ARS	F	Sacramento River	50.3
Natomas Cross Canal South Levee	NAT	D	Natomas Cross Canal	2.7

HEC-RAS (1-dimensional channel model) and FLO-2D (2-dimensional gridded model) hydraulic models were used to produce necessary outputs for the economic evaluation of the future without-project conditions and alternatives. The ARCF used the same basic models that were developed and refined for the existing conditions analyses and the Natomas PACR (Corps, 2010). HEC-RAS was used to model the main flood control channels of the system to determine the water surface profiles and flood hydrographs into the floodplain areas. This HEC-RAS model includes much of the Sacramento River Basin. This was done to capture upstream and downstream influences to the project area as well as to eventually determine the potential project impacts to areas outside the project area.

Flood hydrographs generated in HEC-RAS from a levee break were input into FLO-2D for delineation of the floodplain in each basin. In order to generate flood damages for economic evaluations, floodplains were delineated for the 2-, 10-, 25-, 50-, 100-, 200-, and 500-year events. The analysis was limited to flooding within the basin from levee breaches and does not include localized flooding from rainfall-runoff and smaller streams and drainages.

Floodplain delineations presented in this study are based on a single levee break within a levee reach. The levee break location was determined by the most significant geotechnical concerns along that reach and by any overriding hydraulic concerns, such as low levee elevations or locations where a large amount of water could travel through the levee break and out into the floodplain. The resultant flood depths from FLO-2D and the stage-discharge-frequency curves derived from HEC-RAS outputs were used to perform the risk analysis for the without-project condition and the alternatives.

The analysis consisted of calibrating the hydraulic model to historic flood events using high-water marks and stream gauge data gathered in connection with the 1997 flood, and modeling the existing fix-in-place and no action conditions under the following flood scenarios: (1) the 1957 water surface profiles that serve as the minimum design standard for the SRFCP; (2) the 0.01 AEP (100-year) design flood elevation that affects management of SRFCP-protected floodplains under the National Flood Insurance Program (33 CFR Section 65.10); (3) the 0.005 AEP (200-year) design flood elevation that is likely to affect implementation of the floodplain management standards recently adopted by the California Legislature (Chapter 364, Statutes of 2008 [adding Water Code Section 9602(i)]); and (4) the 0.002 AEP (500-year) design flood elevation that represents an extreme flood event and is the largest flood event for which hydrologic input data have been developed for the hydraulic simulation model.

Basis of Significance

The thresholds of significance encompass the factors taken into account under NEPA to determine the significance of an impact in terms of its context and intensity. The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. The alternatives under consideration were determined to result in a significant impact related to hydrology and hydraulics if they would do any of the following:

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river in a manner that would result in: (1) substantial erosion or siltation on- or off-site, and (2) substantial increase in the rate or amount of surface runoff in a manner that would result in flooding on- or off-site.
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.
- Place housing within a 100-year flood hazard area.
- Place within a 100-year flood hazard area structures which would impede or redirect flood flows.
- Expose people or structures to a significant risk of loss, injury, or death involving flooding.

3.4.3 No Action Alternative

Under the No Action Alternative, no work would be conducted to address seepage, slope stability, overtopping, or erosion concerns in the Sacramento area. Additionally, a non-Federal entity would not construct a project to reduce the risk of flooding in the area. Flow conditions in the system would be consistent with the future without project condition, as described above. As a result, there would be a continued risk of a levee failure during a future flood event from one of these failure modes. If a levee breach were to occur, emergency repair activities would be implemented and could result in the loss of channel capacity and alteration of present day geomorphic processes with the placement of large quantity of rock into the river to close the breach.

3.4.4 Alternative 1 – Improve Levees

Alternative 1 involves the construction of levee remediation measures to address deficiencies such as seepage, slope instability, overtopping, erosion, lack of vegetation compliance, and lack of O&M access along the American River, the Sacramento River, NEMDC, Arcade Creek, Dry Creek, Robla Creek; and Magpie Creek. This alternative combines construction of improvement measures while maintaining the present levee alignment in its existing location (fix in place). Due to the urban nature and proximity of existing development to the levees Alternative 1 proposes fix-in-place levee remediation. The stated purpose of this alternative would be to improve the flood risk management system to safely convey flows up to a level that maximizes net benefits.

The work in Alternative 1 primarily includes landside fixes of levees that do not change in-channel geometry or characteristics, so the hydraulics do not change. As a result, Alternative 1 would not substantially alter the erosion or siltation in the system or increase the rate of surface runoff in a manner that would result in any flooding. Additionally, Alternative 1 would not impact stormwater drainage systems or create additional sources of runoff.

The water surface elevations for Alternative 1, which is also the future without project condition, Alternative 2, and the baseline for both the 10-year and the 200-year events can be found in the Engineering Appendix to the GRR. A crest elevation of 200-year plus 3 feet was used as a baseline to compare the current top of levee. Levee raising was added when the current top of levee fell below this baseline. Plate 3 shows the locations where levee raises are proposed.

Since Alternative 1 involves fix-in-place only, the footprint of the levee system would not significantly change. As a result, the proposed measures would not place housing within a 100-year flood hazard area or place structures in a flood hazard area that would impede or redirect flood flows.

Since Alternative 1 would not alter flows from those expected under the future without project condition, there would be no significant change or effect on hydraulics with the project in place. As a result, effects from Alternative 1 on hydrology and hydraulics would be less than significant and no mitigation would be required.

3.4.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Alternative 2 starts with Alternative 1 (Improve Levees in place) as a base and adds the widening of the Sacramento Weir and Bypass to reduce the extent of levee repairs in the project area. Currently, the Sacramento Weir is 1,920 feet wide with 48 wooden gates that are manually removed when the water surface elevation on the Sacramento River at the I Street gage reaches 30.0 feet. If the Sacramento Bypass were widened, it would allow more water to flow into it and, therefore, into the Yolo Bypass. This would lower the water surface elevation downstream of the confluence with the American River and subsequently reduce the need for levee raising along the Sacramento River in the Pocket area.

If the expanded Sacramento Weir were to be operated as the existing weir is operated, the TSP would result in a diversion of flows from the Sacramento River to the Yolo Bypass that would slightly raise water surface elevations in the Yolo Bypass during frequent events (10 year) compared to both the existing and future without project conditions. To avoid potential effects to the Yolo Bypass, the widened portion of the Sacramento Weir will only be operated when the release from Folsom Dam is increased to above 115,000 cfs. With the Folsom Dam improvements in place, releases from Folsom Dam would be above 115,000 cfs for flood events greater than 1/100 ACE event. Therefore, for events up to and including the 1/100 ACE event, only the existing weir will be operated per the criteria previously established. For events greater than the 1/100 ACE event when the release from Folsom Dam will go above 115,000 cfs, the new weir will be opened. As a result of the increased flood storage space and anticipatory releases at Folsom Dam, this translates into a reduction of flows into the Yolo Bypass with Alternative 2 in place compared to the existing conditions. See Table 12 for a comparison of the flows at various locations for the Existing, Future Without Project (which are the same flows as with Alternative 1), and with Alternative 2 in place. For the 1/100 ACE event and greater, the benefits of the Folsom Dam improvements would be realized in the form of reduced flows compared to the Existing condition.

Table 12. Comparison of 10-, 100-, and 200-year Frequency Flows under Various Conditions.

10 year event	**Existing Condition**	**Future Without Project Condition (also Alternative 1)**	**Alternative 2**
American River	43,000 cfs	72,000 cfs	72,000 cfs
Sacramento Bypass	50,000 cfs	66,000 cfs	66,000 cfs
Yolo Bypass below Sac Bypass	270,000 cfs	296,000 cfs	296,000 cfs
100 year event	**Existing**	**Future Without Project and Alt. 1**	**Alt. 2 (TSP)**
American River	145,000 cfs	115,000 cfs	115,000 cfs
Sacramento Bypass	131,000 cfs	115,000 cfs	115,000 cfs
Yolo Bypass below Sac Bypass	555,000 cfs	535,000 cfs	535,000 cfs
200 year event	**Existing**	**Future Without Project and Alt. 1**	**Alt. 2 (TSP)**
American River	320,000 cfs	160,000 cfs	160,000 cfs
Sacramento Bypass	183,000 cfs	149,000 cfs	164,000 cfs
Yolo Bypass below Sac Bypass	656,000 cfs	631,000 cfs	643,000 cfs

The widening of the Sacramento Weir and Bypass diverts flood flows from the Sacramento and American River into the Yolo Bypass. The widened portion of the weir will only be operated when flood releases from Folsom Dam are above the existing objective release of 115,000 cfs which would occur during flood events greater than 1/100 ACE event. Therefore, for events up to the 1/100 ACE event, there would be no change in flow conditions in the Sacramento and Yolo Bypasses. For flood events greater than 1/100 ACE event when releases from Folsom Dam would go above 115,000 cfs (such as a 1/200 ACE event in which the Folsom release goes up to 160,000 cfs), because of the additional flood storage provided by anticipated operation and physical improvements to Folsom Dam coupled with the widened Sacramento Weir and Bypass, the net effect would be to slightly decrease the peak compared to the existing peak flow in the Yolo Bypass. Therefore, the effect is less than significant.

For the 10- and 100- year event, the changes in flows are tied to the change in operations at Folsom Dam. With regard to the 200-year event, flow on the American River is also tied to the change in operations at Folsom Dam, but for flow in the Sacramento and Yolo Bypasses there is a change in flow as a result of operating the widened Sacramento Weir. The flow changes associated with Folsom Dam will be analyzed as part of the ongoing Folsom Dam Water Control Manual Update, and the effects of those flows, including cumulative effects, will be addressed in the EIS/EIR accompanying the Manual Update.

Although Alternative 2 would result in the creation of a new drainage area within the Sacramento Bypass, the area would be contained within the levee system and would not result in substantial additional erosion, siltation, or runoff. The expanded bypass would not create or contribute flows in excess of the existing capacity of the system, as shown in Table 12 above. No housing would be permitted within the new flood hazard area, and no structures would be permitted that would impede or redirect flows within this area. As a result, effects to hydrology and hydraulics from the implementation of Alternative 2 would be less than significant, and no mitigation would be required.

3.4.6 Avoidance, Minimization, and Mitigation Measures

Because the flows would not increase under these alternatives, effects to hydrology and hydraulics are less than significant, and no hydraulic mitigation is required.

3.5 Water Quality and Groundwater Resources

3.5.1 Environmental Setting

The groundwater table in the study area is very deep and is separated from the slurry walls by a layer of non-permeable soil. Slurry walls have been installed along both the Sacramento and American Rivers over the last 20 years and no contamination of the aquifers has been identified from these construction activities. Additionally, MBK Engineering performed an analysis of the Natomas Basin construction activities and determined that the slurry wall construction was not expected to contaminate groundwater (MBK Engineering 2008). Because there is minimal risk to groundwater supply it will not be discussed further in this DEIS/DEIR.

Regulatory Setting

The following Federal, State, and Local laws and regulations apply to the resources covered in this section. Descriptions of the laws and regulations are discussed in Chapter 5.0.

Federal

- Clean Water Act

State

- Porter-Cologne Water Quality Control Act

<u>Existing Conditions</u>

Pursuant to the Porter-Cologne Act, the Central Valley Regional Water Quality Control Board (RWQCB) prepares and updates the Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Basin Plan) every 3 years. The most recent update was completed in September 2009. The Basin Plan describes the officially designated beneficial uses for specific surface water and groundwater resources and the enforceable water quality objectives necessary to protect those beneficial uses. The American River Common Features project is located within the Central Valley RWQCB's jurisdiction and is subject to the Basin Plan.

American River

The American River originates in the high Sierra Nevada just west of Lake Tahoe, in the Tahoe and El Dorado National Forests. Its three main forks – the South, Middle, and North – flow through the Sierra foothills and converge east of Sacramento. The waters of the American River provide recreation, municipal power, and irrigation for the northern California area.

American River water is generally characterized as high-quality surface water that is low in alkalinity, mineral content, and organic contamination (RWA et.al. 2006). The only contaminate listed on the Section 303(d) list for the American River within the project area is Polychlorinated biphenyls (PCB), which is from an unknown source (SWRCB 2012). However, mercury resulting from historical mining activities is of concern. The Central Valley RWQCB identified eight waterways in the American River Watershed as impaired because some fish have elevated levels of methylmercury that may harm human and wildlife consumers. Of the eight waterways identified the Lower American River is the only one within the study area.

Sources of inorganic mercury in the American River Watershed include tunnels and hydraulic mine workings from historic gold mining operations, municipal discharges, urban and agricultural runoff, and deposition from the air. Methlymercury, a highly toxic form of mercury, is formed by particular bacteria in lakes and stream beds. Methlymercury sources include production within wetland, river, and reservoir sediments, municipal wastewater, agricultural drainage, and urban runoff.

Mercury was mined from the Coast Ranges of California starting in the late 1800s. Much of this mercury was transported to the Sierra Nevada and Klamath-Trinity Mountains to be used for placer gold mining operations. Mercury lost during historic mining activities is now distributed along miles of downstream streams and rivers. Controlling erosion and transport of contaminated sediment are important for reducing fish mercury levels.

Sacramento River

The Sacramento River is the largest river and watershed system in California. This 27,000 square mile basin drains the eastern slopes of the Coast Range, Mount Shasta, the western slopes of the southernmost region of the Cascades, and the north portion of the Sierra Nevada.

The Sacramento River waterways historically were used as places to dispose of contaminants. In recent decades, treatment for municipal wastewater, industrial wastewater, and management of urban stormwater runoff have increased and improved greatly. Industries and municipalities now provide at least secondary treatment of wastewater. Large and medium-size cities are implementing urban stormwater programs to reduce the impacts of urban runoff to adjacent waterways.

The Sacramento River from Knights Landing to the Delta is listed on the Section 303(d) list for chordane, DDT, dieldrin, mercury, and PCB. However, the river's flow volumes generally provide sufficient dilution to prevent concentrations of contaminants in the river from reaching elevated levels (DWR 2012). Sediment transport in the Sacramento River in the study area is affected by historical hydraulic gold mining. Sediment supply to the lower Sacramento River has declined over recent years because dams on tributaries have resulted in less sediment to transport.

East Side Tributaries

The NEMDC conveys drainage water from Dry Creek, Arcade Creek, Magpie Creek, and a large portion of the Natomas area north of the confluence with Dry Creek. The NEMDC outfalls to the Sacramento River are at the northern edge of Discovery Park near the confluence of the Sacramento and American Rivers. Urban stormwater runoff is discharged to the Sacramento River, the American River, and the NEMDC via pumps operated by the City of Sacramento. Urban stormwater runoff contains sediments, nutrients, pathogens, oil and grease, metals, and pesticides.

Sacramento Bypass

The Sacramento Bypass is typically dry, except for during flood and high water events. All water in the Sacramento Bypass consists of overflow from the Sacramento and American Rivers. As a result, water quality conditions in the Sacramento Bypass during high water events would be consistent with the descriptions for the Sacramento and American Rivers, as discussed above.

Surface Water Quality

Surface water quality in the hydraulic region is generally good. Possible types of contamination that can affect water quality include turbidity; pesticides and fertilizers from agricultural runoff; water temperature exceedances; and toxic heavy metals, such as mercury, copper, zinc, and cadmium from acid mine drainage (USGA 2000, DWR 2005). The portion of the Sacramento River within the project area is part of a 16-mile segment from Knights Landing to the Sacramento-San Joaquin Delta that is on the Section 303(d) list for mercury from abandoned mines and toxicity from unknown sources. In addition, the portion of the American River in the study area is part of a 27-mile segment from Nimbus Dam to the confluence with the Sacramento River that is also on the Section 303(d) list for mercury from abandoned mines and toxicity from unknown sources (SWRCB 2006).

The water quality of the Sacramento River is good to excellent, with relatively cool water temperatures, low biochemical oxygen demand (BOD), medium to high dissolved oxygen (DO), and low mineral and nutrient content. In general, the surface water quality of the Sacramento River is representative of agricultural return flows, urban runoff, and natural sedimentation from scouring. CWA Section 303(d) establishes the total maximum daily load (TMDL) process to assist in guiding the application of state water quality standards. It requires the states to identify streams in which water quality is impaired (i.e., affected by the presence of pollutants or contaminants) and to establish the TMDL—the maximum quantity of a particular contaminant that a water body can assimilate without experiencing adverse effects. The 303(d) list breaks up the Sacramento River into four sections: Keswick Dam to Cottonwood Creek, Cottonwood Creek to Red Bluff, Red Bluff to Knights Landing, and Knights Landing to the Delta. All sections of the Sacramento River are listed on the 303(d) list for unknown toxicity, and the Knights Landing to the Delta section is listed for mercury. Mercury is primarily a legacy of gold mining.

Total Suspended Sediment and Turbidity

Total suspended sediment (TSS) is indicative of upstream scouring, bank erosion, and agricultural return flow transporting and depositing sediment. Sediment is considered a pollutant by the Central Valley RWQCB and can transport other contaminants, such as phosphorus, and hydrophobic contaminants, such as organochlorine pesticides. Data were downloaded from the USGS web site from 1997 to 2007 for the Sacramento River at Freeport. Note that more recent flow data (2007 to 2009) are available; however, there is no matching TSS data available for this more recent time frame. Therefore, the most recent available data (2007 to 2009) were used to calculate sediment loads. Monthly average data points are presented in Table 13. Although sedimentation is a natural part of the flow regime for rivers, the Central Valley RWQCB also considers it a pollutant. Excessive sedimentation from construction practices such as placement of riprap on levees or constructing slurry cutoff walls can smother filter-feeding organisms and cause other serious water quality related issues.

Table 13. Monthly Average Total Suspended Sediment and Turbidity for the Sacramento River at Freeport from 1997 to 2007.

Month	Discharge (cfs)	TSS (mg/L)	TSS Load (tons)	Turbidity (NTU)
January	41,414	104	11,670	64
February	44,084	83	9,839	68
March	39,586	70	7,476	15
April	28,552	51	3,946	11
May	25,152	48	3,279	12
June	21,461	30	1,741	17
July	20,432	37	2,019	21
August	18,235	27	1,332	9
September	16,121	29	1,266	10
October	11,950	29	940	6
November	13,612	24	868	8
December	25,105	81	5,463	12

Note: Flow and TSS data are from the USGS and are presented as monthly average from 1997 to 2007. Turbidity data are from CDEC from March 2007 to January 2009 and also are presented as a monthly average. Turbidity data are from the Sacramento River at Hood, a few river miles downstream from the USGS station.
Source: USGS 2013; DWR 2012b.

Turbidity is another measurement of how much sedimentation is in the water and could be measured using an optical light probe. Turbidity is measured in nephelometric turbidity units (NTUs). The Basin Plan states that where ambient turbidity is between 5 and 50 NTUs, projects would not increase turbidity on the Sacramento River by more than 20 percent above the ambient conditions. Furthermore, if the ambient diurnal variation in turbidity fluctuates in and out of the 5 and 50 NTUs threshold, the Basin Plan states that averaging periods can be applied to data to determine compliance. For example, during the summer months, the Sacramento River turbidity could be less than 50 NTUs, and during the winter months, the turbidity could be more than 50 NTUs because of the higher flow rate causing more river scouring. Thus, the monthly average was calculated using hourly California Data Exchange Center (CDEC) data and is presented in Table 13 above. Specific construction activities that are part of the potential alternatives would need to comply with the above-stated thresholds for turbidity.

Dissolved Oxygen, Temperature, Electrical Conductivity, and pH

DO is a critical component for all forms of aquatic life. It also could be highly variable and subject to large oscillations in short time periods. With calm waters and low flows, water bodies could thermally stratify, causing deeper zones to have very low DO concentrations. Additionally, high levels of nutrient loading could cause algal blooms. These blooms could cause large swings in DO levels as the algae populations fluctuate in size, producing oxygen while growing and consuming it while decaying. When DO concentrations fall below certain limits, the resulting low DO throughout the water column could act as a barrier to fish migration and potentially adversely affect spawning success. In extreme cases, persistent low concentrations of DO can result in mortality of benthic organisms and other less mobile aquatic species. The Basin Plan objective for DO in the Sacramento River from the I Street Bridge to the Delta is 7.0 milligrams per liter (mg/L) (Central Valley RWQCB 2007). As shown in Table 14 below, the Sacramento River DO concentrations near Hood from 2003 to 2009 are typically 10 mg/L during the storm season and 8 mg/L or more during the dry season when flows are lower than during the rainy season.

Water temperature is a critical constituent from the standpoint of aquatic life. The Basin Plan objective for temperature requires that it not deviate more than 5°F from ambient river temperature (Central Valley RWQCB 2007). During the summer months of July and August, the temperature of the Sacramento at Hood was approximately 71°F (Table 14). However, this location is downstream of the I Street Bridge, and with the cold water inflow of the American, the I Street Bridge temperature could be within Basin Plan standards. While an unlikely scenario, excessive sedimentation in large quantities could affect the temperature of the Sacramento River.

The potential of hydrogen (pH) is a unit for measuring the concentration of hydrogen ion activity in water and is reported on a scale from 0 to 14. If a solution measures less than 7, it is considered acidic. If a solution measures more than 7, it is considered basic, or alkaline. If a solution measures 7, it is considered neutral. Many biological functions could occur only within a narrow range of pH values. The Basin Plan objective for pH is between 6.5 and 8.5. Furthermore, discharges cannot result in changes of pH that exceed 0.5. The monthly average pH of the Sacramento River from 2003 to 2009 remained stable throughout the year (Table 14). Construction materials such as concrete or other chemicals could affect the pH of the Sacramento River if a discharge were to occur.

Table 14. Monthly Average Physical Data for the Sacramento River at Freeport from 2003 to 2009.

Month	Temperature (°F)	pH (Standard)	DO (mg/L)	EC (µs/cm)
January	48.7	7.5	10.5	170
February	50.9	7.4	10.1	170
March	55.3	7.5	9.7	154
April	58.3	7.4	9.6	138
May	64.3	7.4	8.6	145
June	68.8	7.3	8.2	139
July	71.1	7.3	7.9	134
August	71.0	7.4	7.8	156
September	67.9	7.5	8.0	166
October	62.5	7.2	8.6	145
November	55.9	7.4	8.9	186
December	49.5	7.4	10.2	186

Source: DWR 2012b

Electrical conductivity (EC) is a measure of the degree to which a given water sample conducts an electrical current. The amount of total dissolved solids (TDS) in water is related directly to EC (i.e., high EC is an indicator of high TDS). TDS and EC are general indicators of salinity and are regulated under the Basin Plan. Basin Plan objectives for EC on the Sacramento River are 340 microSiemens per centimeter (µS/cm). Table 14 above shows that monthly average EC levels in the Sacramento River remain below this threshold.

3.5.2 Methodology and Basis of Significance

<u>Methodology</u>

Water quality impacts that could result from project construction activities and project operations were evaluated based on the construction practices and materials that would be used, the location and duration of the activities, and the potential for degradation of water quality or beneficial uses of project area waterways.

<u>Basis of Significance</u>

For this analysis, an effect pertaining to surface water quality and groundwater quality was considered significant under CEQA and NEPA if it would result in any of the following environmental effects, which are based on professional practice, Federal guidelines, and State CEQA Guidelines Appendix G (14 CCR 15000 *et seq.)*:

- Violate water quality standards or waste discharge requirements;
- Substantially deplete groundwater supplies or interfere substantially with ground water recharge;
- Substantially degrade water quality; and
- Alter regional or local flows resulting in substantial increases in erosion or sedimentation.

3.5.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to water quality in the study area, however, existing problems would continue along the levees encompassed within the Common Features study area which could potentially lead to a future flood event or levee failure. However, without levee improvements, there is the continued high risk of levee failure and continuing under seepage and loss of levee foundation soil. If a levee overtopping or breach was to occur floodwaters could be pumped back over levees or recede back through the levee breach into the waterways. Flooded areas could contain contaminants from stored chemicals, septic systems, and flooded vehicles—all of which would be released into floodwaters and subsequently contaminate the Sacramento River and the Delta surface waters and potentially soil and groundwater. These contaminants would likely exceed acceptable established water quality standards and impair beneficial uses.

A catastrophic levee failure could result in collapse of miles of levee slopes and alteration of regional and local flows that would result in substantial increases in erosion and sedimentation. Erosion causing the loss of the levee foundation and eroded topsoil from banks of a river or sloughs would increase turbidity and total dissolved solids in the Sacramento River and ultimately, affecting the environmental resources of the Delta by impairing the beneficial uses of waters of the Delta. Furthermore, if a levee breach were to occur, emergency construction and repair activities would be implemented without the use of Best Management Practices (BMPs) and could result in the release of hazardous construction materials such as oil and other petroleum related products.

Under the No Action Alternative, regular O&M of the levee system would continue as presently executed by the local maintaining entities, with the inclusion of the SWIF plan to address vegetation and encroachment issues long-term. Some erosion repairs could occur under the SRBPP; however the Corps would not implement erosion repairs system-wide within the study area as proposed this project. As a result, erosion would continue and the risk of levee failure and subsequent flooding would increase. If a levee breach were to occur, emergency construction and repair activities would be implemented without the use of BMPs and could result in release of contaminants into the soil (groundwater) and adjacent surface water, as well as increased erosion, which could raise TSS and turbidity in adjacent water bodies. If floodwaters were conveyed beyond the levees throughout the program area, water quality could be significantly affected due to increases in total suspended solids and turbidity. Additionally, significant water quality effects due to levee failure in which flooding occurs in urban, suburban, and agricultural areas would likely be considerable and could include bacterial and chemical (e.g., pesticides, petroleum products, heavy metals) contamination.

3.5.4 Alternative 1 – Improve Levees

The slurry cutoff walls will be constructed primarily of soil mixed with bentonite, but Portland cement may be used as an additive in some cases. Bentonite is a naturally occurring form of clay, and Portland cement is made from limestone and clay. Neither bentonite nor cured Portland cement are water soluble, and grouts composed of both materials are widely used in the water well industry. Both bentonite and cement are used to construct seals in wells drilled for various purposes, including drinking water supply. No groundwater contamination would be expected due to construction of the proposed slurry cutoff walls and other improvements proposed for the levees within the study area (MBK Engineering 2008). Because there is no risk to groundwater supply it will not be discussed further in this DEIS/DEIR.

American River

Installation of the rock trench would not have an impact on water quality because the trench would be located outside of the river natural channel and no in-water work would occur. However, because work would occur on the waterside of the levee there is a potential for spills from construction operations. Construction contractors would be required to prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) and comply with the conditions of the National Pollution Discharge Elimination System (NPDES) general stormwater permit for construction activity. The contractor would be required to obtain a permit from the Central Valley RWQCB detailing a plan to control any spills that would occur during construction. The plan 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.

Where bank protection construction is proposed, revetment would be placed along the river bank to prevent erosion. The placement of revetment along the river banks would temporarily generate increased turbidity in the immediate vicinity of the construction area. Additionally, placement of revetment in the water could result in a sediment plume, generated from the channel bottom and levee side, becoming suspended in the water and could generate turbidity levels above those identified as acceptable by the Basin Plan (Central Valley RWQCB 2007). Turbidity effects from landside construction (e.g., vehicle, staging, placement of construction equipment) would be limited to stormwater runoff carrying loose soil from staging areas and construction vehicle access areas. Best management practices would be implemented to reduce the effect of runoff into the stormwater system to less than significant. Best management practices include such things as coir mats or hay bales to prevent runoff, rock groins to retain sediment, sand bags to prevent erosion, and drain screens to prevent sediment from traveling outside the construction area footprint and into the storm drains system.

As rock revetment is placed in the open water, significant indirect effects would result as the sediment and turbidity plume would drift further downstream and later affect the water qualify in those areas found further downstream of the project area. By implementing the avoidance and minimization measures discussed in Section 3.5.6 impacts could be reduced to less than significant.

Sacramento River

Construction of this alternative would have the same affects as those discussed for the American River where bank protection work would occur. There could be significant affects to water quality due to increased turbidity during construction. The use of barges to install the revetment could cause additional turbidity as the barge moves into the site and anchors. This is considered a significant affect to water quality during construction. Once construction is complete there could be reduced turbidity in the direct vicinity of the site because there would be no exposed soil to erode and deposit into the river. Further, the bank protection sites would include the installation of riparian vegetation which could slow the flows down and reduce turbidity during high flows. This alternative would result in significant effects to water quality during construction activities. Additionally, upstream and downstream of the bank protection area could erode because no rock protection is present now, however, this could occur with or without the construction of the project.

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. The contractor would be required to obtain a permit from the Central Valley RWQCB detailing a plan to control any spills that could occur during construction. The plan 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.

East Side Tributaries

The installation of the slurry walls along these creeks would be done from the top of the levees and no in-water work would occur. Additionally, the construction of the floodwall would be accomplished during the dry season from the landside of the levee. BMPs would be implemented to prevent runoff from the construction site into drainage systems. Staging areas would be designed and located in areas to prevent potential runoff into waterways.

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. The contractor would be required to obtain a permit from the Central Valley RWQCB detailing a plan to control any spills that would occur during construction. The plan 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. Because no in-water work would occur and there is a very low risk of discharge into waterways, this alternative would have a less than significant affect on water quality.

3.5.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Effects to water quality would be the same as Alternative 1 with the additional affects associated with the widening of the Sacramento Weir and Bypass. Construction of the new north levee would occur when water is not flowing through the bypass, and therefore there would be not impacts to water quality during construction of the new north levee of the bypass. However, effects could occur during the construction of the expanded weir along the Sacramento River. There is a potential for water quality impacts to occur if the weir is constructed in a way that debris or other construction materials could enter the Sacramento River. However, it is likely that the weir could be constructed behind the existing levee, which would result in no impacts to water quality.

3.5.6 Avoidance, Minimization, and Mitigation Measures

As part of a turbidity monitoring program the contractor would monitor turbidity in the adjacent water bodies, where applicable criteria apply, to determine whether turbidity is being affected by construction and to ensure that construction does not result in a rise in turbidity levels above ambient conditions, in accordance with the Central Valley RWQCB Basin Plan turbidity objectives. The monitoring program would be coordinated with the Central Valley RWQCB prior to construction, and would be implemented by the construction contractor. The contractor would be required to use BMPs, as described below, to prevent runoff from all construction areas.

Environmental commitments included in the project to reduce the potential for impacts to water quality include: preparation of the SWPPP, Spill Prevention Control and Countermeasures Plan (SPCCP), and a bentonite slurry spill contingency plan (BSSCP). Typical elements of the SWPPP are described below.

In general, the following measures would be implemented as part of the SWPPP, as required by the SWRCB for any construction activities that disturb more than 1 acre, to limit erosion potential.

- Conduct earthwork during low flow periods (July 1 through November 30).
- To the extent possible, stage construction equipment and materials on the landside of the subject levee reaches in areas that have already been disturbed.
- Minimize ground and vegetation disturbance during project construction by establishing designated equipment staging areas, ingress and egress corridors, spoils disposal and soil stockpile areas, and equipment exclusion zones prior to the commencement of any grading operations.
- Stockpile soil on the landside of the levee reaches, and install sediment barriers (e.g., silt fences, fiber rolls, and straw bales) around the base of stockpiles to intercept runoff and sediment during storm events. If necessary, cover stockpiles with geotextile fabric to provide further protection against wind and water erosion.
- Install sediment barriers on graded or otherwise disturbed slopes as needed to prevent sediment from leaving the project site and entering nearby surface waters.
- Install plant materials to stabilize cut and fill slopes and other disturbed areas once construction is complete. Plant materials could include an erosion control seed mixture or shrub and tree container stock. Temporary structural BMPs, such as sediment barriers, erosion control blankets, mulch, and mulch tackifier, could be installed as needed to stabilize disturbed areas until vegetation becomes established.
- Conduct water quality tests specifically for increases in turbidity and sedimentation caused by construction activities.

- Water samples for determining background levels shall be collected in the adjacent water body for each erosion construction site. Testing to establish background levels shall be performed at least once a day when construction activity is in progress. Water samples for determining down current conditions shall be collected in the adjacent water body at a point 5 feet out from the shoreline and 300 feet down current of each erosion site. During periods when there are no in-water construction activities, random, weekly water monitoring will be performed. During periods of in-water construction, water monitoring will occur hourly.
- During working hours, the construction activity shall not cause the turbidity in the adjacent water body down current from the construction sites to exceed the Basin Plan turbidity objectives. Specifically, where natural turbidity is between 0 and 5 NTUs, increases shall not exceed 1 NTU; where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20%; where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs; and where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent (Central Valley RWQCB 2007). In determining compliance with these limits, appropriate averaging periods could be applied provided that beneficial uses will be fully protected.

An SPCCP is intended to prevent any discharge of oil into navigable water or adjoining shorelines. The contractor would develop and implement an SPCCP to minimize the potential for adverse effects from spills of hazardous, toxic, or petroleum substances during construction and operation activities. The SPCCP would be completed before any construction activities begin. Implementation of this measure would comply with state and Federal water quality regulations. The SPCCP would describe spill sources and spill pathways in addition to the actions that would be taken in the event of a spill (e.g., an oil spill from engine refueling would be immediately cleaned up with oil absorbents). The SPCCP would outline descriptions of containments facilities and practices such as doubled-walled tanks, containment berms, emergency shut-offs, drip pans, fueling procedures and spill response kits. It would also describe how and when employees are trained in proper handling procedure and spill prevention and response procedures.

Release of contaminants into adjacent water bodies could result in significant effects. Adherence to the environmental commitments and the implementation of the measures described in this section if spills were to occur would reduce or minimize this to a less than significant effect.

3.6 Vegetation and Wildlife

3.6.1 Environmental Setting

Regulatory Setting

- The Sacramento County Ordinance, Chapter 19.12, Tree Preservation and Protection (Tree Preservation Ordinance.
- The City of Sacramento Protection of Trees Ordinance (City of Sacramento Municipal Code 12.56.060).
- City of Sacramento Heritage Tree Ordinance (City of Sacramento Municipal Code 12.64.020).

Existing Conditions

This section describes the existing vegetation and wildlife resources in the project area. The primary focus of this section will be on areas within the potential construction footprint such as the American River Parkway, the Sacramento River, Robla Creek, Dry Creek, Natomas East Main Drain Canal, Magpie Creek, and Sacramento Bypass. These areas are where potential effects to vegetation and wildlife could occur.

In the summer of 2011, Corps biologists and a survey team tagged and identified trees along all levees within the study area. The identification included tree species, tree diameter, and the location of the tree. Surveys were done for the levee, 30 feet waterside, and 15 feet landside. Trees located on private property on the landside were identified for species and location; however, diameter was not obtained. This information was gathered in coordination with USFWS in accordance with the Fish and Wildlife Coordination Act. A draft Coordination Act Report (CAR) is included in Appendix A.

American River

The American River Parkway contains many vegetation types including: riparian scrub, riparian forest, oak woodland, open water, grasslands, and limited agriculture. Along the river channel vegetation is primarily considered shaded riverine aquatic (SRA) habitat. Trees adjacent to the channel are mainly oaks and cottonwoods with a thick understory of vines, berry bushes, and willows. The Parkway Plan details how the vegetation in the Parkway should be managed and expanded, where appropriate. Although the Plan recognizes the primary purpose of the system is for flood control, it attempts to manage the natural setting of vegetation and wildlife while meeting the goals of the flood control system.

Protected areas in the Parkway contain tracts of naturally occurring vegetation and wildlife that, although capable of sustaining light to moderate use with minimal alterations to the natural landscape, would be easily disturbed by heavy use. Protected areas allow general access and convenience-type facilities (i.e, restrooms, trash cans, and water fountains) to accommodate the anticipated increase in users. Facilities and other improvements are limited to those which are needed for public enjoyment of the natural environment. Emphasis is on protection and restoration of large portions of relatively natural areas which stand a better chance of preservation than smaller pieces and provide better support for wildlife.

Levee slopes along the American River are primarily covered with grasses and a few scattered trees within the levee structure. Several areas within the Parkway have been used as mitigation sites for Corps and other agency projects for endangered species. There are also some areas within the Parkway that have been used to compensate for loss of riparian habitat or oak woodlands from other projects. Landside generally includes ornamental and landscape plantings in private backyards and some individuals have migrated beyond the legal property line and fence line.

Habitats in the project area support various wildlife species. Mammal species include mule deer, coyote, black-tailed jackrabbit, striped skunk, and a variety of rodents. Common bird species in the project area include American robin, spotted towhee, Oregon junco, black phoebe, California towhee, ash-throated flycatcher, red-shafted flicker, mourning dove, California quail, house finch, goldfinch wren, mockingbird, magpie, blackbird, titmouse, and hummingbirds. Common raptors include red-tailed hawk, Cooper's hawk, red-shouldered hawk, American kestrel, and great horned owl. Reptile and amphibian species likely found in the project area include western fence lizard, gopher snake, western rattlesnake, common kingsnake, Pacific treefrog, and western toad.

The river and small backwater areas provide habitat for many water-associated species such as raccoon, beaver, Canada goose, wood duck, common merganser, mallard, black phoebe, great blue heron, belted kingfisher, and common yellowthroat. The levee slopes, dominated by annual grassland, provide foraging habitat and cover for California ground squirrel, pocket gopher, and western meadowlark.

Sacramento River

Habitat on the Sacramento River, within the project footprint, is mostly SRA habitat consisting of oaks and cottonwoods with berry and shrub understory. There are intermittent locations along the waterline with no trees due to rock revetment. The levees on the Sacramento River are immediately adjacent to the river channel with a few short stretches that have small benches.

The SRBPP has repaired some erosion sites along the river using rock revetment on the slope and created small benches. These sites have been planted with riparian vegetation and woody material has been placed in the rock to provide in-water habitat for fish species.

Due to the urban development adjacent to the levees in this area wildlife is limited to small mammals and various avian species. Domestic animals from residents are also often seen along the levees in this basin of the project.

East Side Tributaries

Natomas East Main Drainage Canal

The NEMDC flows into the American River just upstream of the confluence with the Sacramento River. This canal is a narrow channel with many trees in the lower portion. As the canal heads north the channel widens and becomes less vegetated. The levee slopes on the east side of the canal are clear of vegetation due to maintenance practices. The west side of the canal is not part of this project as it was completed as part of the NLIP Phase 4b project.

Arcade Creek

Arcade Creek flow into the NEMDC about 1.5 miles upstream of the confluence with the American River. The levees along this creek are maintained vegetation free; however, the channel does have some trees and understory. Between Norwood Avenue and Rio Linda Boulevard the channel contains a thick riparian area, but vegetation becomes sparse once it passes Rio Linda Boulevard. Due to the urban conditions in this area, wildlife is limited to those similar to the Parkway but in smaller numbers.

Dry and Robla Creeks

Dry and Robla Creeks flow into the NEMDC approximately 4 miles upstream of the confluence with the American River. The area is a wide open space floodplain with both creeks being contained between the two levees. The creeks maintain sufficient water throughout the year for trees to survive along the channel. Scattered wetlands are located in the floodplain with a higher concentration at the confluence with the NEMDC. The actual levee slopes in this floodplain contain very little vegetation due to maintenance practices. Wildlife in the floodplain is similar to that in the Parkway.

Magpie Creek

Magpie Creek is located about 4 miles north of Arcade Creek. The project area of the creek begins in an industrial area where the creek channel contains primary grasses. As the study moves upstream, the area becomes open space before it intersects with Raley Boulevard and additional industrial development. Primary wildlife in this area include jack rabbits, skunks, beavers, and coyotes that wander in from the surrounding undeveloped area. Avian species that utilize this habitat include herons and ducks, and amphibian and reptile species include treefrog and common garter snake.

Seasonal wetlands in the project area include several natural hardpan vernal pools and other areas that may or may not have hardpan, but form standing water and provide similar biological functions and values as the natural vernal pools (Corps 2004).

Sacramento Weir and Bypass

The Sacramento Bypass is used about every 5 to 10 years to convey water from the Sacramento River to the Yolo Bypass. The Sacramento Bypass is owned by the State of California and operated as the Sacramento Bypass Wildlife Area by CDFW. This 360 acre area is an important cover and feeding area for wildlife during late fall, winter, and early spring. Vegetation varies through the area from scattered trees such as mature cottonwoods, willows, and valley oaks to sparsely-covered sand soil area on the eastern end. Game birds, raptors, songbirds, and native mammals are all present in this area. Detailed surveys for wetlands in the bypass will be done prior to construction, however, visual surveys confirm that wetlands are present.

The footprint of the new weir contains about 8 acres of scattered trees along the road, railroad tracks, and levee slope. Primary wildlife in this area is avian species, beavers, skunks, and rabbits. The trees along the river provide shade for many native and non-native species along with some endangered fish species such as salmonids, sturgeon, and delta smelt. These trees are also used by avian species for nesting. Because it is unknown how soon the project would be constructed, bird surveys were not conducted. However, surveys will occur prior to construction.

3.6.2 Methodology and Basis of Significance

Methodology

Impacts to vegetation and wildlife within the project area are evaluated based on data collected from the tree surveys conducted in 2011, site visits, Google Earth, and the American River Parkway Plan. These resources provide a comprehensive overview of the vegetation that exists within the project area and were used to evaluate the impacts of the project alternatives. The goals and objectives of the American River Parkway Plan were also considered for the impact analysis, and how the construction of the alternatives would impact those goals and objectives. Impacts to wildlife were evaluated based on construction activities and changes in habitat types after construction of the project.

The ARCF GRR project description (Section 2.0) assumes that the Corps would receive a variance to address waterside vegetation under the requirements of ETL 1110-2-583. Additionally, a SWIF agreement is being sought by the non-Federal sponsor, which would allow the LMA to defer ETL 1110-2-583 compliance of landside vegetation and encroachments, to be addressed by the LMA at a later time. Effects to vegetation and encroachments are assumed to occur in the footprint of all proposed construction activities, to include the upper waterside slope of the levee per the variance. Any landside vegetation and encroachments outside of the construction footprint would be addressed separately through the SWIF agreement during O&M of the completed project levees. More details about the SWIF and variance are included in Section 1.4.5 above.

Basis of Significance

Effects on vegetation and wildlife would be considered significant if the alternative would result in any of the following:

- Substantial loss, degradation, or fragmentation of any natural communities or wildlife habitat.
- Substantial effects on a sensitive natural community, including Federally protected wetlands and other waters of the U.S., as defined by Section 404 of the Clean Water Act.
- Substantial reduction in the quality or quantity of important habitat, or access to such habitat for wildlife species.
- Conflict with the American River Parkway Plan, Sacramento County Tree Preservation Ordinance, or the City of Sacramento Protection of Trees Ordinance.
- Substantial adverse effects on native wood habitats in the American River Parkway, resulting in the loss of vegetation and wildlife.

3.6.3 No Action Alternative

Under the No Action Alternative, the Corps would not participate in construction of the proposed project. The LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system, but it would be speculative to assume that any additional work would be conducted to address the seepage, slope stability, overtopping, or erosion concerns in the study area. As a result, if a flood event were to occur, the Sacramento area would remain at risk of a possible levee failure.

Without some kind of erosion control measures, the Sacramento River levees would continue to erode during high flows. As the banks of the river erode vegetation would be lost and the levees could fail. It is likely that in order to save the levee structures, flood fight activities would occur during a high flow emergency response. Flood fighting is usually performed by placing large rock along the levee slope to stop erosion and prevent levee failure and loss of lives. The placement of rock would prevent or impede future growth of trees and vegetation on the levee slopes. In the event that flood fighting activities are not successful and a levee failure occurs all vegetation would be lost and any wildlife would be swept away in the flood waters. The loss of vegetation that could occur in a large flood event and the placement of rock along the banks are considered significant impacts to vegetation and wildlife.

Over time the berms within the American River Parkway would erode, and vegetation would be lost. This loss would also cause any wildlife in the area to relocate to other areas where the habitat they need is present. Because we cannot predict when and how large events will occur it is inappropriate to determine at which time the berms will erode. The erosion of the berms will take away the access trails used by many for wildlife observation, fishing access, and other recreational activities. The No Action alternative also does not comply with the American River Parkway Plan which states “Bank scour and erosion shall be proactively managed to protect public levees and infrastructure, such as bridges, piers, power lines, habitat and recreational resources”. The loss of the Parkway vegetation and wildlife habitat would be considered a significant impact.

3.6.4 Alternative 1 – Improve Levees

For both Alternatives 1 and 2 a vegetation variance would be obtained to reduce the impacts to vegetation and wildlife. This would allow most of the trees on the lower one half of the waterside slope to remain in place. In addition, a SWIF agreement with the non-Federal sponsor will allow vegetation and encroachment compliance on the landside of the levee to be deferred and addressed by the LMA at a later time. This would be a beneficial effect to vegetation and wildlife, as standard long-term O&M of the levee system in the study area would otherwise require the immediate removal of all vegetation. Vegetation impacts throughout the project area would occur in the proposed construction footprint. Further details on the SWIF and variance are included in Section 1.4.5 above.

American River

The construction of the launchable rock trenches would result in the removal of 65 acres of riparian habitat within the American River Parkway. This acreage was determined by overlaying the largest possible footprint of the trenches onto an aerial photographic and calculating the riparian habitat within the footprint. Much of this riparian habitat contains trees that have been in the Parkway for 50 to 100 years or more. The Parkway is the largest remaining riparian corridor in Sacramento. In addition to the 65 acres of riparian habitat, construction would occur on an additional 135 acres within the Parkway. These additional 135 acres are primarily the levees, patrol roads, and open lands with no trees. The up to 11 miles of intermittent erosion repair work (bank protection or launchable rock trench) would occur over a 7 year period. Trees would be removed as the trench is constructed over the course of multiple years. Trees outside of the construction footprint would be covered under a vegetation variance and would therefore remain in place.

Most of the 65 acres of riparian habitat is located on land designated by the Parkway Plan as Protected Areas or Nature Study Area. However, the Parkway Plan also allows for flood control activities to be conducted in order to pass 160,000 cfs through the system. Section 4.10 of the Parkway Plan states:

> *Flood control projects, including levee protection projects and vegetation removal for flood control purposes, shall be designed to avoid or minimize adverse impacts on the Parkway, including impacts to wildlife and wildlife corridors. To the extent that adverse impacts are unavoidable, appropriate feasible compensatory mitigation shall be part of the project. Such mitigation should be close to the site of the adverse impact, unless such mitigation creates other undesirable impacts.*

Any trees planted would take many years to mature to the level when they provide the same value as those removed. Because there would be many years between when the trees are planted and when they mature to a value of those removed, this impact is considered significant for the temporal loss of riparian habitat and cannot be mitigated to less than significant.

Construction would likely occur from May through October when birds are likely to be nesting. Once the project is authorized and funded, surveys of the project areas would occur to determine if birds are nesting in areas which may be impacted during construction. If nesting birds are located adjacent to the project area, coordination with the resource agencies would occur.

Sacramento River

Under Alternative 1, the existing levee structure would be degraded by one half to create a working platform for slurry wall installation. As the levee is degraded, all vegetation located in the degraded area would be removed. The maximum degraded area (the upper one half of the levee) is approximately 110 acres and contains about 750 trees of various sizes and species. Because these trees are located on the top half of the levee, they provide a small amount of SRA habitat, as well as habitat for many avian species. On the waterside of the levee there is little understory vegetation on the top half of the levee due to maintenance activities.

Because a vegetation variance would be obtained approximately 930 large trees would be left in place on the lower one-half waterside slope, and rock will be placed around the base of the trees. The trees that would remain in place are scattered over 31,130 linear feet and 50 acres. The rock protection around the trees would reduce the potential for erosion and anchor the trees in place to lower the risk of uprooting in high water events. The understory vegetation would be removed to provide a clean surface to place the rock. Excluding the large trees, vegetation in this area is primarily small shrubs, low growing plants of various species, and grasses. Once the rock protection is in place and a planting berm is constructed the area would be planted with small shrubs. Appropriate plants would be selected to maximize wildlife habitat and comply with Corps and State vegetation policies.

On the landside of the levee, where levee raises are required, all trees would be removed from the levee slope and within 15 feet of the levee toe to construct the levee raise. A landside maintenance easement would be required along the levee toe within the 8 miles of levee raise. This easement will be left in place after construction as access. There are approximately 1,300 trees of various species and size within this landside easement that once removed would not be replaced on-site. As discussed below in the Avoidance, Minimization, and Mitigation Section trees would be planted off-site to replace those removed for construction. The removal of these trees is considered significant, because it would take many years for the replacement trees to establish to the value of those removed.

The landside slopes are primarily covered with a mix of trees and ornamental groundcovers installed over the years by adjacent private property owners. In some places landscaping has been extended beyond the fence or property lines and up the levee slopes. Degrading the levee will include removal of all vegetation on the upper half of the landside slope. All disturbed areas, including the levee slopes, would be planted with native grasses to prevent erosion. The 15 foot landside easement would be maintained vegetation free, except for the native grasses.

Because this area is very urbanized, the primary effects to wildlife would be to avian species. Surveys will be conducted to determine if any nesting birds are present prior to construction. If nesting birds are located adjacent to the project area, coordination with the resource agencies would occur. Trees where nesting birds are located would not be removed while they are actively nesting. However, once the young have fledged the trees may be removed to construct the project.

East Side Tributaries

There would be a maximum of 200 trees removed from both the landside and waterside to construct the project. The trees are suitable nesting habitat for many avian species in the area. Surveys would be conducted to determine if any nesting birds are present prior to construction. If nesting birds are located adjacent to the project area, coordination with the resource agencies would occur. Trees where nesting birds are located would not be removed while they are actively nesting. However, once the young have fledged the trees may be removed to construct the project. Trees would be replanted to replace those removed in accordance with the City of Sacramento tree ordinance. The loss of trees in this area would be considered significant because new plantings would take many years to grow to the value of those removed.

This alternative would result in temporary impact to approximately 4 acres of grasses along the creek channel and levee slopes. Once construction is complete the area would be planted with native grass seed mix to prevent erosion and replace the grasses removed for construction. The grasslands are likely to grow back in a single season, therefore, this impact is considered less than significant.

3.6.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Effects to vegetation and wildlife from construction of the levee repairs are the same for Alternative 1 on the American River and East Side Tributaries. Effects on the Sacramento River and Sacramento Weir and Bypass are discussed below.

Sacramento River

Because the amount of levee raising is significantly reduced under Alternative 2 due to the widening of the Sacramento Weir and Bypass, affects to the landside vegetation on the levees would be less than under implementation of Alternative 1. This would result in the removal of approximately 750 trees of various species compared to the 1,300 trees that would be removed under Alternative 1. However, even with the reduced impact, effects to vegetation and wildlife under Alternative 2 would remain significant due to the temporal loss of vegetation in the area during the growth and development period of the mitigation sites.

Sacramento Weir and Bypass

Habitat within the existing Bypass would remain the same as the existing conditions and would be expanded by about 300 acres. The additional land would become open space and would likely become similar habitat for wildlife as the existing Bypass. Operations of the new weir and bypass will be determined after the construction is complete. No grading or altering of the lands within the existing bypass will occur as part of the alternative. The southern side of the bypass is the lowest elevation so water will naturally flow to the existing area and continue to support existing vegetation and wildlife. Because of the natural flow of water in this area, wetlands in the existing bypass are not expected to be impacted by construction of the project. There is a potential for additional wetlands to develop in the additional 300 acres since this land will no longer be farmed. While the loss of rice fields has a negative effect on giant garter snake (GGS), which is discussed in Special Status Species (Section 3.8), the conversion of this land back to its natural state would have benefits to other wildlife and could become an expansion of the Sacramento Bypass Wildlife Refuge.

There are approximately 8 acres of riparian vegetation that would be removed to construct the weir structure. Included within the 8 acres are 1,500 linear feet of vegetation along the Sacramento River that would be removed to allow the river to flow freely into the weir. Compensation for the loss of this vegetation is discussed in Section 3.6.6 below.

Construction activities would likely cause any wildlife within the bypass and adjacent areas to relocate to nearby rural lands and away from human activities. Once construction is complete the wildlife is expected to return to the area. Therefore, the impacts to wildlife in the Sacramento Bypass would be less than significant. Both native and non-native fish species, along with some endangered species, use this area of the river and are discussed in Fisheries (Section 3.7) and Special Status Species (Section 3.8).

3.6.6 Avoidance, Minimization, and Mitigation Measures

Avoidance, minimization, and mitigation measures are similar for both Alternatives 1 and 2 since the footprint does not change for these two alternatives with the exception of the Sacramento Bypass, which would only be required for Alternative 2. Compensation measures are based on the largest potential footprint and worst case scenario for the purposes of compliance with NEPA. If design refinements are made that result in reduced impacts to vegetation, compensation would be coordinated with the appropriate resource agencies and adjusted accordingly.

American River

During the design refinement phase, plans will be evaluated to reduce the impact on vegetation and wildlife to the extent practicable. Refinements that could be implemented to reduce the loss of riparian habitat include: reduced footprint, constructing bank protection rather than launchable rock trench whenever feasible, and designing planting berms in areas where significant riparian habitat exists adjacent to the levee toe (when no hydraulic impacts would occur).

Trees would remain in locations where the bank protection and planting berm can be constructed, since this area is 15 feet from the levee toe and complies with the Corps vegetation policy. Trees would be protected in place along the natural channel during the placement of rock. The rock would anchor the trees in place and reduce the risk of them falling over during a high flow event. Additional plantings would be installed on the newly constructed berm to provided habitat for fish and avian species. The planting berm would be used to minimize impacts to fish and wildlife species; however, the impact to riparian habitat would still be significant.

To compensate for the removal of 65 acres of riparian habitat, approximately 130 acres of replacement habitat would be created. Species selected to compensate for the riparian corridor removal would be consistent with the approved list of trees, shrubs, and herbaceous plants native to the Parkway. The 130 acres would create habitat connectivity and wildlife migratory corridors that provide for the habitat needs of important native wildlife species, without compromising the integrity of the flood control facilities, the flood conveyance capacity of the Parkway, and Parkway management goals in the Parkway Plan. Some of the 130 acres of riparian would be planted on top of the rock trench. Corps vegetation policy allows for trees to be planted 15 feet from the levee toe. In order to comply with this policy and reduce the amount of maintenance on the compensation lands, trees could be planted on top of the rock trench starting at 30 feet from the waterside toe. In other words, if the trench is 70 feet wide the outer 40 feet could be planted with riparian habitat. Additionally, to comply with the Parkway Plan, lands within the Parkway would be evaluated for compensation opportunities. The exact location of the compensation lands in the Parkway would be coordinated in the design phase of the project with Sacramento County Parks Department (County Parks) and would comply with the Parkway Plan objectives and goals. It is assumed that sufficient lands would be available within the Parkway; however, if there is not sufficient land, other locations within Sacramento County would be identified and public coordination would occur.

Surveys would be conducted for several years prior to construction to determine if any birds are nesting within 0.5 miles of the construction activities. If nests are located within the vicinity of construction for any given year, coordination with the appropriate resource agencies would occur to determine what action should be taken. Trees would not be removed if an active nest is found; however, once the young have fledged, the tree can be removed for construction. If survey results determine that no nests are in the vicinity of construction scheduled for that year, construction may commence without further coordination on this issue.

Sacramento River

Avoidance and minimization measures incorporated as part of the Sacramento River design include: compliance with the Corps vegetation policy through a vegetation variance, installation of a planting berm where erosion protection is required, and narrowing of the levee footprint by construction of a retaining wall, when feasible.

The vegetation variance would allow waterside trees on the lower half of the slope to remain in place. This would allow approximately 930 trees along 10 miles of the Sacramento River to continue to provide habitat for fish and wildlife species. Along with retaining the trees, additional plantings of small vegetation would be done on the newly constructed berm. Species of plants would be coordinated with NMFS, USFWS, and State and local partners.

Compensation for the tree removal was evaluated based on other projects in the Central Valley where riparian trees were removed, coordination with USFWS, and local tree ordinances. Based on this evaluation and the lack of riparian habitat in the urban area, up to 95 acres could be required to compensate for the loss of these trees. There are pieces of land within a short distance that could be planted; however, further evaluation on availability of these lands and coordination with the resource agency would be needed. Lands within the extended Sacramento Bypass could be used to compensate for some of the landside trees being removed. A hydraulic analysis would need to be done to determine to what extent planting could occur. Because it would take many years for the compensation sites to provide the value of those removed, both Alternatives 1 and 2 would cause a significant impact on vegetation and wildlife.

East Side Tributaries

Off-Site mitigation for the removal of 50 trees in the Arcade Creek area would be done in compliance with the Sacramento City tree ordinance. It is estimated that 2 acres would be required to accommodate the planting of approximately 450 trees. There are multiple locations that are suitable for planting the compensation trees within the City of Sacramento Parks land. Discussions with the City of Sacramento Parks Department identified the following locations as potential planting sites:

- **Sacramento Northern Bike Trail**: This trail runs from downtown Sacramento near C Street to Elverta Road. The trail has some open lands that run parallel to the trail, near Arcade Creek. Planting in this area would provide riparian habitat while also providing some beautification of the trail.
- **North Natomas Regional Park**: This Park is locate off Natomas Boulevard and contains 35 acres, including a lake, landscaping, dog park, bridges, walkways, and bikeways. Some of the land within this park could be used to compensate for the tree removal along Arcade Creek as it is within 5 miles of the tree removal area. Planting in this park would provide both riparian habitat and help complete the master plan for this land.
- **Johnston Park**: This Park is located on Eleanor Avenue in Sacramento. The park is approximately 25 acres with swimming pool, ball fields, picnic areas, and community center. The park has many acres of open land that could be used to plant trees. Again, this would provide the needed riparian compensation and benefit the overall quality of the park.
- **Dry Robla Creek**: This area is a 420-acre open space located north of main Avenue and east of NEMDC. Any planting in this area would avoid existing woodland corridor along the Dry Creek channels, vernal pools, seasonal wetlands, and relatively permanent waters. If this area is used to plant compensation habitat, hydraulic modeling would occur to ensure that no impacts to hydraulics occur.

Sacramento Weir and Bypass

Impacts associated with the Sacramento Weir and Bypass are related to the construction of Alternative 2 only, therefore, avoidance, minimization, and mitigation measures discussed in this section would only be implemented if Alternative 2 is constructed.

As stated above, a maximum of 8-acres of riparian vegetation would be removed to construct the 1,500 foot long weir. Compensation was determined by evaluating other projects with similar impacts in the Central Valley, coordination with resource agencies, and evaluation of compensation plantings' ability to provide similar wildlife habitat. Because new plantings would take many years to establish, a temporal loss was considered in the calculation for compensation acreage. A total of 20 acres would be needed to compensate for the removal of the vegetation along the Sacramento River and within the new weir footprint. Plantings could be accomplished within the expanded bypass if hydraulic analysis determines that it would result in no hydraulic impacts. Specific lands for compensation have not been identified; however, lands considered would provide similar habitat to that being impacted. Although replacement trees would be planted off-site to compensate for the removal of 8 acres, the newly planted vegetation will take many years to mature to an equal value of those removed. Because the plantings would take a long time to provide the same value of habitat as those removed this impact would be significant on vegetation and wildlife.

3.7 Fisheries

3.7.1 Environmental Setting

Regulatory Setting

The following Federal and State laws and regulations apply to the resources covered in this chapter. Descriptions of the laws and regulations can be found in Section 5.0.

Federal

- Endangered Species Act
- Clean Water Act
- Magnuson-Stevens Fishery Conservation and Management Act

State

- California Endangered Species Act
- California Fish and Game Code Section 1600: Streambed Alteration Agreements

Existing Conditions

Sacramento River and American River

Native species present in the Sacramento and American Rivers can be separated into anadromous species and resident species. Native anadromous species include four runs of Chinook salmon, steelhead trout, green and white sturgeon, and Pacific lamprey, which are discussed in detail in the Special Status Species Section of this EIS. Native resident species include Sacramento pikeminnow, Sacramento splittail, Sacramento sucker, hardhead, California roach, and rainbow trout and can be found throughout the study area in various habitats that include, but are not limited to, deep pools, riffles, side channels, swift moving cool water, and slow moving warm water habitats. A list of the species that can be found in the waterways within the study area can be seen on Table 15 below.

Table 15. Potential Central Valley Native and Nonnative Fish Species Present in the Study Area.

Common Name	Scientific Name	Origin
Lamprey (two species)	*Lampetra spp.*	native
Chinook Salmon (winter, spring, fall and late fall runs)	*Oncorhynchus tshawytscha*	native
Chum salmon (rare)	*Oncorhynchus keta*	native
Steelhead/rainbow trout	*Oncorhynchus mykiss*	native
White sturgeon	*Acipenser transmontanus*	native
Green sturgeon	*Acipenser medirostris*	native
Delta smelt	*Hypomesus transpacificus*	native
Wakasagi	*Hypomesus nipponensis*	nonnative
Sacramento sucker	*Catostomus occidentalis*	native
Sacramento pikeminnow	*Ptychocheilus grandis*	native
Sacramento splittail	*Pogonichthys macrolepidotus*	native
Sacramento blackfish	*Orthodon microlepidotus*	native
Hardhead	*Mylopharodon conocephalus*	native
Speckled dace	*Rhinichthys osculus*	native
California roach	*Lavinia symmetricus*	native
Hitch	*Lavina exilicauda*	native
Golden shiner	*Notemigonus crysoleucas*	nonnative
Fathead minnow	*Pimephales promelas*	nonnative
Goldfish	*Carassius auratus*	nonnative
Carp	*Cyprinus carpio*	nonnative
Threadfin shad	*Dorosoma petenense*	nonnative
American shad	*Alosa sapidissima*	nonnative
Black bullhead	*Ameiurus melas*	nonnative
Brown bullhead	*Ameiurus nebulosus*	nonnative
White catfish	*Ameiuruscatus*	nonnative
Channel catfish	*Ictalurus punctatus*	nonnative
Mosquito fish	*Gambusia affinis*	nonnative
Inland silverside	*Menidia audena*	nonnative
Threespine stickleback	*Gasterosteus aculaetus*	native
Striped bass	*Morone saxatilis*	nonnative
Bluegill	*Lepomis macrochirus*	nonnative
Green sunfish	*Lepomis cyanellus*	nonnative
Redear sunfish	*Lepomis microlophus*	nonnative
Warmouth	*Lepomis gulosus*	nonnative
White crappie	*Pomoxis annularis*	nonnative

Common Name	Scientific Name	Origin
Black crappie	*Pomoxis nigromaculatus*	nonnative
Largemouth bass	*Micropterus salmoides*	nonnative
Redeye bass	*Micropterus coosae*	nonnative
Spotted bass	*Micropterus punctulatus*	nonnative
Small mouth bass	*Micropterus dolomieu*	nonnative
Bigscale logperch	*Percina macrolepida*	nonnative
Prickly sculpin	*Cottus asper*	native
Tule perch	*Hysterocarpus traski*	native

Important attributes of the aquatic habitat within the American and Sacramento Rivers are aquatic vegetation and SRA habitat. Aquatic vegetation is represented by floating, submerged, and emergent vegetation. Aquatic vegetation serves as hiding cover and an invertebrate food production base for nearly all aquatic species. The percent of aquatic vegetation cover varies throughout the study area.

SRA is represented by overhead canopy cover. Overhanging SRA provides shade which is a form of cover important to the survival of many aquatic organisms, including fish. Overhanging vegetation moderates water temperatures, which is an important factor for various life stages of native fish species. The vegetation provides food and habitat for both terrestrial and aquatic invertebrates, which in turn serve as food for several fish species. Aquatic vegetation, or in-water cover, provides a diversity of microhabitats which allows for high species diversity, abundance, and a food source for instream invertebrates, which in turn are eaten by several native fish species. Thus, a broad food base and extensive cover and habitat niches are supported by in-water cover. These values in turn create high fish diversity and abundance (USFWS 1992a).

The existing overhead shade cover within the study area varies by location and along each waterway. The amount of SRA within the study area was calculated using aerial photography and determining which areas have overhanging vegetation and trees adjacent to the natural channel and which areas do not. Generally, greater shade cover occurs during summer when full tree canopies are present. Analysis of total linear feet (lf) of SRA was conducted using Google Earth Pro for the reaches associated with bank protection on the American and Sacramento Rivers in the ARCF study area (Table 16).

Table 16. Summary of Reach-Specific SRA Analysis.

American River		Sacramento River	
Reach	**Linear Feet (lf) of SRA**	**Reach**	**Linear Feet (lf) of SRA**
A	31,174	D	9,643
B	7,259	E	7,709
C	6,934	F	21,263
		G	11,689
Total	45,367	Total	50,304

Note: Numbers were obtained using aerial photography and are estimates. Numbers are rounded.

Throughout the program area watersheds, altered flow regimes, flood control, and bank protection efforts have reduced sediment transport, channel migration, and instream woody material (IWM) recruitment, and have isolated the channel from its floodplain. Historically the floodplain provided areas for riparian vegetation recruitment and for rearing of native and special-status fish species. Levees and armored banks prevent fish from accessing productive floodplain habitats and limits nutrient exchange between the river and flooded riparian areas (Stillwater Sciences 2004).

East Side Tributaries

The East Side Tributaries provide fish spawning, rearing, and/or migratory habitat for a diverse number of native, nonnative, and special status species (Table 15). Many of the nonnative resident fish species are more tolerant of warm water, low dissolved oxygen, and disturbed environments than native species as encountered in the East Side Tributaries during most of the year. In general, they are adapted to warm, slow-moving, and nutrient-rich waters (Moyle 2002).

Quality fish habitat for native fish species in the East Side Tributaries study area associated with SRA lies in the lower portion of NEMDC below Arcade Creek and in Arcade Creek between Norwood Avenue and the Sacramento Northern Bike Trail. Due to lack of quality SRA habitat in the Magpie Creek and Dry/Robla Creek project areas it would be considered of minimal quality for native fish species.

Analysis of total lf of SRA in the East Side Tributaries was not evaluated because no bank erosion protection is planned and there is minimal, if any, SRA associated with these reaches.

Sacramento Bypass

The Sacramento Bypass provides emigration and rearing habitat for juvenile anadromous fish and spawning and rearing habitat for native resident fish species. The occurrence of these life stages in the Sacramento Bypass is limited mainly to periods when flooding (via the Fremont and Sacramento Weirs) allows individuals to access the area from the Sacramento River. Juvenile Chinook salmon have been captured in the Sacramento Bypass (Jones & Stokes 2001). The area seasonally provides habitat for delta smelt, steelhead, and Chinook salmon, as well as numerous native resident fish species (Sommer et al. 2001). Most juveniles emigrate from the Sacramento Bypass during winter and spring before the floodplains become dry. Thus, the potential for these species' life stages to occur in these areas in any given year depends on the occurrence of flooding; the timing, magnitude, and duration of flooding; and the seasonal timing of specific life stages.

Recognition is growing that naturally functioning floodplains, such as the Yolo Bypass, provide many benefits, including direct economic benefits, ecosystem services, and habitat for a wide diversity of species (Bayley 1991; Tockner and Stanford 2002, as cited in Ahearn et al. 2006). Floodplains provide freshwater habitat for the migration, reproduction, and rearing of native fishes and mitigate flood damage to human settlements (Moyle et al. 2003; Crain et al. 2004; Sommer et al. 2001a).

Floodplains are highly productive habitats that flood during high flows in the winter and spring. Floodplains are important habitats for young native fish species (Moyle et al. 2005). Native resident species such as the Sacramento splittail, which spawn in inundated floodplains, produce the highest numbers of young when flows are high and floodplain habitat is inundated (Moyle 2002).

3.7.2 Methodology and Basis of Significance

Methodology

Existing resource information related to the study area was reviewed to evaluate whether sensitive habitats and native fish species are known from or could occur in the study area. The information reviewed included the following sources:

- Published and unpublished documents and reports pertaining to the study area.
- Analysis of total SRA in lf was conducted using Google Earth Pro for the reaches associated with bank erosion protection on the American and Sacramento Rivers in the ARCF project area.
- California Natural Diversity Data Base (CNDDB)

The key sources of data and information used in the preparation of this section are listed below.

- USFWS list (dated October 2, 2013) of endangered, threatened, and proposed species for the study area (Appendix B);
- Google Earth;
- Published and unpublished reports; and,

- A field survey on October 26, 2007.

<u>Significance Criteria</u>

In general, effects on fish populations are significant when the project causes or contributes to substantial short- or long-term reductions in abundance and distribution. An effect is found to be significant if it:

- Interferes substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Substantially reduces the habitat of a fish population; and/or
- Causes a fish population to drop below self-sustaining levels;

3.7.3 No Action Alternative

Under the No Action Alternative, the Corps would not participate in construction of the proposed project. As a result, if a flood event were to occur, the Sacramento area would remain at risk of a possible levee failure due to seepage, slope stability, erosion, or overtopping. There would be no construction related affects to fish habitat, however effects to fish associated with flood fighting could be significant. Flood fighting is usually performed by placing large rock along the levee slope to stop erosion and prevent levee failure and loss of lives and property. The placement of rock would prevent or impede future growth of trees and vegetation on the levee slopes. Emergency clean-up and earth-moving activities could also result in an increase in sediment and turbidity that adversely affect migration, spawning or rearing habitat. Given the unpredictable nature of emergency clean-up activities, it is likely that implementation of BMPs and measures to reduce effects on fish would not be possible.

High flows in the American River would have a large impact on the American River Parkway as the berms disappear from continued high flows against erodible material. The timeframe for which the berms would erode is unknown because it is impossible to determine how much water will pass through the system and potential flood events. The banks along the American River are very erosive and without some kind of erosion control measures would continue to erode during high flows. As the banks of the river erode, important SRA habitat would be lost and the levees could fail. It is likely that in order to save the levee structures, flood fight activities would occur during a high flow emergency response.

All of these effects would be considered significant; however, given the uncertainty of the occurrence or magnitude of such an event, potential effects on fisheries cannot be quantified based on available information.

3.7.4 Alternative 1 – Improve Levees

American River

Rock placement would most likely disturb the native resident fish by increasing noise, water turbulence, and turbidity, causing them to move away from the area of placement. In some pelagic native juvenile species utilizing the near shore habitat for cover, moving away from that cover could put them at a slight risk of predation. Native benthic species would not be affected due to their location away from the levee slope where revetment placement would take place. Construction during the project may disturb soils and the nearshore environment, leading to increases in sediment in the nearshore aquatic habitat. This in turn may increase sedimentation (i.e., deposition of sediment on the substrate), suspended sediments, and turbidity. Increases in suspended solids and turbidity will generally be short-term in nature. Direct effects were not considered significant to resident native fish species because it was determined that existing conditions would not be worsened by project construction which includes the creation of planting berms to provide shade and instream woody material elements of SRA habitat. The natural bank element of SRA would be lost with the placement of rock along the levee slope. Over time sediment would settle into the rock voids and provide similar substrate characteristics as a natural bank. The direct effects would also not result in a substantial reduction in population abundance, movement, and distribution.

The other proposed levee improvement measure for the American River involves construction of a launchable rock filled trench designed to deploy once erosion has removed the bank material beneath it. All launchable rock trenches would be constructed outside of the natural river channel with no significant direct effects to native fish species.

The erosion measures on the American River is not considered a structural fix, as these measures do not impact the structure of the levee, therefore the vegetation in this portion of the project would not be addressed under the ARCF project. Bank erosion measures therefore will allow the vegetation to remain. Indirect effects were not considered significant to resident native fish species because it was determined that existing conditions would not be worsened by project construction, and would not result in a substantial reduction in population abundance, movement, and distribution.

Program actions would require ground-disturbing activities that potentially cause erosion and soil disturbance, subsequently resulting in sediment transport and delivery to aquatic habitats. Increases in sedimentation and turbidity have been shown to affect fish physiology, behavior, and habitat. An increase in sedimentation and turbidity could occur in adjacent water bodies during earth-moving activities and could be considered significant. Indirect effects would be reduced to less than significant with the implementation of BMPs discussed in Water Quality (Section 3.5).

Sacramento River

Direct effects on the Sacramento River in relation to rock placement would be the same as described above for the American River. The 9 miles of erosion protection planned under this alternative would include the creation of planting berms which would provide the shade and instream woody material elements of SRA habitat. The natural bank element of SRA habitat would be lost with the placement of rock along the levee slope. Over time sediment would settle into the rock voids and provide similar substrate characteristics as a natural bank. The other proposed levee improvements for the Sacramento River involve construction of cutoff walls to address seepage and stability measures and levee raises for overtopping measures. These measures would be constructed outside of the natural river channel with no direct effects to native fish species.

A vegetation variance would allow vegetation below the lower one-half of the slope to 15 feet waterward of the levee toe. Indirect effects were not considered significant to resident native fish species because it was determined that existing conditions would not be worsened by project construction. The planting berm would create additional cover habitat once it has matured. However, the loss of natural bank would still reduce the overall value of the SRA habitat.

Program actions would require ground-disturbing activities that potentially cause erosion and soil disturbance, subsequently resulting in sediment transport and delivery to aquatic habitats. Increases in sedimentation and turbidity have been shown to affect fish physiology, behavior, and habitat. An increase in sedimentation and turbidity could occur in adjacent water bodies during earth-moving activities and could be considered significant. Indirect effects would be reduced to less than significant with the implementation of BMPs discussed in Water Quality (Section 3.5).

East Side Tributaries

Construction of cutoff walls and flood walls would take place above the waterline which would not have significant direct effects. The East Side Tributaries would be required to establish compliance with the Corps vegetation requirements. Due to SRA habitat located on the lower portion of NEMDC below Arcade Creek and between Norwood Avenue and the Sacramento Northern Bike Trail, there would be significant direct effects by reducing the available areas for shade and possible food sources available to the existing native and nonnative fish species present in the study area. Indirect effects to loss of SRA habitat would be reduced to less than significant with the implementation of compensation for the loss of vegetation. This compensation is discussed in detail in Vegetation and Wildlife (Section 3.6).

Program actions would require ground-disturbing activities that potentially cause erosion and soil disturbance, subsequently resulting in sediment transport and delivery to aquatic habitats. Increases in sedimentation and turbidity have been shown to affect fish physiology, behavior, and habitat. An increase in sedimentation and turbidity could occur in adjacent water bodies during earth-moving activities and could be considered significant. Indirect effects would be reduced to less than significant with the implementation of BMPs discussed in Water Quality (Section 3.5).

3.7.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

The Alternative 2 direct and indirect effects for the American River, Sacramento River, and East Side Tributaries would be the same as described above in Alternative 1. Effects associated with construction of the Sacramento Weir and Bypass widening is discussed below.

Sacramento Weir and Bypass

Proposed construction in the Sacramento Bypass would take place during the dry season when no water would be flowing through the project area from the Sacramento River. There would be no significant direct effects to native fish populations because they would not be present in the construction footprint during the proposed construction. Indirect effects associated with this action are discussed below.

Winter floodplain habitat is a vital (and missing) link between upstream gravel beds where salmon spawn and the ocean where they spend the majority of their lives. Water management experts are beginning to recognize that floodplains and bypasses can serve multiple purposes. Floodplains give high flood flows a place to go, taking pressure off levees, and protecting people and property from flooding. Additionally, flood waters in these areas create seasonal habitat for fish and birds.

The State of California has been conducting the Agricultural Floodplain Pilot Study to investigate the biological and physical parameters of fish habitat, as well as the relationships between habitat, growth, and survival. The goal of the project is to see if flooding agricultural land can create a seasonal wetland suitable for raising Chinook salmon, without disrupting agricultural operations. Such information is essential to the development of Bypass rearing habitat for Chinook at appropriate temporal and spatial scales (UC Davis and DWR 2012).

Knaggs Ranch, a research location involved in the Agricultural Floodplain Pilot Study, is located approximately five miles west of the city of Sacramento, in the Yolo Bypass. The initial pilot, completed in 2012, confirmed that juvenile salmon thrive on seasonally flooded agricultural fields, with the project documenting among the highest growth ever recorded in Central Valley salmon research. The second phase, launched in early 2013, will evaluate how different habitat variations might impact the salmon, with the goal of maximizing benefits for the fish without impacting farming operations or planting cycles. The salmon will be released on different types of land (such as post-harvest rice straw or bare ground) to see which makes for better habitat. Research will also determine if long-term survival rates of salmon are improved by increasing the time they spend on floodplains (CWF 2012).

By widening the Sacramento Weir and Bypass, the project would create additional floodplain habitat, which could benefit native fish consistent with the results of the Knaggs Ranch Study. The increase of floodplain habitat could increase opportunities for successful rearing and feeding during seasonal flooding. As a result, indirect effects of the Sacramento Bypass and Weir widening for native fish species would be considered a benefit to the species.

3.3.6 Avoidance, Minimization, and Mitigation Measures

All avoidance, minimization, and mitigation measures associated with SRA and riparian habitat removal are addressed in Vegetation and Wildlife (Section 3.6). BMPs associated with construction related impacts such as dust, runoff, and spills are addressed in Water Quality (Section 3.5).

- In-water construction would be restricted to the August 1 through November 30 work window, during periods of low fish abundance, and outside the principal spawning and migration season. Typical construction season generally corresponds to the dry season, but construction may occur outside the limits of the dry season, only as allowed by applicable permit conditions.
- Due to the deleterious effects of numerous chemicals on native resident fish used in construction, if a hazardous materials spill does occur, a detailed analysis will be performed immediately by a registered environmental assessor or professional engineer to identify the likely cause and extent of contamination. This analysis will conform to American Society for Testing and Materials standards, and will include recommendations for reducing or eliminating the source or mechanisms of contamination. Based on this analysis, the Corps and its contractors will select and implement measures to control contamination, with a performance standard that surface water quality and groundwater quality must be returned to baseline conditions.
- If mitigation or compensation sites are planned within the Sacramento Bypass for the overall ARCF project, future results from the 2013 Knaggs Ranch Pilot Study would be reviewed for potential beneficial habitat for native fish species to be incorporated into the sites.

3.8 Special Status Species

This section describes special status species that either occur or have the potential to occur (existing habitat) in the project area. Special status species are protected by, or are otherwise of concern to, both the Federal and State Governments.

3.8.1 Environmental Setting

Regulatory Setting

Federal

- Endangered Species Act
- Migratory Bird Treaty Act
- Bald and Golden Eagle Protection Act

State

- California Endangered Species Act
- California Fish and Game Code
- California Native Plant Protection Act

Existing Conditions

A list of special status species was obtained from the USFWS website, and a search of the CNDDB was conducted in January 2015. The species lists from these data searches are included in Appendix B. Many of the listed species are not expected to occur in the study area due to lack of suitable habitat. Those species known to occur within or adjacent to the study area are discussed further in this chapter. In general, habitats within the entire study area are similar and so potential for listed species are described for the entire project and not broken out into the separate reaches of the project.

Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (VELB) is Federally listed as threatened. These beetles are patchily distributed throughout the remaining riparian forests of the Central Valley. VELB require elderberry shrubs *(Sambucus sp.)* for reproduction and survival, and are rarely seen because they spend most of their life cycle as larvae within the stems of the shrubs. It appears that in order to function as habitat for the VELB, host elderberry shrubs must have stems that are 1.0 inch or greater in diameter at ground level. Use of the shrubs by the beetle is rarely apparent; often the only exterior evidence is an exit hole created by the larva just before the pupal stage.

Documented occurrences of VELB are present along both the American and Sacramento Rivers. The Corps conducted surveys in 2012 of the levee systems within the study area. The survey area consisted of the levee structures and 15 feet on both the waterside and landside; where access was available. The survey located elderberry clusters, however, actual shrubs, stem size, nor exit hole presence were not determined. The surveys found the greatest amount of clusters on the south side of the American River and determined that both basins contain shrubs. All shrubs are considered to be in a riparian zone except those located on the landside of the levees.

Giant Garter Snake

Giant garter snake (GGS) is Federally and State-listed as threatened. This species is endemic to the basins and flood plains of the Sacramento and San Joaquin Valleys. Generally, GGS inhabits rice fields, irrigation supply and drainage canals, freshwater marshes, sloughs, ponds, and other aquatic habitats. The primary cause of decline, loss, or degradation of aquatic habitat caused by agricultural development, has been compounded by the loss of upland refugia and bankside vegetation cover (Thelander 1994).

Rice fields and their adjacent irrigation and drainage canals and ditches serve an important role as aquatic habitat for the snakes. During the summer, some snakes use the flooded rice fields as long as their prey is present in sufficient densities. In late summer, rice fields provide important nursery areas for newborns. In late summer/fall, water is drained from the rice fields and the snakes prey items become concentrated in the remaining pockets of standing water, which allow the snakes to gorge before their period of winter inactivity (USFWS 1999). It appears that the majority of the snakes move back into the canals and ditches as the rice fields are drained, although a few may overwinter in the fallow fields, where they hibernate within burrows in the small berms separating the rice checks (Hansen 1998). The Sacramento Bypass widening area contains rice fields and adjacent irrigation canals which provide habitat for GGS.

The width of uplands used by the snake varies considerably. However, the USFWS considers 200 feet to be the width of upland vegetation needed to provide adequate habitat for giant garter snake along the borders of aquatic habitat (USFWS 1997).

The East Side Tributaries creeks (Arcade, Dry/Robla, and Magpie) have GGS habitat, however, there is no connectivity to rice fields which is a primary component of GGS habitat. The closest rice fields are in the Natomas Basin which connects to the East Side Tributaries via the NEMDC. Additionally, these creeks do not contain year round water, which is component for possible snake presence. The NEMDC could potentially contain GGS habitat as this waterway is adjacent to the rice fields within the Natomas Basin. Large waterways, such as the Sacramento and American Rivers, do not provide habitat for giant garter snakes.

Table 17. Special Status Species with the Potential to Occur in the Study Area.

Common Name	**Scientific Name**	**Status**	**Habitat**	**Potential for Occurrence**
Valley Elderberry Longhorn Beetle	*Desmocerus californicus dimorphus*	Federal Threatened/ State Endangered	Riparian forest in the Central Valley. Elderberry shrubs are the host plant for this species.	Known to occur throughout the study area.
Giant Garter Snake	*Thamnophis gigas*	Federal/State Threatened	Rivers, Streams, Marshes, Ricefields	May occur in small canals adjacent to levees or in rice fields.
Swainson's Hawk	*Buteo swainsoni*	State Threatened	Open grasslands, prairies, farmlands, and deserts that have some trees for nesting.	Nesting sites have been observed recently within the study area.
Burrowing Owl	*Athene cunicularia*	State Species of Concern	Grasslands, rangelands, agricultural areas, deserts. Nest in burrows on levee slopes.	May occur in the study area.
Central Valley fall-/late fall–run Chinook salmon	*Oncorhynchus tshawytscha*	Federal/State Species of Concern	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Delta.	Occurs in the lower Sacramento and American Rivers, and NEMDC.
Sacramento River winter-run Chinook salmon	*Oncorhynchus tshawytscha*	Federal/State Endangered	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Delta.	Occurs in the Sacramento River.
Central Valley spring-run Chinook salmon	*Oncorhynchus tshawytscha*	Federal/State Threatened	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Delta.	Occurs in the Sacramento and American Rivers.
Central Valley Steelhead	*Oncorhynchus mykiss*	Federal Threatened	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Delta.	Occurs in the Sacramento and American Rivers, Dry/Robla Creek, and NEMDC.

Common Name	**Scientific Name**	**Status**	**Habitat**	**Potential for Occurrence**
North American Green sturgeon	*Acipenser medirostris*	Federal Threatened	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, tributaries, and Delta.	Occurs in the lower Sacramento River.
Delta Smelt	*Hypomesus transpacificus*	Federal/State Endangered	Requires cold, freshwater-saltwater mixing zone, spawns in freshwater.	Occurs in the Sacramento River.
Vernal pool fairy shrimp	*Branchinecta lunchi*	Federal Threatened	Vernal pools in grass or mud-bottomed swales, earth sumps, or basalt flow depression pools in unplowed grasslands.	Occurs in vernal pool habitat near Magpie Creek.
Vernal pool tadpole shrimp	*Lepidurus packardii*	Federal Endangered	Vernal pools and swales containing clear to highly turbid water.	Occurs in vernal pool habitat near Magpie Creek.

Swainson's Hawk

Swainson's hawk is Federally listed as a species of concern protected under the Migratory Bird Treaty Act and State listed as threatened. As many as 17,000 Swainson's hawk pairs may have nested in California at one time (DFG 1994). According to the 2005 California Department of Fish and Game (CDFG) survey, an estimated 1,830 pairs of nesting hawks were found in the California Central Valley. Swainson's hawks typically occur in California only during the breeding season (March through September) and winter in Mexico and South America. The Central Valley population migrates only as far south as central Mexico. Swainson's hawks begin to arrive in the Central Valley in March; nesting territories are usually established by April, with incubation and rearing of young occurring through June (Estep 2003).

Swainson's hawks are found most commonly in grasslands, low shrublands, and agricultural habitats that include large trees for nesting. Nests are found in riparian woodlands, roadside trees, trees along field borders, and isolated trees. Corridors of remnant riparian forest along drainages contain the majority of known nests in the Central Valley (England, Bechard, and Houston 1997; Estep 1984; Schlorff and Bloom 1984). Nesting pairs frequently return to the same nest site for multiple years and decades.

Prey abundance and accessibility are the most important features determining the suitability of Swainson's hawk foraging habitat. In addition, agricultural operations (*e.g.*, mowing, flood irrigation) have a substantial influence on the accessibility of prey and thus create important foraging opportunities for Swainson's hawk. Swainson's hawks feed primarily on small rodents, but also consume insects and birds. Although the most important foraging habitat for Swainson's hawks lies within a 1-mile radius of each nest (City of Sacramento, Sutter County, and TNBC 2003), Swainson's hawks have been recorded foraging up to 18.6 miles from nest sites (Estep 1989).

Within the study area, most of the nests are located along the Sacramento River, Sacramento Bypass, and Yolo Bypass, where foraging habitat is close to the levee system. Because of the urban development adjacent to both sides of the American River, hawks are less likely to nest in this area where foraging areas and food is not as abundant as it is abundant in undeveloped or farmland areas.

Sacramento River Winter-Run Chinook Salmon

The Sacramento River winter-run chinook salmon was listed as threatened under the Federal ESA on August 4, 1989 (NMFS 1989). NMFS subsequently upgraded the Federal listing to endangered on January 4, 1994 (NMFS 1994). NMFS designated critical habitat for Sacramento River winter-run chinook salmon on June 16, 1993 (NMFS 1993a).

Winter-run chinook salmon spend 1 to 3 years in the ocean. Adult winter-run chinook salmon leave the ocean and migrate through the Delta into the Sacramento River from December through July with peak migration in March. Adults spawn from mid-April through August (Moyle 2002). Egg incubation continues through October. The primary spawning habitat in the Sacramento River is above Red Bluff Diversion Dam at RM 243, although spawning has been observed downstream as far as RM 218 (NMFS 2001). Downstream movement of juvenile winter-run chinook salmon begins in August, soon after fry emerge. The peak abundance of juveniles moving downstream at Red Bluff occurs in September and October (Vogel and Marine 1991). Juvenile chinook salmon move downstream from spawning areas in response to many factors, which may include inherited behavior, habitat availability, flow, competition for space and food, and water temperature. The numbers of juveniles that move and the timing of movement are highly variable. Storm events and their resulting high flows and turbidity appear to trigger downstream movement of substantial numbers of juvenile chinook salmon.

Winter-run chinook salmon smolts (*i.e.*, juveniles that are physiologically ready to enter seawater) may migrate through the Delta and San Francisco Bay to the ocean from November through May (Yoshiyama et al. 1998). The Sacramento River channel is the main migration route through the Delta. However, the Yolo Bypass also provides significant outmigration passage during higher flow events. During winter in the Sacramento–San Joaquin system, juveniles rear on seasonally inundated floodplains. Sommer et al. (2001) found higher growth and survival rates of juvenile Chinook salmon reared on the Yolo Bypass floodplain, than those that reared in the mainstem Sacramento River.

Within the study area, the Sacramento River is considered to be critical habitat for winter-run chinook salmon. Critical habitat includes the water column, river bottom, and adjacent riparian zone which fry and juveniles use for rearing (NMFS 2006b). The conservation value of critical habitat in the study area is high because it supports both recruitment and survival of juveniles and adults (NMFS 2006a). The American River, Sacramento River, NEMDC, and Dry/Robla Creeks are also considered to be essential fish habitat (EFH) for winter-run Chinook salmon.

Central Valley Spring-Run Chinook Salmon

The Central Valley spring-run chinook salmon was Federally listed as threatened on September 16, 1999 (NMFS 1999). Their threatened status was reaffirmed in NMFS's final listing determination issued on June 28, 2005 (NMFS 2005a). Critical habitat for Central Valley spring-run Chinook salmon was designated by NMFS on September 2, 2005 (NMFS 2005b).

Adult spring-run chinook salmon enter the mainstem Sacramento River from March through September, with the peak upstream migration occurring from May through June (Yoshiyama et al. 1998). Adults generally enter tributaries from the Sacramento River between mid-April and mid-June (Lindley et al. 2006 as cited in NMFS 2006b). Spring-run chinook salmon are sexually immature during upstream migration, and adults hold in deep, cold pools near spawning habitat until spawning commences in late summer and fall. Spring-run chinook salmon spawn in the upper reaches of the mainstem Sacramento River and tributary streams (USFWS 1995), with the largest tributary runs occurring in Butte, Deer, and Mill Creek's (Yoshiyama et al. 1998). Spawning typically begins in late August and may continue through October. Juveniles emerge in November and December in most locations but may emerge later when water temperature is cooler. Newly emerged fry remain in shallow, low-velocity edgewater (CDFG 1998).

Juvenile spring-run chinook salmon typically spend up to one year rearing in fresh water before migrating to sea as yearlings, but some may migrate downstream as young-of-year juveniles. Rearing takes place in their natal streams, the mainstem of the Sacramento River, inundated floodplains (including the Sutter and Yolo bypasses), and the Delta. Based on observations in Butte Creek and the Sacramento River, young-of-year juveniles typically migrate from November through May. Yearling spring-run chinook salmon migrate from October to March, with peak migration in November (Cramer and Demko 1997; Hill and Webber 1999). Downstream migration of yearlings typically coincides with the onset of the winter storm season, and migration may continue through March (CDFG 1998).

Critical habitat for spring-run chinook salmon in the study area Sacramento River, American River, NEMDC, and Dry/Robla Creeks (NMFS 2006b). Critical habitat includes the stream channels and the lateral extent as defined by the ordinary high-water line or bank-full elevation. All reaches within the ARCF study area are considered to be EFH for spring-run chinook salmon.

Central Valley Fall-/Late Fall–Run Chinook Salmon

Central Valley fall-/late fall–run chinook salmon are currently the most abundant and widespread salmon runs in California (Mills et al. 1997), representing about 80% of the total Chinook salmon produced in the Sacramento River drainage (Kjelson et al. 1982). This species is not listed under the Federal ESA. On March 9, 1998, NMFS issued a proposed rule to list fall-run Chinook salmon as threatened (NMFS 1998a). However, on September 16, 1999, NMFS determined that the species did not warrant listing (NMFS 1999). On April 15, 2004, NMFS classified Central Valley fall-/late fall–run chinook salmon as a species of concern (NMFS 2004). However, EFH is designated for this species.

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

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

Critical habitat is not designated for fall-/late fall–run Chinook salmon, however EFH is designated for this species. EFH is defined as those waters and substrate necessary for spawning, breeding, feeding, or growth to maturity. EFH includes currently and historically accessible habitat. All reaches within the ARCF GRR study area are considered to be EFH for fall-/late fall-run Chinook salmon.

Central Valley Steelhead

The Central Valley steelhead was Federally listed as threatened on March 19, 1998 (NMFS 1998b). The threatened status of Central Valley steelhead was reaffirmed in NMFS's final listing determination on January 5, 2006 (NMFS 2006a). Critical habitat for Central Valley steelhead was designated by NMFS on September 2, 2005 (NMFS 2005b).

Steelhead exhibit highly variable life history patterns throughout their range but are broadly categorized into winter and summer reproductive ecotypes. Winter steelhead are the most widespread reproductive ecotype and the only type currently present in Central Valley streams (McEwan and Jackson 1996). Winter steelhead become sexually mature in the ocean, enter spawning streams in summer, fall or winter, and spawn a few months later in winter or late spring (Meehan and Bjornn 1991; Behnke 1992). In the Sacramento River, adult winter steelhead migrate upstream during most months of the year, beginning in July, peaking in September, and continuing through February or March (Hallock 1987). Spawning occurs primarily from January through March, but may begin as early as late December and may extend through April (Hallock 1987). Individual steelhead may spawn more than once, returning to the ocean between each spawning migration.

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

Critical habitat for Central Valley steelhead includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-waterline or bank-full elevation (NMFS 2006b). There is no EFH designated for Central Valley steelhead.

Delta Smelt

Delta smelt was Federally listed as threatened on March 5, 1993 (USFWS 1993) and critical habitat was designated on December 19, 1994 (USFWS 1994). Delta smelt are endemic to the Sacramento–San Joaquin estuary and are found seasonally in Suisun Bay and Suisun Marsh. They typically are found in shallow water (less than 10 feet) where salinity ranges from 2 to 7 parts per thousand (ppt), although they have been observed at salinities between 0 and 18.4 ppt. Delta smelt have relatively low fecundity and most live for 1 year. They feed on planktonic copepods, cladocerans, amphipods, and insect larva (Moyle 2002).

Delta smelt are semi-anadromous. During their spawning migration, adults move into the freshwater channels and sloughs of the Delta between December and January. Spawning occurs between January and July, with peak spawning from April through mid-May (Moyle 2002). Spawning locations in the Delta have not been identified and are inferred from larval catches (Bennett 2005). Larval fish have been observed in Montezuma Slough; Suisun Slough in Suisun Marsh; the Napa River estuary; the Sacramento River above Rio Vista; and Cache, Lindsey, Georgiana, Prospect, Beaver, Hog, Sycamore, and Barker sloughs (Wang 1986, Moyle 2002, Stillwater Sciences 2006, and USFWS 1996). Spawning was also observed in the Sacramento River up to Garcia Bend (RM 51) during drought conditions, as a result of increased saltwater intrusion that moved delta smelt spawning and rearing farther inland (Wang and Brown 1993).

There is no EFH designated for delta smelt. Critical habitat for delta smelt consists of all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker bays); the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma sloughs; and the contiguous waters in the Delta (USFWS 1994). Critical habitat for delta smelt is designated in the following California counties: Alameda, Contra Costa, Sacramento, San Joaquin, Solano, and Yolo (USFWS 2003). Critical habitat in the ARCF GRR study area includes the Sacramento River up to the I Street Bridge and the Yolo Bypass just above Interstate 80 at the railroad tracks. Primary constituent elements of critical habitat determined to be essential to the conservation of the species include: physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration (USFWS 2006a).

Green Sturgeon

The Sacramento River supports the southernmost spawning population of green sturgeon (Moyle 2002). On April 7, 2006, NMFS determined that the southern distinct population segment (DPS) of green sturgeon was threatened under the Federal ESA (NMFS 2006c). On October 9, 2009, NMFS (74 CFR 52300) designated critical habitat for the green sturgeon southern DPS throughout most of its occupied range. Green sturgeon were classified as a Class 1 Species of Special Concern by CDFG in 1995

(Moyle et al. 1995). Class 1 Species of Special Concern are those that conform to the state definitions of threatened or endangered and could qualify for addition to the official list. On March 20, 2006, emergency green sturgeon regulations were put into effect by CDFG requiring a year-round zero bag limit of green sturgeon in all areas of the state (CDFG 2006).

The southern DPS has a single spawning population in the Sacramento River (NMFS 2005d). Adults typically migrate upstream into rivers between late February and late July. Spawning occurs from March to July, with peak spawning from mid-April to mid-June. Green sturgeon are believed to spawn every 3 to 5 years, although recent evidence indicates that spawning may be as frequent as every 2 years (NMFS 2005c). Little is known about the specific spawning habitat preferences of green sturgeon. Adult green sturgeon are believed to broadcast their eggs in deep, fast water over large cobble substrate, where the eggs settle into the interstitial spaces (Moyle 2002). Spawning is generally associated with water temperatures from 46 to 57 degrees Fahrenheit (°F). In the Central Valley, spawning occurs in the Sacramento River upstream of Hamilton City, perhaps as far upstream as Keswick Dam (Adams et al. 2002).

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

There is no EFH designated for green sturgeon. Designated critical habitat for the southern DPS of green sturgeon includes the Sacramento River downstream of Keswick Dam; portions of the Yolo Bypass; the legal Delta, excluding Five Mile Slough, Seven Mile Slough, Snodgrass Slough, Tom Paine Slough and Trapper Slough; and San Francisco, San Pablo, and Suisun bays.

Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp lives in vernal pools and swales containing clear to turbid water and grassy bottoms in unplowed grasslands. The shrimp is ecologically dependent on seasonal fluctuations in its habitat, such as presence or absence of water during specific times of the year, duration of water, temperature, and quantities of dissolved oxygen (USFWS 1992b).

Vernal pool habitat historically extended throughout the Central Valley. Vernal pools are in danger due to a variety of human-caused activities, including urban development, water supply and flood control activities, and conversion of land to agricultural use. Habitat loss occurs from direct destruction and modification of pools by filling, grading, discing, leveling, and other activities. Vernal pools can also be indirectly impacted when modifications of the surrounding uplands alter the vernal pool watershed (USFWS 1992b).

There are 32 known populations of the vernal pool fairy shrimp, extending from the Stillwater Plain in Shasta County through the Central Valley to Pixley in Tulare County. In addition, the shrimp occur along the central Coast Range from northern Solano County to Pinnacles National Monument in San Benito County. In the study area, vernal pools are known to occur near Magpie Creek, and there are recorded occurrences of vernal pool fairy shrimp in the CNDDB from 1995 (CNDDB 2015).

Vernal Pool Tadpole Shrimp

The vernal pool tadpole shrimp lives in vernal pools and swales containing clear to highly turbid water. The shrimp is ecologically dependent on seasonal fluctuations in its habitat, such as presence or absence of water during specific times of the year, duration of water, temperature, and quantities of dissolved oxygen (USFWS 1992b).

Vernal pool habitat historically extended throughout the Central Valley. Vernal pools are in danger due to a variety of human-caused activities, including urban development, water supply and flood control activities, and conversion of land to agricultural use. Habitat loss occurs from direct destruction and modification of pools by filling, grading, discing, leveling, and other activities. Vernal pools can also be indirectly impacted when modifications of the surrounding uplands alter the vernal pool watershed (USFWS 1992b).

There are 18 known populations of vernal pool tadpole shrimp in the Central Valley, ranging from east of Redding in Shasta County south to the San Luis National Wildlife Refuge in Merced County. In the study area, vernal pools are known to occur near Magpie Creek, and there are recorded occurrences of vernal pool tadpole shrimp in the CNDDB from 1998 (CNDDB 2015).

3.8.2 Methodology and Basis of Significance

Methodology

The evaluation of potential effects on special-status species from each project alternative is based on the results of field surveys and review of existing documentation. Surveys of the study area were conducted in 2011 by Corps staff. The surveys included the levees slopes, landside levee toe and out 15 feet, and waterside levee toe and out 30 feet. Surveys included tree size, species, health, location, elderberry shrubs general size and location. For this analysis, the project alternatives were determined to have a significant impact on special-status species if project activities would have a substantial adverse effect, either directly or through habitat modification, on any species identified as candidate, sensitive, or special species in local or regional plans or policies, or regulations, or by DFW, USFWS, or NOAA Fisheries.

<u>Basis of Significance</u>

Effects on special status-species were considered significant if an alternative would result in any of the following:

- Direct or indirect reduction in growth, survival, or reproductive success of species listed or proposed for listing as threatened or endangered under the Federal or State ESA.
- Direct mortality, long-term habitat loss, or lowered reproductive success of Federally or State-listed threatened or endangered animal or plant species or candidates for Federal listing.
- Direct or indirect reduction in the growth, survival, or reproductive success of substantial populations of Federal species of concern, State-listed endangered or threatened species, plant species listed by the California Native Plant Society (CNPS), or species of special concern or regionally important commercial or game species.
- Have an adverse effect on a species' designated critical habitat.

3.8.3 No Action Alternative

Under the No Action Alternative, the Corps would not participate in construction of the proposed project. As a result, if a flood event were to occur, the Sacramento area would remain at risk of a possible levee failure due to seepage, slope stability, erosion, or overtopping. There would be no construction related affects to special status species, however effects to these species associated with flood fighting could be significant. Flood fighting is usually performed by placing large rock along the levee slope to stop erosion and prevent levee failure and loss of lives and property.

The placement of rock would prevent or impede future growth of trees and vegetation on the levee slopes, which would impact special status fish species from the loss of SRA habitat. Emergency clean-up and earth-moving activities could also result in an increase in sediment and turbidity that adversely affect migration, spawning or rearing habitat for special status fish species. Given the unpredictable nature of emergency clean-up activities, it is likely that implementation of BMPs and measures to reduce effects on fish would not be possible.

High flows in the American River would have a large impact on the American River Parkway as the berms disappear from continued high flows against erodible material. The timeframe for which the berms would erode is unknown because it is impossible to determine how much water will pass through the system and potential flood events. The banks along the American River are very erosive and without some kind of erosion control measures would continue to erode during high flows. As the banks of the river erode, important habitat would be lost, including elderberry shrubs, and the levees could fail. It is likely that in order to save the levee structures, flood fight activities would occur during a high flow emergency response.

All of these effects would be considered significant; however, given the uncertainty of the occurrence or magnitude of such an event, potential effects on fisheries cannot be quantified based on available information.

3.8.4 Alternative 1 – Improve Levees

Valley Elderberry Longhorn Beetle

Within the surveyed study area, approximately 250 shrubs were located along the American River Parkway, 50 shrubs were located along the Sacramento River, and 2 shrubs were located within the East Side Tributaries. Prior to project construction, a qualified biologist would conduct focused surveys of elderberry shrubs within 100 feet of the project area for construction in accordance with the USFWS guidelines. All elderberry shrubs with potential to be affected by project activities would be mapped and surveyed to determine the size of the stems on each shrub, location of shrubs to riparian habitat, and presence of exit holes.

Direct effects to valley elderberry longhorn beetle may occur if elderberry shrubs are incidentally damaged by construction personnel or equipment. Since the project would occur over a 13 year period and construction would occur during beetle flight season, there could be direct mortality caused by construction activities. Elderberry shrubs that cannot be avoided would be transplanted between November and mid-February when the plants are doormat. Transplanting procedures will comply with the Conservation Guidelines for the Valley Elderberry Longhorn Beetle, USFWS, 9 July 1999. Potential impacts due to damage or transplantation include direct mortality of beetles and/or disruption of their lifecycle.

Temporal loss of habitat may occur due to transplantation of elderberry shrubs. Although compensation measures include restoration and creation of habitat, mitigation plantings would likely require one or more years to become large enough to provide supporting habitat. Furthermore, associated riparian habitats may take several decades to reach their full value.

As a result, under Section 7 of the ESA, Alternative 1 may affect, and is likely to adversely affect the VELB. Compensation for affects to these shrubs and the beetle are discussed below in Section 3.8.6. With the implementation of the avoidance, minimization, and compensation measures discussed below, impacts to VELB would be less than significant.

Giant Garter Snake

Affects to GGS under Alternative 1 would result from construction activities along the East Side Tributaries. The East Side Tributaries (NEMDC, Dry/Robla, Magpie, & Arcade Creeks) have some GGS habitat however, the creeks in this area lack year round water and connectivity to rice fields, a major component of GGS habitat. The closest rice fields are about 5 miles away up the NEMDC and above a pump plant located on the NEMDC just above Dry/Robla Creek. Additionally, Arcade Creek has large cover vegetation between Norwood and Rio Linda Boulevard that would make this area undesirable for GGS.

Prior to construction, surveys would be conducted in the East Side Tributaries area to determine whether GGS have the potential to be present in the construction area. If GGS are determined to be present, there would be a potential for short-term effects to GGS upland habitat during construction. Construction activities could disturb GGS due to vibration, noise, and dust.

Affects would occur over a single construction season and would return to the pre-existing conditions once completed. During construction equipment could possibility harm or kill a snake if the snakes are present in the burrows along the levee slopes of the NEMDC. Burrows which are used for hibernation by the snakes would be removed as the levee is degraded to install the slurry wall along the NEMDC.

In consideration of the above information, the project actions are unlikely to result in long-term habitat losses to the giant garter snake, as long as the applicable mitigation and compensation measures are implemented. However, even with on-site mitigation and off-site compensation, the project actions may adversely affect giant garter snakes due to: (1) take during construction and O&M activities; and (2) habitat fragmentation.

Construction would occur between May 1 and October 1 during the snakes active season to minimize impacts to the species. With the implementation of the avoidance, minimization, and compensation measures discussed below, impacts to GGS would be reduced to less than significant. Compensation for effects to GGS habitat is discussed below in Section 3.8.6.

Swainson's Hawks

It is estimated that approximately 134 acres of riparian habitat used by Swainson's hawk for roosting and nesting could be affected by project construction. Any trees removed would be mitigated, however, there would be a significant impact due to the temporal loss of habitat while the new trees grow. Additionally, approximately 2.5 acres of non-native grassland intermixed with barren ground would be removed or disturbed as a result of construction activities at levees. Much of this habitat is within the Sacramento urban area, where Swainson's hawks nest and forage along the American and Sacramento Rivers. Additional habitat for Swainson's hawks does exist within and adjacent to the

Sacramento Bypass. This area is less urbanized and hawks may be more sensitive to human activities. Prior to construction activities, hawk surveys would be conducted within the study area to determine where potential nest sites. The surveys would be conducted annually in close proximity to construction locations and within one-half mile of any anticipated construction. If any hawks are found, coordination with the resource agencies would occur and appropriate avoidance and minimization measures would be established prior to the start of construction. The potential measures that could be implemented are discussed in Section 3.8.6 below. Effects to Swainson's hawks under Alternative 1 would be significant, due to the temporary loss of nesting habitat along the waterways while the new trees grow at the mitigation sites.

Winter-run Chinook Salmon

Construction would occur on approximately 100,000 linear feet of waterside habitat; however, a vegetation variance is included as part of the alternatives and large vegetation would remain in place. Also included is a planting berm which would be planted with species that provide additional habitat for fish species once established (see Figures 8 through 10). Construction activities are not likely to affect winter-run adults because construction will avoid the primary migration period (December through July), will be restricted to the channel edge, and will include implementation of the avoidance and minimization measures described in Section 3.8.6. Winter-run Chinook salmon do not spawn in the study area. Therefore, no construction-related effects on winter-run Chinook salmon spawning or spawning habitat will occur.

Implementation of the bank erosion protection measures may result in adverse effects to juvenile and smolt winter-run chinook salmon, their critical habitat, and EFH. Construction activities that increase noise, turbidity, and suspended sediment may disrupt feeding or temporarily displace fish from preferred habitat. Rearing or outmigrating salmon may not be able to readily move away from nearshore areas that are directly affected by construction activities such as placement of rock revetment; these effects could result in stress, injury, or mortality. Restricting in-water activities to the August 1 through November 30 work window (beginning on July 1 for sites upstream of RM 60) and implementing the avoidance and minimization measures described below will minimize, but not avoid, potential construction-related effects on juveniles and smolts.

The action area does not support spawning habitat for winter-run chinook salmon and no long-term effects on spawning habitat will occur. For juvenile winter-run chinook salmon, the bank protection measures will generally provide long-term increases in bank shading at project sites. The plantings of native grasses and willows are designed to benefit juvenile chinook salmon by increasing the availability (habitat area) and quality (shallow water and instream cover) of nearshore aquatic habitat and SRA relative to current conditions. Figures 8 through 10 are an example of long-term habitat replacement under Alternative 1. As a result, construction of Alternative 1 would result in less than significant effects to winter-run Chinook salmon, and their critical habitat, with the implementation of the mitigation measures discussed below.

Figure 8. Planting Site 4L on the American River after Bank Protection in 2001.

Figure 9. Planting Site 4L on the American River after Bank Protection in 2005.

Figure 10. Planting Site 4L on the American River after Bank Protection in 2010.

Spring-run Chinook Salmon

Adult spring-run Chinook salmon migrate up the Sacramento River from March through September although most individuals have entered tributary streams by mid-June and will not be affected by construction activities. Therefore, potential for construction-related ARCF GRR project effects will be similar to that described for winter-run Chinook salmon. Similar to winter-run Chinook salmon, spring-run Chinook salmon typically spend up to 1 year rearing in fresh water before migrating to sea. Therefore, potential for construction-related effects will be similar to that described for winter-run Chinook salmon above. Restricting in-water activities to the August 1 through November 30 work window and implementing the avoidance and minimization measures described below will minimize potential construction-related effects on juveniles and smolts to below the significance thresholds. Under Section 7 of the ESA, effects from Alternative 1 may affect and is likely to adversely affect spring-run Chinook salmon.

Central Valley Fall-/Late Fall–Run Chinook Salmon

Fall-/late fall–run chinook salmon migrate into the Sacramento River and its tributaries from June through December; therefore, construction activities will coincide with most of the migration period. Construction activities that increase noise, turbidity, and suspended sediment may disrupt adult passage through the study area and may displace these fish as a result of effects on their preferred habitat and spawning habiatat. However, because construction activities will be restricted to the channel edge and will include implementing avoidance and minimization measures described below, adverse effects on habitat will be minimized to below the significance thresholds.

Long-term changes on nearshore habitat are expected to have adverse effects on habitat that is important to all life stages of fall-/late fall–run chinook salmon. The project could represent a long-term loss of a small amount of potential spawning habitat because repairs will require covering bottom substrates with revetment. However, the potential spawning area that might be affected is very small. In general, it is expected that channel areas immediately adjacent to erosion sites do not support spawning riffles. As a result, effects to fall-/late fall-run Chinook salmon from Alternative 1 would be less than significant, with the implementation of the mitigation measures discussed below.

Central Valley Steelhead

In the Sacramento River, adult steelhead migrate upstream during most months of the year, beginning in July, peaking in September, and continuing through February or March. Adults use the river channel in the study area as a migration pathway to upstream spawning habitat, and may also use deep pools with instream cover as resting and holding habitat. The potential for construction-related effects on migrating adult steelhead would be similar to that described above for adult winter-run Chinook salmon. Construction-related activities may affect but are not likely to adversely affect adult migration.

Within the ARCF GRR study area, potential spawning habitat is present in the American River, NEMDC, and Dry/Robla Creek. Steelhead spawn in late winter and late spring outside of the August 1-November 30 construction window; therefore, construction-related effects may affect but are not likely to adversely affect steelhead spawning or their spawning habitat.

Central Valley steelhead rear year-round in the cool upstream reaches of the mainstem Sacramento River and its major tributaries. Juveniles and smolts are most likely to be present in the study area during their downstream migration to the ocean, which may begin as early as December and peaks from January to May. For purposes of this analysis, rearing juvenile steelhead are assumed to use nearshore and off-channel habitat in the study area. The potential for construction-related effects on steelhead juveniles and smolts and their habitat will therefore be similar to that described above for winter-run Chinook salmon. Under Section 7 of the ESA, Alternative 1 may affect and is likely to adversely affect Central Valley steelhead. However, with the implementation of the minimization and mitigation measures discussed below, these effects will be reduced to less than significant.

Delta Smelt

Delta smelt in the Sacramento River have been documented upstream as far as the city of Sacramento (RM 60) (Moyle 2002), and may be present throughout their life cycle. Adult delta smelt migrate upstream between December and January and spawn between January and July, with a peak in spawning activity between April and mid-May (Moyle 2002). Potential effects on delta smelt will be avoided or minimized by restricting in water construction activities on the Sacramento River to the August 1 through November 30 work window.

Potential spawning habitat includes shallow channel edge waters in the Delta and Sacramento River. Construction-related effects include disruption of spawning activities, disturbance or mortality of eggs and newly hatched larvae, and alteration of spawning and incubation habitat. As a result, potential construction-related effects to delta smelt physical habitat would include disruption of spawning activities, disturbance or mortality of eggs and newly hatched larvae, alteration of spawning and incubation habitat, and loss of shallow water habitat for spawning. Approximately 14.86 acres of shallow water habitat would be lost as a result of implementation of the erosion repair measures on the Sacramento River.

The erosion repair is likely to somewhat reduce the sediment supply for riverine reaches directly downstream because the erosion repair is holding the bank or levee in place. However, from a system sediment prospective, the bank material we are protecting in the project reaches is not a major source of sediment compared to the upstream reaches of the Sacramento, Feather, and especially the Yuba River systems. All of the available sediment in the American River watershed is being contained behind Folsom Dam. The site specific designs will be constrained from allowing any velocity increases outside the erosion repair site (Schlunegger 2014).

Juvenile delta smelt may be subject to disturbance or displacement caused by construction activities that increase noise, turbidity, and suspended sediment. Delta smelt may not be readily able to move away from channel or nearshore areas that are directly affected by construction activities (i.e., placement of rock revetment). Larvae may be disrupted during summer months as they migrate downstream to rear in the Delta. Incidental take of delta smelt may occur from direct mortality or injury during a construction activity, or by the impairment of essential behavior patterns (i.e., feeding, escape from predators). In addition, physiological impairment could be caused by toxic substances (i.e., gasoline, lubricants, oil) entering the water. Construction related effects on delta smelt rearing and migration will be minimized by restricting in-water construction activities on the Sacramento River to the August 1 through November 30 work window, thereby avoiding the seasons when these life stages are most likely to occur.

Non-native species may exploit the warmer water temperature in the shallow bench habitat created as an on-site mitigation feature and prey on delta smelt eggs and larvae; however, it is expected that despite the risk of predation, construction of shallow benches will result in a net benefit to delta smelt. Proposed planting of emergent vegetation will enhance habitat complexity by providing cover, incubation habitat, and possibly spawning habitat, especially during high winter and spring flows.

Due to the potential impacts during construction, the delta smelt may be adversely affected during construction under Section 7 of the ESA. However, with the implementation of appropriate mitigation and compensation measures, as discussed below, these impacts would be less than significant.

Green Sturgeon

Potential project effects that may affect, but are not likely to adversely affect are described below for each life stage of green sturgeon and its habitat. An accurate assessment of potential project effects on green sturgeon and its habitat is difficult due to the limited information available on distribution, seasonal abundance, habitat preferences, and other life history requirements of this species.

Adult green sturgeon are believed to move upstream in the Sacramento River in the study area from February through late July (NMFS 2005c). Construction activities occurring outside of these time periods are not likely to affect migrating green sturgeon adults. Construction activities during July, however, may have adverse impacts on any adult green sturgeon that are still migrating upstream. Because construction activities will largely avoid the peak migration period, will be restricted to the channel edge, and will implement the avoidance and minimization measures described in Sections below, adverse effects will be minimized.

Spawning migrations of Green Sturgeon typically occur during the months of March through June (Thomas et al. 2013). The Sacramento River downstream of Knights Landing (RM 90) is not believed to have suitable spawning habitat for green sturgeon, primarily due to lack of suitable coarse bottom substrate such as large cobbles (Corps 2012). Therefore, the ARCF project is not likely to affect spawning green sturgeon or their habitat.

However, if larvae or juveniles are present during construction, in-water activities could result in localized displacement and possible injury or mortality to individuals that do not readily move away from the channel or nearshore areas. Project actions associated with bank protection measures may increase sediment, silt, and pollutants, which could adversely affect rearing habitat or reduce food production, such as aquatic invertebrates, for larval and juvenile green sturgeon.

Long-term changes in nearshore habitat are expected to have negligible effects on adult green sturgeon because adult sturgeon use deep, mid-channel habitat during migration. If juvenile green sturgeon use nearshore areas of the Sacramento River as foraging habitat or refuge from predators, the general long-term effects of the project actions on nearshore habitat values will likely be similar to those described for salmonids and juvenile fish. The direct and indirect effects to green sturgeon would be less than significant with mitigation because large trees which provide SRA habitat would remain on the levees by obtaining a vegetation variance. Additionally, planting berms at revetment areas would create additional habitat once the mitigation sites are established.

Vernal Pool Fairy Shrimp

CNDDB records include historical occurrences of vernal pools and fairy shrimp in the vicinity of the Magpie Creek area. There is approximately 1 acre of land within the construction footprint of the new levee and floodwall that could potentially include vernal pool habitat. This 1 acre could be adversely affected from ground disturbing activities, operation of construction vehicles, or by construction of the new levee and maintenance road.

Prior to initiation of any construction activities, field surveys and a wetland delineation would occur to verify the occurrence of vernal pools in the construction footprint and to determine if any nearby vernal pools could be indirectly affected by construction. If any additional vernal pools were to be impacted, consultation would be reinitiated at that time to determine appropriate avoidance, minimization, or mitigation measures.

The land being acquired on the east side of Raley Boulevard to create a permanent flood basin is in an area with historical occurrences of vernal pools and fairy shrimp. While this land is being acquired as a part of project construction, no construction would occur on the site, and the land would be protected in perpetuity. Indirectly, acquisition of this property would allow for the protection of the vernal pool habitat on this land, and the maintenance of the land to allow for vernal pools to thrive. As a result, creation of the flood basin would have positive impacts to the vernal pool fairy shrimp by allowing for long-term protection of vernal pool habitat. As a result, it is anticipated that effects to vernal pool fairy shrimp would be less than significant, with the implementation of the mitigation discussed below.

Vernal Pool Tadpole Shrimp

Impacts to vernal pool tadpole shrimp under Alternative 1 would be consistent with what was described above for vernal pool fairy shrimp. These impacts would be less than significant, with the implementation of the mitigation discussed below.

3.8.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Effects to special status species under Alternative 2 would be consistent with those described for Alternative 1, with the addition of any effects associated with the widening of the Sacramento Weir and Bypass. Additionally, this alternative would have the added footprint of widening the Sacramento Weir and Bypass which reduces the raises along the Sacramento River from 9 miles to 1 mile. Two listed species would have reduced affects by the implementation of Alternative 2; VELB and Swainson's hawk. Approximately 33 elderberry shrubs would not need to be transplanted under Alternative 2 with the reduced amount of raise along the Sacramento River. Additionally, there would be fewer sites that require levee raises under Alternative 2 resulting in fewer trees being removed along the Sacramento River. Affects to Swainson's hawks would be reduced from 106 acres of riparian habitat lost under Alternative 1 to 71 acres of riparian habitat lost under Alternative 2. Therefore, effects to special status wildlife (i.e., VELB, giant garter snakes, Swainson's hawks, burrowing owl) and various runs of special status chinook salmon, Central Valley steelhead, Delta smelt, and green sturgeon) and their riparian or wetland habitat and/or upland or aquatic habitats are less than significant to all species with the implementation of avoidance, minimization, and compensation measures.

Sacramento Bypass and Weir

A maximum of 375 acres of rice fields would be permanently removed from production and incorporated into the Sacramento Bypass. Existing riparian and wetland habitat within the existing Bypass would remain, but could be expanded by about 300 acres once the rice fields are taken out of production. The additional land would become open space and would likely become similar riparian and wetland habitat supporting listed wildlife and fish (when there is water in it) as the existing vegetation in the Bypass. Operations of the new weir and bypass will be determined after the construction is complete. No grading or altering of the lands within the existing bypass will occur as part of the alternative. The southern side of the bypass is at a lowest elevation so water will naturally flow to the existing area and continue to support existing vegetation and wildlife. Because of the natural flow of water in this area, wetlands in the existing bypass are not expected to be impacted by construction of the project. There is a potential for additional wetlands to actually develop in the added 300 acres of bypass, since the land will no longer be farmed. While the loss of rice fields and shortening the existing irrigation canals has a short term negative effect on GGS, the conversion of this land back to its natural state would have long term ecological benefits to the GGS and other wildlife and could become an expansion of the Sacramento Bypass Wildlife Refuge. As a result, impacts to GGS associated with the bypass widening would be less than significant, with the implementation of the mitigation discussed below.

To the east of the bypass, there are approximately 8 acres of riparian vegetation growing along the Sacramento River that would be removed to construct the new weir structure. The 8-acre area contains both the Old River Road and Union Pacific Railroad (UPRR) tracks. Prior to construction this area would be surveyed to determine if any avian species have nested in the area. If there is nesting Swainson's Hawks construction would be delayed until fledglings have left the nest. Fish in the area would likely disperse with the disturbance to the water. The expansion of the Sacramento Weir and Bypass could have a positive beneficial effect on special status wildlife such as the giant garter snake and its riparian vegetation once construction is complete and lands are converted from farming activities to open space where wetlands and shrubby riparian habitat is expected to naturally regenerate with the increased area that is periodically inundated from flooding during the rainy season. The operation of the weir is not expected to adversely affect any species currently listed under the Endangered Species Act, because the periodic flooding of the bypass are would support the natural processes associated with floodplain habitat. Effects to special status species associated with the bypass widening would be less than significant, with the implementation of the mitigation measures discussed below.

3.8.6 Mitigation, Avoidance, and Minimization Measures

Mitigation, avoidance, and minimization measures are similar for both Alternatives 1 and 2 since the footprint does not change for these two alternatives with the exception of the added impacts associated with widening the Sacramento Bypass. Compensation to mitigate for the loss of riparian habitat supporting special status wildlife and fish is based on the largest potential footprint and worst case scenario for the purposes of compliance with NEPA. If design refinements are made at a later time that result in reduced impacts to vegetation, compensation for the permanent loss of habitat will be coordinated with the appropriate resource agencies and adjusted accordingly.

Valley Elderberry Longhorn Beetle

In accordance with the USFWS 1999 *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* adverse effects to the VELB would be compensated by transplanting the affected elderberries with stems greater than 1 inch in diameter and by planting a mix of native riparian/or upland vegetation at a 2:1 and 6:1 ratios depending on the diameter size of the stems. The amount of compensation for VELB is based on preliminary surveys done in 2011 within the construction footprint. At that time approximately 265 shrubs were located along the levees and within the 15 foot landside and 30 feet on waterside toes. All shrubs that can be transplanted would be transplanted.

Along the American River, shrubs would be transplanted and additional compensation would be installed on top of the newly constructed trench when possible. On-site elderberry compensation would be planted on the trench outside of the vegetation free zone. Sufficient lands are expected to be available to plant the shrubs and associated natives in these on-site areas. If additional lands are needed, off-site plantings could occur at the existing Cal Expo mitigation site or adjacent to the existing River Bend Park mitigation site.

Because elderberry shrubs are fast growing and the size and amount of shrubs could significantly change between the time of the surveys and the construction of the project the exact amount of compensation is unknown. Using the numbers from the 2011 survey an assumption was made that each shrub contained 13 stems measures greater than 1 inch to greater than 3 inches, 5 stems measuring greater than 3 inches to greater than 5 inches, and 2 stems measuring less than 5 inches, and all are within riparian habitat. This would require the compensation as shown in Tables 18 through 20 below Using this assumption a total of approximately 108 acres of elderberry compensation would be required. There are likely many additional shrubs outside the 30 foot waterside survey area that would be impacted by the project. These would also be compensated for in accordance with the 1999 Guidelines.

Table 18. American River Elderberry Shrub Effects and Proposed Compensation.

Location	Stems	Exit Holes	No. of Stems	Elderberry Ratios[1,2]	Elderberry Plantings	Associated Native Planting	Associated Native Ratios
non-riparian	greater than or = 1" & less than or = 3"	No	0	1	0	0	1
		yes	0	2	0	0	2
non-riparian	greater than 3" & less than 5"	No	0	2	0	0	1
		yes	0	4	0	0	2
non-riparian	greater than or = 5"	No	0	3	0	0	1
		yes	0	6	0	0	2
riparian	greater than or = 1" & less than or = 3"	No	1,998	2	3,996	3,996	1
		yes	0	4	0	0	2
riparian	greater than 3" & less than 5"	No	790	3	2,370	2,370	1
		yes	16	6	96	192	2
riparian	greater than or = 5"	No	312	4	1,248	1,248	1
		yes	23	8	184	368	2
TOTAL			**3,139**		**7,894**	**8,174**	
				Calculations:	natives-elderberries	280	
				basins or credits	1,578.8	28	
				total basins or credits=	1,606.8		
					2,892,240		
				total acres need for compensation	66.39669421		

1 Affected elderberry plant minimization ratios based on location, stem diameter, and presence of exit holes

2 Multiply No. of stems by this for planting counts

Table 19. Sacramento River Elderberry Shrub Effects and Proposed Compensation.

Location	Stems	Exit Holes	No. of Stems	Elderberry Ratios[1,2]	Elderberry Plantings	Associated Native Plantings	Associated Native ratios
non-riparian	greater than or = 1" & less than or = 3"	No	0	1	0	0	1
		yes	0	2	0	0	2
non-riparian	greater than 3" & less than 5"	No	0	2	0	0	1
		yes	0	4	0	0	2
non-riparian	greater than or = 5"	No	0	3	0	0	1
		yes	0	6	0	0	2
riparian	greater than or = 1" & less than or = 3"	No	104	2	208	208	1
		yes	0	4	0	0	2
riparian	greater than 3" & less than 5"	No	40	3	120	120	1
		yes	1	6	6	12	2
riparian	greater than or = 5"	No	16	4	64	64	1
		yes	2	8	16	32	2
TOTAL			**163**		**414**	**436**	
				Calculations:	natives-elderberrys	22	
				basins or credits	82.8	2.2	
				total basins or credits=	85		
					153000		
				total acres need for compensation	3.512396694		

1 Affected elderberry plant minimization ratios based on location, stem diameter, and presence of exit holes

2 Multiply No. of stems by this for planting counts

Table 20. East Side Tributaries Elderberry Shrub Effects and Proposed Compensation.

Location	Stems	Exit Holes	No. of Stems	Elderberry ratios[1,2]	Elderberry Plantings	Associated Native Plantings	Associated Native Ratios
non-riparian	greater than or = 1" & less than or = 3"	No	0	1	0	0	1
		yes	0	2	0	0	2
non-riparian	greater than 3" & less than 5"	No	0	2	0	0	1
		yes	0	4	0	0	2
non-riparian	greater than or = 5"	No	0	3	0	0	1
		yes	0	6	0	0	2
riparian	greater than or = 1" & less than or = 3"	No	26	2	52	52	1
		yes	0	4	0	0	2
riparian	greater than 3" & less than 5"	No	10	3	30	30	1
		yes	1	6	6	12	2
riparian	greater than or = 5"	No	4	4	16	16	1
		yes	1	8	8	16	2
TOTAL			**42**		**112**	**126**	
				Calculations:	natives-elderberrys	14	
				basins or credits	22.4	1.4	
				total basins or credits=	23.8		
					42840		
				total acres need for compensation	0.983471074		

1 Affected elderberry plant minimization ratios based on location, stem diameter, and presence of exit holes

2 Multiply No. of stems by this for planting counts

The following is a summary of measures based on the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999a). These measures will be implemented to minimize any potential effects on valley elderberry longhorn beetles or their habitat, including restoration and maintenance activities, long-term, protection, and compensation if shrubs cannot be avoided.

- When a 100-foot (or wider) buffer is established and maintained around elderberry shrubs, complete avoidance (i.e., no adverse effects) will be assumed.
- Where encroachment on the 100-foot buffer has been approved by the USFWS, a setback of 20 feet from the dripline of each elderberry shrub will be maintained whenever possible.
- During construction activities, all areas to be avoided will be fenced and flagged.
- Contractors will be briefed on the need to avoid damaging elderberry shrubs and the possible penalties for not complying with these requirements.
- Signs will be erected every 50 feet along the edge of the avoidance area, identifying the area as an environmentally sensitive area.
- Any damage done to the buffer area will be restored.
- Buffer areas will continue to be protected after construction.
- No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant will be used in the buffer areas.
- Trimming of elderberry plants will be subject to mitigation measures.
- Elderberry shrubs that cannot be avoided would be transplanted to an appropriate riparian area at least 100 feet from construction activities.
- If possible, elderberry shrubs would be transplanted during their dormant season (approximately November, after they have lost their leaves, through the first two weeks in February). If transplantation occurs during the growing season, increased mitigation ratios will apply.
- Any areas that receive transplanted elderberry shrubs and elderberry cuttings will be protected in perpetuity.
- The Corps will work to develop off-site compensation areas prior to or concurrent with any take of valley elderberry longhorn beetle habitat.
- Management of these lands will include all measures specified in USFWS's conservation guidelines (1999a) related to weed and litter control, fencing, and the placement of signs.
- Monitoring will occur for ten consecutive years or for seven non-consecutive years over a 15-year period. Annual monitoring reports will be submitted to USFWS.

Giant Garter Snake

The following measures will be implemented to minimize effects on giant garter snake habitat that occurs within 200 feet of any construction activity. These measures are based on USFWS guidelines for restoration and standard avoidance measures included as appendices in USFWS (1997).

- Unless approved otherwise by USFWS, construction will be initiated only during the giant garter snakes' active period (May 1–October 1, when they are able to move away from disturbance).
- Construction personnel will participate in USFWS-approved worker environmental awareness program.
- A giant garter snake survey would be conducted 24 hours prior to construction in potential habitat. Should there be any interruption in work for greater than two weeks, a biologist would survey the project area again no later than 24 hours prior to the restart of work.
- Giant garter snakes encountered during construction activities will be allowed to move away from construction activities on their own.
- Movement of heavy equipment to and from the construction site will be restricted to established roadways. Stockpiling of construction materials will be restricted to designated staging areas, which will be located more than 200 feet away from giant garter snake aquatic habitat.
- Giant garter snake habitat within 200 feet of construction activities will be designated as an environmentally sensitive area and delineated with signs or fencing. This area will be avoided by all construction personnel.

If any giant garter snake habitat is impacted by construction, the following measures would be implemented to compensate for the habitat loss:

- Habitat (including aquatic and upland) temporarily impacted for one season (May 1 to October 1) will be restored after construction by applying appropriate erosion control techniques and replanting/seeding with appropriate native plants.
- Habitat temporarily impacted for two seasons will be restored and replacement habitat will be created at a 2:1 ratio (disturbed to created acres).
- Habitat temporarily impacted for more than two seasons will be replaced at a 2:1 ratio (or restored plus 2:1 replacement).
- Habitat permanently impacted will be replaced at a 2:1 ratio. Preservation may be credited against, but will not exceed, 50% of the aquatic habitat replacement.

- Habitat permanently or temporarily impacted outside of the May 1 to October 1 work window will be created at a 2:1 ratio.
- All replacement habitats will include both upland and aquatic habitat components at a 2:1 ratio (upland to aquatic acres).
- One year of monitoring will be conducted for all restored areas. Ten years of monitoring will be conducted for created habitats. A monitoring report with photo documentation will be due to USFWS each year following implementation of restoration or habitat creation activities.
- The Corps will work to develop appropriate mitigation prior to or concurrent with any disturbance of giant garter snake habitat.

Swainson's Hawk

To avoid and minimize effects to Swainson's hawk, the Corps would implement the following BMP measures:

- Before ground disturbance, all construction personnel would participate in a CDFW-approved worker environmental awareness program. A qualified biologist would inform all construction personnel about the life history of Swainson's hawk and the importance of nest sites and foraging habitat.
- A breeding season survey for nesting birds would be conducted for all trees and shrubs that would be removed or disturbed which are located within 500 feet (0.5 mile for Swainson's hawk) of construction activities, including grading. Swainson's hawk surveys would be completed during at least two of the following survey periods: January 1 to March 20, March 20 to April 5, April 5 to April 20, and June 10 to July 30 with no fewer than three surveys completed in at least two survey periods, and with at least one of these surveys occurring immediately prior to project initiation (Swainson's Hawk Technical Advisory Committee 2000). Other migratory bird nest surveys could be conducted concurrent with Swainson's hawk surveys with at least one survey to be conducted no more than 48 hours from the initiation of project activities to confirm the absence of nesting. If the biologist determines that the area surveyed does not contain any active nests, construction activities, including removal or pruning of trees and shrubs, could commence without any further mitigation.
- If active nests are found, the Corps would maintain a 0.25-mile buffer between construction activities and the active nest(s). In addition, a qualified biologist would be present on-site during construction activities to ensure the buffer distance is adequate and the birds are not showing any signs of stress. If signs of stress that could cause nest abandonment are noted, construction activities would cease until a qualified biologist determines that fledglings have left an active nest.

Other migratory birds also have potential to nest in or adjacent to the study area and would be significantly affected by construction activities. The following BMPs would be implemented:

- Tree and shrub removal, and other areas scheduled for vegetation clearing, grading, or other construction activities would not be conducted during the nesting season (generally February 15 through August 31 depending on the species and environmental conditions for any given year) . These construction activities could affect them by removing or causing abandonment of active nests of migratory birds protected under the Migratory Bird Treaty Act and California Fish and Game Code. Implementation of mitigation measures described below, would avoid, reduce, or minimize the significant effect.

To reduce the impact on Swainson's Hawk habitat the Corps will seek a vegetation variance on lower half of the waterside levee slope. Additionally, where bank protection work is performed the sites would be planted with vegetation and trees that over time will provide habitat for the hawks.

To compensate for the removal of 134 acres of riparian habitat supporting Swainson's hawks and other migratory birds approximately 268 acres of replacement habitat will be created as a mitigation area. Some areas that may be considered for mitigation are Cal Expo and Woodlake. For those mitigation lands within the American River Parkway species selected to compensate for the riparian corridor removal will be consistent with the approved list of trees, shrubs, and herbaceous plants native to the Parkway. Mitigation within the Parkway will prove to be contiguous and create habitat connectivity with wildlife migratory corridors that supports the needs of important native wildlife species, without compromising the integrity of the flood control facilities, the flood conveyance capacity of the Parkway, and Parkway management goals in the Parkway Plan. To comply with the Parkway Plan, lands within the Parkway will be evaluated for compensation opportunities for any riparian habitat removed from Parkway. The exact location of the compensation lands in the Parkway would be coordinated in the design phase of the project with Sacramento County Parks Department and comply with the Parkway Plan objectives and goals. It is assumed that sufficient lands will be available within the Parkway, however, if there is not sufficient land, other locations within Sacramento County will be identified and pubic coordination will occur. Additional mitigation may be planted in the expanded Sacramento Bypass or on other lands within the Sacramento area that provide similar value to those removed.

Listed Fish Species

The following conservation measures would be implemented to reduce the adverse effects to listed fish species:

- A vegetation variance will be requested providing compliance with ETL 1110-2-583 for the project. The variance would allow vegetation to remain on the lower waterside slope of the levees.
- Landside vegetation and encroachment compliance with ETL 1110-2-583 would occur under a SWIF agreement with the LMA. The SWIF is a two-step process completed by the applicant that is composed of a Letter of Intent, which is followed by submission of a SWIF plan. The SWIF process allows eligible local sponsors to implement levee improvements in a prioritized “worst first” way to optimize the achievement of risk reduction. The Corps acknowledges that implementing system-wide improvements will need to be done within a collaborative intergovernmental framework and that it will take time to develop and implement improvements in complex situations. Challenges include ensuring that both environmental considerations and levee safety imperatives are adequately served.
- In-water construction activities (e.g., placement of rock revetment) would be limited to the period August 1 to November 30 to avoid the primary juvenile migration periods of state and Federally listed salmon and steelhead and the primary spawning, egg, and larval stages of state and Federally listed delta smelt. The Corps could conduct in-water activities as early as July 1 if the USFWS and the DFW determine that delta smelt are not likely to be present in the project area in the year of construction (spawning, egg, and larval life stages of longfin smelt occur earlier than July 1). The Corps would obtain written permission from the USFWS and the DFW before allowing the contractor to begin in-water work before August 1.

The Corps would apply the Standard Assessment Program (SAM) to compensate for SRA cover, which includes shallow water, natural substrates, inundated vegetation during spring and winter, overhanging shade, and instream structure. The objective is to protect existing high-value SRA cover, minimize unavoidable losses of SRA cover, and fully compensate for these losses through a combination of on- and off-site planting of native riparian vegetation in the study area. A compensation plan would be developed prior to or concurrently with program implementation and would include measurable objectives and performance measures, monitoring methods, and remedial actions to ensure full compensation of SRA cover and riparian losses. Direct and indirect effects resulting in permanent losses of SRA cover would be calculated by use of SAM models and compensated for accordingly.

Elements of the plan would include limiting the extent of bank and channel armor to the minimum necessary to meet the flood-protection objectives, preserving large riparian trees and large woody debris, and incorporating native woody vegetation in the rock slope protection proposed for the bank and low-flow shoreline of the Sacramento River. In addition, the compensation plan would include measures to compensate for and enhance SRA cover and riparian vegetation in the area adjacent to the Sacramento River. Potential compensation and enhancement measures include removing existing concrete or rock armor and/or planting banks and adjacent floodplains in areas where low-quality SRA and riparian values currently exist. These measures are expected to compensate (to the degree allowable) for significant effects on SRA cover and riparian habitat and reduce or minimize potential effects on listed species to negligible levels.

The Corps would adhere to all applicable Federal, state, and local laws and regulations during project implementation. The Federally threatened fish listed above is assumed to be found within the project area. In accordance with Section 7 of the ESA, the Corps is consulting with NMFS regarding the potential effects of the proposed action on these listed salmon and steelhead.

The following avoidance and minimization measures and BMPs would be included in the design plans to reduce significant effects to the water quality needed by listed species:

- Coordinate with, and obtain all necessary permits and authorizations from the USFWS, NMFS, and CDFW, and comply with all conditions thereof.
- Prohibit the use of a berm or excavation of the channel to isolate the workspace from flowing water.
- Use silt fences, sediment traps, and other erosion-control devices during in-water construction.
- Install vegetative fencing to protect surrounding riparian vegetation.
- Limit the number of access routes, the number and size of staging areas, and the total project area and clearly mark access routes and boundaries.
- Implement BMPs such as silt fences and straw hay bales and any others identified by the RWQCB and other regulatory agencies to minimize erosion or potential harm to special status fish and their habitat.

<u>Vernal Pool Fairy Shrimp and Tadpole Shrimp</u>

Compensation for the loss of approximately 1 acre of vernal pool habitat would be mitigated through either the enhancement of the flood basin lands being acquired near Magpie Creek to support further vernal pool habitat, or through the purchase of an acre of vernal pool habitat from a mitigation bank. In addition, the following measures would be implemented to avoid and minimize impacts to potential vernal pools in the vicinity of the Magpie Creek construction area:

- Adquate fencing would be placed and maintained around any vernal pool habitat to prevent impacts from vehicles.
- All on-site construction personnel would receive instruction regarding the presence of vernal pool fairy shrimp and vernal pool tadpole shrimp and the importance of avoiding impacts to these species and their habitat.
- If vernal pools are found on site, then a USFWS-approved biologist would monitor any construction-related activities at the proposed project site to ensure that no unnecessary take of listed species or destruction of their habitat occurs. The biologist would have the authority to stop all activities that may result in such take or destruction until appropriate corrective measures have occurred. The biologist would be required to report any unauthorized impacts immediately to USFWS.

3.9 Cultural Resources

The following section addresses cultural resource impacts that could result from implementation of one of the proposed alternatives for the ARCF study.

3.9.1 Environmental Setting

Regulatory Setting

- National Historic Preservation Act of 1966, as amended (NHPA)

Existing Conditions

"Cultural resources" describe several different types of properties: prehistoric and historic archaeological sites; architectural properties such as buildings, bridges, and infrastructure; and resources of importance to Native Americans (traditional cultural properties and sacred sites). "Artifacts" include any objects manufactured or altered by humans.

Prehistoric archaeological sites date to the time before recorded history, and in this area of the U.S., sites are primarily associated with Native American use before the arrival of European explorers and settlers. Archaeological sites dating to the time when these initial Native American-European contacts occurred are referred to as protohistoric. Historic archaeological sites can be associated with Native Americans, Europeans, or any other ethnic group. In the project area and surrounding area, these sites include the remains of historic structures and buildings.

Structures and buildings are considered historic when they are more than 50 years old or when they are exceptionally significant. Exceptional significance can be attributed if the properties are integral parts of districts that meet the criteria for eligibility for listing in the National Register of Historic Places (NRHP) or if they meet special criteria considerations.

Prehistoric and Ethnographic Setting

Well documented prehistoric sites dating from approximately 3,800 to 2,700 Before Present (BP) are commonly characterized by archaeologists as belonging to the Windmiller Pattern (Ragir 1972; Rosenthal et al 2007). Windmiller sites appear to reflect a wide-spread cultural phenomenon marked by distinctive burial patterns, as well as charmstones, shell pendants, and a variety of chipped and ground stone tools.

The Windmiller Pattern gave way to the Berkeley Pattern which remained the common cultural expression until approximately 1,000 BP (Fredrickson 1973). Berkeley Pattern sites reflect period a demographic, political, and subsistence intensification marked by the occupation of larger villages and the onset of a dependence on acorns and other stored food resources for consumption during the leaner parts of the year.

The most recent cultural phase is termed the Augustine Pattern (Bennyhoff 1994; Fredrickson 1973). Augustine Pattern sites reflect the apogee of cultural complexity in Central California. Large villages and towns grew along rivers and tributaries (Rosenthal et al 2007) while the variety of items of material culture expanded to include a broad variety of stone, bone, and shell artifacts. Immediately south of the study area, at site CA-SAC-267, Cosumnes Brown Ware, a type of coiled pottery was developed (Johnson et al 1976). This is the only known ceramic pottery tradition to have ever developed in the area.

The study area is situated within the lands traditionally occupied by the Nisenan, or Southern Maidu. The language of the Nisenan, which includes several dialects, is classified within the Maiduan family of the Penutian linguistic stock (Kroeber 1925). The name “Nisenan” was a self-designation by the native groups occupying the Yuba and American River drainages. The western boundary of Nisenan territory was the western bank of the Sacramento River and the area between present-day Sacramento and Marysville, covering a significant portion of the Central Valley and reaching into the Sierra Nevada Mountains.

Nisenan occupation of the area appears to date back to at least 3,300 years BP. Most of the scientific data about the Nisenan was recovered at archaeological site CA-PLA-101A, also known as the Spring Garden Ravine site in the Auburn Reservoir site (Table 21). This site helped to define late prehistoric chronology of the Nisenan and native occupation over three millennia (Moratto 1984).

Table 21. CA-PLA-101A – Spring Garden Ravine.

	Time Period	**Artifacts or Information Gathered**
Upper (A) Stratum	Less than 1000 years	Arrow points and numerous retouched flakes of silicates, hopper mortars, bedrock mortars, core tools, milling stones. Thought to be Nisenan.
Middle (B) Stratum	1039 to 976 A.D.	Strategically and culturally intermediate.
Lower (C) Stratum	1400 B.C.	Large projectile points of basalt and slate, atlatl weights, bowl mortars, core tools and milling stones.

At the Spring Garden Ravine site, pollen data suggests stability of vegetation for 3,000 years up to the last 500 years as savanna habitat and oak grassland gave way to pine-oak woodland. This shift has been attributed to the halting of historic burning by native groups. The climate of the area occupied by the Nisenan was characterized by mild weather with wet winters and warm, dry summers. The Nisenan often inhabited areas near rivers and some major areas of significance included sites on the American, Sacramento, Bear, Feather, and Yuba Rivers (Moratto 1984). The basic political unit was a village community or tribelet with one primary village and a few satellite villages under one head authority. Villages within the valley were aware of one another and these varying groups of Nisenan had shared political and cultural connections. Generally, villages consisted of 15 to 20 people and as many as several hundred in one group. House structures were conical, dome shaped, and covered with earth, tule mats, grass thatch, and occasionally bark. These structures, along with the ceremonial lodges or chief's residences were large and circular or elliptical and situated on low knolls near streams and above marshy floodplains.

The Nisenan mostly settled in permanent or winter settlements and followed a yearly gathering cycle that led them away from the lowlands and into the hill country each summer. During the annual gathering cycle, the Nisenan harvested acorns, nutmeg, pine nuts, buckeyes, and sunflower seeds and often stored these for long periods. Other vegetation such as greens, tule and cattail roots, brodiaea bulbs, Manzanita berries, black berries, and California grapes was harvested and eaten as it ripened. All valley groups, including the Nisenan, fished trout, perch, chub, sucker, hardhead, eels, sturgeon, and Chinook salmon. Fishing methods included hook, net, harpoon, trap, weir, and poison (Moratto 1984).

The western boundary of Nisenan territory was the western bank of the Sacramento River and the area between present-day Sacramento and Marysville. In the Sacramento Valley, the tribelet, consisting of a primary village and a few satellite villages, served as the basic political unit (Moratto 1984). Valley Nisenan territory was divided into three tribelet areas, each populated with several large villages (Wilson and Towne 1978), generally located on low, natural rises along streams and rivers or on slopes with a southern exposure. One important village, *Pusune*, near Discovery Park, appears to have been recorded as CA-SAC-26. Other villages—*Wollok*, *Leuchi*, *Wishuna*, *Totola*, and *Nawrean*—were located east of the confluence of the Feather and Sacramento Rivers, near the northwestern portion of the Natomas Basin.

Euro-American contact with the Nisenan began with infrequent excursions by Spanish explorers and Hudson Bay Company trappers traveling through the Sacramento and San Joaquin Valleys in the early 1800s. In general, Nisenan lifeways remained stable for centuries until the early to middle decades of the 19th century. With the coming of Russian trappers and Spanish missionaries, cultural patterns began to be disrupted as social structures were stressed. An estimated 75% of the Valley Nisenan population died in the malaria epidemic of 1833. With the influx of Europeans during the Gold Rush era, the population was further reduced as a result of disease and violent relations with the miners.

The local Nisenan occupation occurred within the broader context of Central Valley prehistory. California archaeological sites outside the Central Valley suggest that humans may have first occupied the area by 9,000 to 11,000 BP or earlier (Erlandson et al 2008; Harrington 1948; Mills et al 2005; Simons et al 1985; Zimmerman et al 1989), however, there is little direct evidence of this kind of antiquity in the valley itself. Sites older than 6,000 BP are known from the southern Central Valley (Hartzell 1992), as well as the Sierran foothills and the Coast Range mountains on either side of the valley.

Historic Setting

The following section is drawn from the Historical Overview of Dames & Moore’s 1995 report: *Archeological Inventory Report, Lower American River Locality.* The historic period in interior central California began relatively late by comparison to much of North America, with little or no Euroamerican activity occurring until early in the nineteenth century. Although occasional Spanish exploring expeditions toured the California coast as early as the middle sixteenth century, for over 200 years most Spanish activity in the New World concentrated on colonizing and missionizing in Sonora, the Southwest, and Baja California. The California missions were never supported with adequate resources or personnel for full colonization of the area. Explorations in northern and central California eventually brought European settlers. First the Spanish, then the shift in government replaced New Spain with the republic of Mexico.

Americans and British soon followed, following the call of rich resources and land. Europeans and Americans soon began to establish more permanent settlements, acquiring land grants from the Mexican governors of California. John Marshall’s discovery of gold at John Sutter’s mill in 1848 brought on the Gold Rush which brought on a population boom for California and statehood. The relative isolation and sparse settlement of the Sacramento Valley ended with the discovery of gold. Because of its location near the mining areas, and its location at the farthest point upstream that ocean-going vessels could reasonable navigate, Sacramento soon became a central trading and market city. Mining continued to shape the region and levee systems were built up to protect the burgeoning population from the frequent flooding experience in the area.

The history of the region is strongly tied to the mining industry. Throughout the years of development as Sacramento grew, gold remained an important focus of activities along the American River. After the initial Gold Rush, when gold became more difficult to collect, interest shifted to the exploitation of river beds, deep gravels, and quartz veins. River mining in particular was a far more complex technique, requiring the use of dams, ditches, and flumes to divert streams from their natural beds. The Chinese worked along bars, banks, and gulches and remnants of their camps and activities may still be found on the American River.

Dredging operations continued on the American River until quite recently. The peak of this activity appears to have occurred during World War I, declining thereafter. From 1927 to 1952, several operators dredged the Folsom District. Capital Dredge operated four dredges from 1927 to 1952; Gold Hill Dredging Company operated one dredge from 1933 to 1937; and General Hill Dredging Company operated three dredges from 1938 to 1951. Dredging activities dwindled along the American River until ending altogether in 1962.

Agriculture and ranching were the primary industries in the Sacramento and Sutter County region during the historic period. Regional ranching originated on the New Helvetia rancho in the early 1840s. The Gold Rush precipitated growth in agriculture and ranching, as ranchers and farmers realized handsome returns from supplying food and other goods to miners.

Results of the Records Search for the Study Area

Records searches of pertinent cultural resource information were conducted in 2006 and 2007, and updated in 2010 and 2013 for the overall study area. Most of the searches were conducted at the North Central Information Center (NCIC) of the California Historical Resources Information System, located at California State University, Sacramento (CSUS). The NCIC records search covered portions of the study area in Sacramento and Yolo Counties. The northern portion of the Natomas area is within Sutter County so records searches for that area were also conducted at the Northeast Information Center (NEIC) located at California State University, Chico. The NEIC reported seven previous cultural resource studies in the study area within Sutter County, and the NCIC reported 278 previous studies in the Sacramento and Yolo County portions of the study area; thus a total of 285 studies have been conducted in the study area.

From those previous studies, a total of 175 cultural resources (archaeological and historical sites) were identified within the overall study area. Numerous archaeological investigations have covered large portions of the study area. These have generally focused on areas closest to the rivers and levees. There has been very little archaeological inventory of lands more than 100 feet from the levee toes, and ground surface visibility has frequently been poor even in surveyed areas. The most comprehensive of these investigations were completed by Far Western Anthropological Group (Far Western) in 1990 and Dames & Moore in 1994 as a broad survey in the Natomas Basin and American

River, and more recently between 2007 to 2013 by AECOM Technology Corporation (AECOM).

Previously, in 1990, Far Western conducted surveys of areas along the same route surveyed by Dames & Moore in 1994 (Dames & Moore 1994), as well as of additional areas (Bouey and Herbert 1990). Far Western (Bouey, Berg, and Hunter 1991) followed up with limited test excavations of two sites south of Sacramento International Airport. Numerous cultural resources were identified in the course of previous survey efforts, including ranches and farms; agricultural, transportation, and reclamation features; and debris scatters, as well as prehistoric occupation and burial sites, frequently seen as mounds or the disturbed remnants of mounds.

Field Survey Results

Fieldwork undertaken between 2007 and 2013 by AECOM (formerly EDAW) focused on the areas that would be affected by the Natomas Levee Improvements Project (NLIP) construction conducted by SAFCA: the Natomas Cross Canal south levee, Sacramento River east levee, the Elkhorn Canal and the new Giant Garter Snake/Drainage Canal, Sacramento County–owned Airport bufferlands, and most of the potential borrow sites.

The archaeologists first conducted a survey and shovel testing program within the project area to locate cultural resources. This program originally identified a total of 55 cultural resources including 21 historic sites, ten multi-component sites, ten prehistoric sites, ten isolates, and four resources that were later determined to not be cultural. Sites were then evaluated for eligibility for listing in the National Register of Historic Places (NRHP). Of the 51 remaining cultural resources, seven were determined to be eligible, 43 resources were determined not eligible, and one multi-component site was only evaluated for the historic component-which was determined not eligible for listing in the NRHP. Historic components of the seven eligible sites were determined not eligible for listing in the NRHP. The seven eligible sites and their treatment and/or mitigation is further described in Table 22. Sites determined eligible for the register that are not completely avoided are subject to Historic Property Treatment Plans (HPTP) that stipulate avoidance, data recovery, or some other form of mitigation to resolve adverse effects.

Table 22. NLIP Eligible Sites and Treatment and/or Mitigation.

Site Number	Type of Site	Treatment and/or Mitigation
CA-SAC-15/H	Multi Component – Historic Farm and Prehistoric Mound	Data Recovery of a portion of the site and special construction conditions in the HPTP.
CA-SAC-16/H	Multi Component – Historic Artifact Scatter and Prehistoric Mound	Cataloguing and analysis of existing museum collections, special construction conditions in the HPTP.
CA-SAC-1148	Prehistoric Mound	Avoidance with special construction conditions in the HPTP.
CA-SAC-485/H	Multi Component – Historic Farm and Prehistoric Mound	Avoidance/Special construction conditions in the HPTP.
CA-SAC-1112	Prehistoric Mound	Data Recovery-special construction conditions in the HPTP.
CA-SAC-1130/H	Multi Component – Historic Levee and Prehistoric Mound	Avoidance.
CA-SAC-1142	Prehistoric Mound	Avoidance.

Cultural Resource Site Types

Due to the large geographic scope of the study area, limitations in access, the alluvial nature of the watershed, because levees and other structures have been built on top of much of the original native soil of the study area, and due to the high potential for buried cultural resources that will not be discovered until during construction, a 100% pedestrian survey of the entire study area could not be completed. The portions of the study area that have been previously surveyed for cultural resources are shown on Figure 11.

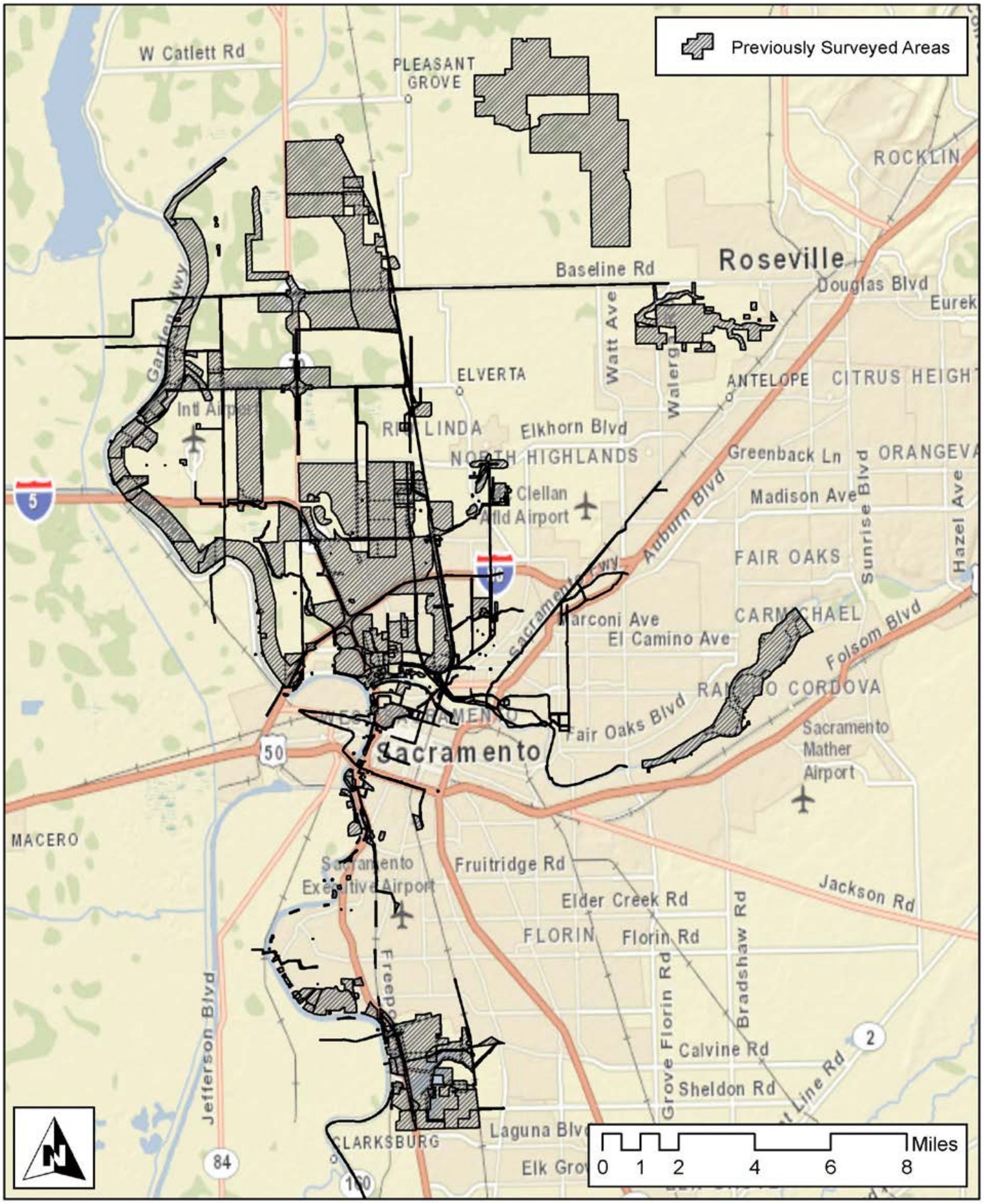

Figure 11. American River Common Features Study Area and Previous Cultural Resource Surveys.

However, data from the records and literature search, concerns relayed by American Indians, knowledge of the prehistory and history of the study area, and recent archaeological surveys conducted as part of NLIP provide information on the types of cultural resource sites that may be found within the study areas. The known cultural resources within the study area can be categorized as the following general types within the Sacramento Valley:

- **Mounds** – Refers to relatively low natural or anthropogenic mounds occupied by Native Americans as habitation sites and burial locations. Discarded refuse and numerous fires frequently generated significant accumulations of midden soil on these features.
- **Midden** – Refers to prehistoric or proto-historic trash deposits containing food refuse, such as discarded bone, shell, and other organic matter; along with broken, discarded or lost artifacts made of various raw materials, including stone, wood, bone, antler, etc. The organic nature of middens tends to produce softer, darker, and greasier soils in contrast to the natural soils on which they rest. Deposition of midden often expanded the size of natural knolls or mounds both horizontally and vertically. Because of the softer soils in middens, they were also used as locations for human and/or animal burials. Middens generally include the full suite of artifacts, materials, and remains that would be encountered in a lithic scatter.
- **Lithics/Lithic Scatter** – The term "lithic scatter" refers to scatters of lithic (stone) debris (or debitage) resulting primarily from manufacture of chipped stone tools such as knives, dart points, arrow points, scrapers, adzes, and other tools. The process of manufacture by chipping or "knapping" resulted in percussion and pressure flakes removed from the raw natural resources of chert, obsidian, basalt, felsite and any other stone raw materials. Lithic scatters often contain fire-cracked rock distinguished by its fire reddened colors and sharp fracture patterns. Such rocks were often used for cooking by dropping heated rocks into baskets full of water and food. The sudden temperature change would commonly cause the rocks to fracture in a distinctive way. Ground stone tools used for processing foods and pigments are also common in lithic scatters. Less commonly, baked clay artifacts and shell or bone tools and ornaments may also occur. Finally, broken fragments of tools used for lithic manufacture such as hammerstones may also be associated with lithic scatters.
- **Traditional Cultural Properties** – Often referred to as "TCPs," Traditional Cultural Properties may be geographic features, locations, rural communities, urban neighborhoods, or other areas associated with cultural practices or beliefs of a living community that are rooted in that community's history, and are important in maintaining the continuing cultural identity of the community. TCPs may include locations associated with the traditional beliefs of an American Indian group about its origins, its cultural history, or the nature of the world; may include buildings and structures, objects or landscapes; and may be associated with religious or cultural practices of American Indians.

- **Historic Debris** – This term may refer to a great number of different artifacts 50 years of age or older that may be considered historical in nature. Cans, metal fragments, nails, glass fragments, glass bottles, and a variety of remnant material may be considered historic debris. In the Sacramento Valley this occasionally includes material thrown from railroad cars as passengers passed through the area, as well as abandoned machinery and equipment. Historic debris may be linked to a number of different historic subsistence activities such as farming, irrigation, construction of infrastructure, and homesteading.
- **Water Related** – The history of the Sacramento Valley is intertwined with that of flood control, reclamation, farming, and irrigation in the city of Sacramento and the surrounding areas. Much of the flood control infrastructure of the area dates back to the turn of the twentieth century. Water-related features may include levees, canals, weirs, bypass channels, drainage ditches, pump houses, wells, pipes, and farm-related structures and equipment.
- **Transportation** – A great number of roads, bridges, railroad tracks, and railroad trestles appear within the study area. These may include dirt or paved roads; bridges over canals, culverts, or other topographic features; and a variety of railroad features. Railroad features may include portions of the Transcontinental Railroad, the Walnut Grove Branch Line Railroad, raised berms that supported railroad rights-of-way, railroad trestle bridges, and lengths of railroad alignments. Within Sacramento, a number of historic railroad features are still in use today, both for the transport of goods, and recreationally and educationally associated with the California Railroad Museum in Old Town Sacramento just east of the Sacramento River.
- **Structures** – This refers to a variety of buildings or structures 50 years of age or older. Within the project area these may include government offices, farmsteads, homesteads, residential structures, barns, ranches, power plants, and sheds. These structures may be made from materials such as wood, concrete, brick, masonry, stucco, and corrugated metal.

Area of Potential Effects

For purposes of complying with Section 106 of the NHPA, a Federal agency will make a determination of the area of potential effects (APE) for the project or undertaking. The APE is defined as “the geographic areas or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.” Additionally, the APE “is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.”

The APE for an undertaking may extend beyond the physical impacts associated with a project. Depending on the scale and nature of the undertaking and the known and anticipated types of cultural resources, the direct or indirect effects may include, but is not limited to: physical modification, intrusion to the visual or esthetic characteristics of landscapes or features, or even access to a historic property.

Because the Section 106 compliance for this undertaking will need to include areas for all construction by the Corps, including those covered in the NLIP Phase 4b EIS/EIR in 2010, it must cover a different geographic area, or APE, than is directly described as the study area in this DEIS/DEIR. The ARCF Project APE includes approximately 12 miles of the north and south banks of the American River immediately upstream from the confluence with the Sacramento River; intermittent sites along the east bank of the Sacramento River downstream of the Natomas Cross Canal (NCC) down to the confluence with the American River; intermittent sites on the south bank of the NCC immediately upstream of the confluence with the Sacramento River; the Sacramento Bypass and Sacramento Weir; an expansion area 1,500 feet north of the Sacramento Bypass and Sacramento Weir; approximately 4 miles of the Pleasant Grove Creek Canal; approximately 8 miles of the Natomas East Main Drainage Canal (NEMDC); approximately 15 miles of the east bank of the Sacramento River downstream of the American River down to Morrison Creek; approximately ½ mile of the south bank of Dry/Robla Creeks; approximately 2 miles of the north and south banks of Arcade Creek; and approximately ½ mile of the Magpie Creek Diversion Canal. For purposes of complying with Section 106 of the NHPA, the APE is shown in Figure 12 and further described in Appendix C. The APE for the ARCF includes areas within the American River Parkway and along Dry and Robla Creeks because it is anticipated that there may be visual or landscape impacts to potential historic properties in those areas.

Archaeological Sensitivity Assessment

In addition to the conclusions regarding the various cultural resources site types that may be found within the study area, an archaeological sensitivity assessment for prehistoric resources was conducted. The sensitivity assessment was built using existing survey data to identify correlations between the occurrence of archaeological sites and environmental variables including proximity to water, historic vegetation, and lithology. This was accomplished in GIS using environmental data and information from the record search indicating where archaeological sites do and do not exist in areas that had been previously surveyed.

Programmatic Agreement

As a result of the various efforts (records and literature searches, archaeological sensitivity assessment, consultation with American Indians, consultation with the interested public, review of existing and recent archaeological inventories and discoveries) to identify cultural resources within the study area, the Corps has determined that the project will likely have an adverse effect on properties that are either included in, or are eligible for inclusion, in the NRHP. The Corps has also determined that it cannot fully determine the effects of the project on NRHP eligible properties for all phases and segments of the project at this time.

In order to provide a framework for the Corps to identify cultural resources, evaluate cultural resources for their eligibility for inclusion in the NRHP, determine possible effects to historic properties, and mitigate effects to historic properties as a result of the project, a programmatic agreement (PA) has been developed by the Corps in consultation with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP). The draft PA was provided to the California Department of Water Resources (DWR), the CVFPB, SAFCA, and potentially interested American Indians for review and comment as part of the development of the PA. As part of the public participation process in the development of the document, the PA is appended to this document for public review and comment during the review period for this DEIS/DEIR (Appendix C).

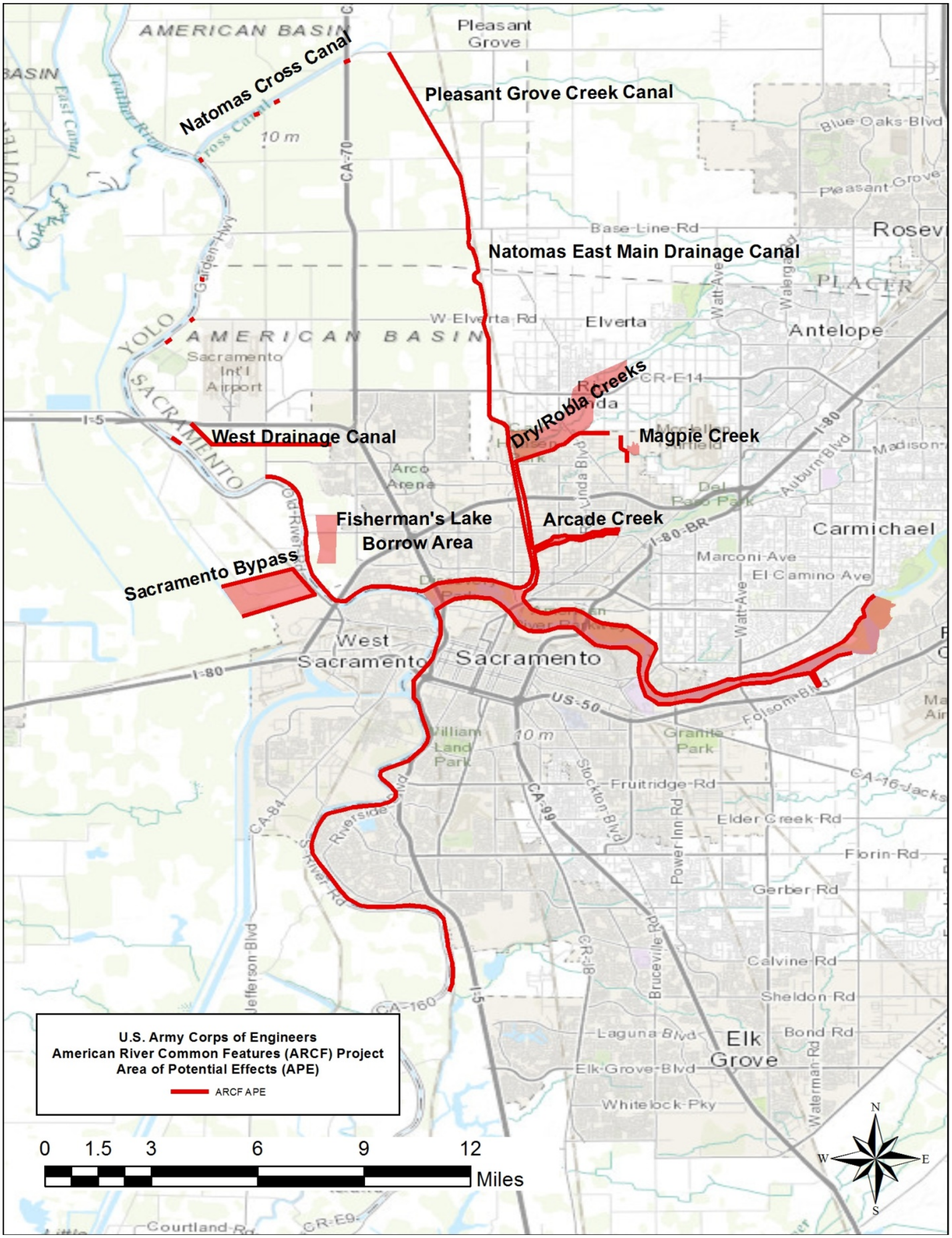

Figure 12. ARCF APE for Compliance with Section 106 of the NHPA.

3.9.2 Methodology and Basis of Significance

Methodology

Analysis of the impacts was based on evaluation of the changes to the existing historic properties that would result from implementation of the project. The term "historic property" refers to any cultural resource that has been found eligible for listing, or is listed, in the NRHP. Section 106 of the NHPA, requires that Federal agencies evaluate and consider the effects of their undertakings on historic properties. In making a determination of the effects to historic properties, consideration was given to:

- Specific changes in the characteristics of historic properties in the study area.
- The temporary or permanent nature of changes to historic properties and the visual study area around the historic properties.
- The existing integrity considerations of historic properties in the study area and how the integrity was related to the specific criterion that makes a historic property eligible for listing in the NRHP.

Previous Section 106 Compliance for the ARCF Study

SAFCA, DWR, and CVFPB were the lead decision makers on the planning, design, environmental and cultural resources compliance, and construction for NLIP Phases 1, 2, 3, 4a, and 4b. SAFCA contracted with EDAW (now AECOM) to complete EIS/EIRs for the overall Natomas Basin. In order to meet the requirements under the Section 404 permits and Section 408 permissions, and because SAFCA planned to seek credit for their share of an authorized Federal project, SAFCA was required to comply with NEPA and the NHPA.

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties and afford the ACHP a reasonable opportunity to comment on such undertakings. The Code of Federal Regulations 36 CFR § 800 outlines the steps and guidelines a Federal agency must follow in order to comply with Section 106. The NEPA compliance effort in the NLIP EIS/EIR, completed in 2007, provided an overview of the known cultural resources and historic properties within the Natomas Basin and the ARCF study area.

Due to the large size of the study area, and because the assessment of effects to historic properties could not be completed prior to the signing of the Record of Decision for the EIS/EIR, an alternate method was required to ensure that the construction efforts within the Natomas Basin undertaken by SAFCA would comply with Section 106 of the NHPA. When effects on historic properties cannot be fully determined prior to approval of an undertaking, and when there may be potential adverse effects of a complex or phased project, a PA may be executed for the undertaking.

On May 1, 2008, a PA for NLIP was executed between the Corps, SAFCA and the SHPO. The NLIP PA only covered actions under the Section 408 permissions and Section 404 permits within the Natomas Basin for which SAFCA was the construction lead. By executing the PA, the NLIP was then in compliance with Section 106 and the signatories to the NLIP PA (the Corps, SAFCA and the SHPO) had an agreed upon series of stipulations that fulfilled the requirements of 36.CFR § 800. The Corps had the responsibility of determining if the actions by SAFCA complied with Section 106, and was responsible for coordinating concurrence with those determinations with the SHPO. All construction efforts for NLIP Phases 1, 2, 3, and 4a were funded entirely by SAFCA, DWR, and CVFPB.

Prior to the construction of Phases 1, 2, 3, and 4a, a series of NEPA compliance documents were completed as supplements to the original EIS/EIR completed in 2007:

- Phase 1 was covered in an Environmental Assessment/Initial Study dated November 2007.
- Phase 2 was covered in a supplement to the EIS/EIR completed in November 2008.
- Phase 3 was covered in an EIS/EIR completed May 2009.
- Phase 4a was covered in a EIS/EIR completed November 2009
- Phase 4b was covered in a EIS/EIR completed October 2010.

Because construction of Phases 1, 2, 3, and 4a (Phase 4b was not constructed) did not address all of the flood risk concerns in the Natomas Basin, the NLIP does not provide complete flood risk reduction for the entire Natomas Basin. Due to funding constraints with SAFCA, DWR, and CVFPB, construction of the remaining perimeter of the Natomas Basin will not be completed under the Section 408 permissions and Section 404 permits. With the completion of the Natomas PACR in 2010, the Corps requested authorization from Congress to construct the remaining work in the Natomas Basin, with the exception of levee raises that were analyzed for the Natomas Basin under the ARCF GRR. However, this remaining Natomas construction was covered under NEPA/CEQA in the NLIP Phase 4b EIS/EIR in October 2010.

Although the NLIP PA covered Section 106 compliance for the entirety of possible construction activities in the Natomas Basin, the roles and responsibilities of the NLIP PA designated SAFCA as responsible for the execution of inventories, surveys, recordation of sites, recommendations of eligibility, and development of historic properties treatment plans and mitigation measures. The NLIP PA includes the Corps and SAFCA in roles as regulatory authority, but with no involvement in the production of technical studies or determinations of effect.

The previously completed EIS/EIRs are applicable for overall NEPA compliance for the Natomas Basin. However, in order for the Corps to be in compliance with Section 106 of the NHPA, and due to the changing roles and responsibilities and authorities, it was determined that a new PA would need to be developed and executed for the remaining construction activities the Corps may undertake in the Natomas Basin, as well as the other recommended project features for the rest of the ARCF Project. For Section 106 compliance purposes in this DEIS/DEIR, this results in a different geographic area designated for possible affects to historic properties and for inclusion in the PA.

Similar to the NLIP PA, the ARCF PA will outline the steps the Corps, as the lead Federal agency for NEPA, will take in order to comply with Section 106 of the NHPA. The ARCF PA must be executed in advance of any construction activities the Corps may undertake for the ARCF and Natomas projects.

Application of Archaeological Sensitivity Assessment

The Archaeological Sensitivity Assessment covers all areas where the Corps may implement construction for the ARCF. The description below is an abbreviated version of the function and structure of the assessment procedure.

The model is designed to produce an approximate value reflecting the probability of an archaeological site existing, visible on the surface of the ground, within 70 meters of any given point in the study area. Units of analysis in the model are an array of points spaced 100 meters apart across the footprint of the ARCF study area. Environmental variables including lithology, historic water courses, and historic vegetation are mapped in the GIS. Those layers are then queried and each data point is associated with a set of these variables.

A calibration data-set is established using those points located within the footprints of previous archaeological surveys where it can be known with some certainty whether a given point is, or is not, located within 70 meters (roughly half the diagonal distance between points on a 100 meter grid) of an archaeological site. Figure 11 illustrates the footprints of previous surveys that have taken place in the study area. For each point in the calibration data set, the following attributes were populated: whether or not the point exists within 70 meters of an archaeological site, the distance to a source of permanent water, the historic vegetative community, and the lithologic unit in which the point is located.

Correlations between the occurrences of each environmental attribute were described mathematically using a regression function. Using the equation generated by the regression for each of the environmental attributes, the probability of site location is extrapolated across a larger 100 meter grid superimposed over un-surveyed portions of the study area using the environmental variables that characterize each of these data points.

This produced three separate maps which individually estimate archaeological sensitivity based on one environmental attribute. The selected environmental attributes are closely related to one another, and typically predict archaeological sensitivity in broadly similar ways. The results produced by the three approaches can be compared by mapping sensitivity predicted by one variable normalized (i.e. divided by) the sensitivity predicted by another. In the case of data points where the two variables predict similar levels of sensitivity, the normalized value is very close to 1.0. However, if the two variables predict significantly different levels of sensitivity, the normalized value will be either well below or above 1.0.

The model was used to generate a predicted number of archaeological sites that would be impacted by each alternative. These results are presented along with a brief sensitivity discussion based on the environmental variables present within the footprints of each alternative.

Basis of Significance

Any adverse effects on cultural resources that are listed or eligible for listing in the NRHP (i.e., historic properties) are considered to be significant. Effects are considered to be adverse if they:

- Alter, directly or indirectly, any of the characteristics of a cultural resource that qualify that resource for the NRHP so that the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association is diminished.

In California, effects to a historic resource or unique archaeological resource are considered to be adverse if they:

- Materially impair the significance of a historical or archaeological resource.

3.9.3 No Action Alternative

Under the No Action Alternative the Corps would not conduct any additional work to address seepage, slope stability, overtopping, or erosion concerns in the Sacramento metropolitan area and, therefore, would not cause any additional effects to cultural resources. The conditions in the study area would remain consistent with current conditions. If a flood event were to occur, potential historic properties such as levees or prehistoric sites within the study area could undergo damage from erosion or levee failure. Sections of the Sacramento and American River levees have been determined eligible for listing in the NRHP and could be damaged should the levees fail. Levee failure resulting in the inundation of residences and other buildings and structures that may be historic properties could threaten the integrity of those resources. As a result, the No Action Alternative would likely result in an adverse effect to cultural resources. However, the magnitude of the adverse effect would depend on the location of the levee failure, severity of the storm, and river flows at the time. As a result, a precise determination of adverse effect and the significance of the effect is not possible and cannot be made. Because of this uncertainty, this potential effect is considered too speculative for meaningful consideration. Additionally, without a Federal undertaking, under the No Action Alternative there would not be a lead Federal agency required to take into account the effects of a proposed undertaking on historic properties. No further action would be required by the Corps.

3.9.4 Alternative 1 – Improve levees

The effects of the erosion repair on the American River, levee geometry measures, cutoff walls, and bank protection on the Sacramento River and construction of cutoff walls, correction of the levee geometry, installation of floodwalls, installation of a conduit or box culvert, raising of floodwalls and existing levees, construction of maintenance roads, installation of floodgates, and creation of a detention basin on the East Side Tributaries would likely result in an adverse effect to some historic properties located within the APE for the project. Adverse effects to historic properties are considered significant. Approximately 30% of the APE for Alternative 1 has been previously inventoried for cultural resources.

The records and literature search conducted for the project identified 69 known prehistoric and historic resources in the total project APE. For the purposes of this DEIS/DEIR, the Corps assumes that all of these resources would be impacted by the levee improvement alternatives. Site specific determinations of effect and impact cannot be made at this time because each site within the APE would need to be field checked, the previous recordation (included site boundary, associated features, integrity) verified, and each site would need to be considered for eligibility for listing in the NRHP. The process for field checking cultural resources sites and making determinations of eligibility for listing in the NRHP are outlined in the PA. The specific sites are listed on Table 23 and the general levee fixes that would impact each resource are indicated as well.

The results of the archaeological sensitivity assessment, which are based on proximity to water sources, lithology, and historic vegetation, are quite consistent in the areas around the levee fixes along the Sacramento and American Rivers. In these areas, predicted archaeological sensitivity is expected to be most accurate. However, the assessment may be overestimating sensitivity in the areas around the East Side Tributary levee improvements. The dominant vegetation throughout much of this portion of the project APE was historically grassland, which the sensitivity assessment suggests may be less sensitive than proximity to water alone would indicate. Based on the application of the Archaeological Sensitivity Assessment, the Corps would estimate that an additional 12 prehistoric archaeological sites could be located in close proximity to the APE for Alternative 1, in addition to the sixty-nine known from the records and literature search.

Specific individual determinations of effect for historic properties that may be affected by Alternative 1 would be completed under the stipulations of the PA, which includes a framework to identify historic properties, evaluate NRHP eligibility, and assess effects. The significant effects to cultural resources as a result of Alternative 1 would be reduced to less than significant by implementing stipulations in the PA intended to resolve adverse effects to historic properties through development of a Historic Properties Management Plan (HPMP) and potential development of HPTPs. Further discussion of specific affects anticipated for Alternative 1 and known cultural resources within those parts of the APE are below.

Table 23. Known Prehistoric and Historic Resources within the APE.

Primary	Trinomial	Site Type	Hist	Pre	American River	Sacramento River	East Side Tributaries
34-00011		Isolate: Gunther point		x		x	
34-00012		1900-1910 farmhouse	x			x	
34-00044	CA-SAC-17	Mound (not relocated, cf. CA-SAC-494/H)		x		x	
34-00045	CA-SAC-18	Mound/ lithic scatter		x		x	
34-00053	CA-SAC-26	Mound		x	x		
34-00058	CA-SAC-31	Mound and historic residence	x	x	x		
34-00059	CA-SAC-32	Mound (possibly destroyed)		x	x		
34-00066	CA-SAC-39	Mound		x	x		
34-00067	CA-SAC-40	Mound (not relocated)		x	x		
34-00070	CA-SAC-43	Mound		x		x	
34-00071	CA-SAC-44	Mound (possibly destroyed)		x		x	
34-00073	CA-SAC-46	Mound (not relocated)		x		x	
34-00075	CA-SAC-48	Mound		x		x	
34-00191	CA-SAC-164	Midden		x		x	
34-00295	CA-SAC-268	Lithic scatter		x		x	
34-00333	CA-SAC-306/H	Mound and historic features/debris	x	x	x		
34-00343	CA-SAC-316	Mound (may not be cultural)		x	x		
34-00457	CA-SAC-430/H	Managed channel	x			x	
34-00486	CA-SAC-459/H	Ranch buildings	x				x
34-00490	CA-SAC-463H	RD 100 and associated resources	x		x	x	x
34-00491	CA-SAC-464H	Western Pacific Railroad	x		x		x
34-00494	CA-SAC-467H	Cistern and spillway	x		x		
34-00495	CA-SAC-468H	Concrete structure	x		x		
34-00508	CA-SAC-481H	American River right bank levee	x		x		x
34-00509	CA-SAC-482H	American River left bank levee	x		x	x	
34-00521	CA-SAC-494/H	Prehistoric and Historic debris (possibly associated with CA-SAC-17)	x	x		x	
34-00522	CA-SAC-495H	Arcade Creek levees	x				x
34-00619	CA-SAC-505H	Historic debris	x			x	
34-00639		WWII Victory Trees	x			x	
34-00640	CA-SAC-516H	Pumping station	x				x

Primary	Trinomial	Site Type	Hist	Pre	American River	Sacramento River	East Side Tributaries
34-00641	CA-SAC-517H	Historic debris	x				x
34-00642	CA-SAC-518H	Concrete bridge abutments	x				x
34-00643	CA-SAC-519H	Robla Creek levee	x				x
34-00644	CA-SAC-520H	Modern building (built 1995)	x				x
34-00645	CA-SAC-521H	Union Pacific Railroad trestle bridge	x				x
34-00646	CA-SAC-522H	Nothern Electric concrete slab bridge	x				x
34-00647	CA-SAC-523H	Railroad trestle bridge	x				x
34-00739	CA-SAC-567H	Historic road	x				x
34-00740	CA-SAC-568H	Historic road	x		x		x
34-00741	CA-SAC-569H	Historic Del Paso Road	x				x
34-00742	CA-SAC-570H	Historic road	x		x		
34-00746	CA-SAC-571H	Sacramento Northern Railroad	x		x		
34-00749	CA-SAC-574H	Historic dump	x		x		
34-00816	CA-SAC-623H	Historic residence	x			x	
34-00817	CA-SAC-624H	Historic residence	x			x	
34-00832	CA-SAC-641H	Farmstead	x			x	
34-00833	CA-SAC-642H	Historic residence	x			x	
34-00858	CA-SAC-657H	Hagginwood/ N. Sacramento dump	x		x		
34-00859	CA-SAC-658H	Pilings in the river	x			x	
34-00884		Historic Road	x			x	
34-00886		Historic Elkhorn Boulevard	x				x
34-00895		River dock	x			x	
34-01000	CA-SAC-689H	Sacramento Gas Works tank supports	x			x	
34-01374		Railroad bridge	x			x	
34-01436	CA-SAC-866H	El Camino Avenue bridge	x				x
34-01497		Southern Pacific Railroad	x			x	
34-01580	CA-SAC-954H	Railroad depot	x			x	
34-01611	CA-SAC-960H	Cliff's marina	x			x	
34-01663		Historic state route 160	x		x		
34-01711		PG&E Power Plant	x			x	
34-02104		Row of valley oaks	x			x	
34-02143		Sacramento River levee	x			x	
34-02215	CA-SAC-115H	Ranch buildings	x			x	
51-00080		Historic debris	x				x
51-00083		Feed mill	x				x
51-00084	CA-SUT-84H	Natomas cross canal and Pleasant Grove Creek levees	x				x
51-00085	CA-SUT-85H	NEMDC east levee	x				x
51-00138	CA-SUT-138H	Historic residence	x				x
	CA-SAC-1115/H	Historic Buildings	x			x	

American River

Within the APE identified for erosion repairs on the American River, a number of cultural resources are known (Table 23), though most have not yet been evaluated for NRHP eligibility. The only known NRHP eligible site (i.e. historic property) is the American River levee. Portions of the levee have been previously found eligible for listing in the NRHP. Impacts could be incurred to prehistoric sites located under or near the levees that may be disturbed by construction of the launchable rock trench, installation of rock on the levee slope, and the construction of access ramps. Historic sites such as the levees, levee features, and buildings, structures, or objects could be impacted by modification to existing features, removal, or temporary relocation due to project construction. The effects of the erosion repair on the American River would likely result in an adverse effect to some of the sites and resources listed on Table 23, and possibly to others that may be discovered during the inventory efforts required under the PA.

Sacramento River

Known historic and prehistoric sites and resources that exist within the APE, including the Sacramento River levee and associated features, are listed in Table 23. The only known NRHP eligible sites (i.e. historic property) include CA-SAC-1115/H, a complex of historic buildings, and the Sacramento River levee. Portions of the levee have been previously found eligible for listing in the NRHP. Impacts could be incurred to prehistoric sites located under or near the levees that may be disturbed by construction of the cutoff walls, measures to correct the levee geometry, and installation of bank protection. Other affects to historic properties may result from disturbance of cultural resources sites due to the construction of access ramps and possibly removal of structures due to the acquisition of properties for levee construction, inspection, maintenance, monitoring, and flood-fighting access. The effects of the levee geometry measures, construction of cutoff walls, and installation of bank protection on the Sacramento River would likely result in an adverse effect to some historic properties located within the APE for the Sacramento River.

East Side Tributaries

Proposed activities that would occur within the APE for these levee improvements includes construction of cutoff walls, correction of the levee geometry, installation of floodwalls (NEMDC), installation of a conduit or box culvert, installation of geotextile material and a floodwall, correction of the levee geometry (Arcade Creek), raising of a floodwall, correction of the levee geometry (Dry and Robla Creeks), raising of the existing levee, construction of maintenance roads, installation of floodgates, construction of a box culvert, and creation of a detention basin (Magpie Creek Diversion Canal). Historic and prehistoric archaeological sites and resources known to occur in these areas are listed in Table 23. Other potential cultural resources that may be affected include previously unidentified prehistoric sites located under or near the levees that may be disturbed by the construction of cutoff walls or the installation of maintenance roads and creation of the detention basin, and historic sites relating to the existing levees or within the areas identified for the ground disturbing activities. The effects of the measures described above for the East Side Tributaries would likely result in an adverse effect to some historic properties located within the APE for the East Side Tributaries.

3.9.5 Alternative 2 – Sacramento Bypass and Improve Levees

Effects to cultural resources from the construction of levee improvements under Alternative 2 would be consistent with those analyzed for Alternative 1 with the addition of effects resulting from construction of the Sacramento Weir and Bypass widening. The effects of Alternative 2 would likely result in an adverse effect to some historic properties located within the APE for the project. Adverse effects to historic properties are considered significant. Like Alternative 1, approximately 30% of the APE for Alternative 2 has been previously inventoried for cultural resources. The addition of the Sacramento Weir and Bypass reduces the need for levee raising on the Sacramento River to less than 1 mile compared to 8 miles with Alternative 1. The Sacramento Bypass has not been previously inventoried for cultural resources, however the Sacramento Weir has been previously recommended as eligible for inclusion in the NRHP.

In addition to those already known cultural resources sites and anticipated sites discovered described under Alternative 1, the Archaeological Sensitivity Assessment predicts slightly less than one additional archaeological site in the APE under Alternative 2. These results suggest that there is approximately an 80% chance of encountering at least one prehistoric archaeological site. However, the majority of this Alternative occurs in the Qb lithologic unit (Holocene basin deposits) which, according to the sensitivity analysis done for the Archaeological Sensitivity Assessment, may be less archaeologically sensitive than proximity to water sources might suggest.

For purposes of NHPA compliance, the specific individual determinations of effect for historic properties that may be affected by Alternative 2 would be completed under the stipulations of the PA, which include a framework to identify historic properties, evaluate NRHP eligibility, and assess effects. The significant affects to cultural resources as a result of Alternative 2 would be reduced to less than significant by implementing stipulations in the PA to resolve adverse effects to historic properties through development of an HPMP and potential development of HPTPs. Further discussion of affects from the features of Alternative 2 and known cultural resources within that part of the APE different from Alternative 1 are below.

Sacramento Bypass

Within the APE identified for construction of levee improvements associated with the Sacramento Weir and Bypass widening, the Sacramento Weir is a known historic property. Although specific design refinements for the widening of the weir are not complete, modifications to the weir may result in an adverse effect to the Sacramento Weir, which could result in a significant effect. Other potential cultural resources and historic properties that may be affected include prehistoric or historic sites located under or near the north side of the Sacramento Bypass where the channel may be widened and disturbed and where relief wells may be installed. Affects to historic properties may also result from disturbance of cultural resources sites due to remediation of a hazardous, toxic, and radiological waste (HTRW) site near the existing north levee, which may consist of historic era debris. The effects of the widening of the Sacramento Weir and Bypass may result in an adverse effect to some historic properties located within the APE for the Sacramento Bypass.

3.9.6 Avoidance, Minimization, and Mitigation Measures

The Corps has determined that the No Action Alternative, Alternative 1, and Alternative 2 may result in an adverse effect to historic properties. Because there would be no Federal undertaking under the No Action Alternative, no further action is required by the Corps under the No Action Alternative. Adverse effects to cultural resources eligible for listing or listed in the NRHP are considered significant. Adverse effects would only potentially result with the Corps' execution of Alternatives 1 or 2. Under NEPA and the NHPA, any significant effect that would result from the implementation of Alternatives 1 or 2 would be reduced to less than significant, as adverse effects would be resolved by implementing stipulations in the PA. Under CEQA, the impacts as a result of Alternatives 1 or 2 would be significant and unavoidable. Mitigation for these impacts would be proposed in accordance with the PA.

Implementation of the PA would resolve adverse effects to historic properties through development of a HPMP and, if necessary, development of HPTPs. Mitigation measures for cultural resources that have been determined to be historic properties adversely affected by the project may include data recovery, Historic American Building Survey/Historic American Engineering Record, oral histories, historic markers, exhibits, interpretive brochures or publications, or other means determined in accordance with execution of the PA and the HPMP and HPTP(s). With the execution and implementation of the PA, the ARCF GRR project would be in compliance with Section 106 of the NHPA.

3.10 Transportation and Circulation

3.10.1 Environmental Setting

Regulatory Setting

- Federal Highway Administration (FHWA) Standards
- California Department of Transportation (CalTrans) Standards
- Sacramento County General Plan Circulation Element

Existing Conditions

The study area is urbanized with many roads and levee structures which can be used for construction activities if a project is authorized. There are also many public and non-public access points to the levee structures in the study area.

Sacramento County uses a roadway classification system for long-range planning and programming. Roadways are classified based on the linkages that they provide and their function, both of which reflect their importance to the land use pattern, traveler, and general welfare. The functional classification system recognizes differences in roadway function and standards between urban/suburban areas and rural areas. The following list describes the linkage and functions provided by each class:

- **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:** 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.

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. Levels of service (LOS) are used to measure the quality of operational conditions within a traffic stream based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience. Six LOS range from A (best) to F (worst) and describe each type of transportation facility discussed above.

Most analyses typically use service flow rates at LOS C, D, or higher to describe acceptable operating service for facility users. LOS E generally is considered unacceptable for planning purposes, unless there are extenuating circumstances or attain a higher LOS is not feasible or extremely costly. For LOS F, it is difficult to predict flow due to stop-and-start conditions. LOS are typically described in terms of traffic operating conditions for intersections, and would be applicable to roadway conditions, as shown in Table 24 below.

Table 24. Regulatory Criteria for Roadways and Intersections.

Level of Service (LOS)	Description of Traffic Conditions
A	Conditions of free flow; speed is controlled by the driver's desires, speed limits, or roadway conditions.
B	Conditions of stable flow; operating speeds beginning to be restricted; little or no restrictions on maneuverability from other vehicles.
C	Conditions of stable flow; speeds and maneuverability more closely restricted; occasional backups behind left-turning vehicles at intersections.
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.
E	Conditions approach capacity; unstable flow with stoppages of momentary duration; maneuverability severely limited.
F	Forced flow conditions; stoppages for long periods; low operating speeds.

Source: Transportation Research Board, 2000

Regional roadways in the greater project area that connect the various basins include freeways and major arterial roadways. The freeways in the project area include the following:

- **Interstate 80 (I-80):** I-80 is a major freeway that runs northeast to southwest through the project area. I-80 heads towards Reno to the east and San Francisco to the west. The freeway crosses the Sacramento River just south of the Sacramento Bypass and continues northeast into the Natomas Basin. It is the primary transportation corridor from Sacramento to the Roseville and Rocklin area of Placer County.

- **U.S. Highway 50 (U.S. 50):** U.S. 50 is a major highway that runs east to west through the Sacramento area. U.S. 50 is the primary transportation corridor from Sacramento to the foothills in El Dorado County and Lake Tahoe. U.S. 50 crosses the Sacramento River near downtown Sacramento from the west, and transects American River South basin from east to west, running generally parallel to the American River.
- **Interstate 5 (I-5):** On the western edge of the study area I-5 runs parallel to the Sacramento River and is the primary transportation corridor between northern and southern California. I-5 passes over the American River in the downtown area near the confluence of the Sacramento and American rivers and continues north into the Natomas basin. The Sacramento River levee is directly adjacent to I-5 from downtown Sacramento to about one mile south near the Sutterville Road off ramp.
- **Business 80/Capitol City Freeway:** Business 80, also known as the Capitol City Freeway, runs north, connecting U.S. 50 in downtown Sacramento to I-80. Business 80 crosses the American River near Cal Expo. This freeway is a major commute route to downtown Sacramento.
- **Highway 160:** Highway 160 is a minor freeway that connects Business 80 to downtown Sacramento. It runs east to west in the American River North basin from Business 80 to 16th Street in downtown Sacramento. Highway 160 crosses the American River just upstream of the confluence with the Sacramento River and downstream of Business 80.

American River

The American River levees would be accessed primarily from I-80, U.S. 50, Business 80, and Highway 160, as described above. In addition, the major arterial roadways which would be used to access the project areas include Watt Avenue, Howe Avenue, Fair Oaks Boulevard, Folsom Boulevard, and Arden Way. These major roadways would be used to connect to local, minor arterials, and connectors to access the study areas.

Five vehicle bridges, which are major arterial roadways, cross the American River: I-5, Business 80, Highway 160, Watt Avenue, Howe Avenue, and H Street. These roads and bridges are the primary commuter routes within the study area. Between the H Street and Howe Avenue bridges, the Guy West Bridge provides pedestrian access across the river into CSUS.

Within the study area, adjacent to the levee system, are many residential streets used primarily for access to the main commuter routes and homes. The streets are also used to access the American River Parkway for both land based and water based recreation activities. Access to the Parkway within this reach requires crossing the levee structure. Many public roads provide access to recreation facilities along the American River, including: William Pond Recreation Area, Campus Commons Golf Course, River Bend Park, Gristmill Park, Waterton Park, Watt Avenue, Glen Hall Park, Howe Avenue, Sutter's Landing Regional Park, and Discovery Park. Most of these access points require crossing the levee structure to enter the recreation facilities. Although the actual recreation trail is located at the levee toe in most areas in this reach, often pedestrian commuters to CSUS will use the top of the levee.

Sacramento River

The Sacramento River levees would be accessed primarily from U.S. 50 and I-5. In addition, the major arterial roadways which would be used to access the project areas include Richards Boulevard, Meadowview Road/Pocket Road, 43rd Avenue, Riverside Boulevard, and Freeport Boulevard. These major roadways would be used to connect to local, minor arterials, and connectors to access the study areas. Work along the Sacramento River near Old Sacramento could have affects to access across the Tower Bridge during the installation of the floodwall along the levee. Coordination with Department of Transportation would occur to ensure that traffic can continue access between Sacramento and West Sacramento. This could include detours to the I Street Bridge to cross the Sacramento River in this area. There are no major bridges within this area of the project that would be impacted by construction of the project.

Access to the levees in this area is from residential streets which connect to maintenance ramps and public access points. Most of these streets are two lane roads with residents on both sides. On the Sacramento River, Miller Park and Garcia Bend Park provide public access to the levee and river. Garcia Bend Park is one of the few locations where park access does not require crossing the levee, however, access to the boat launch does require crossing the levee.

Further south in the study reach Freeport Boulevard runs parallel to the levee for about 3 miles to the end of the study area. South of Pocket Road/Meadowview Road, Freeport Boulevard (Highway 160) is a rural two lane road used to access the town of Freeport and many small Delta towns south of the project. There is limited access to the levee structure in this southern portion of the reach.

East Side Tributaries

The east side tributaries area would primarily be accessed via I-80. In addition, major arterial roadways that would be used to access construction sites include Raley Boulevard, Norwood Avenue, and Marysville Boulevard.

Site access to the NEMDC east levee is extremely limited, because the Union Pacific railroad runs along the landside levee toe. As a result, site access to NEMDC will be primarily via the Arcade Creek levee and over the railroad tracks. Additional site access to NEMDC could occur from the Dry/Robla Creek south levee via Main Avenue and Kelton Way.

Sacramento Bypass

The Sacramento Bypass area would be accessed primarily by I-80 or U.S. 50. Major arterial roadways that serve the project area include Reed Avenue and Harbor Boulevard. The Sacramento Bypass can only be accessed by North Harbor Boulevard, which turns into Old River Road near the bypass. This section of the roadway north of Reed Avenue is classified as a connector roadway. North Harbor Boulevard/Old River Road runs along the top of the Sacramento Weir, as does the Yolo Short line railroad tracks.

3.10.2 Methodology and Basis of Significance

Methodology

The proposed alternatives, if authorized, would consist of constructing levee improvements throughout the Sacramento area. Because of the earthwork involved and the need for materials deliveries, construction would intermittently generate substantial volumes of traffic. Once the construction is completed, maintenance needs would be similar to current conditions. Analysis of traffic effects therefore concentrated on the construction of levee alternatives. The key effects were identified and evaluated based on the environmental characteristics of the study area and the magnitude, intensity, and duration of activities related to the construction and operation of this project.

Basis of Significance

Project alternatives under consideration would result in a significant effect related to transportation and circulation if they would:

- Substantially increase traffic in relation to existing traffic load and capacity of the roadway system.
- Substantially disrupt the flow of traffic.
- Expose people to significant public safety hazards resulting from construction activities on or near the public road system.
- Reduce the supply of parking spaces sufficiently to increase demand above supply.
- Cause substantial deterioration of the physical condition of nearby roadways.
- Result in inadequate emergency access.

3.10.3 No Action Alternative

Under the No Action Alternative, the Corps would not participate in construction of the proposed alternatives; therefore, the project would not create additional traffic in and around the study area. Traffic would be expected to remain generally the same in the Sacramento Metropolitan Area, with gradual increase associated with urban population growth.

In the event of a flood, roadways could be inundated with floodwaters. Some of these roadways could be emergency evacuation routes which would result in people being stranded or prevent emergency vehicles from getting to those in need of help. Roadways could also be damaged by the floodwaters and would require repairs once waters have receded. A precise determination of significance is not possible and cannot be made because the extent of magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered too speculative for meaningful consideration.

3.10.4 Alternative 1 – Improve Levees

Implementation of Alternative 1 would require hauling of construction equipment and materials along highways and local roads that provide access to the project levees. The estimated duration of construction for each study reach under Alternative 1 is shown on Table 4 in Chapter 2. Construction of Alternative 1 is estimated to take approximately 10 years, with work spread out evenly over the entire time period. Evaluation of effects to transportation are based on a maximum of 1 million yards of borrow material and 2.8 million tons of rock being transported for construction. Because of the earthwork involved and the need for materials deliveries, construction would intermittently generate substantial volumes of traffic. Once the construction is completed, maintenance needs would be very limited. Analysis of traffic effects therefore concentrate on the construction of levee improvements.

Implementation of Alternative 1 would result in a substantial increase in traffic on local roadways associated with truck haul trips during construction activities. In addition, traffic controls would cause or contribute to temporary substantial increases in traffic levels on several roadways, as traffic is detoured or slowed. Traffic controls could cause delays during the morning and evening peak commute hours. All construction vehicles would be required to follow local traffic laws and speed limits.

American River

Haul trucks would increase traffic on major surface streets such as Watt Avenue, Fair Oaks Boulevard, Howe Avenue, Folsom Boulevard. Overall, project construction would result in a substantial temporary and short-term increase in traffic on local roadways, and these temporary and short-term impacts are considered significant.

Additionally, haul trucks would use local minor arterial streets to access the construction sites. All construction vehicles would be required to follow local traffic laws and speed limits. Construction on the American River would require trucks to enter the American River Parkway. The increased traffic in the Parkway would result in impacts to recreational users and residents who back up to the levee structure. Those that use the bike path in the Parkway as a commuter route would also be impacted during construction. A detour would be established where the bike trail is impacted to excavate for the installation of the rock trench. Outside of the Parkway, hauling on residential roads to access the Parkway would result in significant impacts to residents along the selected routes.

Haul routes have not been finalized at this time however, previous work on other Corps projects in this area have used existing roadways to access the project sites. Testing of potential borrow sites has not been done and so the exact location of where borrow material will come from is unknown along with the haul routes. The rock needed for construction will be obtained from a commercial source; however, the location of the commercial source is also unknown. Because the American River has many shallow areas, barges cannot be used to transport material to the site, therefore, rock would be transported to the construction site using haul trucks.

Sacramento River

Haul trucks would increase traffic on major surface streets such as Pocket Road, Freeport Boulevard, and Riverside Boulevard. Overall, project construction would result in a substantial temporary and short-term increase in traffic on local roadways, and these temporary and short-term impacts are considered significant. Additionally, haul trucks would use local minor arterial streets to access the construction sites and levee systems.

Where rock berms are constructed, to reduce the risk of erosion, the rock material would be transported from a commercial rock quarry by either barge or haul trucks. Both of these methods of transporting rock have been used in the past on Corps projects. The barges are not expected to have a significant impact on traffic as the Sacramento River is not a major transportation corridor for goods. The primary traffic on the Sacramento River is recreational boaters and they would be able to maneuver around any barges transporting materials to the construction site. Transporting rock using barges would have a less than significant impact on traffic. However, if the rock is transported using haul trucks there would be a short term significant impact on traffic as all the rock is moved on major roadways and onto surface streets to reach the construction sites.

East Side Tributaries

Haul trucks would increase traffic on major surface streets such as Marysville Boulevard and Raley Boulevard. Overall, project construction would result in a substantial temporary and short-term increase in traffic on local roadways, and these temporary and short-term impacts are considered significant. There are many smaller surface streets that will also be used to transport the material to the construction sites.

3.10.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Alternative 2 would require 1 mile of levee raise compared to the 8 miles under Alternative 1. This would result in fewer trucks hauling material along mostly residential streets and along the levee alignment. Additionally, the Sacramento Weir and Bypass expansion would require fill material to construct the new levee. Hauling would occur on existing roads in the rural area of Yolo County. Impacts to traffic under this alternative would be short-term and significant until construction is completed. Once completed traffic would return to the pre-project conditions.

3.10.6 Avoidance, Minimization, and Mitigation Measures

In order to reduce the impacts from traffic to below the significant level, measures would be implemented which could include, but are not limited to the following:

- The contractor would be required to prepare a Traffic Control and Road Maintenance Plan. A traffic control plan describes the methods of traffic control to be used during construction. All on-street construction traffic would be required to comply with the local jurisdiction's standard construction specifications. The plan will reduce the effects of construction on the roadway system in the project area throughout the construction period. Construction contractors will follow the standard construction specifications of affected jurisdictions and obtain the appropriate encroachment permits, if required. The conditions of the encroachment permit will be incorporated into the construction contract and will be enforced by the agency that issues the encroachment permit.
- The construction contractor would provide adequate parking for construction trucks, equipment, and construction workers within the designated staging areas throughout the construction period. If inadequate space for parking is available at a given work site, the construction contractor would provide an off-site staging area and, as needed, coordinate the daily transport of construction vehicles, equipment, and personnel to and from the work site.

- Proposed lane closures will be coordinated with the appropriate jurisdiction and will be minimized to the extent possible during the morning and evening peak traffic periods. Standard construction specifications also typically limit lane closures during commuting hours. Lane closures will be kept as short as possible. If a road must be closed, detour routes and/or temporary roads will be made to accommodate traffic flows. Detour signs will be provided to direct traffic through detours. Advance notice signs of upcoming construction activities will be posted at least 1 week in advance so that motorists are able to avoid traveling through the study area during these times. Within the Parkway, detours would be used to allow for continued use by bicycle commuters.
- Existing safe pedestrian and bicyclist access will be maintained in or around the construction areas at all times. Construction areas will be secured as required by the applicable jurisdiction to prevent pedestrians and bicyclists from entering the work site, and all stationary equipment will be located as far away as possible from areas where bicyclists and pedestrians are present. The construction contractor will notify and consult with emergency service providers to maintain emergency access and facilitate the passage of emergency vehicles on city streets.
- Emergency vehicle access will be made available at all times. Coordination with local emergency responders by the contractor to inform them of the construction activities will be required by the contractor.
- The construction contractor will assess damage to roadways used during construction and will repair all potholes, fractures, or other damages.

As mentioned above, the number of required truck trips has not been determined at this time. However, based on other Corps projects in the area and past experience with similar activities it is assumed that this effect would be remain significant during construction due to the volume of trucks on local roadways.

3.11 Air Quality

3.10.1 Environmental Setting

Regulatory Setting

The following Federal, State, and Local laws and regulations apply to the resources covered in this Section. Descriptions of the laws and regulations can be found in Section 5.0.

Federal

- Federal Clean Air Act (CAA)

State

- California Clean Air Act

Existing Conditions

The ARCF GRR study area is located in the Sacramento Valley Air Basin (SVAB), which includes both Sacramento and Yolo Counties. The majority of the study area is located in Sacramento County, which places the project primarily under the jurisdiction of the Sacramento Metropolitan Air Quality Management District (SMAQMD). However, the Sacramento and Yolo Bypasses are located in Yolo County, which is under the jurisdiction of the Yolo-Solano Air Quality Management District (YSAQMD).

The study area is located at the southern end of the Sacramento Valley, which has a Mediterranean climate characterized by hot, dry summers and mild, rainy winters. Summer high temperatures are hot, often exceeding 100 degrees Fahrenheit (°F). Winter temperatures are cool to cold, with minimum temperatures often dropping into the high 30s. Most of the precipitation occurs as rainfall during winter storms. The rare occurrence of precipitation during summer is in the form of convective rain showers. Also characteristic of the SVAB are winters with periods of dense and persistent low-level fog that are most prevalent between storms. Prevailing wind speeds are moderate.

The topographic features giving shape to the SVAB include the Coast Range to the west, the Sierra Nevada to the east, and the Cascade Range to the north. These mountain ranges channel winds through the SVAB, but also inhibit the dispersion of pollutant emissions. Because the Sacramento Valley is shaped like a bowl, ozone pollution presents a serious problem when an inversion layer traps pollutants close to the ground, causing unhealthy air quality levels. Vehicles and other mobile sources, including trucks, locomotives, buses, motorcycles, agricultural equipment, and construction equipment cause about 70 percent of the region's air pollution problems during the summer (SMAQMD 2010).

May through October is ozone season in the SVAB. This period is characterized by poor air movement in the mornings and the arrival of the Delta sea breeze from the southwest in the afternoons. Typically, the Delta breeze transports air pollutants northward out of the SVAB; however, a phenomenon known as the Schultz Eddy prevents this from occurring during approximately half of the time between July and September. The Schultz Eddy causes the wind pattern to shift southward, causing air pollutants that have moved to the northern end of the Sacramento Valley to be blown back toward the south before leaving the valley. This phenomenon exacerbates concentrations of air pollutants in the area and contributes to violations of the ambient air quality standards (Solano County 2008).

Criteria Pollutants

The CAA established the National Ambient Air Quality Standards (NAAQS) for specific air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter with an aerodynamic diameter of 10 micrometers or less (PM_{10}), fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less ($PM_{2.5}$), and lead (Pb). O_3 is a secondary pollutant that is not emitted directly into the atmosphere. Instead it forms by the reaction of two ozone precursors: reactive organic gases (ROG) and nitrogen oxides (NO_X).

For these criteria pollutants, NAAQS and the California Ambient Air Quality Standards (CAAQS) were established to protect public health and welfare. The standards create a margin of safety protecting the public from adverse health impacts caused by exposure to air pollution. The U.S. Environmental Protection Agency (USEPA) is responsible for enforcing the NAAQS, primarily through their review of the State Implementation Plans (SIPs) for each state. In the State of California, the California Air Resources Board (CARB) is responsible for the establishment of the SIP. The local air quality management districts are responsible for the enforcement of the SIP, as well as the NAAQS and CAAQS. The NAAQS and CAAQS are shown in Table 25.

Table 25. State and Federal Ambient Air Quality Standards.

Pollutant	Averaging Time	National Primary Standard[a]	California Standard[b]	Violation Criteria	
				National	California
CO	8 hour	9 ppm	9 ppm	Not to be exceeded more than once per year	Not to be exceeded
	1 hour	35 ppm	20 ppm	Not to be exceeded more than once per year	Not to be exceeded
NO_2	Annual	0.053 ppm	0.030 ppm	If exceeded mitigation credits will be required.	Not to be exceeded
	1 hour	0.100 ppm	0.18 ppm	The 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 0.100 ppm.	Not to be exceeded
O_3	8 hour	0.075 ppm	0.070 ppm	The ozone standard is attained when the 4th highest 8-hour concentration measured at each site in a year, averaged over 3 years, is equal to or less than the standard.	Not to be exceeded
	1 hour	N/A	0.09 ppm	N/A	Not to be exceeded

Pollutant	Averaging Time	National Primary Standard[a]	California Standard[b]	Violation Criteria	
				National	California
PM_{10}	Annual	N/A	20 µg/m3	N/A	Not to be exceeded
	24 hour	150 µg/m3	50 µg/m3	The 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m3 is equal to or less than one.	Not to be exceeded
$PM_{2.5}$	Annual	12 µg/m3	12 µg/m3	The 3-year average of the weighted annual mean must not exceed	Not to be exceeded
	24 hour	35 µg/m3	N/A	The 24 hour standard is attained when 98% of the daily concentrations, averaged over three years, are equal to or less than the standard	N/A
SO_2	24 hour	0.14 ppm	0.04 ppm	Not to be exceeded more than once per year	Not to be exceeded
	3 hour	N/A[c]	N/A	N/A	N/A
	1 hour	0.075 ppm	0.25 ppm	The 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 0.075 ppm.	Not to be exceeded
Pb	30 day	N/A	1.5 µg/m3	N/A	Not to be exceeded or equaled
	Quarter	1.5 µg/m3	N/A	Not to be exceeded more than once per year	N/A
	3 month	0.15 µg/m3	N/A	Not to be exceeded more than once per year	N/A

Source: CARB, 2012
[a] 40 CFR 50.4 through 50.13
[b] California Code of Regulations, Table of Standards, Section 70200 of Title 17
[c] No National Primary 3 hour standard for SO_2. National Secondary 3 hour standard for SO_2 is 0.5 ppm.
µg/m3 micrograms per cubic meter
ppm parts per million
N/A Not Applicable; State and Federal Standards do not exist.

Table 26. State and Federal Attainment Status.

Criteria Pollutant	Averaging Time	Federal Status	State Status
O_3	1 Hour 8 Hour	N/A Non-Attainment--Severe	Non-Attainment--Serious Non-Attainment--Serious
PM_{10}	24 Hour Annual	Non-Attainment--Moderate N/A	Non-Attainment Non-Attainment
$PM_{2.5}$	24 Hour Annual	Non-Attainment* N/A	N/A Non-Attainment
CO	1 Hour 8 Hour	Attainment Attainment	Attainment Attainment
NO_2	1 Hour Annual	N/A Attainment	Attainment N/A
SO_2	3 Hour 24 Hour Annual	Attainment Attainment Attainment	N/A Attainment N/A
Pb	30 Day Quarter	N/A Attainment	Attainment N/A

Source: SMAQMD, 2012
N/A Not Applicable; State or Federal Standards do not exist.
* USEPA used the updated 2010-2012 ambient air quality data for the determination and final rule became effective on August 14, 2013.

Due to the non-attainment designations for the SVAB discussed above, SMAQMD is required to prepare SIPs for O_3, PM_{10}, and $PM_{2.5}$. The status of these SIPs for the SVAB is summarized below.

- O_3: A final attainment designation for the 2008 O_3 NAAQS of 0.075 ppm has been provided by the USEPA (77 FR 30160) and an attainment plan will be developed for submittal to USEPA in 2015.
- PM_{10}: The USEPA is in the process of reviewing a maintenance plan and evaluating a State's request to redesignate the Sacramento non-attainment area to attainment.
- $PM_{2.5}$: Since SMAQMD has determined this to be below thresholds for the past several years they are preparing a maintenance plan and redesignation request for adoption and submittal to CARB in October 2013.

Additionally, Federal projects are subject to the CAA General Conformity Rule (40 CFR 51, Subpart W). The purpose of the General Conformity Rule is to ensure that Federal project conform to applicable SIPs so that they do not interfere with strategies used to attain the NAAQS. The rule applies to Federal project in non-attainment areas for any of the six criteria pollutants for which the EPA has established these standards, and in any areas designated as "maintenance" areas. The rule covers both direct and indirect emission of criteria pollutants or their precursors that result from a Federal project, are reasonably foreseeable, and can be practicably controlled by the Federal agency through its continuing program responsibility.

Toxic Air Contaminants

A Toxic Air Contaminant (TAC) is defined by California law as an air pollutant that "may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health." TACs can be emitted from stationary or mobile sources. Ten TACs have been identified through ambient air quality data as posing the greatest health risk in California. Direct exposure to these pollutants has shown to cause cancer, birth defects, damage to the brain and nervous system, and respiratory disorders. TACs do not have ambient air quality standards because no safe levels of TACs have been determined. Instead, TAC impacts are evaluated by calculating the health risks associated with exposure.

TACs relevant to the project were determined based on SMAQMD guidance and the project area conditions. The only TAC that has the potential to occur due to this project is diesel particulate matter (DPM). DPM differs from other TACs in that it is not a single substance, but rather a complex mixture of gases, vapors, and particles, many of which are known human carcinogens. Most researchers believe that diesel exhaust particles contribute most of the risk because the particles in the exhaust carry many harmful organics and metals. Unlike the other TACs, no ambient monitoring data are available for diesel PM because no routine measurement method currently exists (DWR, 2012).

With implementation of CARB's Diesel Risk Reduction Plan, it is expected that DPM concentrations in the State of California will be reduced by 75 percent in 2010 and 85 percent in 2020 from the estimated year-2000 level. The Diesel Risk Reduction Plan is a comprehensive plan to reduce diesel PM emissions, and consists of three major components (CARB, 2000):

- New regulatory standards for all new on-road, off-road, and stationary diesel-fueled engines and vehicles, to reduce DPM emissions by about 90 percent overall from current levels.
- New retrofit requirements for existing on-road, off-road, and stationary diesel-fueled engines and vehicles, where determined to be technically feasible and cost effective.
- New Phase 2 diesel fuel regulations to reduce sulfur content levels in diesel fuel to no more than 15 parts per million, to provide the quality of diesel fuel needed by the advanced diesel PM emission controls.

Odors

Odors are typically considered a local air quality problem. USEPA has not established regulations that deal with the generation of odors. However, local air districts have developed rules that apply to and regulate the generation of odors. Odors are generally regarded as an annoyance rather than a health hazard. However, manifestations of a person's reaction to foul odors can range from psychological (e.g., irritation, anger, anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, headache).

The ability to detect odors varies considerably among the population and overall is quite subjective. Some individuals have the ability to smell minute quantities of specific substances; others may not have the same sensitivity but may have sensitivities to odors of other substances. In addition, people may have different reactions to the same odor; an odor that is offensive to one person may be perfectly acceptable to another. It is important to also note that an unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. This is because of the phenomenon known as odor fatigue, in which a person can become desensitized to almost any odor and recognition only occurs with an alteration in the intensity.

Quality and intensity are two properties present in any odor. The quality of an odor indicates the nature of the smell experience. For instance, if a person describes an odor as flowery or sweet, the person is describing the quality of the odor. Intensity refers to the strength of the odor. For example, a person may use the word "strong" to describe the intensity of an odor. Odor intensity depends on the odorant concentration in the air. When an odorous sample is progressively diluted, the odorant concentration decreases. As this occurs, the odor intensity weakens and eventually becomes so low that the detection or recognition of the odor is quite difficult. At some point during dilution, the concentration of the odorant reaches a detection threshold. An odorant concentration below the detection threshold means that the concentration in the air is not detectable by the average human (DWR, 2012).

Sensitive Receptors

A sensitive receptor is generally defined as a location where human populations, especially children, seniors, and sick persons are found, and where there is a reasonable expectation of continuous human exposure according to appropriate standards (e.g., 24-hour, 8-hour, and 1-hour standards). Sensitive land uses and sensitive receptors generally include residents, hospital staff and patients, and school teachers and students.

In the ARCF GRR study area, the primary sensitive receptors would be the residents whose properties are adjacent to the levees along the American and Sacramento Rivers and the East Side Tributaries. Residents back up to the levee and in most cases there is very little space between the levee toe and the back fence. In addition, there are a number of schools along the rivers within both the American River North and South Basins. Additional sensitive receptors could also include recreationists or local wildlife species.

3.11.2 Methodology and Basis of Significance

Methodology

The air quality emissions analysis for the ARCF GRR was developed based on several interrelated assumptions and constraints:

- The project will require 10 separate years to construct the required features;
- Project funding will be limited to $100 million per construction year;
- The project will receive $100 million per construction year;
- In any given year, approximately 85% of the funding will be applied toward construction;
- A construction season is six months (April 15 to October 15);
- Construction will begin in 2015; (this date was used for analysis purposes of this EIS/EIR)
- All project plans and specifications will require that construction contractors use only off-road equipment that implements the SMAQMD Enhanced Exhaust Control Practices and only use on-road hauling equipment that was manufactured in 2010, or later; and,

It was determined through discussions with staff from the SMAQMD, that the most reasonable approach to determine if the project was to be in compliance with Federal and local standards was to base the evaluation on a “worst case scenario” construction year.

Furthermore, the most combined air emissions would occur during the second year of construction in Reach F of the American River South basin. Reach F was chosen because it is the single longest reach (5 miles) in the entire Common Features Project, and due to design, constructability, and funding constraints, will take 3 1/3 years to construct. This would allow for 1.5 miles of construction in years 1 through 3, with the last 0.5 miles to be completed in the fourth year. The following construction activities are scheduled for this reach: clearing of trees and vegetation, degrading and excavation of the levee, construction of two types of seepage control slurry cutoff walls (conventional slot-trench and deep soil mixing), reconstruction of the levee, relocation of utilities, and delivery and installation of rip-rap on the waterside slope. The slurry cutoff walls must be allowed to cure until the following construction season before the rip-rap is placed. Under this scenario, the rip-rap would be placed on the slopes of the segment completed in the first year of construction, while all other construction activities are being conducted in the second year segment. The staggering of construction years for the placement of rip-rap would continue until Reach F would be completed.

In close coordination with SMAQMD, the Corps used their Road Construction Emissions Model (RCEM), as it was designed to calculate air emissions for linear projects. The construction activities listed above were broken out into 19 individual sub-tasks based on information developed by Corps engineering and cost-estimating staff. Using the RCEM, a model run was conducted for each sub-task, with one exception: the barging of rip-rap material to the project site. In this case, information for barging material was developed, in close coordination with SMAQMD staff, for similar activities being conducted for the Folsom JFP. It was agreed that it is reasonable to use this information for the purposes of a feasibility-level study. Although calculations for the JFP involved smaller harbor craft than that assumed for the ARCF project, SMAQMD staff determined that it was reasonable to extrapolate the air emissions data by increasing the horsepower, daily hours and number of days in the JFP model to calculate specific emissions data (ROG, CO, NO_X, PM, and CO_2) for the Common Features project.

In order to provide a means of comparison for future decision-making purposes, the delivery and placement task was also calculated using the assumption that the same amount of material to be barged to the project site, would be trucked to the site in the same period of time. Borrow sites have not been identified at this time but are assumed to be located within a 20 miles radius from the project area. Emissions associated with material borrow activities could fall within SMAQMD, YSAQMD, or Feather River Air Quality Management District (FRAQMD). The average one-way hauling distance between the borrow site locations is approximately 20 miles, of which 18 miles could be in the YSAQMD, 20 miles could be in the SMAQMD, and 8 miles could be in the FRAQMD. It was assumed barges powered by towboats would carry the riprap material from the San Rafael Rock Quarry through the Bay-Delta and the Sacramento River to the project sites. The average one-way hauling distance between the San Rafael Rock Quarry and the project area is approximately 100 miles, of which 22 miles would be in the YSAQMD, 37 miles in the SMAQMD, and 41 miles in the Bay Area Air Quality Management District (BAAQMD).

The results of the construction emissions analysis are shown in Tables 30 (truck delivery scenario) and 31 (barge delivery scenario) in both pounds per day (for local standards) and tons per year (for Federal standards). Note that neither version of this scenario (barging or trucking rip-rap) would be able to perform consistently under the local standard for NO_X (Table 26), however, the trucking alternative would require a lower overall mitigation fee cost. In the case of the Federal *de minimis* standards (Table 28) the alternative that involves trucking the rip-rap is within the Federal *de minimis* standard, even without mitigation, while the barging alternative is assumed to meet the standard using the mitigation provided by the implementation of Enhance Exhaust Control Practices for off-road equipment and only using on-road heavy-duty diesel trucks or equipment with a gross vehicle weight rating of 19,500 pounds or greater shall comply with USEPA 2007 on-road emission standards for PM and NO_X (0.01 g/bhp-hr and at least 1.2 g/bhp-hr, respectively).

Basis of Significance

For this analysis, an effect was considered significant if it would:

- Conflict with, or obstruct implementation of, the applicable air quality plan;
- Violate any air quality standard or substantial contribution to existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a non-attainment area under NAAQS and CAAQS;
- Expose sensitive receptors to substantial pollutant concentrations; or
- Create objectionable odors affecting a substantial number of people.

An air quality effect is considered to be significant if the project's construction emissions would exceed districts' CEQA emission thresholds. Because district-specific CEQA thresholds apply only to the portions of emissions generated under their jurisdiction. The CEQA emission thresholds for the YSAQMD, SMAQMD, BAAQMD, and FRAQMD are shown in Table 27.

Table 27. CEQA Thresholds of Significance.

Pollutant	YSAQMD	SMAQMD	BAAQMD	FRAQMD
Construction				
ROG	10 tons/year	None	54 lb/day	25 lb/day
NO_X	10 tons/year	85 lb/day	54 lb/day	25 lb/day
CO	Violation of a CAAQS	Violation of a CAAQS	None	None
PM10	80 lb/day	Violation of a CAAQS or failure to implement emissions control practices	Exhaust: 82 lb/day; Fugitive dust: failure to implement BMPs.	80 lb/day
PM2.5	None	Same as PM10	Exhaust: 54 lb/day; Fugitive dust: failure to implement BMPs.	None
TACs	None	None	Increased cancer risk of 10 in 1 million; increased non-cancer risk of greater than 1.0 (HI); PM2.5 increase of greater than 0.3 micrograms per cubic meter	None
Operation				
ROG	Same as construction	65 lb/day	Not applicable to the project because no operation and maintenance activity would occur within the district.	Not applicable to the project because no operation and maintenance activity would occur within the district.
NO_X	Same as construction	65 lb/day		
CO	Same as construction	Same as construction		
PM10	Same as construction	Same as construction		
PM2.5	Same as construction	Same as construction		
TACs	Increased cancer risk of 10 in 1 million or increased non-cancer risk of greater than 1.0 (HI)	Increased cancer risk of 10 in 1 million or increased non-cancer risk of greater than 1.0 (HI)		

An air quality effect is considered to be significant under NEPA if the project's construction emissions would exceed the General Conformity *de minimis* thresholds listed in Table 28.

Table 28. Federal General Conformity *de Minimis* Thresholds.

	ROG	NO_X	CO	PM_{10}	$PM_{2.5}$
Air Basin	**Annual Air Pollutant Emissions in Tons per Year**				
Sacramento Valley Air Basin (include YSAQMD , SMAQMD and FRAQMD)	25	25	100	100	100
Bay Area Air Basin (includes BAAQMD)	50	100	100	None	100

Source: 40 CFR 93.153

3.11.3 No Action Alternative

The No Action Alternative is the continuation of the existing conditions along the levee reaches and absence of levee alternatives to increase the level of protection. Current levee operations and maintenance activities would continue, with limited, temporary, intermittent emissions that would not result in a significant level of impact.

Without improvements to the levee system, the risk of levee failure would remain high. Under these conditions, a flood event could cause portions of the levees to fail, triggering widespread flooding and extensive damage. If a catastrophic flood were to occur, emergency flood fighting and clean-up actions would require the use of a considerable amount of heavy construction equipment. Timing and duration of use would directly correlate with flood fighting needs, but it is likely that pollutants emitted would violate air quality standards for pollutants (including those for which the area is already considered non-attainment), increase greenhouse gas (GHG) emissions, and expose sensitive receptors to toxic air emissions. Depending on the magnitude of the flood, flood fighting could last for weeks or even months. Furthermore, because of the unpredictable nature of an emergency response, no BMPs to manage emissions would be in place. All of these effects could be considered significant. However, the timing, duration, and magnitude of a flood event are speculative and unpredictable, and therefore a precise determination of significance is not possible.

3.11.4 Alternative 1 – Improve Levees

A project is deemed inconsistent with air quality plans if it would result in population and/or employment growth that exceeds growth estimates included in the applicable air quality plan, which, in turn, would generate emissions not accounted for in the applicable air quality plan emissions budget. Growth-inducing and cumulative effects are addressed in Chapter 4. As discussed in Chapter 4, the project would not conflict with or obstruct the implementation of air quality plans; therefore this direct effect would be less than significant and no mitigation is required.

Construction Emissions

The construction emissions are estimated for the project site based on the emission rates and assumptions described in Section 3.11.2., Methodology. Emission sources associated with the project site include the off-road construction equipment operating at project sites, on-road vehicles traveling to and from the project sites, retaining wall, utility usage, and fugitive dust associated with earthmoving and soil-disturbance activities at project sites. Emission sources associated with the material borrow activities include the off-road construction equipment operating at borrow sites, on-road hauling trucks traveling between borrow sites and the project sites, and fugitive dust associated with earthmoving and soil-disturbance activities at borrow sites. The delivery of rip-rap was calculated using the assumption that the material could be barged to the project site or trucked to the site during the same period of time. Table 29 summarizes the emission sources associate with the project construction that would occur in the SMAQMD, YSAQMD, BAAQMD, and FRAQMD.

Table 29. Emission Sources occurring in the SMAQMD, YSAQMD, BAAQMD, and FRAQMD.

Emission Sources	SMAQMD	YSAQMD	BAAQMD	FRAQMD
Off-Road Construction Equipment	X			
On-Road Vehicles	X			
On-Water Towboats/ Barges	X	X	X	
Dust Emissions from Land Disturbance and Earth Moving	X			
Off-Site Material Borrow, including fugitive dust, off-road construction equipment, and on-road vehicles associated with the activity.	X	X		X

Maximum daily emissions are estimated for ROG, NO_X, PM_{10}, and $PM_{2.5}$ to evaluate emissions against SMAQMD, and YSAQMD thresholds under the truck delivery scenario. Those results are shown in Table 30. Construction-related emissions under Alternative 1 would exceed the SMAQMD's emission threshold for NO_X. The actual emissions may be reduced depending on the availability of the borrow pits that are located closer to the project sites; regardless, the overall construction emissions under the alternative still would exceed the thresholds. Therefore, construction of the alternative would result in a significant effect. After a 20 percent reduction in NO_X for off-road equipment mitigation, construction-related emissions still would exceed the SMAQMD's emission thresholds for NO_X. Because NO_X emissions would exceed SMAQMD's threshold, the Corps would be required to pay an off-site mitigation fee for NO_X emissions in the SVAB, which would reduce the effect to a less-than-significant level. Borrow activities emissions would not exceed YSAQMD thresholds, therefore, would result in a less-than-significant impact. Since less than 50 percent of borrow activities emissions could occur in FRAQMD, it was assumed FRAQMD thresholds would not be exceeded. Borrow activities emissions associated with potential borrow site located north of the project site were captured in the SMAQMD off-site soil estimations.

Table 30. Construction Emissions: Alternative 1, Truck Delivery Scenario.

	Annual Emissions in Tons					Maximum Daily Emissions in Pounds					
Construction Year	**ROG**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**NO_X**	**NO_X* Mitigated**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emissions generated in SMAQMD											
Year 2 Onsite Construction	1.5	22.3	8.9	7.4	2.0	11.6	159.7	143.7	66.8	29.9	5.4
Year 2 Off-Site Soil Borrow	0	0.7	0.1	0.1	0	6.7	176.2	166.0	34.2	71.8	17.5
Year 2 Total	1.5	23.0	9.0	7.5	2.0	18.3	335.9	309.7	101	101.7	22.9
CEQA Threshold							85				
Exceed Threshold?							Yes				
General Conformity *de minimis* Threshold	25	25	100	100	100						
Exceed Threshold?	No	No	No	No	No						
Emissions generated in YSAQMD											
Year 2 Off-Site Soil Borrow	0	0.6	0.1	.01	0	6.03	158.8	149.4	30.78	65.67	15.75
CEQA Threshold	10	10	NA	NA	NA					80	
Exceed Threshold?	No	No								No	
General Conformity *de Minimis* Threshold	25	25	100	100	100						
Exceed Threshold?	No	No	No	No	No						

Notes:
* Values based on a 20% mitigation for off-road equipment

Maximum daily emissions are estimated for ROG, NO_X, PM_{10}, and $PM_{2.5}$ to evaluate emissions against SMAQMD, YSAQMD, and BAAQMD thresholds under the barge delivery scenario. Those results are shown in Table 31. Construction-related emissions under Alternative 1 would exceed the SMAQMD's and BAAQMD's emission thresholds for NO_X. Therefore, construction of the alternative with barge delivery would result in a significant effect. After a 20 percent reduction in NO_X for off-road equipment mitigation, construction-related emissions still would exceed the SMAQMD's emission thresholds for NO_X. Because NO_X emissions would exceed SMAQMD's threshold, the Corps would be required to pay an off-site mitigation fee for NO_X emissions in the SVAB would be reduced to a less-than-significant level. Borrow activities and barge delivery emissions would not exceed YSAQMD thresholds, therefore, would result in a less-than-significant impact. Since less than 50 percent of borrow activities emissions could occur in FRAQMD, it was assumed FRAQMD thresholds would not be exceeded. Borrow activities emissions associated with potential borrow site located north of the project site were captured in the SMAQMD off-site soil estimations.

Table 31. Construction Emissions: Alternative 1, Barge Delivery Scenario.

Construction Year	Annual Emissions in Tons					Maximum Daily Emissions in Pounds					
	ROG	NO_X	CO	PM_{10}	$PM_{2.5}$	ROG	NO_X	NO_X* Mitigated	CO	PM_{10}	$PM_{2.5}$
Emissions generated in SMAQMD											
Year 2 Onsite Construction	2.0	22.6	10.7	6.25	1.6	11.6	159.7	143.7	66.8	29.9	5.4
Year 2 Off-Site Soil Borrow	0	0.7	0.1	0.1	0	6.7	176.2	166.0	34.2	71.8	17.5
Year 2 Barge Delivery	0.41	3.92	1.67	0.15	0	10.2	95.0	82.9	39.4	3.7	1.7
Year 2 Total	2.4	27.2	12.5	6.5	1.6	28.5	430.9	392.7	140.4	105.4	24.6
CEQA Threshold	NA	NA	NA	NA	NA	NA	85		NA	NA	NA
Exceed Threshold?							Yes				
General Conformity *de Minimis* Threshold	25	25	100	100	100						
Exceed Threshold?	No	Yes	No	No	No						
Emissions generated in YSAQMD											
Year 2 Off-Site Soil Borrow	0	0.6	0.1	.01	0	6.03	158.8	149.4	30.78	65.67	15.75
Year 2 Barge Delivery	0.24	2.33	1	.01	0	6.07	56.5	48.9	23.43	2.2	1
Year 2 Total	0.24	2.93	1.1	.02	0	12.1	215.3	198.3	54.21	67.87	16.75
CEQA Threshold	10	10	NA	NA	NA					80	
Exceed Threshold?	No	No								No	
General Conformity *de Minimis* Threshold	25	25	100	100	100						
Exceed Threshold?	No	No	No	No	No						
Emissions generated in BAAQMD**											
Year 2 Barge Delivery	0.45	4.35	1.85	.16	0	11.32	105.3	91.2	43.67	4.1	1.84
CEQA Threshold						54	54			82	54
Exceed Threshold?						No	Yes			No	No
General Conformity *de Minimis* Threshold	50	100	100	NA	100						
Exceed Threshold?	No	No	No		No						

Notes:
* Values based on a 20% mitigation for off-road equipment
**Only on-water exhaust emissions generated from towboats are expected to occur within the BAAQMD.

As shown in Table 30, annual construction emissions under the truck delivery scenario would not exceed the General Conformity threshold for NO_X in the SVAB, resulting in a less than significant effect. However, under the annual construction emissions for the barging alternative would exceed the General Conformity threshold for NO_X in the SVAB, resulting in a significant adverse effect. With the implementation of the Enhance Exhaust Control Practices for off-road equipment and only using on-road heavy-duty diesel trucks or equipment that comply with USEPA 2007 on-road emission standards, annual construction emissions would be reduced to below *de minimis* thresholds. Therefore, this direct effect would be reduced to a less-than–significant level.

As noted in Section 3.11.2, the air quality management agencies in the project area consider emissions in excess of their project-level thresholds to have the potential to contribute to a cumulative impact on regional air quality. Cumulative effects are addressed in Section 4.2.7.

Fugitive Dust

Construction of the proposed project would result in short-term dust emissions from grading and earth moving activities at the project construction sites and the soil borrow sites. The amount of dust generated would be highly variable and is dependent on the size of the disturbed area at any given time, amount of activity, soil conditions, and meteorological conditions. Nearby land uses, especially those residences and schools located downwind of the project sites could be exposed to dust generated during construction activities, indirectly resulting in potential adverse health effects. This indirect effect would be significant, but implementation of mitigation measures would reduce dust emissions during construction to a less-than-significant level.

Toxic Air Contaminants

Construction of the proposed project would result in short-term diesel particulate emissions from onsite heavy duty equipment and on-road haul trucks. DPM, which is classified as a carcinogenic TAC by CARB, is the primary pollutant of concern with regard to indirect health risks to sensitive receptors. Nearby land uses, especially those residences and schools located downwind of the project sites could be exposed to DPM generated during construction activities, indirectly resulting in potential adverse health effects.

The assessment of health risks associated with exposure to diesel exhaust typically is associated with chronic exposure, in which a 70-year exposure period is often assumed. However, while cancer can result from exposure periods of less than 70 years, acute exposure periods (i.e., exposure periods of 2 to 3 years) to diesel exhaust are not anticipated to result in an increased health risk, as health risks associated with exposure to diesel exhaust are typically seen in exposures periods that are chronic. Because construction activities along each segment are not expected to take place for more than 180 days per year over the of 13-year construction period, construction activities would occur linearly along the segment alignment and would not occur over a prolonged period in any one general location, there would a limited number of pieces of heavy equipment used at a construction site. Furthermore, as required by CARB regulation 13 CCR 2449(d)(3), no in-use off-road diesel vehicles may idle for more than 5 consecutive minutes. In addition, implementation of mitigation measures would further reduce exhaust emissions and associated health risks during construction to less than significant.

Odors

The proposed project would not result in any major sources of odor, and the project would not involve operation of any of the common types of facilities that are known to produce odors (e.g., landfill, wastewater treatment facility). Odors associated with diesel exhaust emissions from the use of onsite construction equipment may be noticeable from time to time by adjacent receptors. However, the odors would be intermittent and temporary and would dissipate rapidly from the source with an increase in distance. Furthermore, as required by CARB regulation 13 CCR 2449(d)(3), no in-use off-road diesel vehicles may idle for more than 5 consecutive minutes. Therefore, this direct effect would be less than significant. In addition, implementation of mitigation measures, which are required under other air quality effects, would further reduce exhaust emissions and provide advanced notification of construction activity.

3.11.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Alternative 2 would include all levee improvements as in Alternative 1, except for a majority of the levee raises along the Sacramento River. Instead of the levee raises, the Sacramento Weir and Bypass would be widened to divert more flows into the Yolo Bypass. Similar to Alternative 1, Alternative 2 would not conflict with or obstruct the implementation of an applicable air quality plan. Growth-inducing and cumulative effects are addressed in Chapter 4.

The construction emissions are estimated for the project site based on the emission rates and assumptions described in Section 3.11.2., Methodology. The assumptions based on the distance and delivery of material is the same as described under Alternative 1. Table 32 summarizes the emission sources associate with the project construction that would occur in the SMAQMD, YSAQMD, BAAQMD, and FRAQMD.

Table 32. Emission Sources Occurring in the SMAQMD, YSAQMD, BAAQMD, and FRAQMD.

Emission Sources	SMAQMD	YSAQMD	BAAQMD	FRAQMD
Off-Road Construction Equipment	X	X		
On-Road Vehicles	X	X		
On-Water Towboats/ Barges	X	X	X	
Dust Emissions from Land Disturbance and Earth Moving	X	X		
Off-Site Material Borrow, including fugitive dust, off-road construction equipment, and on-road vehicles associated with the activity.	X	X		X

Construction of the Sacramento Weir and Bypass Widening would occur in YSAQMD and include clearing of trees and vegetation, degrading and excavating the levee, construction of the new levee, relocation of utilities, and delivery and installation of rip-rap on the waterside slope. Materials for the construction of the new levee would be reused to the greatest extent possible from the existing levee. The potential borrow sites are located adjacent to the Bypass which would reduce the number of haul truck trips going to and from the site. The construction of Alternative 2 would be spread over 10. Construction of the Sacramento Weir and Bypass would reduce the need for levee raises along the Sacramento River. Materials required for the levee raises was assumed to be trucked from with-in a 20 miles radius.

<u>Construction Emissions</u>

Alternative 1 summarizes the maximum daily emissions estimated for ROG, NO_X, PM_{10}, and $PM_{2.5}$ under the construction emissions that would result in the most combined air emission. As shown in Table 30, construction emissions would exceed SMAQMD's NO_X thresholds under the truck delivery scenario. After implementation of mitigation measure to reduce NO_X by 20 percent, construction emissions would still exceed SMAQMD thresholds. Therefore construction of Alternative 2 would result in a significant effect. The Corps would be required to pay an off-site mitigation fee for NO_X emissions in the SVAB. With the implementation of this mitigation measures, NO_X emissions would be reduced to a less-than-significant level.

Table 31 shows the maximum daily emission under the barge delivery scenario. As shown in Table 31, emissions would exceed SMAQMD's and BAAQMD's NO_X thresholds. After implementation of mitigation measure to reduce NO_X by 20 percent, construction emissions would still exceed thresholds. Therefore construction of Alternative 2 would result in a significant effect. The Corps would be required to pay an off-site mitigation fee for NO_X emissions. With the implementation of mitigation measures, the effect from NO_X emissions would be reduced to a less-than-significant level.

As shown in Table 30 above, annual construction emissions under the truck delivery scenario would not exceed the General Conformity threshold for NO_X in the SVAB. This would result in a less than significant effect. However, as discussed under Alternative 1, the annual construction emissions for the barge delivery scenario would exceed the General Conformity threshold for NO_X, resulting in a significant adverse effect. With the implementation of the Enhance Exhaust Control Practices for off-road equipment and only using on-road heavy-duty diesel trucks or equipment that comply with EPA 2007 on-road emission standards, annual construction emissions would be reduced to below *de minimis* thresholds. Therefore, this direct effect would be reduced to a less-than–significant level.

Long-term cumulative air quality effects under Alternative 2 would be similar to Alternative 1. See Section 4.2.7 for further discussion of cumulative effects.

Fugitive Dust

Construction of Alternative 2 could result in slightly higher short-term dust emissions from grading and earthmoving activities in the SVAB relative to Alternative 1. Nearby land uses, especially those residences located downwind of the project sites, could be exposed to dust generated during construction activities, indirectly resulting in potential adverse health effects. This indirect effect would be significant. Implementation of mitigation measures would reduce the impact from dust emissions during construction to a less-than-significant level.

Toxic Air Contaminants

Construction of Alternative 2 would result in slightly higher short-term DPM emissions in the SVAB relative to Alternative 1. Nearby land uses, especially those residences located downwind of the project sites could be exposed to DPM generated during construction activities, indirectly resulting in potential adverse health effects. However, construction activities along each segment are not expected to take place for more than 180 days at each reach, which is well below the 70-year exposure period often assumed in chronic health risk assessment. Moreover, construction activities would occur linearly along the segment alignment and would not occur over a prolonged period in any one general location and all off-road diesel equipment would comply with CARB regulations regarding consecutive idling. In addition, implementation of mitigation measures, which is required under other air quality effects, would further reduce exhaust emissions during construction to a less than significant level.

Odors

Odors associated with diesel exhaust emissions from onsite construction equipment in the SVAB may be slightly higher than Alternative 1. These odors may be noticeable from time to time by adjacent receptors. However, the odors would be intermittent and temporary and would dissipate rapidly from the source with an increase in distance. Furthermore, as required by CARB regulations, no in-use off-road diesel vehicles may idle for more than 5 consecutive minutes. Therefore, this direct effect would be less than significant. In addition, implementation of mitigation measures, which are required under other air quality effects, would further reduce exhaust emissions and provide advance notification of construction activities.

3.11.6 Avoidance, Minimization, and Mitigation Measures

As described above, some emissions from the project would exceed applicable CEQA and NEPA significance criteria. Therefore, the Corps would implement the following mitigation measures to reduce the potential air quality effects of the project.

SMAQMD's Basic Construction Emissions Control Practices

The SMAQMD requires construction projects to implement basic construction emission control practices to control fugitive dust and diesel exhaust emissions (SMAQMD 2011). The Corps would comply with the following control measures for the project:

- Water all exposed surfaces twice daily. Exposed surfaces include but are not limited to: soil piles, graded areas, unpaved parking areas, staging areas, and access roads.
- Cover or maintain at least two feet of free board space on haul trucks transporting soil, sand, or other loose material on the site. Any haul trucks that would travel along freeways or major roadways should be covered.
- Use wet power vacuum street sweepers to remove any visible trackout mud or dirt from adjacent public roads at least once a day. Use of dry power sweeping is prohibited.
- Complete all roadways, driveways, sidewalks, or parking lots to be paved as soon as possible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used.
- Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to 5 minutes [required by California Code of Regulations, Title 13, sections 2449(d)(3) and 2485]. Provide clear signage that posts this requirement for workers at the site entrances.
- Maintain all construction equipment in proper working condition according to the manufacturer's specifications. The equipment must be checked by a certified mechanic and determined to be running in proper condition before it is operated.

Construction Area Particulate Matter Mitigation Measures

If the project's construction contractor determines that the construction activities would actively disturb more than 15 acres per day, then the contractor would be required to conduct PM_{10} and $PM_{2.5}$ dust modeling. If that modeling shows violations of SMAQMD's PM_{10} or $PM_{2.5}$ CAAQS thresholds, then the contractor would be required to implement sufficient mitigation to avoid exceeding SMAQMD significance thresholds (SMAQMD 2011).

Fugitive Dust Emission Mitigation Measures

Fugitive dust mitigation would require the use of adequate measures during each construction activity and would include frequent water applications or application of soil additives, control of vehicle access, and vehicle speed restrictions. The Corps would implement the dust mitigation measures listed below.

- Water exposed soil with adequate frequency for continued moist soil.
- Suspend excavation, grading, and/or demolition activity when wind speeds exceed 20 mph.
- Install wind breaks (e.g., plant trees, solid fencing) on windward side(s) of construction areas.
- Plant vegetative ground cover (fast-germinating native grass seed) in disturbed areas as soon as possible.
- Install wheel washers for all exiting trucks, or wash off all trucks and equipment leaving the site.
- Treat site accesses to a distance of 100 feet from the paved road with a 6 to 12-inch layer of wood chips, mulch, or gravel to reduce generation of road dust and road dust carryout onto public roads.
- Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The phone number of the District shall also be visible to ensure compliance.

Exhaust Emission Mitigation Measures

The project will ensure that emissions from all off-road diesel powered equipment used on the project site do not exceed 40 percent opacity for more than three minutes in any one hour. Any equipment found to exceed 40 percent opacity (or Ringelmann 2.0) shall be repaired immediately. Non-compliant equipment will be documented and a summary provided to the Corps and SMAQMD monthly. A visual survey of all in-operation equipment shall be made at least weekly, and a monthly summary of the visual survey results shall be submitted throughout the duration of the project, except that the monthly summary shall not be required for any 30-day period in which no construction activity occurs. The monthly summary shall include the quantity and type of vehicles surveyed as well as the dates of each survey.

Marine Engine Standards

The use of USEPA adopted Tier 3 and Tier 4 standards for newly-built marine engines in 2008 would be encouraged under the barge delivery scenario. The Tier 3 standards reflect the application of technologies to reduce engine PM and NO_X emission rates. Tier 4 standards reflect application of high-efficiency catalytic after-treatment technology enabled by the availability of ultra-low sulfur diesel. These Tier 4 standards would be phased in over time for marine engines beginning in 2014 (USEPA 2008).

The Corps will use Tier 2 and 3 marine engines standards to reduce marine exhaust emissions. Due to uncertainty as to the availability of Tier 4 marine engines within the required project timeline, this mitigation measure does not require the use of Tier 4 marine engines. However, should they become available during the appropriate construction periods, use of these engines would further lower project emissions.

Construction Equipment

Off-road diesel-powered construction equipment greater than 50 horsepower shall meet Tier-4 off-road emission standards at a minimum under the barge delivery scenario. In addition, if not already supplied with a factory-equipped diesel particulate filter, all construction equipment shall be outfitted with Best Available Control Technology (BACT) devices certified by CARB. Any emissions control device used by the Contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine as defined by CARB regulations.

On-road heavy-duty diesel trucks or equipment with a GVWR of 19,500 pounds or greater shall comply with EPA 2007 on-road emission standards for PM and NO_X (0.01 g/bhp-hr and at least 1.2 g/bhp-hr, respectively) under the barge delivery scenario. Use of these trucks would provide the best available emission controls for NO_X and PM emissions.

Use of Electrical Equipment

Construction equipment powered by electricity, rather than diesel fuel, eliminates criteria pollutant emissions from diesel combustion. Electrification would result in a small amount of indirect CO_2 emissions due to the operation of the electric grid. Various types of construction equipment may feasibly be run on electricity.

<u>NO_X Mitigation Fee to SMAQMD</u>

As of July 1, 2013, the mitigation fee rate is $17,460 per ton of emissions. The Contractor would provide payment of the appropriate SMAQMD-required NO_x mitigation fee to offset the project's NO_x emissions when they exceed SMAQMD's threshold of 85 lbs/day. Estimated calculations for these mitigation fees are included under each alternative's effects analysis in Appendix D. The NO_X Mitigation Fee applies to all emissions from the project: on-road (on-and off site), off-road, portable, marine and stationary equipment and vehicles.

<u>NO_X Mitigation Fee to BAAQMD</u>

The Corps would consult with the BAAQMD in good faith to enter into a mitigation contract for an emission reduction incentive program (e.g., TFCA or Carl Moyer Program). The current emissions limit is $17,080/weighted ton of criteria pollutants (NO_X + ROG + [20*PM]). An administrative fee of 5 percent would be paid to the BAAQMD to implement the program. The contractor would conduct daily and annual emissions monitoring to ensure onsite emissions reductions are achieved and no additional mitigation payments are required. The contractor would be required to ensure the requirement is met. This requirement would be incorporated into the construction contracts as part of the project's specifications.

If a sufficient number of emissions reduction projects are not identified to meet the required performance standard, the Corps would coordinate with the BAAQMD to meet the performance standards of achieving quantities below applicable BAAQMD CEQA thresholds.

3.12 Climate Change

3.12.1 Environmental Setting

<u>Regulatory Setting</u>

The following Federal, State, and local laws and regulations apply to the resources covered in this section. Descriptions of the laws and regulations can be found in Section 5.0.

Federal

- Mandatory Greenhouse Gas Reporting Rule

State

- State Regulations on Greenhouse Gases and Climate Change
- Assembly Bill 32, Global Warming Solutions Act of 2006
- Senate Bill 97
- Executive Order S-13-08
- California Clean Air Act of 1988

Local

- Yolo-Solano Air Quality Management District
- Sacramento Metropolitan Air Quality Management District
- Bay Area Air Quality Management District
- Sacramento County Climate Action Plan
- City of Sacramento Climate Action Plan

Existing Conditions

This section addresses the impacts of GHG emissions associated with implementation of the ARCF GRR on global climate change. Emissions of GHGs are a concern because such emissions contribute, on a cumulative basis, to global climate change. Global climate change has the potential to result in sea level rise (which may result in flooding of low-lying areas), to affect rainfall and snowfall levels (which may lead to changes in water supply and runoff), to affect temperatures and habitats (which in turn may affect biological and agricultural resources), and to result in many other adverse effects. Although global climate change is inherently a cumulative impact, it is important to remember that any single project is unlikely to be able to generate sufficient GHGs by itself to have a significant impact on the environment. However, the cumulative effect of human activities which generate GHG have been clearly linked to quantifiable changes in the composition of the atmosphere, which in turn have been shown to be the main cause of global climate change.

Global Climate Trends and Associated Impacts

On October 30, 2009, the USEPA published a rule for the mandatory reporting of GHGs from sources that in general emit 25,000 metric tons or more of carbon dioxide equivalent per year in the United States. Smaller sources and certain sectors such as the agricultural sector and land use changes are not included in the Greenhouse Gas Reporting Program. Implementation of 40 CFR Part 98 is referred to as the Greenhouse Gas Reporting Program.

Global warming is the name given to the increase in the average temperature of the Earth's near-surface air and oceans since the mid-20th century and its projected continuation. Warming of the climate system is now considered by a vast majority of the scientific community to be unequivocal, based on observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level (IPCC, 2007).

Global mean surface temperatures have risen by 0.74 degrees Celsius (°C) ± 0.18°C when estimated by a linear trend over the last 100 years (1906 to 2005). The rate of warming over the last 50 years is almost double that over the last 100 years (0.13°C ± 0.03°C versus 0.07°C ± 0.02°C per decade). The causes of this measured warming have been identified as both natural processes and the result of human actions. For the next two decades, a warming of about 0.2°C per decade is projected for a range of emissions scenarios.

The Intergovernmental Panel on Climate Change (IPCC) concludes that variations in natural phenomena such as solar radiation and volcanoes produced most of the warming from preindustrial times to 1950 and had a small cooling effect afterward. However, since 1950, increasing GHG concentrations resulting from human activity such as fossil fuel burning and deforestation have been responsible for most of the observed temperature increase. These basic conclusions have been endorsed by more than 45 scientific societies and academies of science, including all of the national academies of science of the major industrialized countries. Since 2007, no scientific body of national or international standing has maintained a dissenting opinion (DWR, 2012).

Increases in GHG concentrations in the Earth's atmosphere are thought to be the main cause of human-induced climate change. GHGs naturally trap heat by impeding the exit of solar radiation that has hit the Earth and is reradiated back into space as infrared radiation. Some GHGs occur naturally and are necessary for keeping the Earth's surface habitable. However, increases in the concentrations of these gases in the atmosphere above natural levels during the last 100 years have increased the amount of infrared radiation that is trapped in the lower atmosphere, intensifying the natural greenhouse effect and resulting in increased global average temperatures.

The effects of warming of the Earth's atmosphere and oceans affect global and local climate systems. Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, in addition to temperature increases (IPCC, 2007). Based on growing evidence, there is high confidence that the following effects on hydrologic systems are occurring: (1) increased runoff and earlier spring peak discharge in many glacier- and snow-fed rivers; and (2) warming of lakes and rivers in many regions, with effects on thermal structure and water quality (IPCC, 2008).

There is very high confidence, based on increasing evidence from a wider range of species, that recent warming is strongly affecting terrestrial biological systems, including such changes as earlier timing of spring events (e.g., leaf-unfolding, bird migration, egg-laying); and poleward and upward shifts in ranges in plant and animal species. Based on satellite observations since the early 1980s, there is high confidence that there has been a trend in many regions toward earlier "greening" of vegetation in the spring linked to longer thermal growing seasons resulting from recent warming (IPCC, 2007).

There is high confidence, based on substantial new evidence, that observed changes in marine and freshwater biological systems are associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels, and circulation. These include shifts in ranges and changes in algal, plankton, and fish abundance in high-latitude oceans; increases in algal and zooplankton abundance in high-latitude and high-altitude lakes; and range changes and earlier fish migrations in rivers (IPCC, 2007).

Changes in the ocean and on land, including observed decreases in snow cover and Northern Hemisphere sea ice extent, thinner sea ice, shorter freezing seasons of lake and river ice, glacier melt, decreases in permafrost extent, increases in soil temperatures and borehole temperature profiles, and sea level rise, provide additional evidence that the world is warming (IPCC, 2007).

Climate Change Conditions in California

With respect to California's water resources, the most important 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 major implications for water supply, flooding, aquatic ecosystems, energy generation, and recreation throughout the state.

<u>Precipitation</u>

Climate change can affect precipitation by changing the overall amount of precipitation, type of precipitation (rain versus snow), and timing and intensity of precipitation events. Changes to these factors propagate through the hydrologic system in California and have the potential to affect snowpack, runoff, water supply, and flood control.

Former State Climatologist James Goodridge compiled an extensive collection of precipitation records from throughout California. These data sets were used to evaluate whether there has been a changing trend in precipitation in the state over the past century (DWR, 2006). Long-term runoff records in selected California watersheds were also examined dating back to 1890. Based on a linear regression of the data, the long-term historical trend for statewide average annual precipitation appears to be relatively flat (no increase or decrease) over the entire record. However, it appears that there might be an upward trend in precipitation toward the latter portion of the record. Precipitation in Northern California appears to have increased between 1 and 3 inches annually between 1890 and 2002 (DWR, 2006).

<u>Snowpack</u>

An increase in the global average temperature is expected to result in a decreased volume of precipitation falling as snow in California and an overall reduction in the Sierra Nevada’s snowpack. Snowpack in the Sierra Nevada provides both water supply (runoff) and storage (within the snowpack before melting), which is a major source of supply for California. According to the California Energy Commission, the snowpack portion of the water supply has the potential to decline by 30 to 90 percent by the end of the 21st century (CEC, 2006). A study by Knowles and Cayan projects that approximately 50 percent of the statewide snowpack will be lost by the end of the century (Knowles and Cayan, 2002).

On average, California’s annual snowpack has the greatest accumulations from November through the end of March. The snowpack typically melts from April through July. California’s reservoir managers rely on snowmelt to fill reservoirs once the threat of large winter and early-spring storms and related flooding risks have passed.

An analysis conducted by DWR of the effect of rising temperatures on snowpack shows that a rise in average annual air temperature of 3°C (5.4°F) would likely cause snowlines to rise approximately 1,500 feet (DWR, 2006). This would result in the equivalent of approximately 5 million acre-feet of water per year falling as rain rather than snow at lower elevations.

Runoff

Runoff is directly affected by changes in precipitation and snowpack. If the amount of precipitation falling as rain rather than snow were to increase earlier in the year, flooding potential could increase. Water that normally would be held in the Sierra Nevada snowpack until spring would flow into the Central Valley concurrently with the rain from winter storm events. This scenario would place more pressure on California's flood control system (DWR, 2006).

Changes in both the amount of runoff and the seasonality of the hydrologic cycle also have the potential to greatly affect the heavily managed water systems of the western United States. The hydrology of the Sacramento River watershed is highly dependent on the interaction between Sierra Nevada snowpack, runoff, and management of reservoirs. Higher snow lines and more precipitation falling in the form of rain rather than snow will increase winter inflows to reservoirs. Higher winter inflows will also likely mean that a greater portion of the total annual runoff volume will occur in the winter, which would translate to higher flows in the Sacramento and American Rivers in the winter than those that currently occur.

Greenhouse Gas Emissions

As defined in Section 38505(g) of the California Health and Safety Code, the principal GHGs of concern are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). With the exception of NF_3, these are the same gases named in the USEPA's Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act. Each of the principal GHGs has a long atmospheric lifetime (one year to several thousand years), and is globally well mixed. In addition, the potential heat trapping ability of each of these gases varies significantly from one another. On a 100-year timescale, methane is about 25 times as potent as CO_2, nitrous oxide is about 298 times as potent as CO_2, and sulfur hexafluoride is about 22,800 times more potent than CO_2 (IPCC, 2007). Conventionally, GHGs have been reported as CO_2 equivalents (CO_2e). CO_2e takes into account the relative potency of non-CO_2 GHGs and converts their quantities to an equivalent amount of CO_2 so that all emissions can be reported as a single quantity.

The primary human-made processes that release these gases include: (1) the burning of fossil fuels for transportation, heating, and electricity generation; (2) agricultural practices that release methane, such as livestock grazing and crop residue decomposition; and (3) industrial processes that release smaller amounts of high global warming potential gases, such as SF_6, perfluorocarbons, and hydrofluorocarbons. Deforestation and land cover conversion have also been identified as contributing to global warming by reducing the Earth's capacity to remove CO_2 from the air and altering the Earth's surface reflectance. The major sources of GHGs that are relevant to the ARCF GRR project are transportation sources and construction emissions. These are discussed in greater detail below.

Transportation

Transportation is a major source of GHGs in California, accounting for 36 percent of the State's total GHG emissions in 2008 (CARB, 2011). Transportation emissions within California are generated primarily by combustion of gasoline, diesel, and some alternative fuels by mobile sources. The indicators of vehicular activity, and resulting GHG emissions, are vehicle miles traveled and the fuel economies of the individual vehicles composing the vehicular fleet. Vehicle miles traveled are associated with movement of people and goods on local, regional, and statewide scales.

Construction

Construction emissions are generated when materials and workers are transported to and from construction sites and when machinery is used for construction activities such as trenching, grading, dredging, paving, and building. Emissions from construction activities are generated for shorter periods than operational emissions; however, GHGs remain in the atmosphere for hundreds of years or more, so once released, they contribute to global climate change unless they are removed through absorption by the oceans or by terrestrial sequestration.

Construction emissions are not accounted for in a separate category in the California GHG inventory (or other inventories that use IPCC GHG emissions sectors for accounting purposes). However, based on the category "Transportation—Not Specified," which includes off-road vehicles and associated diesel fuel combustion, construction emissions accounted for a maximum of 0.4 percent of California's GHG inventory between 2000 and 2008 (CARB, 2011).

Greenhouse Gas Emissions Inventories

A GHG inventory is a quantification of GHG emissions and sinks within a selected physical and/or economic boundary over a specified time. GHG inventories can be performed on a large scale (i.e., for global and national entities) or on a small scale (i.e., for a particular building or person).

Many GHG emission and sink specifications are complicated to evaluate because natural processes may dominate the carbon cycle. Although some emission sources and processes are easily characterized and well understood, some components of the GHG budget (i.e., the balance of GHG sources and sinks) are not known with accuracy. Because protocols for quantifying GHG emissions from many sources are currently under development by international, national, state, and local agencies, ad-hoc tools must be developed to quantify emissions from certain sources and sinks in the interim.

Table 33 outlines the most recent global, national, statewide, and local GHG inventories to help contextualize the magnitude of potential project-related emissions.

Table 33. Global, National, State, and Local GHG Emission Inventories.

Emissions Inventory	CO_2e (metric tons)
2004 IPCC Global GHG Emissions Inventory	49,000,000,000
2009 USEPA National GHG Emissions Inventory	6,633,200,000
2008 CARB State GHG Emissions Inventory	477,740,000
2008 Yolo County GHG Emissions Inventory[a]	651,740
2005 Sacramento County GHG Emissions Inventory	13,925,537

Sources: IPCC 2007; USEPA 2011a; CARB 2010; Yolo County 2011; ICF Jones & Stokes 2009.
[a] Only includes emissions associated with the unincorporated county.

3.12.2 Methodology and Basis of Significance

This section describes the climate change effects associated with the project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant.

Methodology

Although construction activities would result in temporary effects on air quality in the study area, the project would comply with all Federal, State, and local air quality regulations. Where a potentially significant climate change effect is identified, mitigation measures are recommended to reduce the level of expected effects.

The key sources of data and information used in the preparation of this section are listed below.

- *Handbook for Assessing and Mitigating Air Quality Impacts* (Yolo-Solano Air Quality Management District 2007)
- *Guide to Air Quality Assessment in Sacramento County* (Sacramento Metropolitan Air Quality Management District 2009)
- CEQA and Climate Change, Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act (California Air Pollution Control Officers Association 2008)
- Quantifying Greenhouse Gas Mitigation Measures, a Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures (California Air Pollution Control Officers Association 2010)

This section provides an evaluation of the direct and indirect GHG emissions that contribute to the cumulative impact on global climate change from implementing the proposed project.

Almost all increased GHG emissions associated with the proposed project would be generated by construction-related activities. After the project is constructed, operation and maintenance of the project facilities would generally be performed as needed. Maintenance work is less extensive than the construction activities and takes place over a few days per year. In addition, operation and maintenance activities are part of the existing environmental baseline and thus would not create a substantial source of new emissions. Consequently, operation of the project would not result in any adverse effects under NEPA or significant impacts under CEQA related to GHG emissions and are not quantified in this analysis because they are part of the existing environmental baseline. The assessment, therefore, focuses on evaluating GHG impacts from construction activities.

GHG emissions from project construction would result from fuel usage by off-road equipment, on-road vehicles, electricity consumption by office trailers, and barge delivery of materials. For the GHG analysis, the project alternatives were evaluated using conservative construction scenarios referred to as "worsted-case scenarios" to estimate the maximum construction emissions generated by each alternative. The delivery and placement task was also calculated using the assumption that same amount of material to be barged to the project site, would be trucked to the site in the same period of time. The primary GHG emissions generated from these sources would be CO_2, CH_4, and N_2O. Models, tools, and assumptions used to calculate the GHG emissions are described below.

- Off-Road Equipment: CO_2 emissions generated from onsite construction equipment were estimated using the Roadway Construction Emissions Model (Version 7.1.3) emissions model, following the same assumptions described in Section 3.5.
- On-Road Vehicles: CO_2 emissions generated from the on-road vehicle trips were estimated, following the same assumptions described in Section 3.5.
- Barge Delivery: CO_2, CH_4, and N_2O emissions generated from towboats were estimated using emission factors following the same assumptions described in Section 3.5.

Basis of Significance

For this analysis, an effect pertaining to climate change was analyzed based on professional judgment, draft NEPA Guidance published by CEQ, and State CEQA Guidelines Appendix G (14 CCR 15000 *et seq*.). An effect was considered significant if it would:

- Conflict with an applicable plan adopted for the purpose of reducing GHG emissions.

The SMAQMD,YSAQMD, and BAAQMD have local jurisdiction over the project area. Neither air district recommends a GHG emission threshold for construction-related emissions. However, based on the CEQA guidelines established by each district, the districts recommend that GHG emissions from construction activities be quantified and disclosed, a determination regarding the significance of these GHG emissions be made based on a threshold determined by the lead agency, and BMPs be incorporated to reduce GHG emissions during construction, as feasible and applicable. (SMAQMD 2011.)

3.12.3 No Action Alternative

As discussed in Section 3.12.1, Environmental Setting, several indirect effects on the environment are expected throughout California as a result of global climate change. The extent of these effects is still being defined as climate modeling tools become more refined. Regardless of the uncertainty in precise predictions, it is widely understood that substantial climate change is expected to occur in the future. Potential climate change effects in California and the Sacramento area include, but are not limited to, Delta salt water intrusion, extreme heat events, increased energy consumption, increase in infectious diseases and respiratory illnesses, reduced snowpack and water supplies, increased water consumption, and potential increase in wildfires.

Global climate change could expose the No Action Alternative to increased rainfall runoff and flood flows in the Sacramento River. The effects of increased flood flows would be most severe for the No Action Alternative, which does not include any flood risk reduction measures.

Without improvements to the levee system, the risk of levee failure would remain high. Under these conditions, any of the levee deficiencies could cause portions of the levees to fail, triggering widespread flooding and extensive damage. If a catastrophic flood were to occur, emergency flood fighting and clean-up actions would require the use of a considerable amount of heavy construction equipment. Timing and duration of use would directly correlate with flood fighting needs, but it is assumed that pollutants emitted would violate air quality standards for pollutants (including those for which the area is already considered non-attainment), increase GHG emissions, and expose sensitive receptors to toxic air emissions. Depending on the magnitude of the flood, flood fighting could last for weeks or even months. Furthermore, because of the unpredictable nature of an emergency response, no BMPs to manage emissions would be in place. All of these effects could be considered significant. However, the timing, duration, and magnitude of a flood event are speculative and unpredictable, and therefore a precise determination of significance is not possible.

3.12.4 Alternative 1 – Improve Levees

SMAQMD, YSAQMD, and BAAQMD have not formally adopted GHG thresholds for construction construction-related emissions. The BAAQMD's threshold of 10,000 MT per year of CO_2e for stationary sources is compared against the GHG emissions generated from the entire project construction to determine the indirect cumulative contribution to climate change that would result from the construction of Alternative 1.

The construction emissions are estimated for Alternative 1 site–related activities and off-site borrow material activities based on the emission rates and assumptions described in Section 3.11.2. Emission sources associated with site–related activities include the off-road construction equipment operating at project sites, on-road vehicles (except vehicles associated with the material borrow) traveling to and from the project sites, barge delivery to and from the project sites on the Sacramento River, and office trailers operating at project sites. Emission sources associated with borrow material activities include the off-road construction equipment operating at borrow sites, and on-road hauling trucks traveling between borrow sites and the project sites.

The estimated construction GHG emissions, which include CO_2, CH_4, N_2O, and other GHG emissions, are shown in Table 34. As shown in Table 33, project-wide GHG emissions would be well below the BAAQMD's GHG threshold of 10,000 MT CO_2e per year, indicating that project-generated GHG emissions would not contribute to climate change. This indirect effect is less than significant. Implementation of mitigation measures would further reduce GHG emissions during construction.

Table 34. Construction GHG Emissions for All Alternatives, Truck and Barge Delivery Scenarios.

	Total GHG Emissions (MT/year of CO_2e)			
Construction Year	**SMAQMD**	**YSAQMD**	**BAAQMD**	**Project-Wide**
Alternative 1 and 2, Truck Deliver Scenario				
Year 2 On-site Construction	3,204.6	0	0	3,204.6
Year 2 Off-site Soil Borrow	101.3	91.2	0	192.5
Year 2 Total	3,305.9	91.2	0	3,397.1
Alternative 1 and 2, Barge Deliver Scenario				
Year 2 On-site Construction	1,920.8	0	0	1,920.8
Year 2 Off-site Soil Borrow	101.3	91.2	0	192.5
Year 2 Barge Delivery	148.6	88.4	164.7	401.6
Year 2 Total	2,170.7	179.6	164.7	2,514.9
BAAQMD Threshold	–	–	–	10,000
Exceed Threshold?				No

Alternative 1 does not pose any apparent conflict with the goals of AB 32, the key elements and GHG reduction measures in the Climate Change Scoping Plan, or any other plans for reduction or mitigation of GHGs. To date, no Federal, State, or local agency with jurisdiction over the proposed project has adopted plans or regulations that set specific goals for emission limits or emission reductions applicable to the proposed project. The estimated GHG emissions from the implementation of the project were compared to BAAQMD's significance threshold, as shown in Table 34. The estimated emission rates are well below the significance threshold. Therefore, the proposed project would not conflict with or obstruct the implementation of GHG emission reduction plans. This indirect effect is less than significant.

Alternative 1 would increase the likelihood that the flood management system could accommodate future flood events as a result of climate change. Consequently, the project alternative would improve the resiliency of the levee system with respect to changing climatic conditions, potentially reducing exposure of property or persons to the effects of climate change.

3.12.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

The estimated construction GHG emissions for Alternative 2 are shown in Table 34. While the truck delivery scenario would generate slightly more GHG emissions relative to the barge delivery scenario, emissions would be well below the BAAQMD's GHG threshold. Construction-related GHG emissions are not anticipated to indirectly contribute to climate change; this indirect effect is considered less than significant. Implementation of mitigation measures would further reduce this effect. Alternative 2 would not directly conflict with or obstruct the implementation of applicable GHG emission reduction plans. This indirect effect is less than significant.

Under Alternative 2, the Sacramento Weir and Bypass would be expanded to accommodate future flood events. The project alternative would allow the State of California future flexibility in the operations of the weir to move more water into the bypass once the river reaches a certain height. While there is no proposed change in operations of the weir at this time, Alternative 2 would improve the resiliency of the levee system by making the system more adaptable to changing climatic conditions, potentially reducing exposure of property or persons to the effects of climate change.

3.12.6 Avoidance, Minimization, and Mitigation Measures

The following measures may be considered to lower GHG emissions during the construction:

- Encourage and provide carpools, shuttle vans, transit passes and/or secure bicycle parking for construction worker commutes.

- Recycle at least 75% of construction waste and demolition debris.
- Purchase at least 20% of the building materials and imported soil from sources within 100 miles of the project site.
- Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to no more than 3 minutes (5 minute limit is required by the state airborne toxics control measure [Title 13, sections 2449(d)(3) and 2485 of the California Code of Regulations]). Provide clear signage that posts this requirement for workers at the entrances to the site.
- Maintain all construction equipment in proper working condition according to manufacturer's specifications. The equipment must be checked by a certified mechanic and determined to be running in proper condition before it is operated.
- Use equipment with new technologies (repowered engines, electric drive trains).
- Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines).
- Use a CARB approved low carbon fuel for construction equipment. (NO_x emissions from the use of low carbon fuel must be reviewed and increases mitigated.)
- Purchase GHG offset for program-wide GHG emissions (direct emissions plus indirect emissions from on-road haul trucks plus commute vehicles) exceeding future state or Federal significance thresholds applicable at the time of construction. If no GHG significance thresholds have been formally adopted at the time of permitting, then a presumptive GHG threshold of 7,000 metric tons CO_2e (amortized over the 50-year life of the levee program) should be used to define the offset requirement. The 7,000 metric ton presumptive threshold matches the lowest industrial project threshold that has been proposed by any air quality agency in California as of the date of this study. All purchased offsets must be verifiable under protocols set by the California Climate Action Registry, the Chicago Climate Exchange, or comparable auditing programs.

3.13 Noise

3.13.1 Environmental Setting

Regulatory Setting

- City of Sacramento Noise Ordinance
- Sacramento County Noise Ordinance

Existing Conditions

Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). The decibel (dB) scale is used to quantify sound intensity. The human ear is not equally sensitive to all frequencies in the entire spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive in a process called "A-weighting". Since humans are less sensitive to low frequency sound than to high frequency sound, A-weighted decibel (dBA) levels de-emphasize low frequency sound energy to better represent how humans hear. Table 35 summarizes typical A-weighted sound levels.

Table 35. Typical A-Weighted Sound Levels.

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet flyover at 1,000 feet		
	--100--	
Gas lawnmower at 3 feet		
	--90--	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	--80--	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower at 100 feet	--70--	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	--60--	
		Large business office
Quiet urban daytime	--50--	Dishwasher in next room
Quiet urban nighttime	--40--	Theater, large conference room (background)
Quiet suburban nighttime		
	--30--	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	--20--	
		Broadcast/recording studio
	--10—	
	--0--	

Source: Caltrans, 1998

Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level (L_{eq}), the minimum and maximum sound levels (L_{min} and L_{max}), percentile-exceeded sound levels (L_{xx}), the day-night sound level (L_{dn}), and the community noise equivalent level (CNEL). Below are brief definitions of these measurements and other terminology used in this section:

- **Sound.** A vibratory disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- **Ambient noise.** The composite of noise from all sources near and far in a given environment exclusive of particular noise sources to be measured.
- **Decibel (dB).** A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
- **A-weighted decibel (dBA).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
- **Equivalent sound level (L_{eq}).** The average of sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level that in a stated period would contain the same acoustical energy as the time-varying sound that actually occurs during the same period.
- **Exceedance sound level (L_{xx}).** The sound level exceeded XX percent of the time during a sound level measurement period. For example, L_{90} is the sound level exceeded 90 percent of the time, and L_{10} is the sound level exceeded 10 percent of the time. L_{90} is typically considered to represent the ambient noise level.
- **Maximum and minimum sound levels (L_{max} and L_{min}).** The maximum or minimum sound level measured during a measurement period.
- **Day-night level (L_{dn}).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.
- **Community noise equivalent level (CNEL).** The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the A-weighted sound levels occurring during the period from 7:00 p.m. to 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.

L_{dn} and CNEL values rarely differ by more than one dB. As a matter of practice, L_{dn} and CNEL values are considered to be equivalent and are treated as such in this assessment. In general, human sound perception is such that a change in sound level of three dB is just noticeable, a change of five dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving sound level.

For a point source such as a stationary compressor, sound attenuates based on geometry at rate of six dB per doubling of distance. For a line source such as free- flowing traffic on a freeway, sound attenuates at a rate of three dB per doubling of distance. Atmospheric conditions including wind, temperature gradients, and humidity can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound that travels over an acoustically absorptive surface such as grass attenuates at a greater rate than sound that travels over a hard surface such as pavement. The increased attenuation is typically in the range of one to two dB per doubling of distance. Barriers such as buildings and topography that block the line of sight between a source and receiver also increase the attenuation of sound over distance.

Noise levels and impacts are interpreted in relation to noise standards for each city or county. The majority of the project is located within Sacramento County; therefore, those noise level standards will be used to evaluate affects on noise. The Sacramento County noise ordinance states that a standard of 55 dBA is applied during the hours from 7:00 a.m. to 10:00 p.m., and a standard of 50 dBA is applied during the hours from 10:00 p.m. to 7:00 a.m. for residential and agricultural uses. The noise ordinance also states that construction noise is exempt during the hours from 6:00 a.m. to 8:00 p.m. Monday through Friday and from 7:00 a.m. to 8:00 p.m. on Saturdays and Sundays (Chapter 6.68 Noise Control, County of Sacramento Code).

The City of Sacramento exterior noise standard, as stated in the City's noise ordinance, is 55 dBA during the hours from 7:00 a.m. to 10:00 p.m. for residential and agricultural uses. The standard then adjusts to 50 dBA between 10:00 p.m. and 7:00 a.m. for residential and agricultural uses. The noise ordinance also exempts construction noise during the hours from 7:00 a.m. to 6:00 p.m. Monday through Saturday and from 9:00 a.m. to 6:00 p.m. on Sundays. The ordinance further states that the operation of an internal combustion engine is not exempt if the engine is not equipped with suitable exhaust and intake silencers in good working order (8.68.080 Exemptions, Noise Control Standards, City of Sacramento Municipal Code).

The perceptibility of a new noise source that intrudes into a background noise environment depends on the nature of the intruding sound compared to the background sound. In general, if the intruding sound has the same character as the background sound (e.g., an increase in continuous traffic noise compared to background continuous traffic noise), human sound perception is such that a change in sound level of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving the sound level. However, if the intruding sound is of a character different from the background sound (e.g., construction noise in an otherwise quiet neighborhood), the intruding sound can be clearly discernible even if it raises the overall dBA noise level by less than 1 dB.

Operation of heavy construction equipment, particularly pile driving and other impulsive devices such as pavement breakers, create seismic waves that radiate along both the surface and downward into the earth. These surface waves can be felt as ground vibration. Vibration from operation of this equipment can result in effects ranging from annoyance of people to damage of structures. Varying geology and distance will result in different vibration levels containing different frequencies and displacements. In all cases, vibration amplitudes will decrease with increasing distance.

As seismic waves travel outward from a vibration source, they excite the particles of rock and soil through which they pass and cause them to oscillate. The actual distance that these particles move is usually only a few ten-thousandths to a few thousandths of an inch. The rate or velocity (in inches per second [in/sec]) at which these particles move is the commonly accepted descriptor of the vibration amplitude, referred to as the peak particle velocity (ppv). Table 36 summarizes typical vibration levels generated by construction equipment).

Table 36. Vibration Source Levels for Construction Equipment.

Equipment	**PPV at 25 feet**
Pile driver (impact)	0.644 to 1.518
Pile drive (sonic)	0.170 to 0.734
Vibratory roller	0.210
Hoe ram	0.089
Large bulldozer	0.089
Caisson drilling	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003

Source: Federal Transit Administration 2006.

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil conditions through which the vibration is traveling. The following equation can be used to estimate the vibration level at a given distance for typical soil conditions. PPV_{ref} is the reference ppv at 25 feet from Table 36:

$$PPV = PPV_{ref}\left(\frac{25}{distance}\right)^{1.5}$$

There are no applicable Federal, state, or local quantitatively-defined regulations relating to vibration resulting from construction activities. Thresholds for annoyance and structural damage reported by Caltrans (2004) are used in this analysis. Table 37 summarizes typical human response to steady state vibration such as that produced by typical non-impact construction activity.

Table 37. Human Response to Steady State Vibration.

PPV	Human Response
3.6 (at 2 Hz) – 0.4 (at 20 Hz)	Very disturbing
0.7 (at 2 Hz) – 0.17 (at 20 Hz)	Disturbing
0.10	Strongly perceptible
0.035	Distinctly perceptible
0.012	Slightly perceptible

Source: CalTrans 2004

Table 38 summarizes typical human response to transient vibration that is usually associated with transitory impact construction sources such as pile driving activity.

Table 38. Human Response to Transient Vibration.

PPV	Human Response
2.0	Severe
0.9	Strongly perceptible
0.24	Distinctly perceptible
0.035	Barely perceptible

Source: CalTrans 2004

Table 39 summarizes vibration damage thresholds.

Table 39. Maximum Vibration Levels for Preventing Damage to Structures.

Type of Situation	Limiting Velocity (in/sec)
Historic sites or other critical locations	0.1
Residential buildings, plastered walls	0.2 to 0.3
Residential buildings in good repair with gypsum board walls	0.4 to 0.5
Engineered structures, without plaster	1.0 to 1.5

Source: CalTrans 2004

American River

The majority of the study area, including both the American River North and South basins, is located in urban areas, where the primary sources of noise are traffic, trains, common urban uses, and limited air traffic. Boating operation is common along the American River. The areas surrounding the American River are subject to the Sacramento County Noise Ordinance, and in some cases, the City of Sacramento Noise Ordinance.

Major highways and roadways which generate noise near the American River include Business 80, Highway 160, U.S. 50, Watt Avenue, H Street (Bridge), Fair Oaks Boulevard, Howe Avenue, and the Arden/Garden Connector, and Richards Boulevard. Arterial roadways and stationary sources have a localized influence on the noise environment.

Sensitive receptors along the American River include residents along the levee system and along the haul roads. Residents back up to the levee and in most cases there is very little space between the levee toe and the back fence of private properties. Since the levee is higher than the houses noise on the levees travels into the backyards and houses. Some areas have trees between the levee and homes, which will filter some noise from levee activities. In addition, recreationists using the American River Parkway would be considered sensitive receptors, as would the local wildlife in the Parkway.

Sacramento River

The majority of the noise conditions near the Sacramento River are consistent with those described for the American River above. The areas around the Sacramento River are subject to the noise ordinances for both Sacramento County and the City of Sacramento. In addition, the Yolo County and City of West Sacramento Noise Ordinances should be considered in this area due to potential impacts across the river from construction sites.

Certain areas along the Sacramento River have higher boating noise due to public marinas such as Discovery Park, Garcia Bend Park, and Miller Park. In addition, the Sacramento River in downtown Sacramento has higher ambient noise conditions due to the urban nature in this area, with additional noise provided by night life in Old Sacramento and urban activities such as baseball games at Raley Field.

Major highways and roadways which generate noise near the Sacramento River include I-5, U.S. 50, Riverside Boulevard, and Richards Boulevard. Arterial roadways and stationary sources have a localized influence on the noise environment.

Like the American River area, the majority of the Sacramento River levees are in close proximity to local residences, with many peoples' backyards very close to the toe of the levee. Since the levee is higher than the houses noise on the levees travels into the backyards and houses. Some areas have trees between the levee and homes, which will filter some noise from levee activities. In addition, recreationists at Miller, Discovery, and Garcia Bend Parks are considered to be sensitive receptors, as are any wildlife in the area.

East Side Tributaries

The majority of the noise conditions near the tributaries are consistent with those described for the American River above, with the exception that the small tributaries have no boating noise associated with them. Magpie Creek and Dry/Robla Creek may experience higher levels of air traffic noise due to their close proximity to the McClellan Airport. The tributary areas are subject to the Sacramento County Noise Ordinance.

Major highways and roadways which generate noise near the tributaries include I-80, Norwood Avenue, Rio Linda Boulevard, and Marysville Boulevard/Raley Boulevard. Arterial roadways and stationary sources have a localized influence on the noise environment.

Sensitive receptors along the tributaries include residents along the levee system and along the haul routes. Along NEMDC, Arcade Creek, parts of Dry/Robla Creek, and parts of Magpie Creek residents back up to the levee and in most cases there is very little space between the levee toe and the back fence of private properties. Since the levee is higher than the houses noise on the levees travels into the backyards and houses. Portions of the Dry/Robla Creek levees are bordered by open fields of grassland and fallow agricultural lands. Portions of the Magpie Creek Diversion Canal flow through industrial areas and business districts, as well as some open fields. In addition, sensitive receptors include recreationists using the Sacramento Northern Bike Trail, which crosses Arcade Creek just downstream of Rio Linda Boulevard, and crosses Robla Creek just upstream of the project area. Sensitive receptors near the tributaries also include local wildlife, particularly those species using the open space within the Dry and Robla Creek levees.

Sacramento Bypass

The Sacramento Bypass is located in Yolo County. The bypass area is primarily open space and agricultural. Common noises are generated from agricultural machinery, boat traffic on the Sacramento River, and vehicles along the Old River Road. Just south of the existing Bypass is the California Highway Patrol (CHP) Academy. This academy performs driver's training for officers and generates noises associated with speeding cars and police pursuits.

Noise sensitive land uses in the vicinity of the Bypass primarily consist of residents located across the Sacramento River on Garden Highway. These residences are approximately 900 feet from the eastern edge of the Bypass. There are no residential properties within the existing bypass; however, there is one residence about 1,500 feet north of the proposed construction area for the new widened weir and bypass. Sensitive receptors would include these residences, wildlife, recreationists, and nesting birds.

3.13.2 Methodology and Basis of Significance

Methodology

Construction activities (including construction equipment used for long-term maintenance) are the predominant source of noise and vibration associated with the project. Construction noise impacts have been assessed using an analysis method recommended by the U.S. Department of Transportation for construction of large public works infrastructure projects (FTA, 2006). Based on anticipated construction equipment types and methods of operation, construction noise levels for various elements of the construction process have been calculated. These predicted levels were compared to significance criteria to determine whether significant impacts are predicted to occur. Where significant noise impacts have been identified, mitigation measures to reduce noise impacts have been specified.

The magnitude of construction noise impacts at noise-sensitive land uses depends on the type of construction activity, the noise level generated by various pieces of construction equipment, the distance between the activity, and noise-sensitive land uses. For this analysis noise levels at various distances from the construction equipment were estimated using calculation procedures recommended by the Federal Transit Administration (FTA, 2006). The calculations used for this analysis include distance attenuation (6 dB per doubling of distance) and attenuation from ground absorption for both hard ground and soft ground.

Basis of Significance

For the purposes of this study, the Sacramento County noise standards will be used to determine effect levels because most of the work that would affect sensitive receptors is located in Sacramento County. The Sacramento County noise ordinance states that a standard of 55 dBA is applied during the hours from 7:00 a.m. to 10:00 p.m., and a standard of 50 dBA is applied during the hours from 10:00 p.m. to 7:00 a.m. for residential and agricultural uses. The noise ordinance also states that construction noise is exempt during the hours from 6:00 a.m. to 8:00 p.m. Monday through Friday and from 7:00 a.m. to 8:00 p.m. on Saturdays and Sundays (Chapter 6.68 Noise Control, County of Sacramento Code).

The proposed project would have a significant impact from noise if construction would result in any of the following:

- A substantial temporary or permanent increase in ambient noise levels in the study area above the existing levels.
- Exposure of sensitive receptors to excessive noise levels (those levels that exceed the Sacramento County noise ordinance, as discussed above).
- Exposure of sensitive receptors or structures to groundborne vibration.

3.13.3 No Action Alternative

Under the No Action Alternative, the Corps would not participate in the proposed project. As a result, there would be no construction-related effects to the acoustic environment, including the generation of groundborne vibration. The noise levels in the study area would remain consistent with the existing ambient noise levels present under current conditions. It is highly likely that if the project is not constructed that a large flood event could result in levee failure. The amount of noise that would be generated to repair the damaged levee and clean up of the flooded lands could exceed noise standards.

3.13.4 Alternative 1 – Improve Levees

Construction of Alternative 1 would generate temporary, short-term, and intermittent noise at or near noise sensitive receptors in and around the study area due to construction activities associated with the proposed levee repairs. Noise sensitive receptors in and around the study area were described in detail in Section 3.13.1. Typical construction equipment noise levels are shown in Table 40 below.

Table 40. Construction Equipment Noise Levels.

Equipment Type[1]	dBA at 50 Feet	Equipment Type	dBA at 50 Feet
Air Compressor	78	Groundwater Well Drilling Operations[2]	77
Asphalt Paver	77	Generator	81
Backhoe	78	Grader	85
Compactor	83	Hoe Ram Extension	90
Concrete Breaker	82	Jack Hammer	89
Concrete Pump	81	Pneumatic Tools	85
Concrete Saw	90	Rock Drill	81
Crane, Mobile	81	Scraper	84
Dozer	82	Trucks	74-81
Front-end Loader	79	Water Pump	81

Notes:
1. All noise levels based on equipment fitted with properly maintained and operational noise control devices, per manufacturers specifications.
2. Groundwater well drilling noise was measured by AECOM for the NLIP Phase 2 EIR 1st Addendum dated May, 2009.
Sources: FTA, 2006; SAFCA, 2009

Operation of heavy construction equipment, particularly pile driving and other impulsive devices such as pavement breakers, create seismic waves that radiate along the surface of the earth and downward into the earth. These surface waves can be felt as ground vibration. Vibration from operation of this equipment can result in effects ranging from annoyance of people to damage of structures. Varying geology and distance will result in different vibration levels containing different frequencies and displacements. In all cases, vibration amplitudes will decrease with increasing distance. As seismic waves travel outward from a vibration source, they excite the particles of rock and soil through which they pass and cause them to oscillate. The actual distance the soil particles move is usually only a few ten-thousandths to a few thousandths of an inch. The rate or velocity (in inches per second) at which these particles move is the commonly accepted descriptor of the vibration amplitude, referred to as the "peak particle velocity" (PPV). Table 41 summarizes ground vibration levels generated by typical construction equipment.

Table 41. Vibration Source Levels for Construction Equipment.

Equipment	PPV at 25 feet
Vibratory roller	0.210
Large bulldozer	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003

Source: Federal Transit Administration, 2006

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil conditions through which the vibration is traveling. Historically, vibration impacts caused by construction activity occur mainly in cases where both the construction site and the receptor are on bedrock, which readily transmits vibration. With regard to the proposed project, ground vibration propagates weakly through loose, alluvial soil such as that found in the project area (FTA 2006). Therefore, ground vibration from construction equipment is expected to be discernible only for very short distances from the construction site (roughly 40 feet away). Table 42 summarizes typical human response to prolonged, steady state vibration such as that produced by typical non-impact construction equipment during earthmoving activities.

Table 42. Human Response to Steady State Vibration.

PPV	Human Response
3.6 (at 2 Hz) – 0.4 (at 20 Hz)	Very disturbing
0.7 (at 2 Hz – 0.17 (at 20 Hz)	Disturbing
0.20	Potential damage to interior plaster walls
0.10	Strongly perceptible
0.035	Distinctly perceptible
0.012	Slightly perceptible

Source: Caltrans, 2004

Ground vibration generated by construction equipment would be discernible only at residences within 40 feet of the construction equipment. This alternative would not involve pile driving, which is the type of construction activity that otherwise might cause the most severe vibration impacts. Furthermore, the soil type found throughout the project area is loose alluvial soil, which does not readily transmit ground vibration (FTA, 2006). Table 43 shows estimated ground vibration levels generated by a vibratory compactor, which is the type of equipment (other than pile drivers) most likely to cause vibration impacts at a construction site. As shown in Table 42, the vibration level is expected to dissipate to less than the impact criterion of 0.10 inches/second (the “strongly discernible” level) at distances more than 40 feet of the compactor. If the vibratory roller was used within 30 feet of a building, then it is possible vibration could damage interior plaster walls. Based on this analysis, ground vibration could cause a significant effect if construction is required within 40 feet of a vibration-sensitive building (defined as a building with either plaster or wallboard for internal walls and ceilings). Implementation of mitigation measures would reduce this effect to less than significant.

Table 43. Estimated Ground Vibration Levels Caused by a Vibratory Roller.

Distance from Construction Equipment (feet)	Ground Vibration PPV (inches/second)
25	0.21
30	0.20–Potential damage to interior plaster walls
40	0.10–Strongly discernible
50	0.07
100	0.026

Note: Assumes a single vibratory roller, with a source vibration level (PPV) of 0.210 inches/second at 25 feet.
Source: Corps, 2009

American River

Erosion protection construction activities in the American River Parkway could result in temporary significant impacts on residents, recreationists, and other noise sensitive groups. While Sacramento County has a construction noise exemption during daylight hours, as described in Section 3.13.1, noise levels above 55 dBA are generally considered to be a significant effect on sensitive receptors because they exceed the noise standard for the project area. For the erosion protection activities proposed for the American River, noise levels could exceed 55 dBA during construction. Table 44 below shows estimated noise levels for erosion protection construction activities. According to the estimates in Table 44, there is the potential for significant effects to sensitive receptors that are 500 feet or less from the construction site. Mitigation would be implemented to reduce these noise levels to less than significant.

Table 44. Noise Levels during Construction of Erosion Protection.

Distance Between Source and Receiver (feet)	Calculated 1-Hour L_{eq} Sound Level (dBA)
50	82
100	74
200	66
300	61
400	58
500	56
1,000	48
1,500	43
2,000	40
3,000	35

Note: This calculation does not include the effects, if any, of local shielding from walls, topography, or other barriers which may reduce sound levels further.
Source: Corps, 2009

Sacramento River

Effects associated with the erosion protection work on the Sacramento River would be consistent with those described for the American River above. Noise effects associated with the slope stability, seepage, erosion, and height improvements for the Sacramento River levees, including the construction of a slurry wall and levee raise are discussed below.

Along the Sacramento River, many residents' homes and backyards are immediately adjacent to the levee, with little to no buffer zone. As a result, there would be very little attenuation to reduce the noise effects from construction of the levee improvements for some residents in this reach. Table 44 below lists estimated noise levels from construction activities proposed for the Sacramento River levees.

Table 45. Summary of Predicted Construction Noise Levels.

Construction Activity	Cumulative Noise Levels at 50 Feet
Stripping	88
Levee Degrading	93
Cutoff Wall Installation	83
Soil Placement/Compaction (slope work, levee raise)	95
Rip Rap Installation	88
Roadway Construction	87

Source: Based on data collected for the Southport EIP EIS/EIR (WSAFCA, 2012).
Noise levels were obtained from data collected on previous construction projects.

While Sacramento County has a construction noise exemption during daylight hours, as described in Section 3.13.1, noise levels above 55 dBA are generally considered to be a significant effect on sensitive receptors. According to the estimates shown in Table 45, noise effects to sensitive receptors would be significant during construction of the Sacramento River levee improvements. Mitigation described in Section 3.13.6 would be implemented to reduce these noise levels to less than significant.

East Side Tributaries

The majority of the features proposed for the east side tributaries' levees would have similar noise effects to those described under the Sacramento River above and would be significant. In particular, the Arcade Creek, NEMDC, and Dry Creek, and Robla Creek levees have residents living adjacent to them who would likely be adversely affected by construction noise in the area. Mitigation described in Section 3.13.6 below would be implemented to reduce these noise levels to less than significant.

The feature exclusively proposed for the east side tributaries is construction of a floodwall or floodwall raise to improve levee height. However, construction of this feature would not increase noise levels beyond that of the additional levee features proposed for this reach. As a result, the effects associated with this action would be similar to those described for the Sacramento River above and shown in Table 45. Mitigation measures would be implemented to further reduce these construction noise levels to less than significant.

3.13.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Noise effects from construction of the levee repairs under Alternative 2 would be consistent with the analysis in Alternative 1, except that the noise impacts under Alternative 2 would be for a shorter duration, as there would be less than 1 mile of levee raises constructed downstream on the Sacramento River compared to 8 miles of levee raise for Alternative 1.

Noise effects associated with the widening of the Sacramento Weir and Bypass would also be similar to the effects described under Alternative 1. Noise would be generated from construction equipment and activities, however in this case the study area is primarily rural. The closest sensitive receptors are approximately 900 and 1,500 feet away from the construction area, respectively. Mitigation described in Section 3.13.6 below would be implemented to reduce these noise levels to less than significant.

3.13.6 Avoidance, Minimization, and Mitigation Measures

During construction, noise-reducing measures would be employed in order to ensure that construction noise complies with local ordinances. Prior to the start of construction, a noise control plan would be prepared that would identify feasible measures to reduce construction noise, when necessary. The following measures would apply to construction activities within 500 feet of a sensitive receptor, including, but not limited to, residences. These measures may include, but are not limited to, the following:

- Provide written notice to residents within 1,000 feet of the construction zone, advising them of the estimated construction schedule. This written notice would be provided within one week to one month of the start of construction at that location.
- Display notices with information including, but not limited to, contractor contact telephone number(s) and proposed construction dates and times in a conspicuous manner, such as on construction site fences.
- Schedule the loudest and most intrusive construction activities during daytime hours (7:00 a.m. to 7:00 p.m.), when feasible.
- Require that construction equipment be equipped with factory-installed muffling devices, and that all equipment be operated and maintained in good working order to minimize noise generation.
- Locate stationary noise-generating equipment as far as practicable from sensitive receptors.
- Limit unnecessary engine idling (i.e., more than 5 minutes) as required by State air quality regulations.
- Employ equipment that is specifically designed for low noise emission levels, when feasible.
- Employ equipment that is powered by electric or natural gas engines, as opposed to those powered by gasoline fuel or diesel, when feasible.
- If the construction zone is within 500 feet of a sensitive receptor, place temporary barriers between stationary noise equipment and noise sensitive receptors to block noise transmission, when feasible, or take advantage of existing barrier features, such as existing terrain or structures, when feasible.
- If the construction zone is within 500 feet of a sensitive receptor, prohibit use of backup alarms and provide an alternate warning system, such as a flagman or radar-based alarm that is compliant with State and Federal worker safety regulations.
- Locate construction staging areas as far as practicable from sensitive receptors.
- Design haul routes to avoid sensitive receptors, to the extent practical.

- If there are any occupied buildings with plaster or wallboard construction within 40 feet of construction equipment, a vibration control plan would be prepared prior to construction.

3.14 Recreation

3.14.1 Environmental Setting

Regulatory Setting

- American River Parkway Plan
- Sections 9 and 10 of the Rivers and Harbors Appropriation Act of 1899 (33 U.S.C. §§ 401 and 403)
- State Wild and Scenic Rivers Act in 1972 (PRC Section 5093.50-5093.70)
- Sacramento City Parks and Recreation Master Plan
- Sacramento County Bikeway Master Plan
- Old Sacramento State Historic Park General Plan

Existing Conditions

The primary recreational feature within the American River Parkway (Parkway) which could be affected by the project is the Jedediah Smith Recreation Trail, which provides bicycle, pedestrian, and equestrian trails from Discovery Park to Folsom Lake. The trail also connects with the Sacramento River Trail and Old Sacramento State Historic Park, and many people use it daily to commute to work by bicycle into Downtown Sacramento. The southern terminus of the Sacramento Northern Bike Trail is located at the point where the Jedediah Smith Recreation Trail crosses Del Paso Boulevard headed downstream. The Sacramento Northern Bike Trail transitions to the top of the levee from the Jedediah Smith Recreation Trail at this location and continues north through Sacramento County. The levee crown is covered with a compacted aggregate base material that is also used for pedestrian recreational activities.

American River

The study area contains a significant portion of the American River Parkway. The Parkway is an open space greenbelt which extends approximately 29 miles from Folsom Dam to the American River's confluence with the Sacramento River. The river has a broad channel with riparian vegetation along the banks and is located within the American River Parkway corridor. The river is the central focus of the

Parkway which provides enjoyment to residents and visitors of the Sacramento region.

The California legislature passed the State Wild and Scenic Rivers Act in 1972 (PRC Section 5093.50-5093.70). The legislature said that it was the State's intent that "certain rivers which possess extraordinary scenic, recreation, fisheries, or wildlife values shall be preserved in their free-flowing state, together with their immediate environment, for the benefit and enjoyment of the people of the State." The 23-mile portion of the American River that extends from below Nimbus Dam to the confluence with the Sacramento River has been designated as a Wild and Scenic River for its recreational uses under both the State and Federal Wild and Scenic Rivers Acts.

In 2008, the County of Sacramento finalized the *American River Parkway Plan* to provide a guide to land use decisions affecting the Parkway and specifically addressing the Parkway's preservation, use, development, and administration. The Parkway Plan acts as the management plan for the Federal and State Wild and Scenic Rivers Acts (see Land Use Section 3.3).

Permitted recreational activities in the Parkway are divided into five categories: nature appreciation, recreation enjoyment, trails recreation, recreational participation in group sports and athletics, and aquatic recreation. Many activities are prohibited in the Parkway, including: hunting, motor vehicles and scooters on trails, fireworks, and jumping or diving from bridges. Most of the prohibited activities are considered to be invasive to the natural environment or could damage the integrity of the natural setting.

The bicycle trail (Jedediah Smith Memorial Trail) is a corridor for Parkway and non-Parkway destinations, providing access for bicyclists between downtown Sacramento and points to the east. The trail has become a well established commuter route and vital recreational asset. Bicyclists require wide trails and a smooth surface to accommodate a large number of users and a wide range of speeds. The needs of bicycle commuters are somewhat different than those of recreational users of the Parkway. Bicycle commuters often ride the bicycle trail during normal commuter hours. The trails near California State University, Sacramento have a much higher volume of bicyclists and pedestrians, since students bike or walk to and from classes. This volume does decrease when school is not in session.

Recreational boating is one of the primary uses of the American River. Boat access is located at Discovery Park on both the Sacramento and American River side of the park. Boat launches within the Parkway are located at Howe Avenue, Watt Avenue, and Gristmill Park. The river can become very shallow between Sunrise and Howe Avenue when releases from Folsom Dam are reduced, making motorized boating impracticable. Rafting on this stretch of the river is very common during summer months with the highest use on the weekends and holidays.

Many parks are located within the American River Parkway portion of the study. Following is a description of the parks and their activities.

Discovery Park. Located just north of downtown Sacramento at the confluence of the American River and the Sacramento River, this 302-acre park is a popular site for rafters and waders. Discovery Park is the trailhead for the 32-mile long Jedediah Smith Memorial Trail. The park also features a boat launch. Discovery Park was designed to flood and take pressure off American River levees during high water events. For safety reasons, the park closes when water flows into the public areas and remains closed until the water subsides.

Sutter's Landing Regional Park. Nestled along the banks of the American River about a mile northeast of downtown Sacramento, this 172-acre park currently offers a wide variety of recreational opportunities including a covered skateboard park, a dog park, picnic areas, basketball and bocce ball courts, as well as access to trails along the American River and a boat launch for kayaks, canoes, and other non-motorized boats. Visitors can also see a diversity of wildlife at this site including river otters, beavers, jackrabbits, cottontails, coyotes, raccoons, gopher snakes, fence lizards, skunks, ground squirrels, voles, and an occasional sea lion, as well as a wide variety of bird species ranging from shorebirds and waterfowl to raptors making it an ideal location for nature watching as well as birding. Other popular activities at this location include walking, jogging, and biking.

Paradise Beach. Just off of U.S. 50 at Howe Avenue, Paradise Beach offers a sandy beach area and is a popular spot for swimming.

Campus Commons Golf Course. Built in 1972, the 1,699 yard Campus Commons Golf Course is a public nine hole executive course located just north of California State University Sacramento, along the American River.

Guy West Bridge. The Guy West Bridge is a pedestrian-only suspension bridge crossing the historic Lower American River. It is modeled after the famed Golden Gate Bridge in San Francisco, but spans only 600 feet compared to the Golden Gate’s 6,450 feet. The bridge was constructed to tie the California State University campus to a business and residential community on the north side of the American River.

Howe Avenue. Located down river from California State University, Sacramento, this car-top launch site allows small boats and rafts to be launched into the American River. Because of the swift rapids, this site is not conducive to swimming and wading.

Waterton and Save the American River Association. Just off of U.S. 50 at Watt Avenue, Waterton Access is a small site providing access along the river. The area is inhabited by deer and jackrabbits, so it is ideal for nature watching. The nearby Save the American River Association Access offers similar opportunity.

Watt Avenue. Just off Watt Avenue is an American River access point popular as a take-out spot for rafters, canoeists, and kayakers. Fishing is also popular here because of the range of shallow and deep water.

Gristmill Park. Located off Mira Del Rio Drive and Folsom Boulevard in Rancho Cordova, Gristmill Park is a popular place for fishing, bird watching, and nature watching/photography. The area also has some nice walking paths popular with the locals that wind through oak woodlands along the southern bank of the river in either direction from the parking area. In addition to the usual assortment of birds in these woodlands such as woodpeckers, Northern flickers, and red-shouldered hawks, it is not unusual to spot deer and coyote here as well. Due to the calmness of the river at this location, it is a popular launch spot for kayaking and canoeing.

William Pond Recreation Area. Located off Arden Way, the William Pond Recreation Area is one of the most well-established and popular parks along the river. Named in honor of the first director of County Parks, the park is handicap-friendly and offers a man-made fishing pond with a specialized fishing pier and ramp and paved walking trails that gently slope around the park.

River Bend Park (formerly Goethe Park). River Bend Park, formerly C.M. Goethe Park, is one of Sacramento's oldest county parks. It is located at U.S. 50 and Bradshaw Road and offers many recreation facilities. Horse and hiking trails wind through the park for plenty of wildlife viewing. This facility also has large group picnic sites often used for community events. River Bend Park is the endpoint for many recreational rafters on the American River.

Soil Born Farms. Located on the American River in Rancho Cordova (40 acres) and in Sacramento on Hurley Way (1.5 acres), Soil Born Farms organically grows a wide variety of fruits and vegetables linked to the seasons and temperament of the Sacramento region. All produce is harvested within a day of distribution to local restaurants, famers markets, and at their own farm stand at the American River ranch location from May to November. This nonprofit farm is actively involved in fostering organic farming through their farm apprentice program and youth education. All water used in irrigation comes from the American River and no synthetic pesticides or fertilizers are used.

Sacramento River

The Sacramento River has an abundance of recreation activities within the study area. Fishing, picnicking, water skiing, and bicycling are just a few of the more popular activities. Boat launches in this area of the study are located at Miller Park and Garcia Bend Park. The bicycle trail along the Sacramento River runs from above the confluence with the American River approximately four miles downstream of the confluence. The bike trail, which is used as a commuter route to downtown Sacramento, is located on top of the levee throughout most of this area. Designated parks in this area of the project include the following:

Miller Park. Adjacent to the Sacramento Marina, off Harborview Drive from Front Street, this 57 acre city park is right on the Sacramento River. The park includes picnic areas, boat trailer parking, and a boat ramp and dock. There is also a store called Rat's Snack Shop.

Garcia Bend Park. Located between Pocket Road and the Sacramento River, this 19-acre community park is a popular place for recreation providing soccer fields, lighted tennis courts, play areas, picnic areas, restrooms, and a public boat ramp providing access to the Sacramento River.

The Riverfront Promenade. A new addition to Sacramento's riverfront, a couple blocks were opened in 2001. It is located just downstream of Old Sacramento and is still in the early stages of development. When complete, the promenade will be a mile long walking and cycling path that connects Old Sacramento to Miller Park.

East Side Tributaries

All of the tributaries, including Arcade Creek, Dry/Robla Creek, NEMDC, and Magpie Creek, support walking, bird watching, and fishing. None of the tributaries have designated recreation areas; however, the NEMDC is considered part of the American River Parkway from the confluence with the American River upstream approximately 0.4 miles. The Sacramento Northern Bike Trail crosses through this area of the Project at Arcade Creek. The trail is used by many cyclists, and has a diverse environment ranging from industrial areas to grasslands and cattle grazing fields.

Sacramento Bypass

The Sacramento Bypass is owned by the State of California and operated by CDFW as the Sacramento Bypass Wildlife Refuge. Access is gained at numerous points from County Roads 126 or 127. There is a gate across County Road 127 and vehicles are not allowed on the levee road. County Road 126 is paved for 1 mile before encountering a gate, restricting further vehicle access along the levee. Access is limited to foot traffic within the Refuge and along levee roads. Fishing, wildlife viewing, and bird watching are allowed in this area. Hunting is allowed between September 1 and January 31. Game species include waterfowl (when the area is flooded), ring necked pheasant, and mourning dove. No big game hunting is allowed in this area.

The Yolo Shortline Railroad (also known as the Sacramento River Train) is another recreational opportunity in the area. The Yolo Shortline Railroad is a popular northern California tourist attraction. This dinner train operates two lines, one between Woodland and West Sacramento and the other between West Sacramento and Clarksburg. The Yolo Shortline Railroad tracks run along the top of the Sacramento Weir.

3.14.2 Methodology and Basis of Significance

Methodology

Impacts to recreational opportunities within the project area are evaluated based on temporary and permanent changes to those resources that would occur with implementation of one of the proposed alternatives. Compliance with the American River Parkway Plan and other regional planning documents (City of Sacramento General Plan, City of Sacramento Parks and Recreation Master Plan) were taken into consideration when analyzing the various alternatives. Compliance with the Rivers and Harbors Act and the Wild and Scenic Rivers Act was also taken into consideration.

Basis of Significance

The thresholds of significance encompass the factors taken into account under NEPA to determine the significance of an impact in terms of its context and intensity. The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. Adverse effects on recreation would be considered significant if implementation of an alternative plan would result in any of the following:

- Eliminate or substantially restrict or reduce the availability, access, or quality of existing recreational sites or opportunities in the project area;
- Cause substantial long-term disruption in the use of an existing recreation facility or activity;
- Result in inconsistencies or non-compliance with regional planning documents;
- Result in inconsistencies or non-compliance with the American River Parkway Plan; or
- Result in inconsistencies with the Rivers and Harbors Act or the Wild and Scenic Rivers Act.

3.14.3 No Action Alternative

Under the No Action Alternative, the levee improvement project would not be constructed, therefore, there would be no construction-related effects to recreation in the study area. However, existing problems would continue along the levees encompassed within the ARCF Project study area which could potentially lead to a future flood event or levee failure. Such an event could potentially result in flooding and inundation of existing recreational facilities, trails, bike paths, and recreation areas rendering them unusable until cleanup and restoration activities could take place. Under the No Action Alternative, sustained high flows on the American River would erode the banks in the parkway, and over time, the parkway and the recreational opportunities and facilities within it, would be lost. This same degree of loss could also occur as the result of a single very large event if existing problems are not addressed. The No Action Alternative would result in inconsistencies and non-compliance with the

American River Parkway Plan which states that:

> *Public facilities and private encroachments that inappropriately constrain the operation and maintenance of the flood-control system should be redesigned or relocated.*
>
> *Bank scour and erosion shall be proactively managed to protect public levees and infrastructure, such as bridges, piers, power lines, habitat and recreational resources. These erosion control projects, which may include efforts to anchor berms and banks with rock revetment, shall be designed to minimize damage to riparian vegetation and wildlife habitat, and should include a revegetation program that screens the project from public view, provides for a naturalistic appearance to the site, and restores affected habitat values.*

The effects of the No Action Alternative would cause significant impacts to recreation facility that could not be mitigated as there are no areas within the urbanized Sacramento Region that would provide a similar recreation experience as the American River Parkway.

3.14.4 Alternative 1 – Improve Levees

American River

Construction of erosion protection measures is expected to take up to 10 years, with construction occurring in multiple locations within the Parkway at the same time. While this would not be a permanent long-term affect, 10 years of linear construction would be considered a significant effect to recreation activities because it would reduce the quality of existing recreation activities. Portions of the road on top of the levee would be closed to pedestrian access during the construction period. Additionally, construction of the launchable rock trench would disturb several miles of bike trails as well as access to public parks and boat launches within or adjacent to the Parkway. Such closures and disturbances would result in non-compliance with the American River Parkway Plan which states that flood control berms, levees and other facilities should be, to the extent consistent with proper operation and maintenance of these facilities, open to the public for approved uses, such as hiking, biking and other recreational activities.

These closures and disturbances would also result in non-compliance with the Wild and Scenic Rivers Act which states that "certain selected river of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations" Recreational resources that could potentially be affected by construction of the erosion protection measures include Paradise Beach, the Campus Commons Golf Course, the Guy West Bridge, and the boat launches at Howe Avenue, Watt Avenue, and Gristmill Park.

Construction vehicles would be present in staging areas at various points along the Parkway and construction activities could result in potential disruptions/detours not only of bike trails, but of hiking trails and equestrian trails as well. The access roads in and out of the Parkway at various locations would be used as haul routes for trucks transporting borrow material resulting in increased traffic along the entry routes used by recreationists. Proximity to construction equipment and activities may also degrade recreational experiences, due to noise, visual effects, smells, and air quality. This would be a significant effect on recreation activities during construction. Mitigation measures would be implemented in order to reduce impacts on recreation; however, even with the mitigation measure effects to recreation during construction would be significant. Once construction is complete the recreation facilities would be returned to the pre-construction conditions and long term effects would be less than significant. The mitigation measures are discussed below.

Many people who use the recreation facilities in the Parkway are daily users who enjoy the tranquility of the Parkway in an urban environment. While construction activities are underway, the tranquility of the Parkway will be lost. Because the construction would be occurring for several years and would take away the overall pleasure of recreation activities, there would be a significant effect that cannot be mitigated. While bike trails, running paths, boat ramps, and equestrian trails can all is rerouted or accessible a short distance away, there would still be an overall reduction in the recreation quality with continuous construction over a 10 year period and, therefore, would result in a significant effect. Construction will also occur during the summer months when the Parkway recreation activities are at the peak. The timing of construction cannot be mitigated as it is unsafe to perform construction activities in the floodway during the flood season.

Sacramento River

Construction of levee improvements would have potential short-term effects to recreation along the Sacramento River. Activities would occur in the vicinity of Miller Park and Garcia Bend Park during summer months when the park is at the peak use time. Paved parking areas at both parks could be used for staging of equipment and other construction activities. Access to the parks would remain open during construction but could be impacted by construction equipment using the same access or levee construction. The boat ramps at both of these parks would also remain open during construction. Walking trails and the existing bike path may be temporarily rerouted during construction. Detours would be temporary and would return to pre-construction conditions following the completion of construction. There would be short-term term significant effects along the Sacramento River reach of the project, however, there would be no long-term effects because the area would be returned to the pre-construction conditions once completed.

East Side Tributaries

Construction of levee improvements on the tributaries would have minimal effect on recreation uses, except for the levee trail, which is sometimes used as a walking path or for cycling. People who commonly use this area would be able to continue the walking and cycling on other public roads and trails. There are no formal recreational facilities in this area of the project that would be impacted during construction. These areas are highly urbanized and consist mainly of industrial buildings and single family dwellings along the landside of the levee. Since there are very few recreation uses in these areas, any effects to recreation would be temporary and less than significant. Construction activities are not expected to have an impact on the Sacramento Northern Bike Trail. However, tree planting mitigation could occur along this trail which would provide for a more pleasurable environment for cyclists.

3.14.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Effects to recreation from the construction of levee improvements under Alternative 2 would be consistent with those analyzed for Alternative 1 with the addition of effects resulting from construction of levee improvements associated with the Sacramento Weir and Bypass widening. Those effects are described below.

Sacramento Bypass

Construction of levee improvements associated with the Sacramento Weir and Bypass widening would have possible short-term effects on recreational use. During construction, certain areas would be closed to the public while other areas might be used as haul routes or borrow/disposal sites. Activities such as bird watching, walking, running, and jogging along the Sacramento Bypass levee crown and nearby roads would be restricted. Construction activities could potentially overlap with hunting season in the Sacramento Bypass Wildlife Area, which occurs from September 1 through January 31, restricting hunting activities for a limited period of time. In addition, there may be temporary effects to the Yolo Shortline Railroad. Construction activities would have a significant effect on the Yolo Shortline Railroad as portions of the railway may have to be shut down or relocated during construction activities.

3.14.6 Avoidance, Minimization, and Mitigation Measures

The following measures would be taken to keep the public informed of construction activities to mitigate for effects to bike trail/recreation trail access. Coordination with recreation user groups would occur prior to and during construction for input into mitigation measures that would reduce affects to the maximum extent practicable. Advance notice would be given to recreation users informing them of anticipated activities and detours to reduce the affects.

To ensure public safety, flaggers, warning signs, and signs restricting access would be posted before and during construction, as necessary. In the event that bike trails would be disrupted, detours would be provided. Detour routes would be clearly marked, and fences would be erected in order to prevent access to the project area. In areas where recreational traffic intersects with construction vehicles, traffic control will be utilized in order to maintain public safety. The public will have continued access to the Parkway and recreation facilities during construction, but bike and running trail users would likely be required to detour onto public roads or alternative trails. If any access point needs to be closed during construction, notices will be posted providing alternative access routes.

These mitigation measures will reduce the effects on recreation; however, impacts would still be significant because of the duration of construction and the inability to provide similar quality recreation during construction. Any recreation facilities affected by the project would be replaced in-kind within the existing area and no long-term impacts are anticipated.

3.15 Visual Resources

3.15.1 Environmental Setting

Regulatory Setting

There are no Federal or State laws regulating visual resources.

Existing Conditions

This section describes the existing visual conditions of the study area. Visual resources are the natural and human-built features of the landscape that can be seen and that contribute to the public's enjoyment of the environment. Physical features that make up the visible landscape include land, water, vegetation, and geological features; the built environment includes buildings, roadways, bridges, levees, and other structures.

Several sets of criteria have been developed for determining visual quality. One common set of criteria includes vividness, intactness, and unity (FHWA 1988). There terms are defined as follows:

- Vividness is the visual power or memorability of landscape components that combine in visual patterns.
- Intactness is the visual integrity of the natural and constructed landscape and its freedom from encroaching elements. This factor can be present in urban and rural landscapes as well as natural settings.
- Unity is the visual coherence and compositional harmony of the landscape resources of the area.

The existing visual quality in the project area is determined based on both the relative degree of vividness, intactness, and unity apparent in views, and/or visual sensitivity. Visual sensitivity or concern is based on several factors: visibility of the landscape, proximity of viewers to the visual resources, elevation of viewers compared to the elevation of the visual resources, frequency and duration of views, number of viewers, types of individuals and groups of viewers, and viewers' expectations.

American River

The main group of viewers in this area of the project consists of residents living adjacent to the levee, travelers across the Business 80, Fair Oaks Boulevard/H Street, Howe Avenue, and Watt Avenue Bridges, recreational users of the American River Parkway, and boaters on the American River.

The visual environment along the American River includes the urban development on the landside of the levee with homes and landscaped backyards. The existing levees block views of the American River from most adjacent landside areas. A view of the American River Parkway from the second story of homes directly adjacent to the levee is possible in some areas. People using the top of the levee for recreational activities see primarily riparian forest and open space lands throughout the Parkway on the waterside. Figures 13 through 17 shows a sample of views from various locations within the Parkway.

The Parkway's open spaces and natural resources provide users with a highly-valued natural setting and feeling of serenity in the midst of a developed urban area. The Parkway provides all of the visual quality of intactness, vividness, and unity as a linear park which can be observed by users with limited urban disruption. The Parkway's aesthetic values are those unique qualities that define the Parkway experience for those who use the Parkway.

According to the Parkway Plan flood control policies:

> *Bank scour and erosion shall be proactively managed to protect public levees and infrastructure, such as bridges, piers, power lines, habitat and recreational resources. These erosion control projects, which may include efforts to anchor berms and banks with rock revetment, shall be designed to minimize damage to riparian vegetation and wildlife habitat, and should include a revegetation program that screens the project from public view, provides for a naturalistic appearance to the site, and restores affected habitat values.*

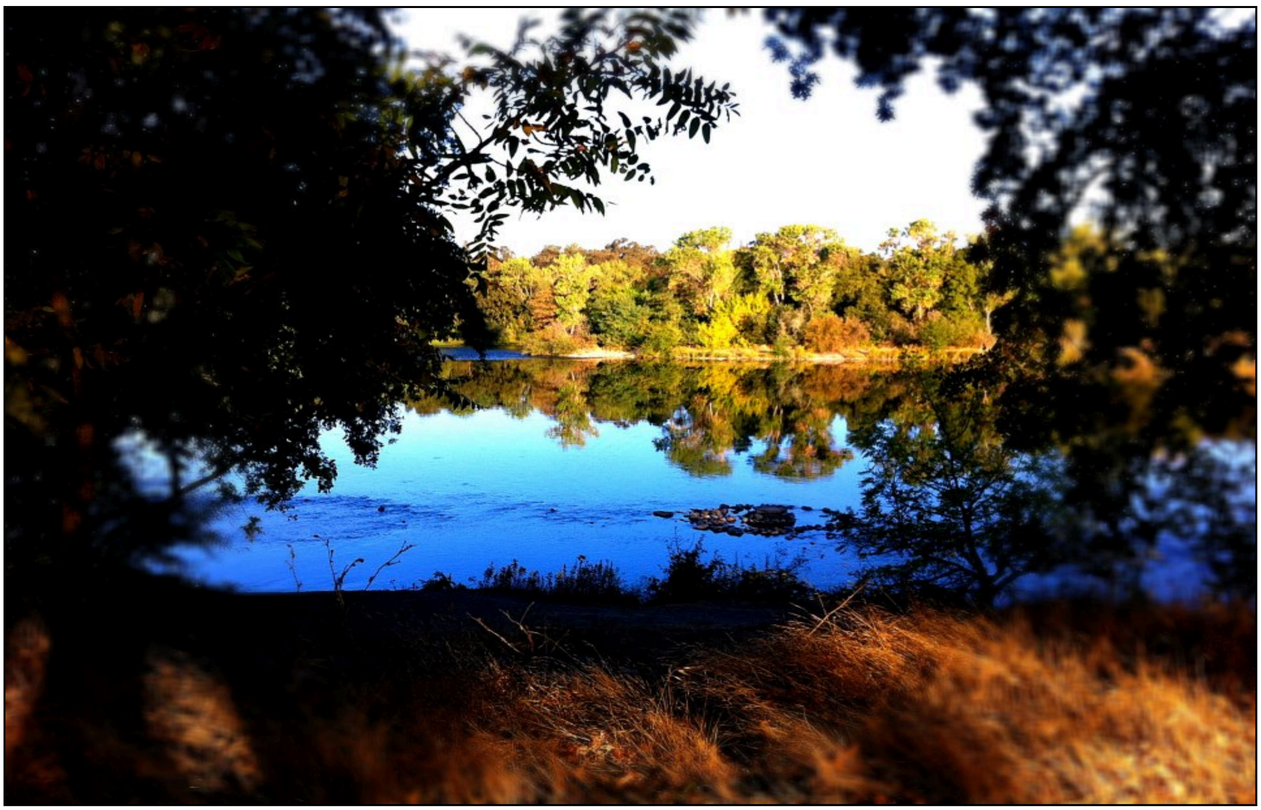

Figure 13. View of American River from Bike Trail. (Source: Tim Davis 2013)

Figure 14. View of American River with Artist. (Source: Tim Davis 2013)

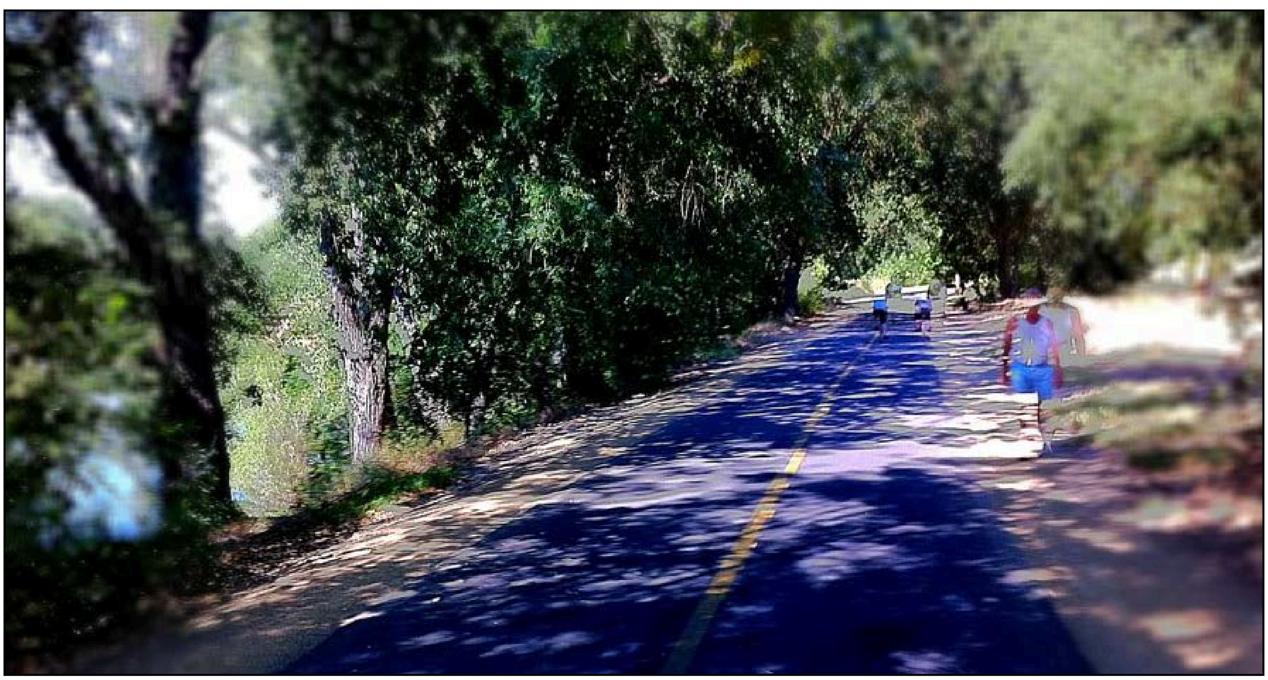

Figure 15. American River Bike Trail with Cyclist and Jogger. (Source: Tim Davis 2013)

Figure 16. View of American River near Watt Avenue. (Source: Tim Davis 2013)

Figure 17. View of American River from Guy West Bridge looking at H Street Bridge. (Source: Tim Davis 2013)

Sacramento River

The main groups of viewers along the Sacramento River are residents living adjacent to the levee; travelers across U.S. 50, Tower, and I Street bridges; recreational users of the existing bike path and facilities; and boaters on the Sacramento River. Figure 18 is a typical view of this area.
Within this reach of the study the Sacramento River has residential properties on the landside and a narrow riparian corridor on the waterside. Much of this area is closed to the public by gates that prevent public access onto private property. Boaters on the Sacramento River view the narrow riparian corridor and the tops of homes adjacent to the levee. Discovery Park is located in this area of the study and is used for both water and land based recreation. This area includes large picnic areas, a sandy beach, and bike trails.

Figure 18. Sacramento River in Pocket Area.

East Side Tributaries

Natomas East Main Drain Canal

This area is very urbanized with industrial buildings and single family dwellings along the landside of the levee. There are also some small vacant parcels of land along the lower stretch of this waterway. The waterside levee slopes are grasses with some trees within the canal channel. Viewers in the area include residents on the landside and vehicle traffic across the Arden Garden Connector, El Camino Avenue, and San Juan Road/Silver Eagle Road bridges. The highly urbanized area and lack of natural vegetation prevents this reach from providing an intact visual experience. There are not a lot of recreational users in this area of the project due to the lack of facilities. Figures 19 and 20 are pictures of a typical view of this area.

Figure 19. Natomas East Main Drain Canal.

Figure 20. Natomas East Main Drain Canal Levee.

Arcade Creek

This area is very urbanized with homes on the landside and little vegetation on the water side. A small floodwall is on top of the levee in much of the study area. Viewers in the area include residents, and a few recreational users. Because the homes are lower than the levee in this area and there is a floodwall the landside residents have very little view of the creek. Figures 21 and 22 are pictures of a typical view of this area.

Figure 21. Arcade Creek.

Figure 22. Arcade Creek at its Confluence with NEMDC.

Dry/Robla Creek

This area is an open space natural corridor between the two levees. On the landside of the levees urban development is prominent throughout most of this study reach. Viewers in this area are primarily local residents. Figures 23 and 24 are pictures of a typical view of this area.

Figure 23. Dry/Robla Creek Levee and Channel.

Figure 24. Dry/Robla Creek Channel.

Magpie Creek

This area is open space with some small ranchettes and light industrial uses on the fringe of the creek. Viewers in this area are primarily local residents. The levee structure is very low in this area and hard to define from a viewer's perspective. Figure 25 is a typical view of this area.

Figure 25. Magpie Creek Diversion Channel.

Sacramento Bypass

The Sacramento Bypass consists primarily of open space and flood conveyance land uses. No development or agricultural activities occur within the bypass. Agricultural land borders the Sacramento Bypass to the north, southwest, and west. The Sacramento Weir serves as its eastern boundary, separating the Bypass from the Sacramento River. The California Highway Patrol (CHP) Academy is located to the adjacent to the south levee of the Bypass.

The primary viewers using the Sacramento Bypass area are recreationists. Recreational uses consist of boating and fishing along the Sacramento River, hunting in the bypass, bird watching, walking, running, and jogging along the Sacramento Bypass levee crown and nearby roads. Viewers using the levees of the bypass for recreation have expansive views of the open space within the bypass, and the agricultural fields beyond. The high-rise buildings of downtown Sacramento can be seen above the tree line. Background views to the Sierra Nevada foothills to the east are rare, while views of the Sutter Buttes to the north are more common. Some views are obscured by vegetation adjacent to the levees of the bypass near the CHP Academy. Views also differ seasonally, offering different views when vegetation is dormant or in leaf.

While the visual quality of the bypass itself is moderate, the views offered from it are moderately high. Appealing views of the bypass and Sacramento cityscape present both rural and urban scenes that are attractive. Figures 26 through 28 are pictures of this area during a high water event.

Figure 26. Sacramento Weir.

Figure 27. Sacramento Weir in High Water Event.

Figure 28. Sacramento Bypass (Downstream of Weir) with Water.

3.15.2 Methodology and Basis of Significance

Methodology

Evaluation of the project's potential impacts on visual resources was based on a review of scenic vistas and landscapes that could be affected by project-related activities. Visual contrasts were examined, which included evaluations of changes in form, size, colors, project dominance, view blockage, and duration of impacts. Other elements such as natural screening by vegetation or landforms, placement of project components in relation to existing structures, and likely viewer groups were also considered.

Basis 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. The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. A proposed alternative would result in a potentially significant impact to visual resources if it would:

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

3.15.3 No Action Alternative

Under the No Action Alternative, the Corps would not participate in construction of the proposed project. As a result, the project would not cause additional effects to visual resources. Under this alternative, visual conditions in and around the study area would remain consistent with current conditions, with the potential for the visual character to be adversely affected by a future flood event and levee failure.

3.15.4 Alternative 1 – Improve Levees

Borrow Sites

Activities at borrow sites would consist of large excavation equipment removing soil to extract suitable material and transporting the material to the levee construction sites. The estimated amount of borrow material needed is 1 million cubic yards, which could require more than 400 acres of land to extract suitable material. Multiple sites have been considered for borrow material. The sites being considered are in rural areas and are not currently being used for crop production or other urban uses. Actual selection of borrow sites would be determined based on the least damage to the natural and human environment. During construction the existing visual character will be diminished as large equipment moves soil and the sites become exposed dirt. However, this is a short term impact and once the site is completed and restored the effects will be less than significant or could be a positive effect on the visual character.

The Corps will coordinate with the CDC to comply with the Surface Mining and Reclamation Act of 1975. Reclamation of the sites is included as part of the project design by returning the sites to pre-construction conditions or improving the sites visual character with compensation plantings. After the completion of restoration, the borrow sites would be similar to existing conditions or would increase habitat and the natural looking environment by placing compensation for other project affects on the sites after soil is extracted. No mitigation would be required for borrow sites.

American River

Construction would occur on approximately 11 of the 26 miles of the American River Parkway, a construction area of nearly 200 acres. Within the 200 acres are approximately 65 acres of riparian habitat that would be removed to construct the launchable rock trenches. The remaining 135 acres are existing levee slopes, which will be degraded to install the rock trench, and staging areas. Vehicles in the Parkway are normally limited to maintenance, park rangers, and random field crews. During construction equipment would be moving throughout the Parkway as equipment and materials are delivered and removed from the sites. This would create a reduction in the visual quality of the Parkway. Construction in the Parkway would be primarily during the summer months and would last for approximately 10 years. While this is considered a short-term impact, with the number of construction vehicles required and the construction timeframe extending for 10 years, this is considered a significant effect to the visual tranquility of the Parkway.

The loss of riparian vegetation from the construction of the launchable rock trenches would have a long term impact on the visual resources in the Parkway. The launchable rock trenches would be designed to include a planting berm, which would be planted with trees outside of the 15 foot vegetation free zone to compensate for some of the 65 acres of lost riparian habitat. However, the trees would take many years to grow to the similar visual value as those removed. This is considered a significant effect to visual resources and cannot be mitigated.

During construction of the bank protection sites, activities in the Parkway would be similar to those for the rock trench. Construction vehicles would be moving throughout the Parkway transporting materials to the sites. The footprint for the bank protection sites would be adjacent to the river channel, varying distances from the public access areas. Visual impacts of completed bank protection sites would likely only be seen from the river and to those within the Parkway. Trees would remain in place and anchored with rock to protect them from future erosion. These sites would also be planted with vegetation; once the vegetation is established the rock would likely not be visible from either the river or the Parkway. It would likely take 3 to 5 years to establish the vegetation at these sites. Figures 8 through 10 are pictures of a site similar to the proposed bank protection sites and what the site looked like post-construction, 4 years after construction, and 9 years after construction. The visual value of these sites would take time to reach the full natural environment preferred by users. Visual effects at bank protection sites are considered to be less than significant because the sites would quickly revegetate and provide a natural looking environment similar or enhanced from existing conditions.

Sacramento River

Construction activities along the Sacramento River would require the hauling of equipment and materials to the sites. There would be large construction equipment on barges and on top of the levee during construction of the levee improvements. Boaters and pedestrians would be able to see the construction equipment and activities. Residents that back up to the levee would also see the construction activities from their backyard and windows. The presence of construction equipment would degrade the visual quality of the scenic vistas of the Sacramento River for the residents and recreational users. Construction along the Sacramento River would be intermittent for approximately 8 years. Construction would occur laterally so most residents will experience construction activities behind their homes for one to two construction seasons.

This alternative would require the removal of some vegetation and landscaping from private property in areas where levee raising is recommended. This would have a long term effect on those individual residents as the levee and maintenance corridor would replace portions of their landscaped backyard. This would be a significant effect to the individual homeowners because it would decrease the existing visual character of the backyards.

Construction of the bank protection would be visible from the river and the levee. People using the river and levee do not normally see construction equipment in the area. While construction is taking place, people would have a visual disturbance compared to the existing conditions. Like the American River, the visual effects would be short-term and, similar to the American River effects discussed above, vegetation planted along the bank would cover the rock and provide natural habitat within 3 to 5 years. Large trees would also remain in place, which would reduce the effects to visual resources. Effects to visual resources are short-term and are considered less than significant.

East Side Tributaries

The waterways in this area of the project are much different from the Sacramento and American Rivers because the creeks are dry much of the year. The creeks contain overgrown vegetation and multiple areas have scattered debris such as shopping carts, appliances, and tires. Construction equipment would use the levee roads and ramps to access each area of construction. Residents would view the equipment during construction activities, however, this would last only one construction season and once complete the area would return to the pre-construction conditions. Work in each area would only last for a single season, however, it would take approximately 3 years to complete all of the east side tributaries.

Levee modifications along the NEMDC, Dry/Robla, and Magpie Creeks would not significantly alter the visual environment in these areas. These tributaries are not located in an area used for recreation or where viewer sensitivity is high. Homes back up to the areas where activities would occur and the levees are mostly void of vegetation and wildlife. Many of these areas are industrial parks with commercial buildings and have restricted public access. Those areas with public access are primarily used by walkers and runners for exercise purposes.

Levee improvements, and specifically levee raises along Arcade Creek would require the acquisition of residential private property. Most of the properties in this area have minimal or no backyard landscaping and there is no vegetation on the levee slopes, therefore, overall the visual effects in this area would be less than significant. However, there are a few residents that have landscaping which would need to be removed. This would result in an affect to that individual resident; however, because overall there are limited residents that have landscaping this effect would be considered less than significant.

During construction, heavy equipment would be present in the area and seen by local residents as equipment enters and exits the area. Construction in this area is expected to last for approximately 3 years. Construction on the levees would move laterally so most people would experience activities near their residences for one construction season. These effects are considered to be short term and less than significant.

3.15.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Visual resource effects are the same as Alternative 1 for the American River, Sacramento River, and East Side Tributaries.

Sacramento Weir and Bypass

Expansion of the Sacramento Weir and Bypass would include the removal of the existing north levee and contouring of land within the expanded bypass. This requires the use of large construction equipment to remove and rebuild the levee. Large equipment moving throughout this area would be a change from the natural environment that currently exists. This would be a short-term impact and once construction is complete the area would become a natural floodway. Since this is not a populated area, this impact is considered less than significant.

Construction of the weir would have some visual effects as the concrete weir is formed and poured. This would also require the relocation of the River Road and rail road on top of the weir. These construction activities would be seen by people using the river for recreational purposes and driving along Old River Road. Construction would take approximately 3 years, and once complete the bypass area will provide the same visual value as it did prior to construction. The natural environment that currently exists along the river would be replaced by the new concrete weir. However, this is a small amount of change compared to all the natural vegetation that exists along the Sacramento River. This impact is considered less-than-significant because it is short-term and a small footprint which will not have a substantial effect on the overall scenic value of the river.

3.15.6 Avoidance, Minimization, and Mitigation Measures

Avoidance, minimization, and mitigation measures are similar for both Alternatives 1 and 2 since the footprint does not change for these two alternatives with the exception of the Sacramento Bypass, which would only be required for Alternative 2.

American River

Significant effects to visual resources during construction cannot be avoided and cannot be mitigated. Construction equipment would need to be moving within the Parkway during construction activities to access sites and transport materials. Once construction is complete vehicles movement in the Parkway would return to the pre-project conditions.

Trees will be planted along the outer portion of the rock trench where there is sufficient space. These trees will take some time to mature to the visual value of those removed, however, as shown in the Figures 8 through 10, it does not take a lot of time. Additional trees could be planted at other areas within the Parkway in compliance with the Parkway Plan to mitigate for the removal of the trees which provide a natural environmental in an urban area. The short term effects will be significant, however, the planting of trees will reduce the effects to visual resources to less than significant once the trees are established and provide similar views as those removed.

Sacramento River

Significant effects to visual resources during construction cannot be avoided and cannot be mitigated. Construction equipment would need to be moving along the levee and within the river during construction activities to access sites and transport materials. Once construction is complete vehicle and barge movement would return to the pre-project conditions.

To minimize visual impacts trees would be left in place on the waterside lower third of the levee. The understory vegetation will be removed in order to place rock. To mitigate the removal of understory vegetation, planting berms will be installed and planted with vegetation to provide a similar visual appearance as before construction. By constructing the planting berms and installing vegetation the long term effects to visual resources will be reduced to less than significant.

On the landside of the levee visual resources cannot be mitigated because the new levee maintenance corridor would be constructed where backyards currently exist. The removal of landscaping would take away the current visual character of the individual properties and would be a significant affect.

East Side Tributaries

Because homes are directly adjacent to the levee and there is insufficient space for the maintenance corridor, other than in the backyards of private property, no mitigation for visual resources is available. No other avoidance, minimization, or mitigation measures for visual resources are available, however, due to short duration of construction and the lack of existing backyard landscaping this affect would remain less than significant.

3.16 Public Utilities and Service Systems

3.16.1 Environmental Setting

Regulatory Setting

- California Integrated Waste Management Act
- City of Sacramento General Plan

Existing Conditions

This section addresses the public utilities and service systems and their uses within the project area. Public utilities and service systems in the area include the following: water supply, storm water, wastewater, solid waste, electrical and natural gas, telephone and cable, and fire and police protection services.

Water Supply

More than 20 public and private water districts provide water supply service in the unincorporated area of Sacramento County. The Sacramento County Water Agency is responsible for providing water supply service primarily in the urbanizing portion of unincorporated Sacramento County, between the American and Cosumnes Rivers, in the American River South basin.

In the city of Sacramento, water supply is provided by the City of Sacramento from a combination of surface and groundwater. There are two water treatment plants that divert water from the Sacramento and American Rivers, as well as city-operated groundwater supply wells, to supply domestic water. The City has two water treatment plants: (1) the Sacramento River water treatment plant just below the confluence with the American River; and (2) the Fairbairn water treatment plant on the American River. Both of these water treatment plants are within the ARCF GRR project area. The City's water facilities also include pumping facilities, a system of transmission and storage mains, and water storage reservoirs.

In addition to these two facilities, the East Bay Municipal Utility District and the Sacramento County Water Agency own and operate a water intake facility just north of Freeport on the Sacramento River to supply water to central Sacramento County and the East Bay Area. The Freeport water intake facility is also located within the project area. However, no construction activities will occur directly in the vicinity of the intake structure as this was newly renovated and updated to comply with Corps policy.

The City of West Sacramento's intake structure is located at Bryte Bend, upstream of the confluence of the Sacramento and American Rivers. Water withdrawn from the Sacramento River is treated at the Bryte Bend Water Treatment Plant, which is operated 24 hours a day by State-certified water treatment plant operators.

Storm Water

Storm water management in the project area is a cooperative effort between several agencies including the Department of Water Resources, SAFCA, and local reclamation districts. SAFCA is the organization primarily responsible for drainage and flood control and the City of Sacramento provides storm water drainage to incorporated areas south of the American River. The City's storm water drainage system includes approximately 45,000 storm drain inlets, 65 miles of canals, and over 100 pump stations. Within the project area, there are approximately 80 drain inlets, 30 storm drains, 45 culverts, 8 pump stations, and 2 storm water discharge points.

Stormwater in the agricultural portions of the study area, including the Sacramento Bypass area, is drained primarily by overland flow into human-made ditches, natural drainage swales, and watercourses that discharge into waterways.

Wastewater

Wastewater treatment within the city of Sacramento is provided by the Sacramento Regional County Sanitation District (SRCSD). SRCSD operates all regional interceptors and wastewater treatment plants serving the city with the exception of the combined sewer and storm drain treatment facilities operated by the City of Sacramento. The Sacramento Regional Wastewater Treatment Plant is owned and operated by the SRCSD and provides sewer treatment for much of the study area. The City of Sacramento is responsible for providing and maintaining sewer services in incorporated Sacramento County.

Solid Waste

The Sacramento Regional Solid Waste Authority (SWA) is a joint powers authority of Sacramento County and the City of Sacramento. The SWA Board of Directors consists of elected officials from the county and the member cities. The SWA regulates commercial solid waste collection by franchised haulers through SWA ordinances.

The City of Sacramento collects municipal refuse from all residents and about a third of commercial customers on a weekly basis. The refuse is then transferred to the Sacramento Recycling and Transfer Station and then taken to the Lockwood Landfill in Sparks, Nevada. The remaining two-thirds of commercial waste is collected by private haulers and deposited at several facilities, including the Sacramento County Keifer Landfill and private transfer stations.

Electrical and Natural Gas Service

Sacramento Municipal Utility District (SMUD) and the Pacific Gas and Electric Company (PG&E) provide electric and natural gas services for the city of Sacramento and Sacramento County areas. Within the project area, there are approximately 150 overhead power/light poles and approximately 20 gas pipelines.

Telephone and Cable

Telephone, cable television, and other telecommunications services are provided by a variety of private companies within the project area. Telecommunications are primarily provided by Sprint, AT&T, Comcast, and Surewest for telephone, internet, and cable television. Cellular phone service providers in the area include T-Mobile, Verizon, Sprint, AT&T, Metro PCS, Sure West, Virgin Mobile, and Net 10.

Fire and Police Protection

The City of Sacramento provides fire and police protection within the city limits. Sacramento County provides police services (through the Sheriff's Department) and fire protection in the unincorporated areas of the county.

3.16.2 Methodology and Basis of Significance

Methodology

Effects to public utilities and service systems were identified by comparing existing service capacity and facilities against project implementation. Evaluation of potential utility and service systems impacts was based on the duration and extent to which such services would be affected as well as the ability of a service provider to continue to provide a level of service that could meet the needs of an affected community. The evaluation assumed modifications to levees would occur in phases and between June through October.

Basis of Significance

The thresholds of significance encompass the factors taken into account under NEPA to determine the significance of an impact in terms of its context and intensity. The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines because CEQA is more stringent than NEPA. Adverse effects on public utilities and services would be considered significant if implementation of an alternative plan would result in any of the following:

- Require the construction or expansion of any utility systems due to project implementation;
- Disruption or significantly diminished quality of the public utilities and services for an extended period of time;
- create an increased need for new fire protection, police protection, or ambulance services or significantly affect existing emergency response times or facilities;
- Create damage to public utility and service facilities, pipelines, conduits, or power lines; or
- Create inconsistencies or non-compliance with regional planning documents.

3.16.3 No Action Alternative

Under the No Action Alternative, the Corps would not participate in construction of the proposed project. As a result, there would be no construction-related effects to public utilities and services in the project area. The utilities in the area would remain consistent with current conditions and there would be no change in types, quality, or availability of services in the project area. The potential would exist, however, for public utilities and services to be adversely affected by a future flood event or levee failure. Such an event could cause inundation from high flows and destruction or damage to utility lines, natural gas supply lines, and water or wastewater piping or facilities, all of which could lead to widespread contamination, temporary power outages, and interruptions of other utilities in the project area and surrounding areas.

If the project is not constructed and a levee failure were to occur there would be a significant amount of debris produced from the flooded properties. This would include vegetation, construction, white goods (appliances) and hazardous and toxic waste. The quantity of debris is unknown due to the fact that the size of flood and damage is unpredictable. It is likely that the debris caused by a flood would be far more than the debris generated by the construction of this project.

Varying levels of damage could occur to public service structures as well, causing delays in fire protection, police protection, or emergency medical assistance. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related risks cannot be predicted. Because the effects of a levee failure are unpredictable, a precise determination of significance is not possible and cannot be made.

3.16.4 Alternative 1 – Improve Levees

Construction of Alternative 1 could have potential effects to utility systems in the project area. There is the potential for construction-related damage to infrastructure and disruption of service during construction activities. In addition, infrastructure that currently runs through the levee prism would require either relocations or other alterations in order to comply with Corps policy for encroachments through the levee structure. There is the potential for temporary disruptions in utility service during relocation or alteration of infrastructure.

Water Supply

Modifications to irrigation infrastructure would involve relocation or alteration of features located within the project footprint. Irrigation and pipeline penetrations from wells and pumps that encroach through the levee prism would be adjusted, as necessary, to meet current Corps regulations. These adjustments could consist of raising the pipelines over the levee prism or installation of positive closure devices. Some wells and pumps in the footprint of the proposed flood damage reduction facilities could be relocated outside of the project footprint. The timing of these replacements would be planned, to the extent feasible, to prevent disruption of service.

All of the known penetrations on the American River have been brought into compliance under the WRDA 96/99 project so no relocations or alteration would be required in this area. However, there are several penetrations along the Sacramento River and the East Side Tributaries that will need to be brought into compliance. Based on past experience with levee work along both the Sacramento and American Rivers, unknown penetrations may be encountered during construction. Any water supply encroachments would be brought into compliance during construction before the levee segment is completed and all efforts would be made to prevent disruption in water supply.

Although steps would be taken to minimize potential impacts to water supply infrastructure, temporary interruptions could occur if water supply infrastructure is damaged or otherwise rendered inoperable at a time when it is needed. However, with the implementation of the proposed avoidance and minimization measures (Section 3.16.6), this effect would be reduced to less than significant.

In addition, there could be impacts to the Sacramento River and Fairbairn water treatment plants, and the Freeport water intake facility. Project construction in the vicinity of these structures include bank protection, slurry wall installation, slope reshaping, ETL 1110-2-583 vegetation policy compliance, and possibly launchable rock trench construction near the Fairbairn water treatment plant. Construction would not impact the water supply facilities themselves, however, there is the potential for increased turbidity near the in-stream intake facilities due to construction of bank protection sites and increased fugitive dust during slurry wall and slope reshaping work. BMPs and minimization measures would be implemented to reduce both turbidity and fugitive dust. Turbidity effects are discussed in greater detail in Section 3.5, and the best management practices to be implemented are detailed in Section 3.5.6. Fugitive dust effects are discussed in detail in Section 3.11, and the minimization measures to be implemented are detailed in Section 3.11.6.

Storm Water

Implementation of Alternative 1 has the potential to impact storm water systems due to an increase in turbidity from construction-related runoff. However, this impact would be reduced by required best management practices that would be implemented by the contractor during construction. The contractor would prepare and implement a SWPPP prior to construction that would detail the measures that would be implemented to reduce impacts to storm water systems to less-than-significant. Effects to storm water runoff, the SWPPP, and other avoidance and minimization measures that would be implemented are discussed in greater detail in the Water Quality analysis, Section 3.5 of this document.

Wastewater

Construction-related activities could potentially affect wastewater utilities in that pipes and other utilities that penetrate the levee would have to be removed or relocated. Utilities would be removed or relocated in one of two ways: (1) a surface line over the levee prism; or (2) a through-levee line equipped with positive closure devices. Private encroachments shall be removed by the non-Federal partner or property owner prior to construction. Population size would not increase as a result of the project, therefore, there would be no increase in wastewater needs and no increases to flows or drainages within the project area and any impact to wastewater facilities would be considered less than significant.

Solid Waste

Construction of Alternative 1 would temporarily increase solid waste generation in the study area. Sources of solid waste related to construction activities would include cleared vegetation and debris. Excess earthen materials resulting from degradation of existing levee structures would be either reused for reconstruction of the levee, if appropriate, or hauled off-site and disposed of at the disposal sites established for the project during preconstruction design. Waste materials (including cleared vegetation) and excess earth materials (e.g., organic soils, roots, grass, and excavated materials that do not meet levee embankment criteria) would be used in the reclamation of borrow sites or hauled offsite to a suitable disposal location.

Other solid waste materials, such as asphalt, concrete, pipes, and gravel, would be removed from the footprint of the proposed construction sites and disposed of at an appropriate, licensed landfill. Hazardous materials (e.g., building materials containing lead paint or asbestos) encountered during the removal of structures would be disposed of in accordance with regulatory standards (see Section 3.17, "Hazards and Hazardous Materials").

The location of the landfill used for disposal construction-related waste would be determined by the construction contractor prior to initiation of construction activity and would be approved by the Corps. This disposal site would be selected based on capacity, type of waste, and other factors. Only those landfills determined to have the ability to accommodate the construction disposal needs of the alternatives would be used. It is likely that the Kiefer Landfill, owned and operated by Sacramento County and located about 15 miles southeast of the city, would be used for a significant portion of the construction waste. Other landfills that may also be utilized include the Yolo County Central Landfill, Western Regional Landfill in Placer County and the Lockwood landfill in Sparks Nevada. Project construction and operation would not cause existing regional landfill capacity to be exceeded; therefore this impact is considered less than significant.

Electrical and Natural Gas Service

Implementation of the Alternative 1 is not expected to create additional demand for electricity or natural gas and would not require the construction or expansion of natural gas lines. However, it could be necessary to relocate existing electrical and natural gas lines. As a result, it is possible that there could be a temporary loss of service to certain areas during relocation of this infrastructure. Because the potential exists for damage and service interruptions to existing electrical and natural gas service utilities both identified and unidentified, this construction effect, though temporary, would be considered potentially significant. With the implementation of the avoidance and minimization measures discussed below, this effect would be reduced to less than significant.

Telephone and Cable

Construction-related activities could potentially impact communication and cable lines within the project footprint and surrounding areas. The extent and intensity of construction-related activities are unknown; however, these activities may require vertical and/or horizontal relocation of existing infrastructure. Construction activities could also potentially cause damage to existing infrastructure resulting in a temporary interruption in service. Such an impact would be considered potentially significant as the extent of the damage could affect the ability of service providers to quickly restore interrupted service.

Fire and Police Protection

Construction of the alternatives would not result in the need for new or altered law enforcement or fire protection facilities, however there is the potential for traffic and access related impacts to fire and police services. Impacts associated with traffic and vehicular access is covered in the Transportation analysis, Section 3.10. It is unlikely for construction and operational activities associated with the project to necessitate increased fire or police protection services, such as additional officers and equipment. Adequate service is provided in the region by local county and city service departments, and actions would be conducted in compliance with Occupational Safety and Health Administration (OSHA) standards.

Construction activities could affect emergency fire protection services because they could potentially spark a fire on a project site or an adjacent area. However, this possibility is highly unlikely and a project-specific fire protection program would be developed prior to any construction-related activities and implemented during construction. Fire and police protection would be stretched to capacity if a flood were to occur under the No-Action alternative as these services are maximized during emergency flood events and therefore, this alternatives would be less than significant compared to the without project conditions. Any effects to Fire and Police Protection Services would therefore be considered less than significant and no mitigation would be required.

3.16.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Effects to public utilities and service systems from the construction of levee improvements under Alternative 2 would be consistent with those analyzed for Alternative 1. Under Alternative 2, levee raises on the Sacramento River would be greatly reduced, however it is assumed that this would not change the level of effort or impacts associated with bringing utility encroachments into compliance with Corps policy. Under Alternative 2, the Sacramento Weir and Bypass would be widened instead of most of the levee raises. There are no major West Sacramento or Yolo County utility infrastructure systems located in the footprint of the Sacramento Weir and Bypass, therefore this action would not impact those systems. Localized effects in this area could occur if power lines or other pipe lines occur in the area, but their impacts would be consistent with those discussed for the levee improvements above. With the implementation of the avoidance and minimization measures discussed in Section 3.16.6 below, impacts to utility infrastructure and service systems would be less than significant.

3.16.6 Avoidance, Minimization, and Mitigation Measures

In order to mitigate for any disruption to public utilities and service systems, consultation with all known service providers would take place prior to construction to identify specific infrastructure locations and appropriate protection measures. Consultation would continue during construction to ensure avoidance/protection of facilities to minimize service disruptions. Where feasible, replacement utility structures would be completed before demolition of existing facilities. Mitigation measures would include the following:

- Notification of any potential interruptions in service shall be provided to the appropriate agencies and affected landowners.
- Before the start of construction, utility locations shall be verified through field surveys and the use of the Underground Service Alert services. Any buried utility lines shall be clearly marked in the area of construction on the construction specifications in advance of any earthmoving activities.
- Before the start of construction, a response plan shall be prepared to address potential accidental damage to a utility line. The plan shall identify chain of command rules for notification of authorities and appropriate actions and responsibilities to ensure the safety of the public and workers. Worker education training in response to such situations shall be conducted by the contractor. The response plan shall be implemented by the project proponent(s) and its contractors during construction activities.
- Utility relocations shall be staged to minimize interruptions in service.
- Construction activities will be coordinated with first responders within the study area so plans can be implemented to avoid response delays due to construction detours.

3.17 Hazardous Wastes and Materials

For purposes of 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 Section 171.8). California Health and Safety Code Section 25501 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 California Health and Safety Code Section 25141(b) 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.*

3.17.1 Environmental Setting

Regulatory Setting

The principal Federal regulatory agency responsible for the safe use and handling of hazardous materials is the EPA. Key Federal, State, and local statutes, plans, and policies pertaining to hazardous wastes are listed below.

Federal

- Resource Conservation and Recovery Act
- Comprehensive Environmental Response, Compensation, and Liability Act

State

- Hazardous Materials Release Response Plans and Inventory Act of 1985
- Hazardous Waste Control Act
- Emergency Services Act

Local

- Sacramento County Multi-Hazard Mitigation Plan
- Yolo county Multi-Hazard Mitigation Plan

Existing Conditions

The Corps conducted a Phase I Environmental Site Assessment (Phase I ESA) for the study area (Appendix H). Phase I ESAs are intended to determine the presence of recognized environmental conditions, which are defined as a past, present, or likely future releases of hazardous substances or petroleum products into the soil, groundwater, or surface water of a site. The following is a summary of the findings from the Phase I ESA completed for the study.

As a part of the Phase I ESA, a database search was conducted using the Department of Toxic Substance Control's (DTSC) Envirostor database and SWRCB Geotracker database which revealed the following sites within the ARCF footprint.

- Old Bryte Landfill (Sacramento Bypass);
- Sacramento Terminal bulk petroleum facilities on the Sacramento River (American River South);
- Old Southern Pacific rail yard on the Sacramento River (American River South);
- Site of former Harbor Sand & Gravel and Bell Marine, levee encroachment on the American River (American River South); and
- Fuel Stop Mini-Mart, leaking underground storage tank being treated by air sparging adjacent to the Arcade Creek levee and bridge crossing (American River North).

Sacramento County has historically and is currently largely an agricultural area. Agricultural land use can often involve the application of pesticides, the residues of which may remain in soils for years. Soil testing from the project footprint was not completed at the time of release of this DEIS/DEIR; however, prior to construction activities, soil will be tested and if pesticide concentrations in the soil are found that exceed pertinent threshold levels, a plan for safe transport, use, and disposal of these soils would be prepared.

Historic hydraulic gold mining in the Sierra foothills has left a legacy of mercury contamination in the river sediments and the levees from which they were dredged. Detection and response would be the same as for agricultural pesticides.

American River

The following issues and uses were discovered during site surveys and database searches that may have affected the following parcels within the American River footprint:

Assessor Parcel Number (APN) 001-016-011 was a former sand and gravel business, now the site of a pavement recycling company between the old Sacramento city landfill and former Scollan landfill. The business encroaches on the levee with structures and debris piles.

Two former wastewater treatment plants, located on the north bank of the American River at Exposition Park and River Walk Way, have been converted to wastewater pumping and flow equalization stations that pump wastewater south across the American River to the regional wastewater treatment plant at Elk Grove.

Lead concentration may be elevated on roadways atop the levee from past use of leaded gasoline, especially at bridge locations where old leaded paint may be present. The land between 20th Street and the Capitol City Freeway (Business I-80) north of the UPRR tracks and B Street has been completely filled in to above the levee crown elevation by old unregulated city landfills. This may pose issues of landfill gas migration, storm water runoff, and landfill leachate seepage during placement of erosion control measures.

Sacramento River

APNs 009-0012-071-072, 009-002-001, and 009-0030-054 consist of the Sacramento Terminal bulk petroleum handling facility. The site is undergoing soil and groundwater remediation for petroleum releases. Land use restrictions apply. Contaminated properties are on both sides of the levee and petroleum pipelines pass through the levee.

Treated wastewater discharge for the SRCSD is located in the project area at Freeport. Special health and safety and avoidance requirements may apply when working in the vicinity of wastewater facilities.

A railroad track runs on top of the levee on the Sacramento River below the American River. Creosoted railroad ties may have left residual contamination in the railroad roadbed.

East Side Tributaries

APN 251-0292-016 consists of a leaking underground storage tank being treated with air sparging. The site is located adjacent to the levee at a bridge crossing site, and the treatment system is located at the toe of the levee, limiting avoidance options.

APN 275-0111-001 consists of a groundwater contamination and land use restriction in industrial property adjacent to the levee. Numerous contaminated properties exist in this area of Old North Sacramento by the NEMDC.

Sacramento Bypass

APN 042-280-011 consists of the Yolo County abandoned, uncapped, unregulated dump site, adjacent to the Sacramento Bypass north levee. This site has elevated lead concentration, probably from battery waste generated by a former lead recycler in West Sacramento.

3.17.2 Methodology and Basis of Significance

Methodology

This section addresses potential sources of hazards and risks associated with hazardous material that may be associated with implementation of the proposed alternatives under consideration.

Basis of Significance

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the Sate CEQA Guidelines. These thresholds also 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 impacts. The alternatives under consideration were determined to result in a significant impact 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 Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment; or
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency excavation plan.

3.17.3 No Action Alternative

Under this alternative no construction would occur and therefore there would be no potential for hazardous spills due to construction activities. Sites within the study area would continue to exist and would be the responsibility of regulating agencies to continue the handling of these sites. There would be no impact under this alternative.

3.17.4 Alternative 1 – Improve Levees

American River

Construction activities would involve the use of potentially hazardous material, such as fuels, oils and lubricants, and cleaners, which are commonly used in construction projects. 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.

Site APN 001-016-011, which is currently a pavement recycling company, is in an area where no levee work is required under this alternative; therefore, no impacts would occur if this alternative were to be constructed.

Any hazardous substance encountered during construction would be removed and properly disposed of by a licensed contractor in accordance with Federal, State, and local regulations. Compliance with applicable regulations would reduce the potential for accidental release of hazardous materials during transport and construction activities. The risk of significant hazards associated with the transport, use, and disposal of these materials is low.

Sacramento River

The Sacramento Terminal bulk petroleum handling facility is in an area where work would not occur under this alternative; therefore, no impacts would occur if this alternative were to be constructed.

The Sacramento Wastewater Treatment facility is located in this reach of the project. However, when the plant was installed in 2012, the levee surrounding the plant was re-enforced and no work is needed at this location. Coordination with SRCSD would occur prior to construction to ensure all special health and safety requirements are met when construction work occurs near this area.

In locations where the railroad is located on the top of the levee in this reach of the project, soil sampling will be done to determine if any contaminants have leached into the soil from the railroad ties. Any hazardous substance encountered would be removed and properly disposed of by a licensed contractor in accordance with Federal, State, and local regulations.

East Side Tributaries

The sites that are located in this area of the project could be affected by construction activities. The contractor would be required to comply with all Federal, State, and local laws if contaminated soil is encountered. Any hazardous substance encountered would be removed and properly disposed of by a licensed contractor in accordance with Federal, State, and local regulations.

Borrow Sites

The exact location of borrow sites has not been determined, however, a preliminary assessment using USGS soil maps has identified multiple areas within 20 miles of the project that could provide adequate borrow material. Testing of borrow sites would occur prior to the use of material and sites which have contaminated soils would not be used for this project. Any hazardous substance encountered during construction would be removed and properly disposed of by a licensed contractor in accordance with Federal, State, and local regulations.

3.17.5 Alternative 2 – Sacramento Bypass and Improve Levees (TSP)

Impacts to the Sacramento River, American River, and East Side Tributaries levees would be the same as Alternative 1, with the additional affects associated with the expansion of the Sacramento Weir and Bypass as discussed below.

Sacramento Weir and Bypass

The Old Bryte Landfill, located adjacent to the north levee of the Sacramento Bypass, would be remediated in accordance with Federal, State, and local laws by the non-federal partner prior to construction. Capping of the site is not allowed, as this area would become part of the floodway and capping is not allowed under the Comprehensive Environmental Response, Compensation, and Liability Act. No construction activities would occur in proximity to this site until the site has been completely remediated and meets all Federal, State, and local regulatory requirements. Therefore, this alternative would have no impacts.

3.17.6 Avoidance, Minimization, and Mitigation Measures

Compliance with applicable regulations would reduce the potential for accidental release of hazardous materials during construction. The contractor would also be required to prepare a SWPPP, which details the contractors plan to prevent discharge from the construction site into drainage systems, lakes, or rivers. This plan would include BMPs, as detailed in Section 3.5.6, which would be implemented at each construction site.

Project areas would be tested for contaminants prior to construction, and any materials found would be disposed of in accordance with all Federal, State, and local regulations at an approved disposal site. Implementation of these mitigation measures would reduce the impacts from hazardous materials at project sites to less than significant. If significant time has elapsed between approval of this document and construction, additional investigations should be done to reduce the risk of encountering a site during construction. If construction activities would occur in close proximity to sites listed in the existing conditions section, a Phase II ESA should also be conducted. This would further reduce the risk of exposure to workers and the public during construction and assist in the remediation planning.

3.18 Socioeconomic, Population, and Environmental Justice

3.18.1 Environmental Setting

Regulatory Setting

- Executive Order 12898 entitled *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*

Existing Conditions

Sacramento County

According to the 2010 census, Sacramento County had a population of approximately 1.4 million. The urban development is centralized around the cities of Sacramento, Citrus Heights, Elk Grove, and Rancho Cordova. Other outlying areas include the cities of Roseville and Folsom, which are both outside the project area. The population projection for Sacramento County is 1.7 million persons by 2025, representing a gain of approximately 500,000 new residents, and an increase of slightly more than 41%. Although the county as a whole is expected to increase in population, the project area is at build out and, therefore, expected population growth would occur outside the project area where vacant land could be developed.

According to the 2010 Census data, of the 1.4 million people in Sacramento County, 65% are white, 15% are Asian, 10.9% are African American, and the remaining are of other ethnic background. The median household income is $56,439, slightly less than the State average of $60,883. There are 13.9% of the people below poverty level, which is about the same as the statewide average of 13.7%. The median value of homes is $324,200, slightly lower than the State average of $458,500.

Yolo County

According to the 2010 census, Yolo County has a population of approximately 200,000. The majority of the population is located in the cities of Davis, West Sacramento, and Woodland. The remaining portion of Yolo County is rural with scattered towns and farming communities. The largest grow the area has been in West Sacramento which grew nearly 3.5% from 1990 to 2010.

Yolo County's population is 49.9% White, 30.3 % Hispanic, 14.1% Asian, 3.0% African American, and the remaining are of other ethnic backgrounds. The median income for Yolo County is $57,077 with a median home value of $337,700. There is 17.1% of the population in Yolo County living below poverty level, slightly higher than the State average of 13.7%. Yolo County has an unemployment rate of 8.9%, lower than the state average of 10.2% (California EDD 2012). Based on 2010 Census data there are no significant low income or minority groups within the study area.

The University of California, Davis (UC Davis) is located in Yolo and Solano Counties and is the largest campus in the UC system by land area. Many of the residents of Davis are students resulting in a high percentage of rental properties and multi-unit structures. While the county's economy is based primarily on agriculture, the government sector is the largest employment sector consisting of approximately one third of the county employment. This sector is comprised primarily of State agencies and includes UC Davis employees.

Environmental Justice

Environmental justice is defined as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies". Fair treatment means that no racial, ethnic, or socioeconomic group should bear a disproportionate share of adverse effects as a result of the execution of Federal, State, local and tribal environmental programs and policies (FEMA, 2007). Analysis of environmental justice is required by NEPA. Meaningful involvement means that:

- Potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that affect their environmental or health.
- The public's contribution can influence the regulatory agency's decision.
- The concerns of all participants are considered in the decision-making process.
- Decision makers seek out and facilitate the involvement of those potentially affected.

Based on 2010 Census data there are no significant low income or minority groups within the study area.

3.18.2 Methodology and Basis of Significance

Methodology

NEPA requires the Federal Agency to look at both the natural and "human environment" when evaluating the impacts of a proposed project. The human environment looks at the overall quality of life for the population surrounding the project and any area that would be affected by the outcome of the project.

Basis 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. Alternatives under consideration were determined to result in a significant impact related to population and housing if they would do any of the following:

- Induce substantial population growth in an area, either directly (for example; by proposing new homes and businesses) or indirectly (for example; through extension of roads or other infrastructure);
- 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.

3.18.3 No Action Alternative

Under the No Action alternative there is a high probability that flooding would occur, damaging or destroying many homes and businesses within the city of Sacramento, resulting in significant socioeconomic impacts. People who live and work in the downtown area would be impacted by flooding of their homes and potentially flooding of their place of work.

Additionally, the area being flooded contains many Federal, State, and local government agencies. Because so much of the government support system is within the flooded area recovery could be delayed and people could be displaced from both their homes and jobs. The fact that people would be recovering from their personal loss could also impact the ability of the governments to be fully functional. This would result in a significant impact to the economic stability of the Sacramento metropolitan area.

3.18.4 Alternative 1 – Improve Levees

Temporary disruption to the community would occur during construction. Disruptions to the community are primarily related to traffic congestion, noise, recreation, and leisure activities. Haul routes would consist of existing roads, causing additional traffic congestion on residential streets. Hauling would occur during normal construction hours which could coincide with commute traffic. Hauling would also occur on the existing levee adjacent to residential properties. This would be a nuisance to residents due to truck engine noise and dust. The close proximity to the residential properties would occur during the summer months and would disrupt the tranquility that currently exists for the residents. This would be a short term impact, and while significant to the residents, it is not considered significant to the overall project as it is a limited number of residents affected.

Much of the project is immediately adjacent to established communities within the city of Sacramento. Implementation of the project would require the acquisition of some private properties in established communities. Regardless of the extent to which these communities are “established,” the project’s removal of residences would disrupt, but would not physically divide, these communities. Any taking of homes would be done on a case by case basis, and all engineeringly acceptable options will be evaluated before homes are taken. If homes need to be taken to construct the project, the Corps will comply with the Federal Relocation Act.

The project is in a fully urbanized area and no additional housing or business development is expected with the construction of these alternatives. The construction of the project does not change or prevent access to large business complexes or communities.

Because the project is set in an urban area no change in population is expected under all alternatives. The areas within the project are already at build out and any additional population increases would be insignificant. The alternatives would reduce the risk of flooding to the existing populations and lands behind the existing levee system. Local land use plans do not indicate significant development in areas where urban development does not already exist. The project is not anticipated to displace a significant number of residents or divide an established community. Any disruption of communities would be short term during construction when traffic, noise, and other construction related activities could affect resident’s daily life styles. Construction of this alternative would result in less than significant affects because the impacts would be short term and no long term impacts are expected to occur.

<u>Environmental Justice</u>

Alternative 1 was designed to convey the 160,000 cfs released from Folsom Dam. All levees within the study area would be constructed to the same criteria and standard. The benefits of the Common Features project would extend to all of the Sacramento Metropolitan area; therefore it would not provide disproportionate benefits or effects to any minority or low income populations. Therefore, the effect is less than significant.

3.18.5 Alternative 2 –Sacramento Bypass and Improve Levees (TSP)

Effects under Alternative 2 would be consistent with the discussion above for Alternative 1. There would be no additional effects to socioeconomics, population, or environmental justice under Alternative 2. Construction of this alternative would result in less than significant affects.

3.18.6 Avoidance, Minimization, and Mitigation Measures

Because the project would not have a significant socioeconomic impact on the community no mitigation measures are required. However, by reducing the risk of flooding the project could result in positive impacts to the socioeconomics by reduced likelihood of flooding, loss of lives, and pain and suffering. The project would also reduce the cost of flood insurance to structures removed from the 100-year FEMA floodplain. Mitigation for relocation of people and their homes would be compensated under the Federal Relocation Act.

4.0 CUMULATIVE IMPACTS, GROWTH-INDUCING IMPACTS, AND OTHER REQUIREMENTS

4.1 Cumulative Effects

NEPA and CEQA require the consideration of cumulative effects of the proposed action, combined with the effects of other projects. NEPA defines a cumulative effect as an effect on the environment that results from the incremental effect of an action when combined with other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 C.F.R. § 1508.7). The CEQA Guidelines define cumulative effects as "two or more individual effects which, when considered together, compound or increase other environmental impacts" (CERES, 2007).

This section discusses the potential cumulative effects of the ARCF GRR when added to other past, present, and reasonably foreseeable future actions. If the project is not expected to contribute to a cumulative effect on a resource, then that resource is not included in the sections below. The resources not included below include hazardous and toxic waste, hydrology and hydraulics, land use, socioeconomics, utilities and services, and geology, as these resources would not have cumulative effects when considered with other past, present, or reasonably foreseeable future actions. The remaining resources could involve a cumulative effect, and are discussed in more detail in Section 4.2 below.

4.1.1 Methodology and Geographic Scope of the Analysis

<u>**Methodology**</u>

The cumulative effects analysis determines the combined effect of the ARCF project alternatives and other closely related, reasonably foreseeable projects. Cumulative effects were evaluated by identifying projects in and around the Sacramento region that could have individually minor but collectively significant actions taking place over a period of time. These potential effects are combined to the potential adverse or beneficial effects of the proposed alternatives to determine the type, length, and magnitude of potential cumulative effects. Those effects that cannot be avoided or reduced to less than significant are more likely to contribute to cumulative effects in the area. Mitigation of significant cumulative effects could be accomplished by rescheduling actions of proposed projects and adopting different technologies.

Basis of Significance

Significance of cumulative effects is determined by meeting the Federal and State mandates and specified criteria identified under each environmental resource section in Chapter 3 above to evaluate impacts from the combination of the proposed alternatives and the other related projects discussed below.

Geographic Scope

The geographic area that could be affected by the project varies depending on the type of environmental resource being considered. Air and water resources extend beyond the confines of the project footprint since effects on these resources would not necessarily be confined to the project area. Table 46 presents the general geographic areas associated with the different resources addressed in the DEIS/DEIR. The related projects that are considered may also vary under each environmental resource section depending on the type of environmental effects that may result from these projects.

Table 46. Geographic Areas that Would Be Affected by the ARCF GRR Project.

Resource Area	**Geographic Area**
Agriculture	Sacramento Bypass
Hydrology and Hydraulics	Sacramento and American Rivers, East Side Tributaries, and Sacramento Bypass in the vicinity of the study
Water quality	Sacramento and American Rivers, East Side Tributaries, and Sacramento Bypass in the vicinity of the study
Biological resources	Sacramento and American Rivers, East Side Tributaries, Sacramento Bypass, American River Parkway, and habitat at individual waterside improvement sites, with regional implications for species
Special Status Species	Sacramento and American Rivers, East Side Tributaries, and Sacramento Bypass in the vicinity of the study
Cultural resources	Individual ground disturbance sites, with regional implications
Transportation and circulation	Roadway network in the study area, with regional implications
Air quality	Regional (SMAQMD); global for greenhouse gas emissions
Noise	Immediate vicinity of the individual sites of construction activity
Recreation	Local (facilities near construction sites)
Visual resources	Individual levee improvement sites and landscape level

4.1.2 Past, Present, and Reasonably Foreseeable Future Projects

This section briefly describes other projects in the Sacramento area. The exact construction timing and sequencing of these projects are not yet determined or may depend on uncertain funding sources. Consideration of each of these projects is necessary to evaluate the cumulative effects of the proposed project on environmental resources in the area.

Lower American River Common Features Project

Based on congressional authorizations in WRDA 1996 and WRDA 1999, the Corps, CVFPB, and SAFCA have undertaken various improvements to the levees along the north and south banks of the American River and the east bank of the Sacramento River. Under WRDA 96, the most recent improvements include closing the gaps along the American River System (Remaining Sites) that were not completed during the original construction of the 26 miles of slurry walls completed in 2002. The Remaining Sites are anticipated to be completed in 2014 prior to construction of this project. Several other phases of repairs have been completed in the Natomas Basin under the Lower American River Common Features Project.

Natomas Levee Improvement Project

In 2007, the Natomas Levee Improvement Project was authorized as an early-implementation project initiated by SAFCA in order to provide flood protection to the Natomas Basin as quickly as possible. These projects consist of improvements to the perimeter levee system of the Natomas Basin in Sutter and Sacramento Counties, as well as associated landscape and irrigation/drainage infrastructure modifications. SAFCA, DWR, CVFPB, and the Corps have initiated this effort with the aim of incorporating the Landside Improvements Project and the Natomas Levee Improvement Project into the Federally-authorized American River Common Features Project. Construction on this early implementation project was completed in 2013. Future project features will be completed under the proposed ARCF, Natomas PACR or the ARCF GRR, upon authorization. The Natomas PACR was completed and a ROD signed in 2010, however, Congressional authorization and funding have not been provided at the time of this report preparation.

Sacramento River Bank Protection Project

The SRBPP was authorized to protect the existing levees and flood control facilities of the SRFCP. The SRBPP was instituted in 1960 to be constructed in phases. Bank protection has generally been constructed on an annual basis. Phase I was constructed from 1963 to 1975, and consisted of 436,397 linear feet of bank protection. Phase II was authorized in 1974 for 405,000 linear feet of bank protection. The SRBPP directs the Corps to provide bank protection along the Sacramento River and its tributaries, including that portion of the lower American River bordered by Federal flood control project levees. Beginning in 1965, erosion control projects at twelve sites covering 16,141 linear feet of the south and north banks of the lower American River have been implemented. This is an ongoing project, and additional sites requiring maintenance will continue to be identified indefinitely until the remaining authority of 4,966 linear feet is exhausted over the next 3 years. WRDA 2007 authorized an additional 80,000 linear feet of bank protection to Phase II.

West Sacramento GRR

The West Sacramento GRR would determine the Federal interest in reducing the flood risk within the West Sacramento project area. The purpose of the West Sacramento GRR is to bring the 50-miles of perimeter levees surrounding West Sacramento into compliance with applicable Federal and State standards for levees protecting urban areas. Proposed levee improvements would address: (1) seepage; (2) stability; (3) levee height; and (4) erosion concerns along the West Sacramento levee system. Measures to address these concerns would include: (1) seepage cutoff walls; (2) seepage berms; (3) stability berms; (4) levee raises; (5) flood walls; (6) relief wells; (7) sheet pile walls; (8) jet grouting; and (9) bank protection. The final array of alternatives for the West Sacramento GRR include: (1) No Action Alternative; (2) Alternative 1 – Improve Levees; (3) Alternative 3 – Improve Levees with a Closure Structure on the DWSC; and (4) Alternative 5 – Improve Levees with a setback levee along the Sacramento River south levee.

Folsom Dam Safety and Flood Damage Reduction Project

The Folsom Dam Safety and Flood Damage Reduction Project address the dam safety hydrologic risk at the Folsom Facility and improves flood protection. Several activities associated the project include: the Folsom Dam Auxiliary Spillway, referred to as the Joint Federal Project (JFP), static upgrades to Dike 4, Mormon Island Auxiliary Dam (MIAD) modifications, and seismic upgrades (piers and tendons) to the Main Concrete Dam.

Auxiliary Spillway Excavation

Spring 2009 to Fall 2010. Major work under Phase II of the JFP includes partial excavation of the western portion of the auxiliary spillway, construction of the downstream cofferdams, relocation of the Natoma Pipeline, and the creation of an access road to the stilling basin. This portion of the JFP was covered under the 2007 Folsom Dam Safety and Flood Damage Reduction Project EIS/EIR (2007 EIS/EIR). Construction was conducted by the United States Bureau of Reclamation (USBR) and was completed prior to the start of the Control Structure construction effort.

Dike 4 and 6 Repairs

Summer 2009 to June 2010. To address seepage concerns due to static and hydrologic loading for Dikes 4 and 6, USBR installed full height filters, toe drains, and overlays on the downstream face of each earthen structure. This portion of the JFP was covered under the 2007 EIS/EIR.

Mormon Island Auxiliary Dam Modification Project

Summer 2010 to Spring 2016. USBR released the Draft EIS/EIR for the MIAD Modification Project in December 2009. The preferred MIAD action alternative of jet grouting selected in the 2007 Folsom Dam Safety and Flood Damage Reduction FEIS/EIR was determined to be neither technically nor economically feasible. Four action alternatives were analyzed in the MIAD Draft Supplemental EIS/EIR. All alternatives address methods to excavate and replace the MIAD foundation, place an overlay on the downstream side, and install drains and filters; the alternatives differ only in their method of excavation. In addition, all four action alternatives in the Draft Supplemental EIS/EIR include habitat mitigation proposed for up to 80 acres at Mississippi Bar on the shore of Lake Natoma to address impacts from the JFP.

Pier Tendon Installation, Spillway Pier Wraps, and Braces at Main Concrete Dam

April 2011 through Spring 2014. These three projects address seismic concerns at the main concrete dam. These improvements are designed to help stabilize the main concrete dam against movement during a major earthquake. This portion of the JFP was covered under the 2007 FEIS/EIR.

Control Structure, Chute, and Stilling Basin

Spring 2011 to Fall 2017. Phase III of the JFP consists of construction of the auxiliary spillway control structure. This effort is currently under construction by the Corps and is projected to be completed in the fall of 2014. Concrete lining of the spillway chute and stilling basin will be conducted from approximately early 2014 to fall 2017. Construction of the control structure, and the concrete lining of the chute and stilling basin were all covered under the Corps' 2010 EA/EIR.

Additional Downstream Features

Fall 2013 to Spring 2017. The design refinements to Phase III construction were evaluated in a supplemental EA/EIR include the construction of a temporary traffic light, modification to the existing dirt access haul road, installation of the stilling basin drain, and use of the existing nearby staging area with the installation of a new batch plant to be used and operated for other downstream features work. This work would be completed by fall of 2013, with the exception of the stilling basin drain which would be installed in 2017. This portion of the JFP was covered under the 2012 Prison Staging Area and Stilling

Basin Drain EA/EIR.

Approach Channel

Spring 2013 to Fall 2017. The approach channel project is the final construction activity of Phase IV of the JFP. The primary and permanent structures consist of the 1,100 foot long excavated approach channel and spur dike. A transload facility and concrete batch plant will be constructed as necessary temporary structures to facilitate the construction. Additional existing sites and facilities that would be utilized for the length of the project include the Folsom Prison staging area, the existing Bureau of Reclamation Overlook, the MIAD area, and Dike 7. This portion of the JFP was covered under the 2012 Folsom Dam Modification Project, Approach Channel EIS/EIR.

Right Bank Stabilization Project

Projected to begin in 2015. The right bank stabilization project would be the first component under Phase V of the JFP. Technical studies and hydraulic modeling indicated that the convergence of flows from the main dam and the auxiliary spillway could erode and possibly destabilize the existing slope along the right bank of the American River. Existing rock downstream of the stilling basin would be exposed to potential scour when water is released and discharged back to the American River. The proposed action would provide slope protection to the vulnerable upper slope and stabilized the lower portion of the slope with rock anchors. A draft EA/EIR should be available by summer of 2014.

JFP Site Restoration

Projected to begin in 2017. Upon completion of the JFP construction, the project area would be restored under Phase V. Activities include regrading and reseeding the site as necessary to prevent erosion, removal of the temporary haul road, removal of the Dike 8 public overcrossing, decommissioning office complex and miscellaneous activities. Restoration planning activities could begin in 2014.

<u>Folsom Dam Water Control Manual Update</u>

The Folsom Dam Water Control Manual (WCM) is being updated to reflect authorized changes to the flood management and dam safety operations at Folsom Dam to reduce flood risk in the Sacramento area. The WCM Update will utilize the existing and authorized physical features of the dam and reservoir, specifically the auxiliary spillway and submerged tainter gates currently under construction and scheduled to be completed in 2016.

Along with evaluating operational changes to utilize the additional operational capabilities created by the auxiliary spillway and tainter gates, the WCM Update will assess the use of available technologies to enhance the flood risk management performance of Folsom Dam to include a refinement of the basin wetness parameters and the use of real time forecasting operation. Further, the WCM Update will evaluate options for the inclusion of creditable flood control transfer space in Folsom Reservoir in conjunction with Union Valley, Hell Hole, and French Meadows Reservoirs (also referred to as Variable Space Storage). The study will result in an Engineering Report as well as a Water Control Manual implementation the recommendations of the analysis.

It should be noted that the initial WCM Update effort will focus on additional operational capabilities created by the auxiliary spillway. The Water Control Manual will be further revised in the future to reflect the capabilities to be provided by the Dam Raise and additional Common Features project improvements as appropriate

Folsom Dam Raise

Construction of the Folsom Dam Raise project would likely follow completion of the JFP and the WCM projects The Dam Raise project includes raising the right and left wing dams, Mormon Island Auxiliary Dam and dikes 1-8 around Folsom Reservoir by 3.5 feet; the three emergency spillway gates; and three ecosystem restoration projects (automation of the temperature control shutters at Folsom Dam and restoration of the Bushy and Woodlake sites downstream). The design for the dam raise portion of the project, should begin in 2015 and be completed in FY16, with construction following in phases through 2017 and 2018. The ecosystem restoration projects are not scheduled at this time.

Bay Delta Conservation Plan (BDCP)

The BDCP is a plan with co-equal goals for water supply reliability of State Water Project and Central Valley Project and for conservation and restoration of endangered and sensitive species habitats in the Delta. The plan will identify and implement conservation strategies to improve the overall ecological health of the Delta; identify and implement more ecologically friendly ways to move fresh water through or around the Delta; address toxic pollutants, invasive species, and impairments to water quality; and provide a framework and funding to implement the plan over time.

Alternatives being evaluated under the BDCP include conveyance options of different infrastructure components and operational scenarios. At this time, no conveyance options are proposed within the Southport project area. The restoration options include various degrees of restoration in the Delta and Suisun Marsh and could propose activities in the Southport area. The BDCP could contribute to beneficial cumulative effects by increasing suitable habitat for fish and wildlife species. A supplemental EIS/EIR for the BDCP is anticipated for public release in 2015.

<u>Central Valley Project Biological Opinions</u>

Biological Opinions (BOs) issued by USFWS and NMFS for the Central Valley Project (CVP) and State Water Project (SWP) determined that the existing fish passage structure at Fremont Weir was inadequate to allow normal fish passage at most operational levels of the Sacramento River. As a result, the BOs required the USBR and/or DWR to increase inundation of suitable acreage for fish habitat within the Yolo Bypass and to modify operations of the Sacramento Weir or Fremont weir to increase juvenile rearing habitat. The BOs also require restoration of 8,000 acres of tidal marsh habitat in the Delta to benefit Delta smelt and up to 20,000 acres of salmonid habitat restoration. The operations of the SWP and CVP are currently subject to the terms and conditions of these BOs until the new water conveyance infrastructure identified in the BDCP becomes operational. At that time, an integrated BO on coordinated long-term operation of the CVP and SWP will be completed by USFWS and NMFS. Implementation of the BOs is expected to be compatible with the Common Features Project.

4.2 Cumulative Impacts Analysis

4.2.1 Water Quality

Water quality could be affected within the actual construction area and upstream and downstream of the work area. Construction activities such as rock placement, clearing and grubbing, and slope flattening, have the potential to 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 the Sacramento River Bank Protection Project and the West Sacramento GRR, could be under construction during the same timeframe as the ARCF project. If construction occurs during the same timeframe water quality could be diminished primarily due to increased turbidity. All projects would be required to coordinate with the RWQCB and overall water quality will be required to meet the Basin Plan objectives. There are no anticipated long-term water quality affects with the implementation of multiple projects.

4.2.2 Vegetation and Wildlife

Implementation of the ARCF project has the potential to remove large amounts of vegetation within the project area. The SRBPP and West Sacramento projects would also require the removal of habitat within the Sacramento Metropolitan area. These affects along with the historical decline of vegetation due to urbanization would result in significant cumulative effects. Additionally, compliance with the Corps' vegetation policy could also result in the removal of vegetation along waterways.

The avoidance, minimization, and mitigation measures would be implemented in accordance with the recommendations of the Coordination Act Report, however, potential adverse effects on biological resources would remain significant due to the amount of habitat being removed to construct the project and the time lapse before the new plantings would mature to the level of those removed. Once all the mitigation and compensation plantings have matured to the level of those removed, the affects to biological resources would be less than significant because the new habitat would be similar to those removed over the 50 year life of the project.

4.2.3 Fisheries

Potential cumulative effects on fish would include effects associated with other projects proposed to occur on the Sacramento and American Rivers. Cumulative effects were evaluated within the construction area and upstream and downstream of the project within the affected river. The Corps' Sacramento River Bank Protection Project and West Sacramento GRR would both result in direct loss of fish habitat from construction. Direct loss of habitats would still result because of the construction of bank protection measures; however both of these projects are expected to implement mitigation measures, including onsite plantings that would improve long term fish habitat on the Sacramento River. In addition, the completion of the Folsom JFP and the new Water Control Manual Update for Folsom Dam would likely benefit downstream fish species on the American River. The new spillway at Folsom Dam will enable better control of outflows from Folsom Dam, including the ability to release colder water from deeper in the lake, which would improve conditions on the American River for fish species. While short term cumulative effects would be significant from the direct effects associated with construction, the implementation of these projects would in time result in a net benefit to fish from the construction of setback levees and planting berms. The ARCF Project along with many other projects being considered for the region could result in limited opportunities for mitigation of SRA habitat for fish species.

4.2.4 Special-Status Species

Special status fish species use the American and Sacramento Rivers for migration, therefore, cumulative effects for fisheries were evaluated based on changes to habitat that could occur at the construction sites and change in conditions downstream of the project areas as a result of construction. Implementation of the project has the potential to contribute to the loss or degradation of sensitive habitats and to adversely affect special-status fish species. These effects could contribute to the species declines and losses of habitat that have led to the need to protect these species under the Federal and State ESA.

The approval of a vegetation variance would allow trees to remain in place along the lower one-third of the levee and provide essential habitat for many special-status fish species. Beyond the existing trees being left in place, plants would be installed within the planting berm and potentially provide habitat where none currently exist due to long term erosion. With various projects being considered in the Sacramento and Delta region, lands available for mitigation and compensation could become difficult to locate. This would be especially true for waterside riparian habitat along the Sacramento River.

Cumulative effects on GGS and their habitat were evaluated within the construction area, haul routes, borrow sites, and immediately adjacent to construction activities. Because avoidance, minimization, and compensation measures would be implemented in accordance with the requirements of the Federal and State ESA, and other relevant regulatory requirements, and the project would protect habitat in place and create habitat, potential adverse effects on special-status species and on sensitive habitats would be reduced to a less than significant level. Additionally, other projects that could occur in the area would also be implemented in accordance with the requirements of the Federal and State ESA.

4.2.5 Cultural Resources

Cumulative impacts to cultural resources would be primarily related to individual ground disturbance sites, with potential regional implications for sites if they are considered as part of a historic district, landscape, or multiple sites that may be ethnographically significant and to other construction projects that could occur during the same timeframe as those considered for this study and within the same vicinity as this study. These projects may include the Lower American River Common Features Project, the Natomas Levee Improvements Project, the Sacramento River Bank Protection Project, the West Sacramento GRR, the Folsom Dam Safety and Flood Damage Reduction Project, the Folsom Dam Water Control Manual Update, and the Folsom Dam Raise. At the time of this analysis there are several ground disturbing construction projects anticipated to modify the Sacramento River levees that would result in similar impacts as those included above. As a result, the cumulative overall impact to non-renewable cultural resources is likely, as well as significant and unavoidable. However, individual projects would implement separate mitigation measures that would address the effects caused by these projects. This project is addressing affects through the execution of a PA. The PA includes stipulations to reduce the significant, adverse effects to less than significant. Therefore, the project would not result in significant cumulative impacts.

4.2.6 Air Quality

Cumulative effects to air resources were evaluated within each air basin. Construction of the proposed alternatives would result in emissions of criteria pollutants; however, with the implementation of mitigation measures these emissions are expected to be below the thresholds of the Federal and State CAA. With the exception of the Folsom Dam WCM Update, which has no construction associated with it, all of the related projects discussed above would cumulatively contribute to emissions of criteria pollutants throughout the region, particularly if they are constructed concurrently, which could have a significant cumulative effect on air quality. It is anticipated that each of these projects would implement their own mitigation plan to reduce the emissions to below the significance levels which would result an overall cumulative effect of less than significant, unless the projects are constructed concurrently.

At this time, it is unknown at what point in time the ARCF project would be under construction, as construction is dependent on Congressional authorization and appropriation. However, it is likely that the ARCF project would be constructed at the same time as the West Sacramento GRR. It would be necessary to ensure that the ARCF and the West Sacramento GRR projects are not constructing at sites in close proximity to one another, such as on opposite sides of the river, at the same time. However, on a regional level, these projects would still contribute to a significant cumulative effect, and coordination with the SMAQMD would need to occur prior to construction to reduce these effects. Coordination with SMAQMD would result in the identification of mitigation measures, such as low emission vehicles, mitigation credits, and dust control measures, to reduce the overall cumulative effects on air quality to less than significant.

4.2.7 Climate Change

It is unlikely that any single project by itself could have a significant impact on the environment with respect to GHGs. However, the cumulative effect of human activities has been linked to quantifiable changes in the composition of the atmosphere, which, in turn, have been shown to be the main cause of global climate change (IPCC 2007). Therefore, the analysis of the environmental effects of GHG emissions is inherently a cumulative impact issue. While the emissions of one single project will not cause global climate change, GHG emissions from multiple projects throughout the world could result in a cumulative effect with respect to global climate change.

At this time, it is unknown at what point in time the ARCF project would be under construction, as construction is dependent on Congressional authorization and appropriation. However, it is likely that the ARCF project would be constructed at the same time as the West Sacramento GRR. It is expected that the primary impacts from these concurrent projects would be due to construction activities. On an individual basis, each of these projects would mitigate emissions below the general reporting threshold. If these projects are implemented concurrently, it is possible that the combined cumulative effects could be above the Federal reporting requirement for major facilities for GHG emissions of 25,000 tons of CO_2e per year. It would be necessary to ensure that the ARCF and the West Sacramento GRR projects are not constructing at sites in close proximity to one another, such as on opposite sides of the river, at the same time. However, on a regional level, these projects would still contribute to a significant cumulative effect, and coordination with the SMAQMD would need to occur prior to construction to reduce these effects.

In addition, the majority of the related projects are flood risk management projects. By implementing these projects, the action agencies would be reducing potential future emissions associated with flood fighting and future emergency actions. The related projects could combine to reduce long-term potential GHG emissions in the Sacramento metropolitan area. As a result, the overall cumulative GHG emissions from these projects are considered to be less than significant.

4.2.8 Noise

This project and the other local projects listed above would result in temporarily increased levels of ambient noise in the study area. Cumulative effects to noise would be limited to the projects that are in a close enough proximity to the ARCF construction sites to contribute to the project's noise and create a cumulative effect to the sensitive receptors impacted by the project. The only project that could contribute to the ARCF construction noise due to proximity is the West Sacramento GRR. The Corps would ensure that both projects are not constructing at the same time on opposite sides of the river in order to avoid these cumulative effects to the extent practicable. With this coordination, there would be no cumulative effects due to noise in the study area.

4.2.9 Recreation

Cumulative impacts to recreation are primarily related to other construction projects that could occur during the same timeframe as those considered for this study and within a close enough proximity to one another that recreationists would be impacted by potential impacts to multiple facilities At the time of this analysis no heavy construction projects are anticipated to occur in the American River Parkway or the East Side Tributaries that would create a cumulative effect on recreation opportunities in those areas. However, the combined impact of West Sacramento and ARCF construction sites on opposing sides of the Sacramento River could create a nuisance to boaters and other recreationists on the river. It would be necessary to ensure that the ARCF and the West Sacramento GRR projects are not constructing at sites in close proximity to one another, such as on opposite sides of the river, at the same time. With this coordination, there would be no cumulative effects to recreation.

4.2.10 Visual Resources

Cumulative impacts to visual resources are primarily related to other construction projects that could occur within the same visual view-scape as this study and result in loss of visual quality both during construction and after construction. If authorized and constructed Alternative 2 would result in a significant amount of large trees and other vegetation removed along the Sacramento River and the American River. Other projects in the vicinity, such as the West Sacramento Project and the SRBPP could also result in the removal of large trees and other vegetation. Implementation of the ARCF Project, when combined with other future projects in the vicinity, would result in a significant cumulative impact on visual resources, primarily from removal of vegetation. Additionally, the long time period for replanted vegetation to reach a size similar to the vegetation removed as a result of construction would be considered a cumulatively significant affect on visual resources along the Sacramento and American Rivers. No other projects are anticipated in the area of the East Side Tributaries and therefore no cumulative effects would occur.

4.3 Growth Inducing Impacts

NEPA and CEQA both require a discussion of how a project, if implemented, could induce growth. This section presents an analysis of the potential growth-inducing effects of the proposed project. Direct growth inducement would result if a project involved construction of new housing. Indirect growth inducement would result, for instance, if implementing a project results 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; 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).

Growth inducement may lead to environmental effects, such as increased demand for utilities and public services, increased traffic and noise, degradation of air or water quality, degradation or loss of plant or animal habitats, and conversion of agricultural and open space land to urban uses. Growth within a floodplain area increases the risk to people or property from flooding.

Within the project area, population growth and urban development are driven by local, regional, and national economic conditions. Local land use decisions are within the jurisdiction of the City of Sacramento and Sacramento County. Each of these agencies has adopted a general plan. These general plans provide an overall framework for growth and development within the jurisdiction of each agency, including the project area.

Growth inducing impacts would be the same for both Alternatives 1 and 2 as development in the area protected with implementation of the project is covered by existing general plans and is largely completed. Levees within the project area provide flood control for both the City of Sacramento and Sacramento County and help convey water flowing from the surrounding mountain ranges to the Delta. Construction of these alternatives would reduce the risk of flooding in the study area and help to maintain the integrity of the existing levee system.

There is currently sufficient workforce in the Sacramento metropolitan area to support construction of the project if approved. Implementation of either action alternative would have no significant effect on growth and, therefore, no mitigation is required.

4.4 Unavoidable Adverse Effects

State CEQA Guidelines CCR Section 21100(b)(2)(A) provides that an EIR shall include a detailed statement setting forth "any significant effect on the environment that cannot be avoided if the project is implemented." Chapter 3 provides a detailed analysis of all potentially significant environmental impacts of the ARCF project, feasible mitigation measures that could reduce or avoid the project's impacts, and whether these mitigation measures would reduce these impacts to less-than-significant levels. Cumulative impacts are discussed in Section 4.1 above. If a specific impact cannot be reduced to less-than-significant level, it is considered a significant and unavoidable impact.

The ARCF GRR project would have the following significant and unavoidable environmental effects (direct, indirect, and/or cumulative).

- Temporary increase in traffic on public roadways;
- Loss of vegetation and wildlife habitat on the Sacramento River levees, in the American River Parkway, and along Arcade Creek due to construction of levee improvements;
- Cumulative loss of vegetation and wildlife habitat within the Sacramento Metropolitan area;
- Cumulative short term loss of fisheries habitat due to project construction along the lower American and Sacramento Rivers;
- Temporary closure of recreation facilities including bike trail, walking trails, and boat launches in the American River Parkway during construction;

- Loss of aesthetic and visual resources due to construction related disruption of existing visual conditions in the American River Parkway and along the Sacramento River; and,
- Cumulative loss of aesthetic and visual resources primarily from removal of vegetation along the lower American and Sacramento Rivers.

Under CEQA, the following impacts would be significant and unavoidable. Mitigation for these impacts would be proposed in accordance with the PA. With the implementation of this mitigation the ARCF GRR project would be in compliance with Section 106 of the NHPA.

- Potential damage or disturbance to known archaeological or architectural resources from ground-disturbance or other construction related activities
- Potential damage to or destruction of previously unidentified or undiscovered cultural resources from ground disturbance or other construction-related activities; and
- Potential discovery of human remains during construction.

4.5 Relationship of Short-Term Uses 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 the EIS/EIR “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 recreation facilities, and increased air emissions, ambient noise level, dust generation, and are not expected to alter the long-term productivity of the natural environment. Project implementation would also result in long-term effects, including permanent loss of farmland, changes in visual resources, and adverse effects on existing riparian habitat.

Project implementation would contribute to long-term productivity of the environment by improving the levee system that protects the city of Sacramento by reducing the overall flood risk. The project would also reduce the risk of erosion along the American River Parkway, where bank protection is constructed, during a high flow event and the loss of riparian habitat and recreation facilities.

These long-term beneficial effects of the project would outweigh its potentially significant short-term impacts to the environment.

4.6 Irreversible and Irretrievable Commitment of Resources

NEPA requires that an EIS include a discussion of the irreversible and irretrievable commitments of resources which may be involved should the project be implemented. Similarly, the State CEQA Guidelines require a discussion of the significant irreversible environmental changes that would be caused by the project should it be implemented.

The irreversible and irretrievable commitments of resources are 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 commitments 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.

As described throughout this DEIS/DEIR, without implementation of the Common Features Project, the risk of levee failure would remain high. While a precise quantification of environmental impacts associated with potential levee failure is not possible, there is a potential for a variety of significant environmental impacts. Levee failure and the resulting emergency and reconstruction efforts could expend more energy, overall, than construction of the Common Features Project. A large volume of debris would result from a flood event, such things as cars, appliances, housing materials, and vegetation would all be generated with a flood and would likely have to be disposed of in a landfill. After debris removal is completed, re-building would occur and new materials would be required to construct homes, businesses, roads, and other urban infrastructure. Thus, project implementation preempts potentially substantial future consumption, and is likely to result in long-term energy and materials conservation.

5.0 COMPLIANCE WITH APPLICABLE LAWS, POLICIES, AND PLANS

This chapter summarizes the environmental laws and regulations that apply to the ARCF Project and describes the status of compliance with those laws and regulations. The Project would not only comply with the Federal environmental laws and regulations, but would comply with all state, regional, and local laws, regulations, and ordinances.

5.1 Federal Laws, Regulations, and Policies

Clean Air Act of 1972, as amended (42 U.S.C. 7401, et seq.)

Partial compliance. The Federal 1970 Clean Air Act (CAA) authorized the establishment of national health-based air quality standards, and also set deadlines for their attainment. The Federal Clean Air Act Amendments of 1990 (1990 CAA) made major changes in deadlines for attaining National Ambient Air Quality Standards (NAAQS). State and local agencies, within areas that exceed the NAAQS, are required to develop state implementation plans (SIP) to show how they will achieve the NAAQS for nonattainment criteria pollutants by specific dates. SIPs are not single documents; rather, they are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, permitting, etc.), district rules, state regulations and federal controls. USEPA is responsible for enforcing the NAAQS primarily through reviewing SIPs that are prepared by each state. As required by the Federal CAA, the USEPA has established and continues to update the NAAQS for specific criteria air pollutants: O_3, CO, NO_2, SO_2, PM10, PM2.5, and Pb.

Pursuant to CAA Section 176(c) requirements, USEPA promulgated the General Conformity Rule, which applies to most federal actions, including the ARCF project. The General Conformity Rule is used to determine if Federal actions meet the requirements of the CAA and the applicable SIP by ensuring that pollutant emissions related to the action do not:

- Cause or contribute to new violations of a NAAQS.
- Increase the frequency or severity of any existing violation of a NAAQS.
- Delay timely attainment of a NAAQS or interim emission reduction.

A conformity determination under the General Conformity Rule is required if the Federal agency determines: the action will occur in a nonattainment or maintenance area; that one or more specific exemptions do not apply to the action; the action is not included in the Federal agency's "presumed to conform" list; the emissions from the proposed action are not within the approved emissions budget for an applicable facility; and the total direct and indirect emissions of a pollutant (or its precursors), are at or above the *de minimis* levels established in the General Conformity regulations.

For the ARCF study, the construction reach with the most potential air quality emissions associated with it was selected for analysis under the CAA. For this reach, emissions associated with construction of slurry walls, bank protection, levee raises, and emissions from both construction equipment and barges were analyzed to determine the worst case scenario for air quality impacts. The analysis conducted determined that the emissions associated with construction of this reach would be below *de minimus* levels (Section 3.11), and thus, with the implementation of mitigation measures to further reduce emissions, this effect would be less than significant. As a result, the ARCF project is considered in compliance with the CAA.

GHG emission management is regulated by Federal, state, and local levels of government. USEPA is responsible for GHG regulation at the Federal level. On December 7, 2009, the Final Endangerment and Cause or Contribute Findings for Greenhouse Gases (endangerment finding), under Section 202(a) of the CAA went into effect. The endangerment finding states those current and projected concentrations of the six key GHGs threaten the public health and welfare of current and future generations. Furthermore, it states that the combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution which threatens public health and welfare (USEPA 2012a). Under the endangerment finding, the USEPA is developing vehicle emission standards under the CAA. Greenhouse Gases under Section 202(a) of the CAA determines whether project emission sources and emission levels significantly affect air quality based on Federal standards established by the EPA and State standards set by CARB. The ARCF is currently estimated to be well beneath the reporting limits for GHGs. As a result, the project is considered to be in compliance with the CAA.

<u>Clean Water Act of 1972, as amended (33 U.S.C. 1251, et seq.)</u>

Partial Compliance. The Clean Water Act (CWA) is the primary Federal law governing water pollution. It established the basic structure for regulating discharges of pollutants into waters of the U.S. and gives the USEPA the authority to implement pollution control programs, such as setting wastewater standards for industries (USEPA 2002). In some states, such as California, the USEPA has delegated authority to regulate the CWA to state agencies.

Section 401 of the CWA regulates the water quality for any activity that may result in any in-water work or discharge into navigable waters. These actions must not violate Federal water quality standards. The Central Valley RWQCB administers Section 401 of the CWA in California, and either issues or denies water quality certifications. Water quality certifications typically include project-specific requirements established by the RWQCB to ensure attainment of water quality standards.

Section 404 of the CWA requires that a permit be obtained from the Corps when an action will result in the discharge of dredged or fill material into wetlands and waters of the U.S. Under Section 404, the Corps regulates such discharges and issues individual and/or general permits for these activities. Before the Corps can issue a permit under Section 404, it must determine that the project is in compliance with the CWA Section 404(b)(1) guidelines. The 404(b)(1) guidelines specify that "no discharge of dredged or fill material shall be permitted if there is a practical alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (40 C.F.R. § 230.10[a]).

When conducting its own civil works projects, the Corps does not issue permits to itself. Rather, the Corps complies with the guidelines and substantive requirements of the Clean Water Act, including Section 404 and Section 401. The ARCF project would require discharge of fill material into Waters of the U.S., therefore a section 404(b)(1) analysis was conducted on the tentatively selected plan, and is included with this document as Appendix E. The discharge of fill material would comply with the 404(b)(1) guidelines with the inclusion of appropriate measures to minimize pollution or adverse effects on the aquatic ecosystem. A Section 401 water quality certification will be requested from the Central Valley RWQCB.

The project would also require an NPDES permit since it would disturb 1 or more acre of land and involve possible storm water discharges to surface waters. Prior to construction, the contractor would prepare a SWPPP and then submit a Notice of Intent form to the Central Valley RWQCB, requesting approval of the proposed work. This storm water plan would identify best management practices to be used to avoid or minimize any adverse effects of construction on surface waters. Once the work is completed, the contractor would submit a Notice of Termination in order to terminate coverage by the NPDES permit.

Endangered Species Act of 1973, as amended (16 U.S.C. 1531, et seq.)

Partial Compliance. Pursuant to the ESA, USFWS and NMFS have regulatory authority over Federally listed species. Under the ESA, a permit to "take" a listed species is required for any Federal action that my harm an individual of that species. Section 7 of the ESA prohibits Federal agencies from authorizing, funding, or carrying out activities that are likely to jeopardize the continued existence of a listed species or destroy or adversely modify its critical habitat. By consulting with USFWS and NMFS before initiating projects, agencies review their actions to determine if those actions could adversely affect listed species or their habitat. Through consultation, USFWS and NMFS work with Federal agencies to help design their programs and projects to conserve listed and proposed species. Because a number of listed species are potentially affected by Federal activities, USFWS and NMFS coordination with other Federal agencies is important to species conservation and may help prevent the need to list candidate species.

The USFWS is the administering agency for this authority regarding non-marine species and NMFS is the administering agency for fish species. A biological assessment that includes the Corps' determination of may adversely affect listed species (salmonids, steelhead, green sturgeon, Delta smelt, valley elderberry longhorn beetle, and giant garter snake) from the proposed project was submitted to USFWS and NMFS in June 2014 to initiate Section 7 Consultation (Appendix G). The regulatory agencies reviewed the assessment and determined that additional information was required. On July 23, 2014, the Corps received a request for additional information from USFWS. On September 9, 2014, the Corps received a request for additional information from NMFS. The updated biological assessment was resubmitted to the resource agencies in February 2015. With receipt of BOs from the resource agencies, and the implementation of any required mitigation and compensation measures, the Corps would be in full compliance with this Act.

Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661, et seq.)

Partial Compliance. The Fish and Wildlife Act (FWCA) ensures that fish and wildlife receive consideration equal to that of other project features from projects that are constructed, licensed, or permitted by Federal agencies. The FWCA requires federal agencies that construct water resource development projects to consult with USFWS, NMFS, and the applicable state fish and wildlife agency (CDFW) regarding the project's impacts on fish and wildlife and measures to mitigate those impacts. The USFWS and CDFW have participated in evaluating the proposed project, and a draft Coordination Act Report (CAR) is provided in Appendix A. The Corps will consider all recommendations proposed in the draft CAR. With issuance of a final CAR from USFWS and CDFW, the Corps would be in full compliance with this Act.

Magnuson-Stevens Fishery Conservation and Management Act (16. U.S.C. 1801, et seq.)

Partial Compliance. The Magnuson-Stevens Act requires that all Federal agencies consult with NMFS regarding actions or proposed actions permitted, funded, or undertaken that may adversely affect essential fish habitat. Essential fish habitat is defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Both the American and Sacramento Rivers are designated as essential fish habitat for salmon (winter, fall/late fall, and spring-run), and steelhead. The ARCF project and its potential effects to EFH are being coordinated with the NFMS under the Magnuson-Stevens Act, and the Corps anticipates recieving EFH conservation recommendations from NMFS prior to the final report milestone. The ARCF project will be in full compliance with this Act once a response is provided to the EFH conservation recommendations.

Migratory Bird Treaty Act of 1936, as amended (16 U.S.C. 703, et seq.)

Partial Compliance. The Migratory Bird Treaty Act implements various treaties and conventions between the United States, Canada, Japan, Mexico, and Russia, providing protection for migratory birds as defined in 16 U.S.C. § 715j. The project is in very urbanized areas where traffic congestion and human activities are very common. Birds in these areas have adjusted to the human environment and continue to nest in areas with multiple human activities occurring. To ensure that the project does not affect migratory birds, preconstruction surveys would be conducted by a qualified biologist in areas adjacent to the project construction site. If breeding birds are found in the area where construction is expected to occur, a protective buffer would be delineated and USFWS and CDFG would be consulted for further actions. With the implementation of these surveys, the project would be in compliance with this Act.

Executive Order 11988, Flood Plain Management

Full Compliance. The objective of this Executive Order (EO) is the avoidance, to the extent possible, of long- and short-term adverse effects associated with the occupancy and modification of the base flood plain (1% annual event) and the avoidance of direct and indirect support of development in the base flood plain wherever there is a practicable alternative. Reductions in the base (FEMA's 100-year) flood plain as a result of this project occur only in areas that are currently developed, and existing local ordinances strictly regulate further development in the base flood plain. Therefore, this project would not directly or indirectly support development in the flood plain. Section 3.3, Land Use, provides additional information on EO 11988.

Executive Order 11990, Protection of Wetlands

Full Compliance. This EO directs Federal agencies, in carrying out their responsibilities, to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. As discussed in Section 3.6, Vegetation and Wildlife, reasonable effort will be taken in the detailed design of the project to avoid disturbance to existing wetlands and implementation of environmentally sustainable designs. Any destruction, loss, or degradation of wetlands would be compensated through creation of new wetland habitat.

Executive Order 12989, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Full Compliance. This EO states that Federal agencies are responsible for conducting their programs, policies, and activities that substantially affect human health of the environment in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination under such programs, policies, and activities because of their race, color, or national origin. The ARCF project levees have been designed to convey the 160,000 cfs released from Folsom Dam. All levees within the study area will be constructed to the same criteria and standard. The benefits of the ARCF project would extend to all of the Sacramento Metropolitan area; therefore it would not provide disproportionate benefits or effects to any minority or low income populations and is in compliance with EO 12989.

Farmland Protection Policy Act (7 U.S.C. 4201, et seq.)

Full Compliance. This Act requires a Federal agency to consider the effects of its actions and programs on the Nation's farmland. There is a small portion of land adjacent to the Sacramento Bypass that would be removed from production and is currently under Williamson Act Prime and Unique Agricultural Land. The effects of the removal of the small piece of land are discussed in the Land Use Section of this report. The minimal amount of land which would be converted from agricultural land to open space would be considered less than significant because it is less than 1% of the total Prime Farmland in Yolo County. As a result, the ARCF project is in full compliance with this Act.

National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321, et seq.)

Partial Compliance. NEPA applies to all Federal agencies and most of the activities they manage, regulate, or fund that affect the environment. This act requires full disclosure of the environmental effects, alternatives, potential mitigation, and environmental compliance procedures of proposed actions. NEPA requires the preparation of an appropriate document to ensure that Federal agencies accomplish the law's purposes. This DEIS/DEIR constitutes partial compliance with NEPA. Full compliance will be achieved when the final EIS/EIR and Record of Decision are filed with the USEPA.

National Flood Insurance Program

The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 were intended to reduce the need for large, publicly funded flood control structures and disaster relief by restricting development on floodplains. The Federal Emergency Management Agency (FEMA) manages the National Flood Insurance Program (NFIP) to subsidize flood insurance to communities that comply with FEMA regulations limiting development in floodplains. FEMA issues Flood Insurance Rate Maps (FIRMs) for communities participating in the NFIP. These maps delineate flood hazard zones in the community. The maps are designed for flood insurance purposes only and do not necessarily show all areas subject to flooding. The maps designate lands likely to be inundated during a 1% (100-year) storm event and elevations of the base flood. They also depict areas between the limits affected by 1% (100-year) and 0.2 % (500-year) events and areas of minimal flooding. FIRMs are often used to establish building pad elevations to protect new development from flooding effects.

National Historic Preservation Act of 1966, as amended (16 U.S.C. 470)

Partial Compliance. Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to take into account the effects of a proposed undertaking on properties that have been determined to be eligible for, or included in, the National Register of Historic Places (NRHP). If cultural resource(s) have been identified during a survey or record and literature search, the federal agency overseeing the project begins the process to determine whether the cultural resources is/are eligible for listing in the NRHP. Section 106 of the NHPA as amended, mandates the evaluation process. The implementing regulations for Section 106 are at 36 C.F.R. § 800 et seq.

Inventory, evaluation for listing in the NRHP, and determinations of effects to cultural resources are made by Federal agencies for cultural resources within a project's APE. For purposes of complying with Section 106 of the NHPA, a Federal agency will make a determination of the APE for the project or undertaking. The APE is defined as "the geographic areas or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." Additionally, the APE "is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking."

The APE for an undertaking may extend beyond the physical impacts associated with a project. Depending on the scale and nature of the undertaking and the known and anticipated types of cultural resources, the direct or indirect effects may include physical modification, intrusion to the visual or esthetic characteristics of landscapes or features, or even access to a historic property.

After a cultural resource has been determined eligible for listing in the NRHP, it is regarded the same as any other property that is listed and becomes formally known as a "historic property," regardless of age. The term "historic property" refers exclusively to NRHP listed or eligible properties.

For a federal project to be in compliance with Section 106, one of the following five scenarios will occur: (1) no historic properties exist in the APE; (2) the undertaking does not have the potential to affect historic properties; (3) there are known historic properties in the APE but the undertaking will not adversely affect them; (4) known historic properties will be adversely affected by the project and a memorandum of agreement (MOA) or programmatic agreement (PA) may be executed that will guide the mitigation or resolution of adverse effects; or (5) adverse effects are not known and a PA may be executed that will guide the inventory and identification of historic properties, evaluation of potential adverse effects to historic properties, and mitigation or resolution of adverse effects. For this undertaking, a PA will be executed to manage the inventory and evaluation of cultural resources and mitigation of historic properties.

MOAs and PAs are negotiated between the federal agency, the State Historic Preservation Officer (SHPO), and possibly the Advisory Council on Historic Preservation. Other entities such as the local sponsor, historic preservation groups, and Native American tribes may be invited to participate as concurring parties to MOAs and PAs. A record of the consultation for this project as it relates to compliance with Section 106 is included in Appendix C.

SHPO Consultation

In a letter dated February 2, 2012, the Corps initiated consultation with the SHPO, informing the SHPO of the proposed project and asking for comments on the determination of the APE, the proposed development of a PA, and the proposed efforts to identify historic properties within the APE. The Corps followed that consultation letter with a letter dated July 12, 2012, which transmitted the draft PA for review and comment, refined the previous determination of the APE, and informed the SHPO of the Corps' determination of the potential that the project may adversely affect historic properties, as well as the resolution of adverse effects through the execution of a PA. The Corps requested comments and proposed a meeting to discuss the project and the PA. After the formal letter sent in July, the Corps followed up with emails to the SHPO and consultation meetings with the SHPO in October and November 2012, and transmittal of the draft PA and supporting documents for the PA and the project. The draft PA and attachment was again transmitted in a letter dated June 12, 2014 and the Corps requested comments from the SHPO. The SHPO provided comments on the draft PA on August 8, 2014 and those comments have been considered for incorporation into the current draft PA appended to this EIS/EIR. Consultation with the SHPO is included in Appendix C.

ACHP Consultation

In a letter dated February 2, 2012, the Corps initiated consultation with the ACHP, informing the ACHP of the project, the planned process to comply with Section 106, and asked the ACHP to participate in the development of the PA. The Corps followed that consultation letter with a letter dated July 16, 2012, transmitting the draft PA for review and comment, and requesting that the ACHP notify the Corps if they plan to participate in the project and the PA. The ACHP responded in a letter dated August 7, 2012, by acknowledging the letters sent previously and declining to participate in the project or the PA. The ACHP requested that the final PA be filed with the ACHP once executed. Consultation with the ACHP is included in Appendix C.

Programmatic Agreement Development

In accordance with 36 CFR § 800.14(b), when the potential effects of a Federal agency's undertaking cannot be determined prior to approval a PA may be developed for a project. Because the Corps cannot fully determine the effects of the Undertaking on Historic Properties [36 C.F.R. § 800.14(b)(1)(ii)], for all phases and segments of the ARCF GRR at this time, in order to provide a framework for the Corps to identify cultural resources, evaluate cultural resources for their eligibility for inclusion in the NRHP, determine possible effects to historic properties, and mitigate effects to historic properties as a result of the project, the Corps determined that a PA was the appropriate means to comply with Section 106 of the NHPA for the ARCF GRR. The PA was developed in consultation with the SHPO and ACHP, and comments from DWR, the CVFPP, and SAFCA were requested. The PA was sent to potentially interested Native Americans, requesting their comments and interest in signing the PA as concurring parties. All comments from all parties were considered in the development of the PA. A draft of the PA is included in Appendix C.

American Indian Consultation

A list of potentially interested Native Americans was obtained from the California Native American Heritage Commission in February 2011 and updated in September 2011 and February 2013. Those individuals were contacted on multiple occasions in 2011, 2012, 2013, and 2014 regarding the project and the Corps' efforts to identify cultural resources within the study area. In 2012 and 2013, the Corps met with the United Auburn Indian Community of the Auburn Rancheria, the Shingle Springs Band of Miwok Indians, and the Buena Vista Rancheria to discuss the project. In 2014, the Corps began to meet with the United Auburn Indian Community of the Auburn Rancheria and the Shingle Springs Band of Miwok Indians on a regular, quarterly basis to discuss the project. Some of the concerns brought up by American Indians included the treatment of American Indian remains discovered during construction of the project, involvement of American Indian tribal monitors during construction, the opportunities for American Indians to review and comment on archaeological survey reports and determinations of eligibility and affect, and the involvement of American Indians in the identification of cultural resources sites of tribal interest, such as TCPs. The draft PA was transmitted to potentially interested Native Americans in letters dated April 5, 2013, June 6, 2013, and June 2014 requesting review and involvement from interested tribes and individuals. Consultation with American Indian tribes and individuals is included in Appendix C. As part of the Section 106 compliance efforts, the PA includes stipulations for continual involvement by Native Americans throughout the execution of the PA.

Public Involvement

In April 2013, letters to 100 historical societies, museums, state historic parks, associations with historic interests, local city and county groups, and groups of various prehistoric and historic interests were sent providing a description and map of the project and requesting information on cultural resources within the study area (Appendix C). One response, from the Center for Sacramento History, was received, noting they would keep the Corps' letter on file.

Compliance with Section 106

In accordance with 36 CFR § 800, the implementing regulations of Section 106 of the NHPA, the Corps has determined that the ARCF GRR will likely result in adverse effects to historic properties. In order to take into account the effects of a proposed undertaking on historic properties, the Corps has developed a PA. The Corps has consulted with interested parties, the SHPO, the ACHP, DWR, the CVFPP, SAFCA, and American Indian tribes and individuals in the development of the PA. Signing of the PA by the Corps, the SHPO, and DWR evidences the legal commitment by the Corps as the lead Federal agency to comply with Section 106 of the NHPA. With the execution of the PA the Corps will be in compliance with Section 106.

Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (49 CFR Part 24)

The Uniform Relocation Act ensures the fair and equitable treatment of persons whose real property is acquired or who are displaced as a result of a Federal or Federally assisted project. All or portions of parcels within the ARCF Project footprint would need to be acquired for project construction. Federal, state, 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 § 4601 et seq.) (Uniform Act), and implementing regulation, 49 C.F.R. Part 24. Relocation advisory services, moving costs reimbursement, replacement housing, and reimbursement for related expenses and rights of appeal are provided for in the Uniform Act.

ARCF Project implementation would require acquisition of property in the footprint to construct flood risk management facilities and improvements. Additionally, temporary relocation of residents may occur during portions of construction. Property acquisition and relocation services, compensation for living expenses for temporarily relocated residents, and negotiations regarding any compensation for temporary loss of business would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act.

Wild and Scenic Rivers Act (16 U.S.C. 1217, et seq.)

Full Compliance. This act was enacted to preserve selected rivers or sections of rivers in their free-flowing condition in order to protect the quality of river waters and to fulfill other national conservation purposes. The Lower American River, below Nimbus Dam, has been included in the Federal Wild and Scenic Rivers system since 1981. The ARCF project is consistent with the land use management, flood risk reduction, and levee protection policies of the American River Parkway Plan. These policies require that flood management agencies maintain and improve the existing flood control system, and manage vegetation in the Parkway to maintain the structural integrity and conveyance capacity of the flood control system, consistent with the need to provide a high level of flood risk reduction (Sacramento County 2008:4-84).

5.2 State of California Laws, Regulations, and Policies

Alquist-Priolo Earthquake Fault Zoning Act

Full compliance. The Alquist-Priolo Earthquake Fault Zoning Act (California PRC Sections 2621–2630) was passed by the California Legislature in 1972 to mitigate the hazard of surface faulting to structures. The Act's main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The act addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards. Local agencies must regulate most development in fault zones established by the State Geologist. 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. As discussed in Section 3.2, the ARCF GRR study area does not contain any Alquist-Priolo Earthquake Fault Zones.

California Clean Air Act

Partial compliance. The California Clean Air Act was signed into law in 1988 and, for the first time, clearly spelled out in statute California's air quality goals, planning mechanisms, regulatory strategies, and standards of progress. The California Clean Air Act provides the State with a comprehensive framework for air quality planning regulation. Prior to passage of the Act, Federal law contained the only comprehensive planning framework.

The California Clean Air Act requires attainment of state ambient air quality standards by the earliest practicable date. For air districts in violation of the state ozone, carbon monoxide, sulfur dioxide, or nitrogen dioxide standards, attainment plans were required by July 1991. CARB is responsible for the development, implementation, and enforcement of California's motor vehicle pollution control program, GHG statewide emission estimates and goals, and development and enforcement of GHG emission reduction rules. A summary of the major California GHG regulations that will affect the project's GHG emissions are presented in Section 3.12. Section 202(a) of the California Clean Air Act requires projects to determine whether emission sources and emission levels significantly affect air quality based on Federal standards established by the USEPA and State standards set by CARB. Compliance with the California Clean Air Act for GHG emissions is expected with incorporated mitigation specified in Section 3.12.6. As a result, full compliance with this Act is expected with coordination with SMAQMD and preconstruction permitting.

California Endangered Species Act

Partial Compliance. This Act requires the non-Federal partner to consider the potential adverse affects to State-listed species. As a joint NEPA/CEQA document, this DEIS/DEIR has considered the potential effects to State-listed species, as discussed in Section 3.8. There is the potential for the ARCF project to impact the State-listed giant garter snake, and Swainson's hawk, if nests are present at the construction sites. The State has been coordinating with CDFW regarding potential impacts to State-listed species. Since the giant garter snake is both Federally and State-listed, the Corps would be implementing minimization measures at construction sites that include GGS habitat as specified in the Corps' programmatic agreement with USFWS regarding this species. Prior to construction of any site, the Corps and the State would conduct preconstruction surveys to determine the presence of nests at construction sites. If nests are present, coordination with CDFW would occur to determine any mitigation or minimization measures that would need to be implemented to protect Swainson's hawks. The ARCF would be in full compliance with this Act once these surveys are conducted and coordination has occurred.

California Environmental Quality Act

Partial Compliance. CEQA requires that State and local agencies identify the significant environmental impacts of their actions, and avoid or mitigate those impacts, when feasible. The CEQA amendments of December 30, 2009, specifically require lead agencies to address GHG emissions in determining the significance of environmental effects caused by a project, and to consider feasible means to mitigate the significant effects of GHG emissions (California Natural Resources Agency 2012). The CVFPB, as the non-Federal partner, will undertake activities to ensure compliance with the requirements of this Act. CEQA requires the full disclosure of environmental effects, potential mitigation, and environmental compliance for the proposed project. The CVFPB will consider certifying the final EIR and adopting its findings. Certification of the final EIR by the CVFPB would provide full compliance with CEQA.

California Seismic Hazards Mapping Act

Full Compliance. The California Seismic Hazards Mapping Act of 1990 (California Public Resources Code [PRC] Sections 2690–2699.6) addresses seismic hazards other than surface rupture, such as liquefaction and induced landslides. The Seismic Hazards Mapping Act 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. The closest active fault to the ARCF GRR project is located approximately 30 miles to the northwest, as discussed in Section 3.2. As a result, there would be no significant effects on the project due to seismicity, and the ARCF study is in full compliance with this Act.

California Surface Mining and Reclamation Act

The Surface Mining and Reclamation Act of 1975 (SMARA) (PRC Sections 2710–2719) is the principal legislation addressing mineral resources in California. Surface mining operations include, "…borrow pitting, streambed skimming, segregation and stockpiling of mined materials (and recovery of the same) …" (CCR, Title 14, Section 3501). Section 3501 further defines excavations for on-site construction as "earth material moving activities that are required to prepare a site for construction of structures, landscaping, or other land improvements (such as excavation, grading, compaction, and the creation of fills and embankments), or that in and of themselves constitute engineered works (such as dams, road cuts, fills, and catchment basins)." SMARA was enacted in response to land use conflicts between urban growth and essential mineral production. Its stated purpose is to provide a comprehensive surface mining and reclamation policy that will encourage the production and conservation of mineral resources while ensuring that; significant environmental effects of mining are prevented or minimized, mined lands are reclaimed and residual hazards to public health and safety are eliminated, and consideration is given to recreation, watershed, wildlife, aesthetic, and other related values.

The SMARA statute requires mitigation to reduce adverse impacts on public health, property, and the environment. Because borrow activities associated with the ARCF GRR project, would disturb more than 1 acre or remove more than 1,000 cubic yards of material through surface mining activities, including the excavation of borrow pits for soil material, the project proponent(s) must comply with SMARA. SMARA governs the use and conservation of a wide variety of mineral resources, although some resources and activities are exempt from its provisions, including excavation and grading conducted for farming, construction, or recovery from flooding or other natural disaster.

The State Mining and Geology Board reviews the local ordinances to ensure that they meet the procedures established by SMARA. In general, SMARA permitting requires lead agency approval of a permit, a reclamation plan, and the posting of approved financial assurance for the reclamation of mined land. Cities and counties have the authority to enforce SMARA and create additional regulations. Sacramento, Sutter, and Yolo Counties are the SMARA lead agencies for surface mining operations in their respective counties within the ARCF GRR study area. Compliance is achieved by either obtaining a SMARA permit or exemption.

Plate 6 displays all potential borrow sites that would supply soil borrow for the Common Features project construction. SMARA permits or exemptions would be obtained, as appropriate, for selected borrow sites. Excavation activities would not commence until all regulatory and compliance requirements for borrow activities have been met.

California Water Code

Partial compliance. The ARCF study is located within the jurisdiction of the Central Valley RWQCB, within the greater Sacramento Valley watershed. The preparation and adoption of water quality control plans, or Basin Plans, and statewide plans, is the responsibility of the SWRCB. State law requires that Basin Plans conform to the policies set forth in the California Water Code beginning with Section 13000 and any State policy for water quality control. These plans are required by the California Water Code (Section 13240) and supported by the Federal CWA. Section 303 of the CWA requires states to adopt water quality standards which "consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses." According to Section 13050 of the California Water Code, Basin Plans consist of a designation or establishment for the waters within a specified area of beneficial uses to be protected and water quality objectives to protect those uses. Adherence to Basin Plan water quality objectives protects continued beneficial uses of water bodies. Because beneficial uses, together with their corresponding water quality objectives, can be defined per Federal regulations as water quality standards, the Basin Plans are regulatory references for meeting the State and Federal requirements for water quality control (40 CFR 131.20). The potential effects of the proposed project on water quality have been evaluated and are discussed in Section 3.5. Compliance with the California Water Code will be accomplished by obtaining certifications from the Central Valley RWQCB and 404 review internally by the Corps.

Porter-Cologne Water Quality Control Act

Partial Compliance. The Porter-Cologne Water Quality Control Act of 1970 established the SWRCB and nine RWQCBs within the State of California. These groups are the primary state agencies responsible for protecting California water quality to meet present and future beneficial uses and regulating appropriative surface rights allocations. The preparation and adoption of water quality control plans, or Basin Plans, and statewide plans, is the responsibility of the SWRCB. State law requires that Basin Plans conform to the policies set forth in the California Water Code beginning with Section 13000 and any State policy for water quality control. These plans are required by the California Water Code (Section 13240) and supported by the Federal CWA. Section 303 of the CWA requires states to adopt water quality standards which "consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses." According to Section 13050 of the California Water Code, Basin Plans consist of a designation or establishment for the waters within a specified area of beneficial uses to be protected and water quality objectives to protect those uses. Adherence to Basin Plan water quality objectives protects continued beneficial uses of water bodies. The potential effects of the proposed project on water quality have been evaluated and are discussed in Section 3.5. This project expects to achieve full compliance with the Water Quality Control act by achieving compliance with RWQCB certification mandates for Section 401 of the Federal CWA.

6.0 CONSULTATION AND COORDINATION

This chapter summarizes public and agency involvement activities undertaken by the Corps, CVFPB, and SAFCA that have been conducted to date, are ongoing, and/or will be conducted for this project, and which satisfy NEPA and CEQA requirements for public scoping and agency consultation and coordination. Additionally, Native American consultation activities are described.

6.1 Public Involvement Under NEPA and CEQA

The Lead Agencies are implementing a comprehensive public participation program to fully inform and engage potentially affected agencies, stakeholders and communities. This section describes public involvement to date and future steps to be taken with the public.

6.1.1 Notice of Intent, Notice of Preparation, and Scoping Meetings

The Corps published the NOI to prepare the ARCF GRR EIS in the Federal Register (Vol. 73, No. 41) on February 29, 2008. The State of California, CVFPB published the NOP with the State Clearinghouse on February 27, 2008. A series of public scoping meetings were held in March 2008 to present information to the public and to receive public comments on the scope of the EIS. There is no mandated time limit to receive written comments in response to the NOI under NEPA. Appendix F contains the NOI, NOP, the one comment letter received in 2008 (which is also summarized in Table 47), and copies of the posters for the March 2008 scoping meetings.

Table 47. Written Comments Received on the NOI.

Commenter	Date
California Department of Transportation	April 1, 2008
• Requests clarification as to which portions of the project will use trucks to haul materials and which will use waterside barges for hauling materials. • Requests a Traffic Management Plan including necessary mitigation, haul routes, dates of operation, and truck trip volumes be prepared in order for review. • Notes that an encroachment permit will be required if electronic warning signs will be used within State right-of-way at work sites to warn public of trucks entering or leaving state highways. • Expresses concern about piezometer locations and wells near the subgrade section of I-5 (the Boat Section) and requests these sites be identified and not be disturbed during levee improvement. • Requests maps describing the project “activity areas” and clarification of the scope of the project and potential impacted highway and bridge structure areas. • Requests identification and notification of any work near State right-of-way.	

6.1.2 Next Steps in the Environmental Review Process

This DEIS/DEIR will be circulated for a 45 day public review period to Federal, State, and Local agencies, organizations, and individuals who have an interest in the project. A notice of availability of the DEIS/DEIR will be published in the Federal Register when the document is released for public review. Public workshops will be held during the review period on to provide additional opportunities for comments on the draft document. All comments received during the public review period will be considered and incorporated into the final EIS/EIR, as appropriate. Comments and responses will be included with the final document as a part of Appendix F.

Once the final EIS is completed, a Notice of Availability will be published in the Federal Register and local newspapers, indicating that the final EIS will be available for a 30-day review period before the Corps makes a final decision whether or not to approve implementation of the proposed action. After considering any additional comments, the Corps will sign a Record of Decision (ROD) for the project. The ROD is a written, public record explaining why the Corps chose a particular course of action. The selected action and any practicable mitigation measures will be identified in the ROD. The proposed action cannot be initiated before the ROD is signed. In addition, project construction is also contingent on congressional authorization and appropriation of funds.

6.1.3 Major Areas of Controversy

Based on the comments received during the public scoping period and the history of the NEPA and CEQA processes undertaken by the Corps and the Non-Federal and Local partners, the major areas of public controversy associated with the project area:

- Temporary construction related effects on residents and businesses adjacent to the project levees
- Construction related impacts on cultural and biological resources
- Vegetation and tree removal
- Impacts to recreation facilities
- Impacts to endangered species and their habitat
- Conversion of private property to flood control structure

6.2 Native American Consultation

A list of potentially interested Native Americans was obtained from the California Native American Heritage Commission in February 2011 and updated in September 2011 and February 2013. Those individuals were contacted on multiple occasions in 2011, 2012, 2013, and 2014 regarding the project and the Corps' efforts to identify cultural resources within the study area. In 2012 and 2013, the Corps met with the United Auburn Indian Community of the Auburn Rancheria, the Shingle Springs Band of Miwok Indians, and the Buena Vista Rancheria to discuss the project. In 2014, the Corps began to meet with the United Auburn Indian Community of the Auburn Rancheria and the Shingle Springs Band of Miwok Indians on a regular, quarterly basis to discuss the project. Some of the concerns brought up by American Indians included the treatment of American Indian remains discovered during construction of the project, involvement of American Indian tribal monitors during construction, the opportunities for American Indians to review and comment on archaeological survey reports and determinations of eligibility and affect, and the involvement of American Indians in the identification of cultural resources sites of tribal interest, such as TCPs. The draft PA was transmitted to potentially interested Native Americans in letters dated April 5, 2013, June 6, 2013, and June 2014 requesting review and involvement from interested tribes and individuals. Consultation with American Indian tribes and individuals is included in Appendix C. As part of the Section 106 compliance efforts, the PA includes stipulations for continual involvement by Native Americans throughout the execution of the PA.

6.3 Coordination with Other Federal, State, and Local Agencies

Chapter 5.0 "Compliance with Applicable Laws, Policies, and Plans" describes the project's compliance with applicable Federal laws and regulations, including consultation to date with various Federal agencies. The following briefly summarizes these consultation and coordination efforts. See Chapter 5.0 for additional details.

The Corps coordinated with USFWS during the planning phase of the study to help analyze potential effects to endangered species and biological resources. This document has been coordinated with the DWR and SAFCA. Coordination with the SHPO was conducted during the early planning phase of this study. Additionally this document will be circulated to those listed in Section 6.4 for public comments. Comments received will be incorporated as appropriate.

6.4 List of Recipients

The following Federal, State, and local agencies and organizations will either receive a copy of the DEIS/DEIR or a notification of the document's availability. Individuals who may be affected by the project or who have expressed interest through the public involvement process will also be notified.

6.4.1 Elected Officials and Representatives

Governor of California
Honorable Edmund G. Brown, Jr.

United States Senate
Honorable Barbara Boxer
Honorable Dianne Feinstein

United States House of Representatives
Honorable Doris Matsui
Honorable Michael Thompson
Honorable Ami Bera
Honorable Tom McClintock

California State Senate
Honorable Richard Pan
Honorable Ted Gaines
Honorable Lois Wolk

California State Assembly
Honorable Kevin McCarty
Honorable Bill Dodd
Honorable Jim Cooper

Sacramento County
Supervisor Phil Serna
Supervisor Patrick Kennedy
Supervisor Susan Peters
Supervisor Roberta MacGlashan
Supervisor Don Nottoli

Yolo County
Supervisor Oscar Villegas
Supervisor Don Saylor
Supervisor Matt Rexroad
Supervisor Jim Provenza
Supervisor Duane Chamberlain

City of Sacramento

Mayor Kevin Johnson
Councilmember Angelique Ashby
Councilmember Allen Warren
Councilmember Jeff Harris
Councilmember Steven Hansen
Councilmember Jay Jennings, II
Councilmember Larry Carr

6.4.2 Government Departments and Agencies

Federal Government Agencies

- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- National Marine Fisheries Service
- Federal Emergency Management Agency
- U.S. Geological Survey
- Natural Resources Conservation Service
- U.S. Bureau of Reclamation

State of California Government Agencies

- California Air Resources Board
- Delta Stewardship Council
- Delta Protection Commission
- Central Valley Flood Protection Board
- Central Valley Regional Water Quality Control Board
- California Department of Conservation
- California Department of Fish and Wildlife
- California Department of Parks and Recreation
- California Department of Transportation

- California Department of Water Resources
- Native American Heritage Commission
- California State Office of Historic Preservation
- California State Clearinghouse
- California State Lands Commission
- California State Water Resources Control Board
- Governor's Office of Emergency Services

Regional, County, and City Agencies

- American River Flood Control District
- Sacramento Area Flood Control Agency
- City of Sacramento
- Sacramento County
- Yolo County
- City of West Sacramento
- Sacramento Metropolitan Air Quality Management District
- Yolo-Solano Air Quality Management District

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8.0 LIST OF PREPARERS

This DEIS/DEIR was prepared by the U.S. Army Corps of Engineers, Sacramento District. The following is a list of individuals who prepared sections of the DEIS/DEIR, provided significant background materials, provided project description engineering details, or participated in preparing the DEIS/DEIR.

Table 48. List of Preparers.

Name	Title	Experience
Stefanie Adams	Student Trainee (Archaeology)	5 Years
Anne Baker	Social Science Environmental Manager	8 Years
Elizabeth Holland	Senior Social Science Environmental Manager	28 Years
David Colby	Fisheries Biologist	11 Years
Josh Garcia	Chief, Environmental Analysis Section	15 Years
Thomas Goebel	Civil Engineer	20 Years
S. Joe Griffin	Archeologist	9 Years
Victoria Hermanson	Biological Science Environmental Manager	1 Year
Josh Holmes	Assistant District Counsel	5 Years
Michael Kynett	Senior Geotechnical Engineer	6 Years
Jamie LeFevre	Biological Science Environmental Manager	6 years
Melissa Montag	Historian/Social Science Study Manager	12 Years
Andrew Muha	Water Resources Planner	6 Years
Mario Parker	Biological Science Environmental Manager	21 Years
Richard Perry	Archeologist	24 Years
Sara Schultz	Water Resources Planner	15 Years
Jessie Schlunegger	Chief, Hydraulic Analysis	11 Years
Dan Tibbitts	Project Manager	23 Years
Tanis Toland	Ecosystem Restoration Regional Technical Specialist	24 Years

9.0 INDEX

PLATES

Plate 1. Watershed Map.

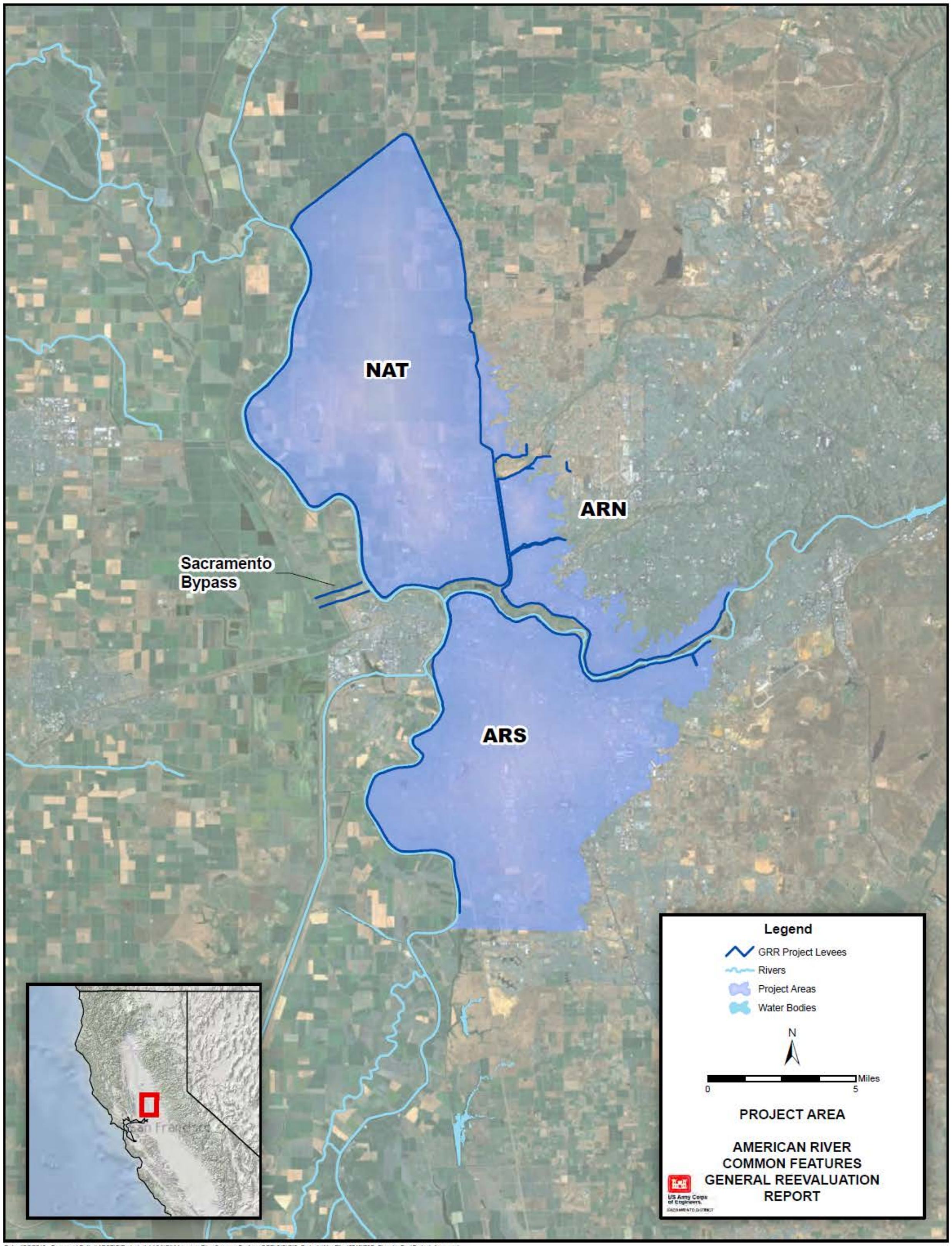

Plate 2. Study Area Map.

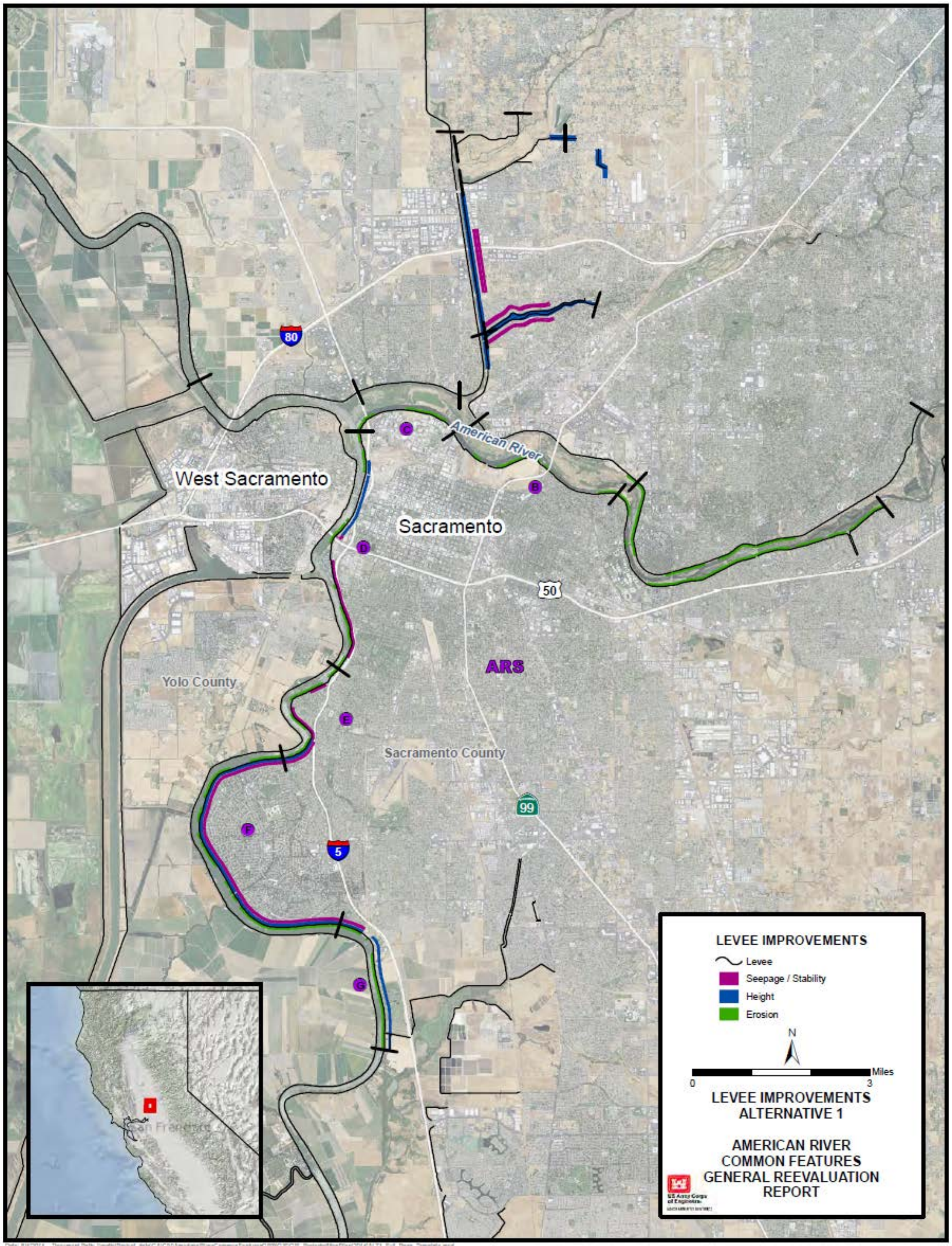

Plate 3. Alternative 1 Footprint.

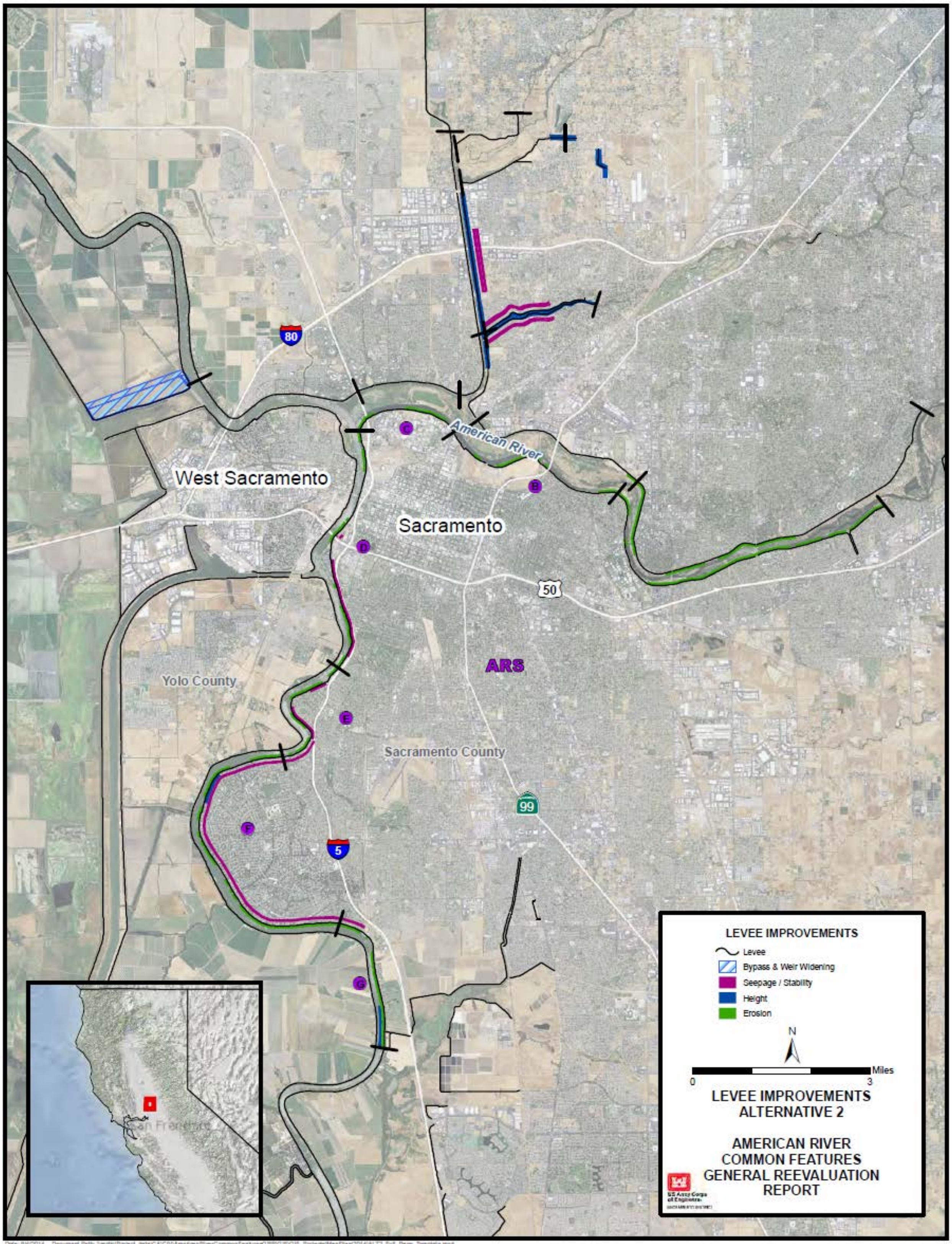

Plate 4. Alternative 2 Footprint.

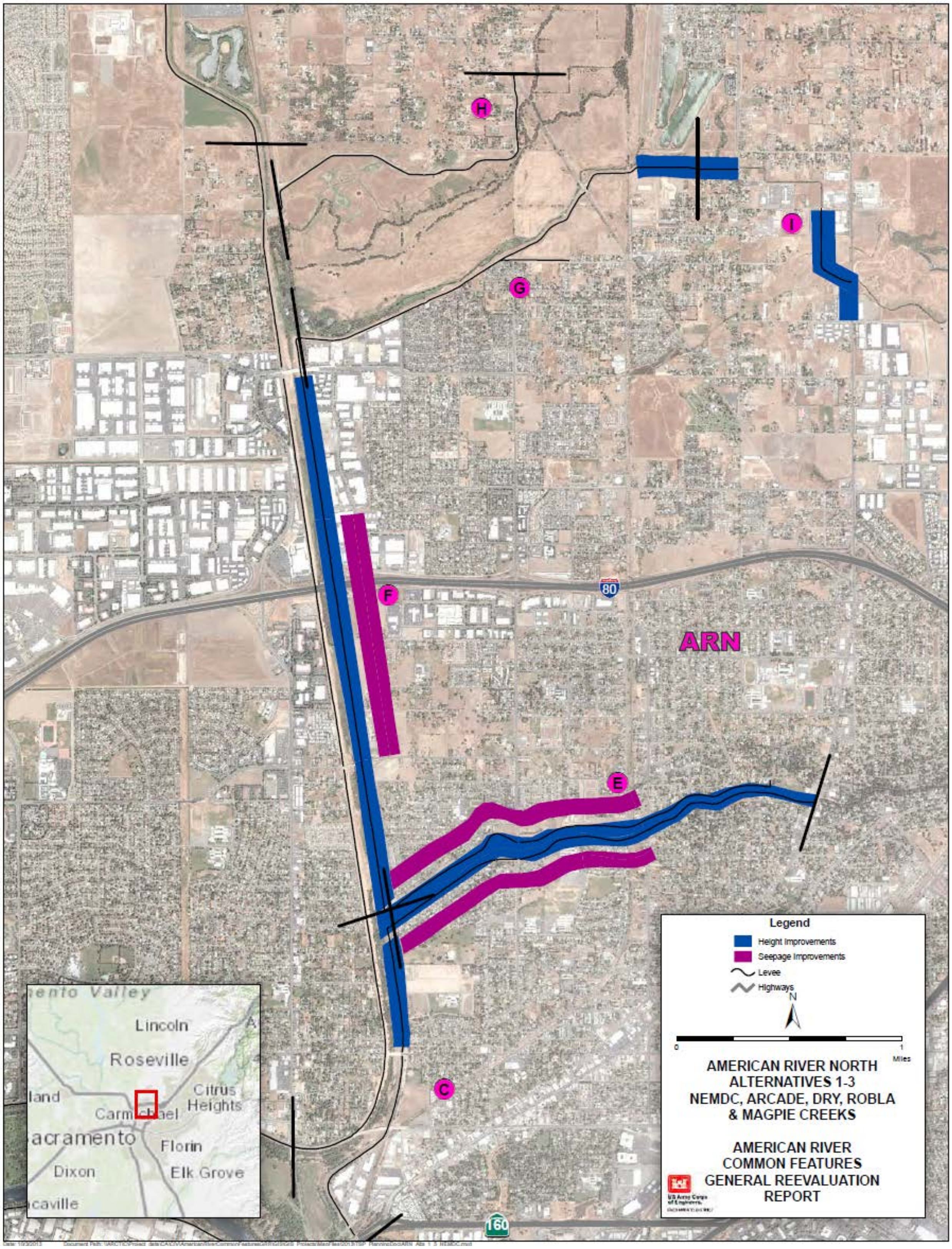

Plate 5. Detailed NEMDC Alternative 1 & 2 Footprints.

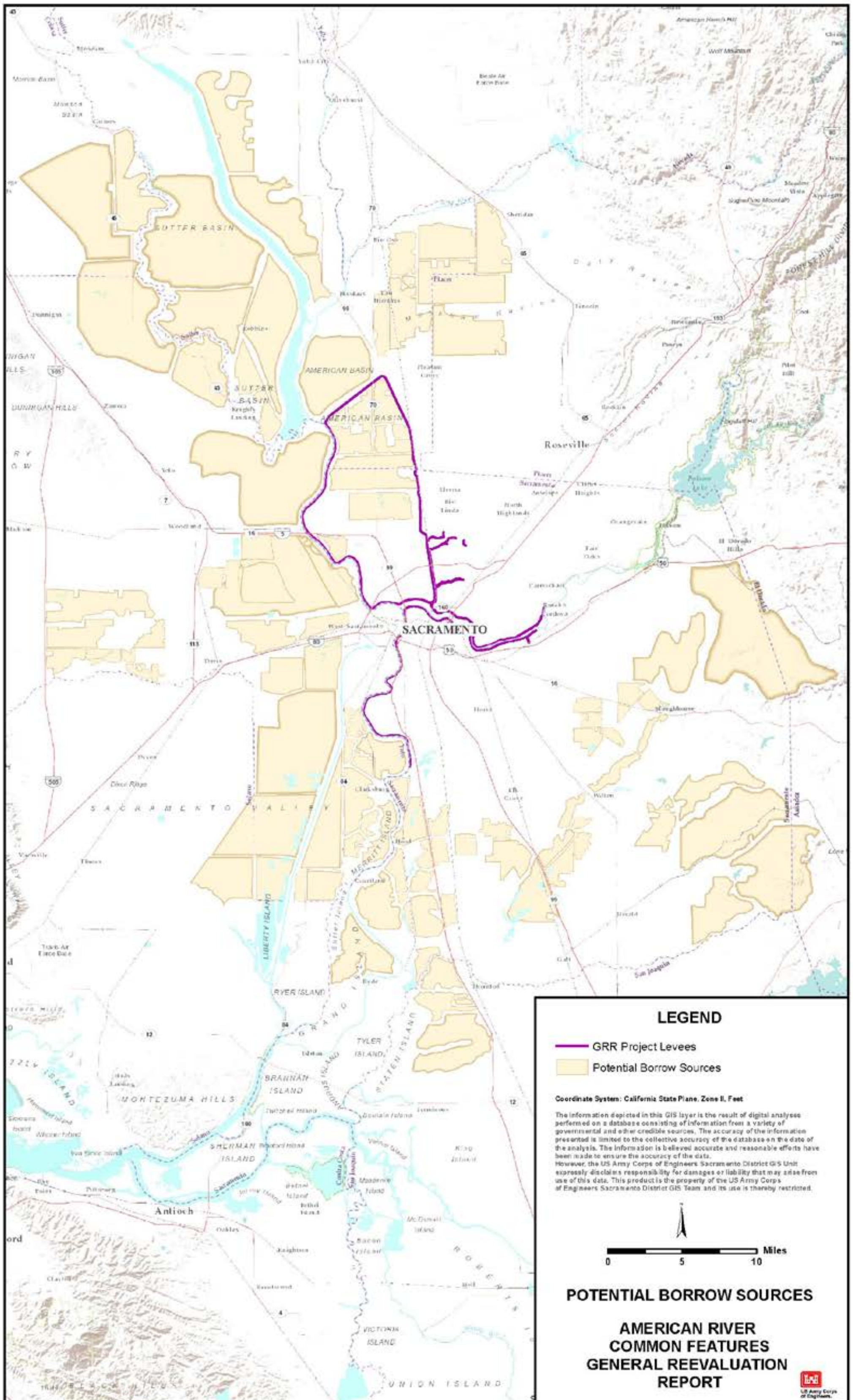

Plate 6. Potential Borrow Sites.