AMERICAN RIVER WATERSHED COMMON FEATURES GENERAL REEVALUATION REPORT

COMMUNICATION

FROM

THE ASSISTANT SECRETARY OF THE ARMY, CIVIL WORKS, DEPARTMENT OF DEFENSE

TRANSMITTING

THE AMERICAN RIVER WATERSHED COMMON FEATURES GENERAL REEVALUATION FINAL REPORTS AND APPENDICES FOR DECEMBER 2015 (REVISED MAY 2016)

PART 2 OF 3

SEPTEMBER 22, 2016.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

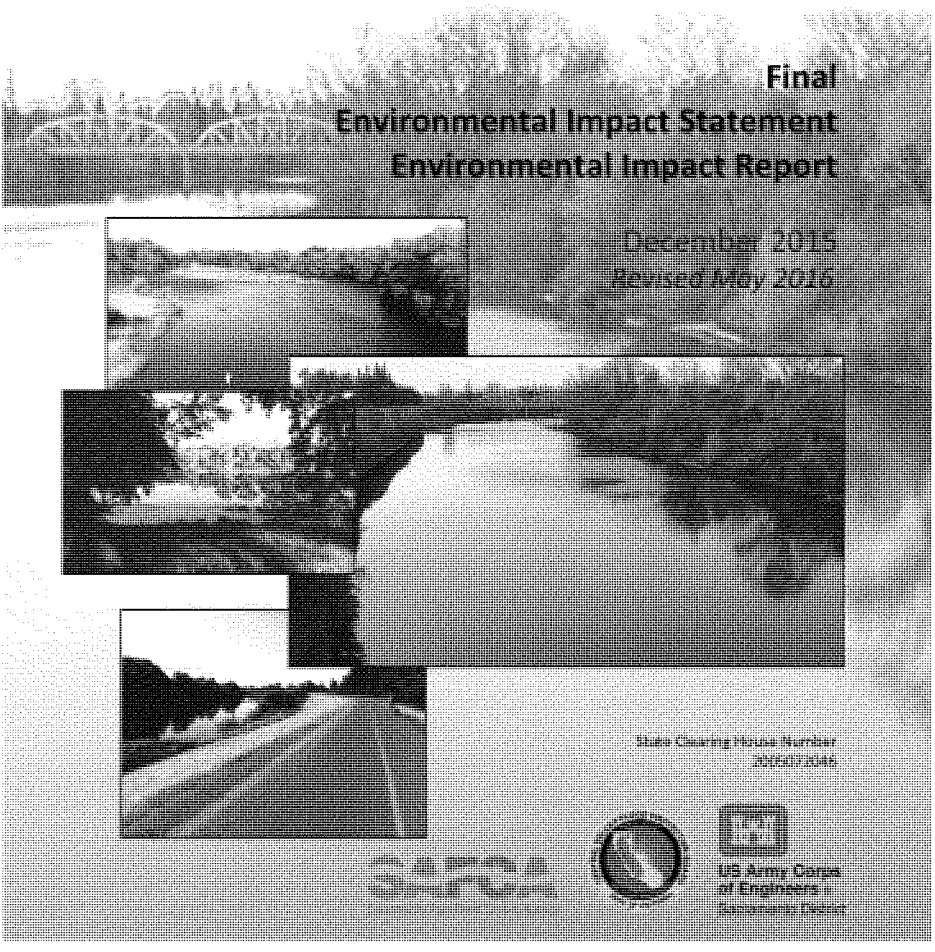
U.S. GOVERNMENT PUBLISHING OFFICE

21–920 WASHINGTON : 2016

AUTHENTICATED U.S. GOVERNMENT INFORMATION GPO

American River Watershed

Common Features
General Reevaluation Report



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RECORD OF DECISION

American River Common Features Project
Sacramento County, California

The Final General Reevaluation Report (GRR) and Environmental Impact Statement/Environmental Impact Report (EIS/EIR), dated December 2015 and revised May 2016, and the report of the Chief of Engineers, dated April 26, 2016, address flood risk management in the city of Sacramento, Sacramento County, California. Based on these reports, the reviews of other Federal, State and local agencies, Indian Tribal Nations, input from the public, and the review by my staff, I find the plan recommended by the Chief of Engineers to be technically feasible, economically justified, in accordance with environmental statutes, and in the public interest.

The Final GRR and EIS/EIR, incorporated herein by reference, evaluated various non-structural and structural alternatives to modifying the authorized project features to reduce flood risk along the Sacramento River, the American River, and the eastside tributaries in the Sacramento area. The plan recommended for implementation is Alternative 2 - Improve Levees and Widen the Sacramento Weir and Bypass. The recommended plan is the Locally Preferred Plan (LPP) and includes:

- Sacramento River East Levee:
  - Construct nine miles of slurry cutoff walls to address levee seepage and stability concerns;
  - Construct 10 miles rock bank protection to address erosion concerns;
  - Construct 2.5 miles of geotextile stabilized slope and two miles of slope flattening to address levee stability concerns; and,
  - Raise one mile of levee.
- American River:
  - Construct four miles of rock bank protection and launchable rock trenches on the right bank to address erosion concerns; and,
  - Construct seven miles of rock bank protection and launchable rock trenches on the left bank to address erosion concerns.
- Eastside Tributaries:
  - Construct four miles of slurry cutoff wall to address levee seepage and stability concerns along the Natomas East Main Drain (NEMDC) and Arcade Creeks;
  - Construct four miles of levee raises to address potential overtopping of floodwaters along Arcade Creek; and,
  - Raise approximately one mile of levee and extend the levee along Magpie Creek; and preserving 80 acres of floodplain.
- Sacramento Bypass:
  - Widen the Sacramento Weir and Bypass by 1,500 feet to reduce the water surface elevation in the Sacramento River and allow more water to flow into the Bypass system.
  - Construct a small structure to facilitate fish passage between the stilling basin of the widened Sacramento Weir and the Sacramento River to minimize fish

stranding and subsequent mortality. This additional work will be entirely paid by the non-Federal sponsor.

- Implement the environmental compensatory mitigation plan and associated monitoring and adaptive management plan. Monitoring will continue until the mitigation is determined to be successful based on the identified criteria within the compensatory mitigation plan. Monitoring is expected to last no more than 10 years following the completion of mitigation construction.

In addition to a "no action" plan, two alternatives were evaluated in the EIS/EIR: Alternative 1 included measures to improve the levees and Alternative 2, the recommended plan, included measures to improve the levees and measures to widen the Sacramento Weir and Bypass. Several other structural and non-structural alternatives were considered but were eliminated due to adverse environmental effects, greater cost relative to benefits, and/or substantial public opposition. In addition to being the LPP, the recommended plan is also the environmentally preferable alternative.

All practicable means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. An environmentally sustainable design for the flood risk management features, in regards to revegetation within the widened bypass area has been included to the extent possible. The project will result in unavoidable permanent impacts to 0.40 acres of wetland habitat, 0.25 acres to vernal pools, 2 acres to oak woodlands, 3,292 stems (70 acres) of elderberry shrub habitat utilized by Valley Elderberry Longhorn Beetle, 14 acres to shallow water habitat typically utilized by Delta Smelt, 34 acres of aquatic spawning habitat for Delta Smelt, 20 acres of instream habitat typically utilized by the Green Sturgeon, 150 acres to riparian habitat typically utilized by the Western Yellow-billed Cuckoo, 15 acres to aquatic habitat typically utilized by the Giant Garter Snake, and 30 acres of upland habitat typically utilized by the Giant Garter Snake. The project will result in unavoidable temporary impacts to 82,325 linear feet of shaded riverine aquatic habitat and 75 acres of upland habitat typically utilized by the Giant Garter Snake. To mitigate for these unavoidable impacts, the U.S. Army Corps of Engineers (Corps) will purchase credits at an approved mitigation bank equivalent to restoring habitat to 0.8 acres of wetlands, 0.5 acres of vernal pools, 42 acres of shallow water habitat, 32 acres of aquatic spawning habitat, 45 acres of aquatic habitat for Giant Garter Snake, and 90 acres of upland habitat for the Giant Garter Snake. At locations on- and off-site of the study area, the Corps will restore 301.2 acres of riparian habitat, 70.89 acres of elderberry shrubs, 4 acres of oak woodlands, 75 acres of upland habitat for the Giant Garter Snake, 20 acres of instream habitat for Green Sturgeon including fish passage, and replant 82,325 linear feet of shaded riverine aquatic habitat.

In accordance with Section 7 of the Endangered Species Act of 1973, as amended, the U.S. Fish and Wildlife Service (USFWS) issued a Biological Opinion (BiOp) on September 11, 2015 and National Marine Fisheries Service (NMFS) issued a BiOP on September 9, 2015. USFWS and NMFS both determined that the project,

including the Corps' proposed compensatory mitigation, will not jeopardize the existence of federally listed species or modify designated critical habitat. All terms and conditions resulting from these consultations shall be implemented in order to minimize take of threatened and endangered species.

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, the Corps determined that the recommended plan may adversely affect historic properties. The Corps and the California State Historic Preservation Office entered into a programmatic agreement, dated September 10, 2015. Under the programmatic agreement, the Corps commits to avoiding impacts to historic properties to the extent practicable. An Historic Properties Management Plan will be developed and implemented to address inadvertent discoveries and will identify appropriate mitigation measures such as data recovery, Historic American Building Survey/Historic American Engineering Record/Historic American Landscape Survey, oral histories, historic markers, exhibits, interpretive brochures or publications, or other means. All stipulations of the programmatic agreement shall be implemented in order to minimize adverse impacts to historic properties.

In accordance with the guidelines for specification of disposal sites for dredged or fill material under section 404(b)(1) of the Clean Water Act, the Corps determined that the recommended plan is the least environmentally damaging practicable alternative. Compensatory mitigation for unavoidable impacts to waters of the U.S. are incorporated in the project mitigation requirements. A water quality certification pursuant to section 401 of the Clean Water Act will be obtained from the California Central Valley Regional Water Quality Control Board (RWQCB) during the pre-construction engineering and design phase. In a letter dated December 2, 2015, the RWQCB indicated that they support implementation of the recommended plan. In a letter dated February 16, 2016, the RWQCB outlined the requirements for compliance. The Corps confirmed that the recommended plan is consistent with the RWQCB requirements and committed to developing and implementing a Stormwater Pollution Protection Plan, Spill Prevention Control and Countermeasures Plan, and a Bentonite Slurry Spill Contingency Plan during the pre-construction engineering and design phase.

In compliance with the Clean Air Act of 1963, as amended, the Corps will avoid and minimize impacts to air quality with the implementation of best management practices, including implementation of the Sacramento Metropolitan Air Quality Management District's Enhanced Exhaust Control Practices and the use of on-road hauling equipment manufactured in 2010 or later. The Corps will coordinate with the Sacramento County Department of Parks and Recreation, local recreation users and bike groups, implement best management practices for safety as flaggers, signage, detours, and fencing to notify and control recreation access and traffic around construction sites during construction, and restore recreation facilities directly impacted to pre-project conditions following construction to reduce significant impacts to recreation.

Technical, environmental, and economic criteria used in the formulation of alternative plans were those specified in the Water Resource Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resource Implementation Studies. All applicable laws, executive orders, regulations and local government plans were considered in evaluation of alternatives. Based on review of these evaluations, I find the flood risk reduction benefits of the recommended plan outweigh the costs and any adverse effects. This Record of Decision completes the National Environmental Policy Act process.

August 29, 2016
Date

Jo-Ellen Darcy
Assistant Secretary of the Army
(Civil Works)

AMERICAN RIVER, CALIFORNIA
COMMON FEATURES PROJECT
GENERAL REEVALUATION REPORT

Final Environmental Impact Statement/

Environmental Impact Report

U.S. Army Corps of Engineers
Sacramento District

December 2015

AMERICAN RIVER COMMON FEATURES GENERAL REEVALUATION REPORT

SACRAMENTO COUNTY, CALIFORNIA

FINAL ENVIRONMENTAL IMPACT STATEMENT/ ENVIRONMENTAL IMPACT REPORT

December 2015

Type of Statement: Final 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 enhance flood risk management for the city of Sacramento by improving the levees that surround the city. This EIS/EIR describes the environmental resources in the project area; evaluates the direct, indirect, and cumulative environmental effects of three alternatives, including the no action alternative; describes avoidance, minimization, and compensation measures. Most potential adverse effects would be either short term, or would be avoided or reduced using best management practices. However, there would be some significant and unavoidable impacts associated with this project. The beneficial effects of each alternative are also discussed.

Public Review and Comment: The public review period for the final EIS/EIR occurred from January 22, 2016 to February 22, 2016. 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 environmental impact statement/environmental impact report (EIS/EIR) 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 Reevaluation 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 infrastructure 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 EIS/EIR 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 EIS/EIR

The purpose of this EIS/EIR is to evaluate the potential significant environmental impacts of the alternatives proposed in the GRR. This EIS/EIR 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 early 2016. This decision will be based on numerous factors, including the potential environmental impacts and mitigation measures addressed in this EIS/EIR, permitting requirements, Federal and state authorizations, funding and financing mechanisms, and implementation schedule.

This EIS/EIR will also be used by CEQA lead and responsible 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) and the California State Lands Commission (CSLC), to ensure that they have met the requirements of CEQA before deciding whether to issue discretionary permits or leases 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), Arcade Creek, 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.S 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 EIS/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.

Under CEQA, the CVFPB's objectives for the project are as follows:

- Reduce the chance of flooding and damages, once flooding occurs, and improve public safety, preparedness, and emergency response.
- Reduce maintenance and repair requirements by modifying the flood management systems in ways that are compatible with natural processes.
- Integrate the recovery and restoration of key physical processes, self-sustaining ecological functions, native habitats, and species.
- Ensure that technically feasible and cost-effective solutions are implemented to maximize the flood risk reduction benefits given the practical limitations of applicable funding sources.

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.

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 Creek/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
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
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.6.3 Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (Recommended 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 Creek, and Magpie Creek, 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.

ES.7 Environmental Effects and Mitigation Measures

The effects to the human and natural environment have been considered throughout the planning phase of the study and opportunities have been evaluated to reduce effects 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 effects 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 was prepared and transmitted to USFWS and NMFS on April 3, 2015 (Appendix G). Consultation pursuant to Section 7 of the Endangered Species Act (ESA) has been on-going as part of the ARCF GRR study phase. The Biological Opinion from NMFS was received on September 9, 2015. The Biological Opinion from USFWS was received on September 11, 2015. With receipt of these opinions from the services, and implementation of the enclosed reasonable and prudent measures and terms and conditions, the ARCF GRR is in full compliance with the Federal ESA.

This project was coordinated with USFWS under the Fish and Wildlife Coordination Act (the 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 CAR, and has been coordinated with USFWS, NMFS, and CDFW. Section 4.7 of the EIS/EIR includes the recommendations from the CAR and the Corps' response to those recommendations.

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	Alternative 1 Impacts	Alternative 2 Impacts	Duration of Impact	Mitigation Alternative 1	Mitigation Alternative 2
GGS Uplands	None	30 acres	Permanent	None	90 acres
GGS Aquatic	None	15 acres	Permanent	None	45 acres
Riparian	184 acres	150 acres	Permanent	368 acres	300 acres
SRA habitat (ESA fish species)	80,825 LF	82,325 LF	Single Construction Season	80,825 LF Self Mitigating with on-site planting[2]	82,325 LF Self Mitigating with on-site planting
Elderberry Shrubs	3,250 stems	3,250 stems	Permanent	70 acres	70 acres
Vernal Pools	0.25 acre	0.25 acre	Permanent	1 acre	1 acre
Delta Smelt Spawning	32 acres	32 acres	Permanent	32 acres	32 acres
Delta Smelt Shallow Water Habitat	14 acres	14 acres	Permanent	42 acres	42 acres
Green Sturgeon Benthic	20 acres	20 acres	Permanent	20 acres	20 acres
Oak Woodland	2 acres	2 acres	Permanent	4 acres	4 acres
Wetlands	0.4 acres	0.4 acres	Permanent	1 acre	1 acres

Notes: [1] Assumes vegetation variance is granted for Sacramento River waterside levee compliance and a SWIF for the landside

ES.8 Cumulative Impacts

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

ES.9 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, 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 biological resources.
- Vegetation and tree removal.
- Effects to cultural resources and resources significant to Native American tribes.
- 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 Valley 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.

The draft GRR and EIS/EIR were circulated for public review beginning on March 13, 2015. The notice of availability (NOA) was published in the Federal Register on March 13, 2015. The draft GRR and EIS/EIR were made available both on the Sacramento District, Corps of Engineers website as well as the website for the Central Valley Flood Protection Board. Hard copies of the draft GRR and EIS/EIR were provided to area libraries. Letters and/or DVD copies of the GRR and EIS/EIR were sent to interested parties, local residents, and to the agencies and elected officials listed in Section 6.4 of the EIS/EIR. Public workshops were held during the review period to provide additional opportunities for comments on the draft documents. All comments received during the public review period were considered and incorporated into the final GRR and EIS/EIR as appropriate. The meeting locations, dates and times were as follows:

- April 8, Hagginwood Community Center—3270 Marysville Blvd, Sacramento (5-7 p.m.).
- April 9, Elk's Lodge— 6446 Riverside Boulevard, Sacramento (5-7 p.m.).
- April 15, Library Galleria—828 I Street, Sacramento (3-5 p.m.).
- April 17, Arden-Dimick Library— 891 Watt Ave., Sacramento (5-7 p.m.).

A total of 137 people attended the four meetings. At the meetings, comments were solicited through the use of court reporters. Additionally, comments could be submitted through mail or electronic mail. Oral and written comments were made throughout the series of meetings by local, State, and Federal agencies, community organizations, and individuals.

Public comments on the draft documents focused in part on: 1) access to recreational features during and after construction; 2) design, placement, and justification for rock erosion protection along the American and Sacramento Rivers; 3) effects to vegetation as a result of the alternatives; 4) clear presentation of the anticipated level of the performance of the project; and 5) coordination with stakeholders in future phases of the project. The comments and the responses to them are summarized in the Public Involvement Appendix (Appendix F).

The final GRR and EIS/EIR were circulated for public review beginning on January 22, 2016. The notice of availability (NOA) was published in the Federal Register on January 22, 2016. The final GRR and EIS/EIR were made available both on the Sacramento District, Corps of Engineers website. Hard copies of the final GRR and EIS/EIR were provided to area libraries. Letters and/or DVD or hard copies of the GRR and EIS/EIR were sent to interested parties, local residents, and to the agencies and elected officials listed in Section 6.4 of the EIS/EIR. All comments received during the public review period were considered and incorporated into the final GRR and EIS/EIR, as appropriate.

Public comments on the final documents focused in part on: 1) access to recreational features during and after construction; 2) design, placement, and justification for rock erosion protection along the American and Sacramento Rivers; 3) effects to vegetation as a result of the alternatives; and 4) coordination with stakeholders in future phases of the project. The comments and the responses to them are summarized in the Public Involvement Appendix (Appendix F)

After considering any additional comments received during public review of the final EIS/EIR, 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.

ES.11 Recommended Plan

Alternative 2, Improve Levees and Widen the Sacramento Weir and Bypass has been identified as the Recommended Plan. 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 Sacramento 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 Creek, and Magpie Creek. Alternative 2 would also include erosion measures for specific locations along the American River.

The Recommended Plan has been identified as the Environmentally Preferable Alternative under NEPA and the Environmentally Superior Alternative under CEQA. The Recommended Plan is also the Least Environmentally Damaging Practicable Alternative under Section 404 of the Clean Water Act as it results in less riparian habitat removal along the Sacramento River and therefore less impacts to the aquatic ecosystem. 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 (Recommended Plan)
Land Use			
Effect	Inconsistent with local land use policies to protect existing urban area.	Acquisition of properties for levee easements along the Sacramento River and Arcade Creek.	Acquisition of properties for levee 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, 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.

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (Recommended Plan)
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 short term impacts. Long term effects are less than significant with mitigation.	Significant short term impacts. Long term effects are 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.	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 (Recommended Plan)
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 effects to Giant Garter Snake (GGS), valley elderberry longhorn beetle, salmonids, green sturgeon, Delta smelt, Western yellow-billed cuckoo, vernal pool crustaceans, and Swainson's Hawks during construction. Indirect effects due to loss of habitat and temporal effects while habitat mitigation establishes. Vegetation Variance for the waterside levee slopes would significantly limit the effects to endangered fish species.	Direct effects to Giant Garter Snake (GGS), valley elderberry longhorn beetle, salmonids, green sturgeon, Delta smelt, Western yellow-billed cuckoo, vernal pool crustaceans, and Swainson's Hawks during construction. Indirect effects due to loss of habitat and temporal effects while habitat mitigation establishes. Vegetation Variance for the waterside levee slopes would significantly limit the effects to endangered fish species. Effects to listed

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (Recommended Plan)
			fish species due to increased stranding potential at the Sacramento Bypass.
Significance	Significant.	Less than Significant with mitigation	Less than Significant with mitigation
Mitigation	None proposed.	Mitigation per the terms of the Biological Opinions (Appendix J). Replace habitat for species either on-site or in close proximity to lost habitat. Implement BMPs discussed in Section 3.5.6 and conservation measures in the BOs during construction to prevent mortality. Implement green sturgeon modeling and monitoring to improve effects assessment, minimize construction impacts, and mitigate for lost benthic habitat per the terms of the BOs.	Mitigation per the terms of the Biological Opinions (Appendix J). Replace habitat for species either on-site or in close proximity to lost habitat. Implement BMPs discussed in Section 3.5.6 and conservation measures in the BOs during construction to prevent mortality. Implement green sturgeon modeling and monitoring to improve effects assessment, minimize construction impacts, and mitigate for lost benthic habitat per the terms of the BOs. Implement fish passage at the Sacramento Bypass, and grade the widened Sacramento Bypass to reduce stranding potential.
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.	Adverse effects resolved with mitigation under NHPA and reduced to less than significant with mitigationunder NEPA. Potentially significant and unavoidable under CEQA.	Adverse effects resolved with mitigation under NHPA and reduced to less than significant with mitigation under NEPA. Potentially 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.

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (Recommended Plan)
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 area including; homes, businesses, public facilities.	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 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.

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (Recommended Plan)
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 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.

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (Recommended Plan)
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			
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	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for levee	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for levee

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (Recommended Plan)
	Capitol's government centers also possible.	easements.	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	Significant.	All projects would implement their own mitigation measures, however, the

Resource	Effect	Significance	Mitigation
	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.		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.
Cultural Resources	Multiple projects would likely impact cultural resources in a manner consistent with the ARCF project.	Significant.	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. Resolution of all adverse effects across multiple projects is unlikely considering the nature of finite cultural resources that may be lost or damaged by the implementation of these projects. Although mitigation would minimize these impacts, there is still likely a significant cumulative effect to cultural resources.
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

Resource	Effect	Significance	Mitigation
			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.
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.

CONTENTS

EXECUTIVE SUMMARY **1**

ES.1 Introduction 1

ES.2 Purpose and Intended Uses of this EIS/EIR 1

ES.3 Study Area 2

ES.4 Project Background 2

ES.5 Need for Action 4

ES.6 Alternatives 5

ES.6.1 No Action Alternative 5

ES.6.2 Alternative 1 – Improve Levees 6

ES.6.3 Alternative 2 – Improve Levees and Widen the Sacramento Weir and Bypass (Recommended Plan) 7

ES.7 Environmental Effects and Mitigation Measures 7

ES.8 Cumulative Impacts 8

ES.9 Areas of Controversy 9

ES.10 Public Involvement 9

ES.11 Recommended Plan 11

1.0 INTRODUCTION **1**

1.1 Scope of the Environmental Analysis 1

1.2 Project Location and Study Area 2

1.2.1 Project Location 2

1.2.2 Study Area 2

1.3 Background and History of the American River Common Features Project 3

1.4 Project Purpose and Need for Action 7

1.4.1 Seepage and Underseepage 8

1.4.2 Levee Erosion 9

1.4.3 Levee Stability 10

1.4.4 Levee Overtopping 10

1.4.5 Vegetation and Encroachment Compliance 11

1.4.6 Releases from Folsom Dam 14

1.5 Environmental Regulatory Framework and Authority 15
1.5.1 National Environmental Policy Act 15
1.5.2 California Environmental Quality Act 15
1.5.3 Study Authority 16
1.6 Intended Uses of this Document 17
1.7 Resources Relied on in Preparation of this EIS/EIR 17
1.7.1 Related Documents and Resources 17
1.7.2 Incorporation by Reference 19
1.8 Application of NEPA and CEQA Principles and Terminology 19
1.9 Community Outreach, Agency Coordination, and Issues of Known Controversy 20
1.10 Organization of the EIS/EIR 22
2.0 ALTERNATIVES 25
2.1 Introduction 25
2.1.1 Alternative Formulation and Screening 25
2.1.2 Measures and Alternatives Considered, But Eliminated From Future Consideration 27
2.2 No Action Alternative 30
2.3 Alternative 1 – Improve Levees 31
2.3.1 American River 35
2.3.2 Sacramento River 36
2.3.3 East Side Tributaries 42
2.3.4 Operation and Maintenance 45
2.4 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 45
2.4.1 Sacramento Weir and Bypass 47
2.4.2 American River 49
2.4.3 Sacramento River 49
2.4.4 East Side Tributaries 49
2.4.5 Operation and Maintenance 51
2.5 Comparison of Alternatives 51
3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES 59
3.1 Introduction 59
3.2 Geological Resources 59

3.2.1 Environmental Setting 59
3.2.2 Methodology and Basis of Significance 63
3.2.3 No Action Alternative 64
3.2.4 Alternative 1 – Improve Levees 65
3.2.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 66
3.2.6 Mitigation Measures 66
3.3 Land Use 67
3.3.1 Environmental Setting 67
3.3.2 Methodology and Basis of Significance 70
3.3.3 No Action Alternative 71
3.3.4 Alternative 1 – Improve Levees 72
3.3.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 77
3.3.6 Mitigation Measures 80
3.4 Hydrology and Hydraulics 81
3.4.1 Environmental Setting 81
3.4.2 Methodology and Basis of Significance 90
3.4.3 No Action Alternative 92
3.4.4 Alternative 1 – Improve Levees 93
3.4.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 93
3.4.6 Mitigation Measures 95
3.5 Water Quality and Groundwater Resources 95
3.5.1 Environmental Setting 95
3.5.2 Methodology and Basis of Significance 101
3.5.3 No Action Alternative 102
3.5.4 Alternative 1 – Improve Levees 103
3.5.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 106
3.5.6 Mitigation Measures 106
3.6 Vegetation and Wildlife 108
3.6.1 Environmental Setting 108
3.6.2 Methodology and Basis of Significance 116
3.6.3 No Action Alternative 117

3.6.4 Alternative 1 – Improve Levees 118
3.6.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 125
3.6.6 Mitigation Measures 127
3.7 Fisheries 131
3.7.1 Environmental Setting 131
3.7.2 Methodology and Basis of Significance 136
3.7.3 No Action Alternative 137
3.7.4 Alternative 1 – Improve Levees 137
3.7.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 141
3.3.6 Mitigation Measures 143
3.8 Special Status Species 144
3.8.1 Environmental Setting 144
3.8.2 Methodology and Basis of Significance 162
3.8.3 No Action Alternative 163
3.8.4 Alternative 1 – Improve Levees 164
3.8.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 179
3.8.6 Mitigation Measures 180
3.9 Cultural Resources 195
3.9.1 Environmental Setting 195
3.9.2 Methodology and Basis of Significance 210
3.9.3 No Action Alternative 212
3.9.4 Alternative 1 – Improve levees 213
3.9.5 Alternative 2 – Sacramento Bypass and Improve Levees 217
3.9.6 Mitigation Measures 219
3.10 Transportation and Circulation 219
3.10.1 Environmental Setting 219
3.10.2 Methodology and Basis of Significance 224
3.10.3 No Action Alternative 225
3.10.4 Alternative 1 – Improve Levees 225
3.10.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 227
3.10.6 Mitigation Measures 228

3.11 Air Quality 229
3.11.1 Environmental Setting 229
3.11.2 Methodology and Basis of Significance 236
3.11.3 No Action Alternative 240
3.11.4 Alternative 1 – Improve Levees 240
3.11.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 245
3.11.6 Mitigation Measures 250
3.12 Climate Change 254
3.12.1 Environmental Setting 254
3.12.2 Methodology and Basis of Significance 261
3.12.3 No Action Alternative 263
3.12.4 Alternative 1 – Improve Levees 264
3.12.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 265
3.12.6 Mitigation Measures 265
3.13 Noise 266
3.13.1 Environmental Setting 266
3.13.2 Methodology and Basis of Significance 274
3.13.3 No Action Alternative 275
3.13.4 Alternative 1 – Improve Levees 275
3.13.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 280
3.13.6 Mitigation Measures 281
3.14 Recreation 282
3.14.1 Environmental Setting 282
3.14.2 Methodology and Basis of Significance 287
3.14.3 No Action Alternative 288
3.14.4 Alternative 1 – Improve Levees 288
3.14.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 291
3.14.6 Mitigation Measures 292
3.15 Visual Resources 293
3.15.1 Environmental Setting 293
3.15.2 Methodology and Basis of Significance 305

3.15.3 No Action Alternative 305
3.15.4 Alternative 1 – Improve Levees 306
3.15.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 310
3.15.6 Mitigation Measures 311
3.16 Public Utilities and Service Systems 313
3.16.1 Environmental Setting 313
3.16.2 Methodology and Basis of Significance 316
3.16.3 No Action Alternative 316
3.16.4 Alternative 1 – Improve Levees 317
3.16.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 321
3.16.6 Mitigation Measures 321
3.17 Hazardous Wastes and Materials 322
3.17.1 Environmental Setting 322
3.17.2 Methodology and Basis of Significance 325
3.17.3 No Action Alternative 326
3.17.4 Alternative 1 – Improve Levees 327
3.17.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan) 328
3.17.6 Mitigation Measures 329
3.18 Socioeconomic, Population, and Environmental Justice 329
3.18.1 Environmental Setting 329
3.18.2 Methodology and Basis of Significance 331
3.18.3 No Action Alternative 332
3.18.4 Alternative 1 – Improve Levees 332
3.18.5 Alternative 2 –Sacramento Bypass and Improve Levees (Recommended Plan) 333
3.18.6 Mitigation Measures 333
4.0 CUMULATIVE IMPACTS, GROWTH-INDUCING IMPACTS, AND OTHER REQUIREMENTS 335
4.1 Cumulative Effects 335
4.1.1 Methodology and Geographic Scope of the Analysis 335
4.1.2 Past, Present, and Reasonably Foreseeable Future Projects 337
4.2 Cumulative Impacts Analysis 342
4.2.1 Water Quality 342

4.2.2 Vegetation and Wildlife 342
4.2.3 Fisheries 343
4.2.4 Special Status Species 343
4.2.5 Cultural Resources 347
4.2.6 Air Quality 348
4.2.7 Climate Change 348
4.2.8 Noise 349
4.2.9 Recreation 349
4.2.10 Visual Resources 350
4.3 Growth Inducing Impacts 350
4.4 Unavoidable Adverse Effects 351
4.5 Relationship of Short-Term Uses and Long-Term Productivity 352
4.6 Irreversible and Irretrievable Commitment of Resources 353
4.7 Resource Agency Recommendations and Responses 354
4.7.1 USFWS Coordination Act Report Recommendations and Responses 354
4.7.2 NMFS Essential Fish Habitat Recommendations and Responses 357
5.0 COMPLIANCE WITH APPLICABLE LAWS, POLICIES, AND PLANS 359
5.1 Federal Laws, Regulations, and Policies 359
5.2 State of California Laws, Regulations, and Policies 370
6.0 CONSULTATION AND COORDINATION 375
6.1 Public Involvement Under NEPA and CEQA 375
6.1.1 Notice of Intent, Notice of Preparation, and Scoping Meetings 375
6.1.2 Public Review 376
6.1.2 Final Public Review 377
6.1.3 Next Steps in the Environmental Review Process 378
6.1.4 Major Areas of Controversy 378
6.2 Native American Consultation 378
6.3 Coordination with Other Federal, State, and Local Agencies 379
6.4 List of Recipients 380
6.4.1 Elected Officials and Representatives 380
6.4.2 Government Departments and Agencies 382

7.0 REFERENCES **384**

8.0 LIST OF PREPARERS **400**

9.0 INDEX **402**

FIGURES

Figure 1. Bank Protection and Launchable Rock Trench Typical Design.
Figure 2. Fix-in-place with Cutoff Wall and Levee Raise.
Figure 3. Fix-in-place with Cutoff Wall and No Levee Raise.
Figure 4. Planting Berm with Vegetation and Woody Material.
Figure 5. NEMDC, Arcade, and Dry/Robla Creek Scenario.
Figure 6. Floodwall and New Levee along Magpie Creek.
Figure 7. Velocities in the Lower American River at 115,000 cfs.
Figure 8. Velocities in the Lower American River at 160,000 cfs.
Figure 9. American River Velocity Contours.
Figure 10. Comparison of Existing and Future Folsom Dam Releases.
Figure 11. Planting Site 4R on the American River After Bank Protection in 2001.
Figure 12. Planting Site 4R on the American River After Bank Protection in 2005.
Figure 13. Planting Site 4R on the American River After Bank Protection in 2010.
Figure 14. American River Common Features Study Area and Previous Cultural Resource Surveys.
Figure 15. ARCF APE for Compliance with Section 106 of the NHPA.
Figure 16. View of American River from Bike Trail. (Source: Tim Davis 2013)
Figure 17. View of American River with Artist. (Source: Tim Davis 2013)
Figure 18. American River Bike Trail with Cyclist and Jogger. (Source: Tim Davis 2013)
Figure 19. View of American River near Watt Avenue. (Source: Tim Davis 2013)
Figure 20. View of American River from Guy West Bridge looking at H Street Bridge. (Source: Tim Davis 2013)
Figure 21. Sacramento River in Pocket Area.
Figure 22. Natomas East Main Drain Canal.
Figure 23. Natomas East Main Drain Canal Levee.
Figure 24. Arcade Creek.
Figure 25. Arcade Creek at its Confluence with NEMDC.
Figure 26. Magpie Creek Diversion Channel.
Figure 27. Sacramento Weir.
Figure 28. Sacramento Weir in High Water Event.
Figure 29. Sacramento Bypass (Downstream of Weir) with Water.

TABLES

Table ES-1. Proposed Measures for the ARCF Project.
Table ES-2. Habitat Impacts and Proposed Mitigation/Compensation for the ARCF GRR.
Table ES-3. Summary of Environmental Effects and Mitigation Measures.
Table ES-4. Summary of Potential Cumulative Effects and Mitigation.

Table 1. Authorized Project Features.
Table 2. Terminology of NEPA and CEQA for Common Concepts.
Table 3. Alternative 1 – Proposed Levee Improvement Measures by Waterway.
Table 4. Tentative Construction Schedule for Alternative 1.
Table 5. Alternative 2 – Proposed Levee Improvement Measures by Waterway.
Table 6. Tentative Construction Schedule for Alternative 2.
Table 7. Comparison of the Environmental Impacts of the Common Features Project Alternatives.
Table 8. Land Use Impacts from the Sacramento Weir and Bypass Expansion.
Table 9. Comparison of Existing and Future Without Project Flow Releases from Folsom Dam.
Table 10. Index Points.
Table 11. Comparison of 10-, 100-, and 200-Year Frequency Flows under Various Conditions.
Table 12. Monthly Average Total Suspended Sediment and Turbidity for the Sacramento River at Freeport from 1997 to 2007.
Table 13. Monthly Average Physical Data for the Sacramento River at Freeport from 2003 to 2009.
Table 14. Vegetation Impacts for ARCF GRR – Alternative 1.
Table 15. Vegetation Impacts for ARCF GRR – Alternative 2.
Table 16. Potential Central Valley Native and Nonnative Fish Species Present in the Study Area.
Table 17. Summary of Reach-Specific SRA Analysis.
Table 18. Special Status Species with the Potential to Occur in the Study Area.
Table 19. Assumed Life Stage Timing and Distribution of Special Status Fish Species.
Table 20. O&M Elderberry Shrub Effects and Compensation
Table 21. American River Elderberry Shrub Effects and Proposed Compensation.
Table 22. Sacramento River Elderberry Shrub Effects and Proposed Compensation.
Table 23. CA-PLA-101A – Spring Garden Ravine.
Table 24. NLIP Eligible Sites and Treatment and/or Mitigation.
Table 25. Known Prehistoric and Historic Resources within the APE.
Table 26. Regulatory Criteria for Roadways and Intersections.
Table 27. State and Federal Ambient Air Quality Standards.
Table 28. State and Federal Attainment Status.
Table 29. CEQA Thresholds of Significance.
Table 30. Federal General Conformity *de Minimus* Thresholds.
Table 31. Emission Sources Occurring in the SMAQMD, YSAQMD, BAAQMD, and FRAQMD.
Table 32. Construction Emissions: Alternative 1, Truck Delivery Scenario.
Table 33. Construction Emissions: Alternative 1, Barge Delivery Scenario.

Table 34. Emission Sources Occurring in the SMAQMD, YSAQMD, BAAQMD, and FRAQMD.
Table 35. Construction Emissions: Alternative 2, Sacramento Bypass and Weir Widening Construction.
Table 36. Construction Emissions: Alternative 2, Truck Delivery Scenario With Bypass Widening.
Table 37. Construction Emissions: Alternative 2, Barge Delivery Scenario With Bypass Widening.
Table 38. Global, National, State, and Local GHG Emission Inventories.
Table 39. Construction GHG Emissions for all Alternatives, Truck and Barge Delivery Scenarios.
Table 40. Typical A-Weighted Sound Levels.
Table 41. Vibration Source Levels for Construction Equipment.
Table 42. Human Response to Steady State Vibration.
Table 43. Human Response to Transient Vibration.
Table 44. Maximum Vibration Levels for Preventing Damage to Structures.
Table 45. Construction Equipment Noise Levels.
Table 46. Vibration Source Levels for Construction Equipment.
Table 47. Human Response to Steady State Vibration.
Table 48. Estimated Ground Vibration Levels Caused by a Vibratory Roller.
Table 49. Noise Levels during Construction of Erosion Protection.
Table 50. Summary of Predicted Construction Noise Levels.
Table 51. Geographic Areas that Would Be Affected by the ARCF GRR Project.
Table 52. Written Comments Received on the NOI.
Table 53. Corps List of Preparers.
Table 54. Sponsors' List of Preparers

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
Plate 7. Existing and Proposed Erosion Protection on the American River

APPENDICES

Appendix A – Coordination Act Report
Appendix B – Existing Habitat Maps of the Study Area
Appendix C – Cultural Resources Appendix
Appendix D – Air Quality Analysis
Appendix E – 404(b)(1) Analysis
Appendix F – Public Involvement
Appendix G – Biological Assessment
Appendix H – Phase 1 Environmental Site Assessment
Appendix I – Habitat Mitigation and Monitoring Plan and Cost Effectiveness/Incremental Cost Analysis
Appendix J – USFWS and NMFS Biological Opinions
Appendix K – NRCS form DA 1006
Appendix L – CEQA Mitigation Monitoring and Reporting Plan
Appendix M – Central Valley Flood Protection Plan Executive Summary

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
CAPCOA	California Air Pollution Control Officers Association
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
CSLC	California State Lands Commission
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
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HALS	Historic American Landscape Survey
HEP	habitat evaluation procedures
HMMAMP	habitat mitigation, monitoring, and adaptive management plan
HMMP	habitat mitigation and monitoring Plan
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 Pollutant 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
PED	preconstruction engineering and design
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 environmental impact statement/environmental impact report (EIS/EIR) 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.

NEPA applies to all "major Federal actions significantly affecting the quality of the human environment" (42 U.S.C. § 4332(C)) and is intended to result in better informed decisions and to allow for greater public involvement. Under NEPA, an EIS must be prepared when a major Federal action is under consideration that may have significant impacts on the quality of the 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. This EIS/EIR 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 EIS/EIR will analyze the environmental effects of the proposed alternatives using the largest footprint that is expected to be constructed. The scope of the GRR will include the evaluation of the Federal interest in addressing seepage, slope stability, erosion, and height concerns on the levees in.

During the preconstruction engineering and design phase of the project, if authorized, the Corps would then do a site-specific analysis including full biological site surveys and site-specific engineering. The Corps shall prepare supplements to either draft or final environmental impact statements if: (i) the Corps makes substantial changes in the proposed action that are relevant to environmental concerns; or (ii) there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts.

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 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), Arcade Creek, 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 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.

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)

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 encroached into the design freeboard risking overtopping levees throughout the system including those 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, levees 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 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).

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).

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.

Under CEQA, the CVFPB's objectives for the project are as follows:

- Reduce the chance of flooding and damages, once flooding occurs, and improve public safety, preparedness, and emergency response.
- Reduce maintenance and repair requirements by modifying the flood management systems in ways that are compatible with natural processes.
- Integrate the recovery and restoration of key physical processes, self-sustaining ecological functions, native habitats, and species.
- Ensure that technically feasible and cost-effective solutions are implemented to maximize the flood risk reduction benefits given the practical limitations of applicable funding sources.

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 study area). Potential of liquefaction of 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 standard for urban flood protection in California which applies to cities with populations greater than 10,000 inhabitants. This standard requires levees to withstand flows with 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. USACE does not identify a target level of risk reduction but rather identifies the plan which reasonably maximizes net benefits. The analysis to identify the plan which maximizes net benefits was done with an awareness of the State's goal for urban flood protection for the purpose of informing the State of where the individual plans fall relative to the State's standards. Neither of the final alternatives is currently able to contain a 1/200 ACE event with 90% assurance. The levee improvements along the Sacramento River will increase

the assurance to a level close to 90% but the assurance for the levees along the American River will remain around approximately 60% for the 1/200 ACE. It will be contingent upon the local community to demonstrate to the State that the aggregate flood risk management projects meet the State's standard.

1.4.5 Vegetation and Encroachment Compliance

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.

Most California levees were built close together after the Gold Rush to make the rivers run faster to scour out debris in the channel from hydraulic mining. As a result, trees and shrubs on levees now provide the only waterside habitat that remains for many sensitive wildlife species. In some cases, the levee slopes contain brush and trees that are the last remnants of a vast riparian forest, which once extended across the valley floor adjacent to the Sacramento River. Extensive destruction of California's Central Valley riparian forests has occurred during the last 150 years due to agricultural and urban development. According to some estimates, riparian forests in the Central Valley have declined by as much as 89 percent during that time period. Many of the encroachments were granted permits for construction in the past, while some were built without any prior knowledge or approval from any governing agency.

Issues with vegetation on levees are summarized as follows:

- Levee Visibility – Riparian vegetation can cause a reduction in visibility of the levee, particularly in very dense areas of vegetation. Levee visibility is important for maintenance and inspection crews to identify problems in levee integrity such as the presence of burrowing animals, cracks, slumping, and seepage.
- Accessibility – Vegetation can block access to the levee crest or landside of the levee for flood fight requirements and maintenance access purposes.
- Through-levee Seepage – Riparian vegetation roots can cause seepage problems through levees and affect the general integrity of the levee.
- Windthrow – Risk to levee integrity can be caused during storms as a result of windthrow. The root balls of felled trees during storms can displace relatively large amounts of earth which can affect the strength of the levee, or if on the waterside, increase the risk of scour.

- Slope Stability – Riparian vegetation can cause slope stability problems, particularly on the waterside of levees. Tree roots extending in the river flow can cause erosion problems near the toe of the levee, a particularly critical part of the levee in terms of slope stability.
- Burrowing Animals – Riparian vegetation may encourage the development of animal burrows detrimental to the levee or may reduce visibility of burrows.

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.

The Water Resources Reform and Development Act of 2014 (WRRDA 2014) Section 3013 requires a review of the Corps' levee vegetation policy. The review is in progress, therefore no new policies have been established at this time. As a result, the Corps is making no assumptions about what will be included in the new policy. However, WRRDA 2014 Section 3013(g)(1) also requires that vegetation removal not be a condition or requirement for the approval of funding of a project or any other action, unless the specific vegetation has been demonstrated to present an unacceptable safety risk. The engineering analysis described above, which evaluated the safety risk of existing vegetation on the levees, is in compliance with WRRDA 2014.

System Wide Improvement Framework

The SWIF agreement between the Corps and the non-Federal sponsor allows the LMA to defer compliance with ETL 1110-2-583. Under the SWIF agreement, the LMA would address landside vegetation and encroachment (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 will include the following:

- 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 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.

1.5 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. 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 address activities within the project area. These plans and regulations were considered during the preparation of this EIS/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 EIS/EIR 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 EIS/EIR 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 could be implemented to avoid, reduce, or compensate for impacts to the environment. The public was notified that the EIS/EIR was available for review and the Corps and CVFPB requested public comments on the proposed plan. Public comments received on the DEIS/DEIR have been incorporated into this final EIS/EIR, as appropriate, and are included in Appendix F.

The CVFPB will consider whether or not to certify the EIR and approve the ARCF GRR in late 2015. This decision will be based on numerous factors, including the potential environmental impacts and mitigation measures addressed in this EIS/EIR, permitting requirements, Federal and state authorizations, funding and financing mechanisms, and implementation schedule. This EIS/EIR 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.

Once finalized, the EIS/EIR will be used in conjunction with the GRR to support the Chief of Engineers' report to Congress on the Corps' preferred alternative. 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. Following the preparation of the Chief's Report and the signing of the ROD, the project would be submitted to Congress for authorization. In addition, project construction is also contingent on appropriation of funds from Congress, which may be a separate action from the project's authorization.

1.7 Resources Relied on in Preparation of this EIS/EIR

1.7.1 Related Documents and Resources

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

- 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 EIS/EIR are listed in Chapter 7, "References."

1.7.2 Incorporation by Reference

For the purposes of CEQA, this EIR incorporates by reference the environmental analysis and other information contained in the Consolidated Final Program Environmental Impact Report (FPEIR) for the 2012 CVFPP. The CVFPP FPEIR addresses a broad range of levee system integrity and environmental issues in a planning area that includes the study area. It is referenced in this EIR to provide additional information about broad-scale issues and planning efforts, cumulative activities, macro-level management alternatives, and the associated environmental effects (both beneficial and potentially adverse). Mitigation strategies described in the CVFPP PEIR have been adapted for purposes of this EIR as appropriate. The executive summary of the CFRPP PEIR is included as Appendix M. The full text of the CVFPP PEIR is available online at http://www.water.ca.gov/cvfmp/documents.cfm and the CVFPP PEIR is available for inspection at Central Valley Flood Protection Board, 3310 El Camino Avenue Room 151, Sacramento, CA 95821, David Martasian (916) 574-1442.

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 this document uses both NEPA and CEQA terminology.

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 Community Outreach, Agency Coordination, and Issues of Known Controversy

Public involvement activities associated with the project include public meetings, Native Tribe and agency meetings, and distribution of the draft and final EIS/EIR for public review and comment.

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.

The draft GRR and EIS/EIR were circulated for public review beginning on March 13, 2015. The notice of availability (NOA) was published in the Federal Register on March 13, 2015. The draft GRR and EIS/EIR were made available both on the Sacramento District, Corps of Engineers website as well as the website for the Central Valley Flood Protection Board. Hard copies of the draft GRR and EIS/EIR were provided to area libraries. Letters and/or DVD copies of the GRR and EIS/EIR were sent to interested parties, local residents, and to the agencies and elected officials listed in Section 6.4 of the EIS/EIR. Public workshops were held during the review period to provide additional opportunities for comments on the draft documents. All comments received during the public review period were considered and incorporated into the final GRR and EIS/EIR as appropriate. The meeting locations, dates and times were as follows:

- April 8, Hagginwood Community Center—3270 Marysville Blvd, Sacramento (5-7 p.m.).
- April 9, Elk's Lodge— 6446 Riverside Boulevard, Sacramento (5-7 p.m.).
- April 15, Library Galleria—828 I Street, Sacramento (3-5 p.m.).
- April 17, Arden-Dimick Library— 891 Watt Ave., Sacramento (5-7 p.m.).

A total of 137 people attended the four meetings. At the meetings, comments were solicited through the use of court reporters. Additionally, comments could be submitted through mail or electronic mail. Oral and written comments were made throughout the series of meetings by local, State, and Federal agencies, community organizations, and individuals.

Public comments on the draft documents focused in part on: 1) access to recreational features during and after construction; 2) design, placement, and justification for rock erosion protection along the American and Sacramento Rivers; 3) effects to vegetation as a result of the alternatives; 4) clear presentation of the anticipated level of the performance of the project; and 5) coordination with stakeholders in future phases of the project. The comments and the responses to them are summarized in the Public Involvement Appendix (Appendix F).

The final GRR and EIS/EIR were circulated for public review beginning on January 22, 2016. The notice of availability (NOA) was published in the Federal Register on January 22, 2016. The final GRR and EIS/EIR were made available both on the Sacramento District, Corps of Engineers website. Hard copies of the final GRR and EIS/EIR were provided to area libraries. Letters and/or DVD or hard copies of the GRR and EIS/EIR were sent to interested parties, local residents, and to the agencies and elected officials listed in Section 6.4 of the EIS/EIR. All comments received during the public review period were considered and incorporated into the final GRR and EIS/EIR, as appropriate.

Public comments on the final documents focused in part on: 1) access to recreational features during and after construction; 2) design, placement, and justification for rock erosion protection along the American and Sacramento Rivers; 3) effects to vegetation as a result of the alternatives; and 4) coordination with stakeholders in future phases of the project. The comments and the responses to them are summarized in the Public Involvement Appendix (Appendix F)

After considering the comments received during public review of the final EIS/EIR, 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.

To help the community stay informed about current project activities, information is provided in a variety of ways:

- Representatives of the Sacramento District attend and report on the status of the GRR at the American River Task Force meetings which occur quarterly and are open to the public;
- GRR updates are provided at the monthly SAFCA Board of Directors meetings, which typically occur on the third Thursday of each month. These meetings are held at the Sacramento County Board of Supervisors Chambers at 700 H Street, Sacramento, California, 95814, begin at 3 p.m., and are open to the public.
- The Sacramento District briefs the CVFPP on the status of the GRR upon request. The CVFPP meets monthly on the last Friday of the month beginning at 9 a.m. at various locations

including the Sacramento City Hall, 915 I Street, Sacramento, California, 95814, and are open to the public. Archived video footage of previous meetings is located at the following link: http://www.cvfpb.ca.gov/meetings/2013/videos/index.cfm

- Quarterly coordination meetings are held with the United Auburn Indian Community of the Auburn Rancheria and the Shingle Springs Band of Miwok Indians.

1.10 Organization of the EIS/EIR

The content and format of this EIS/EIR 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 EIS/EIR is organized as follows:

- The Executive Summary summarizes the purpose and intended uses of the EIS/EIR, 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 EIS/EIR: 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 EIS/EIR is also included.
- Chapter 7, "References," provides a bibliography of sources cited in this EIS/EIR.
- 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 EIS/EIR and can be found on the disc located in the back cover of this EIS/EIR.

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. 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.
- Operation of the structure would inundate the Yolo Bypass more frequently than current operations, causing a significant disruption to the Yolo County agricultural economy.

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 Creek, and Magpie Creek, 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	AR5 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. Plate 7 shows the existing and proposed erosion protection sites on the American River.

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 revetment would be placed on the existing bank at a slope varying from 2H:1V to 3H:1V 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.

Launchable Rock Trench

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.

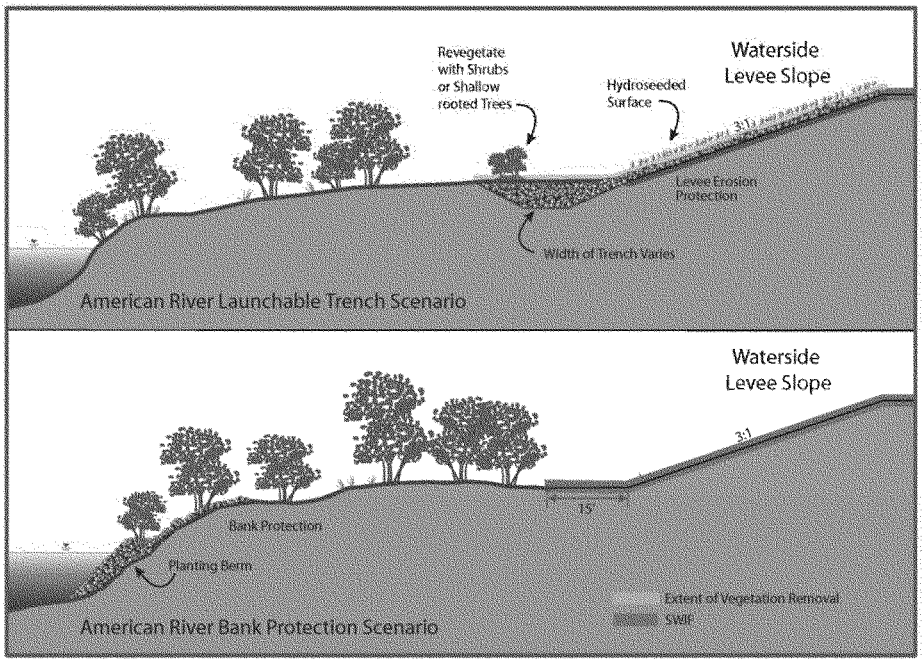


Figure 1. Bank Protection and Launchable Rock Trench Typical Design.

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.

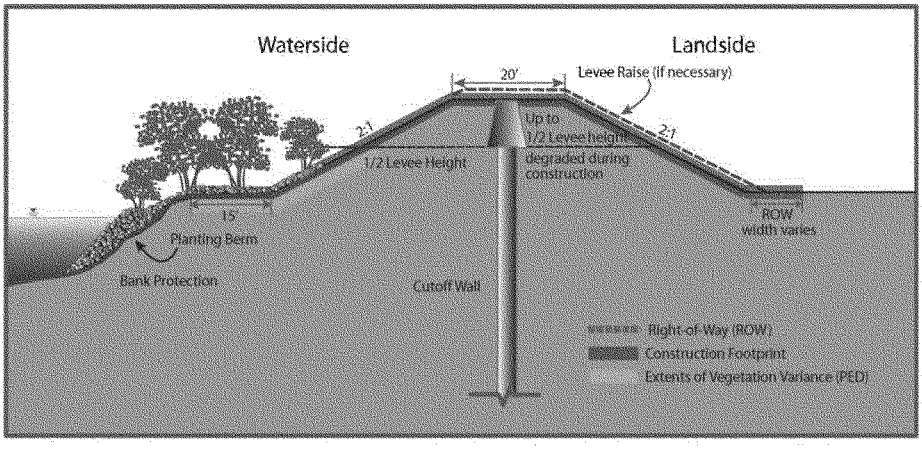


Figure 2. Fix-in-place with Cutoff Wall and Levee Raise.

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.

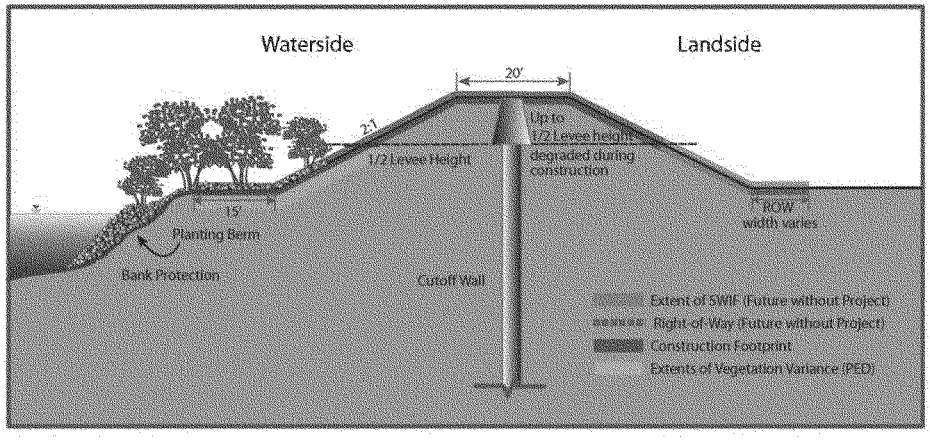


Figure 3. Fix-in-place with Cutoff Wall and No Levee Raise.

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.

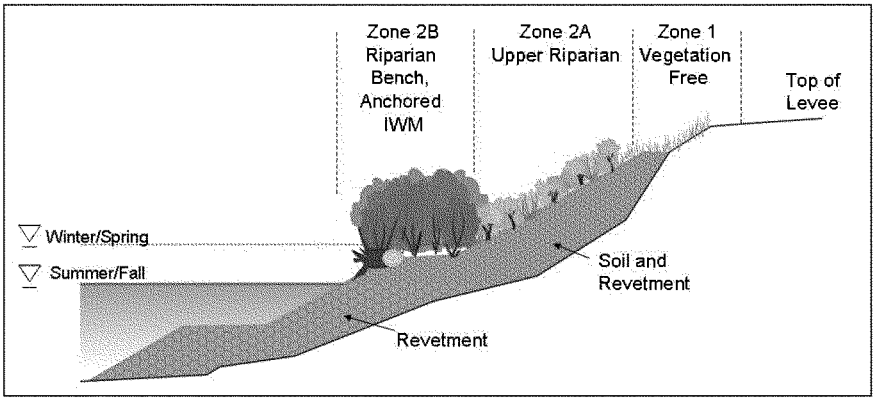


Figure 4. Planting Berm with Vegetation and Woody Material.

Launchable Rock Trench

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.

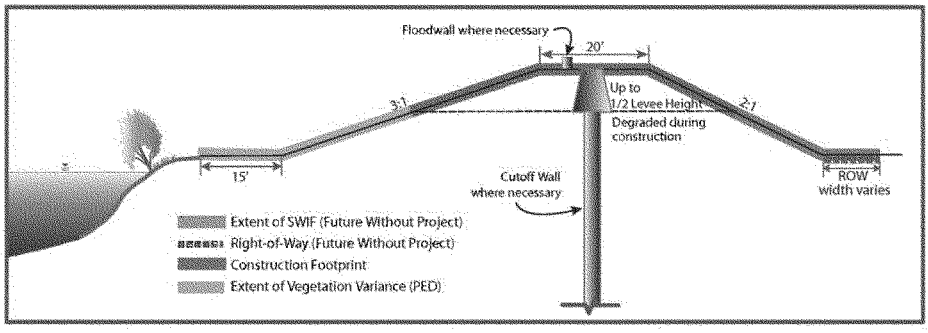


Figure 5. NEMDC and Arcade Creek Scenario.

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.

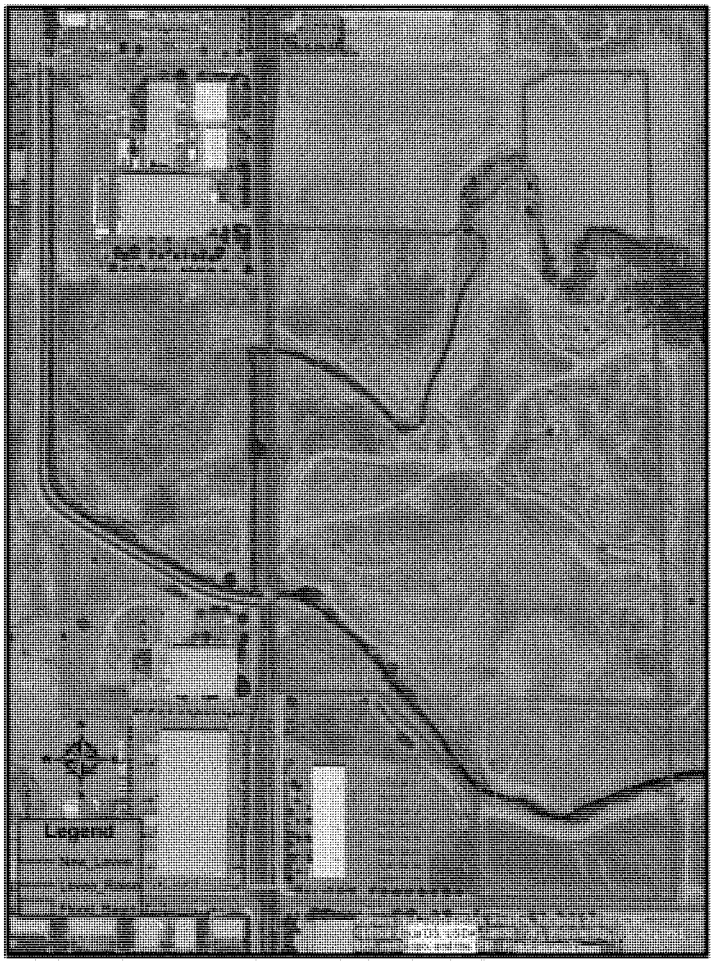


Figure 6. Floodwall and New Levee along Magpie Creek.

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 revised 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.

The local maintaining agencies would be responsible for any additional environmental compliance required to implement the SWIF, including any needed Clean Water Act Section 404 permits applicable to O&M activities.

2.4 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)

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.

Alternative 2 has been identified as the Corps' Recommended Plan. Additionally, Alternative 2 is the Environmentally Preferable Alternative under NEPA and the Environmentally Superior Alternative under CEQA. Under the Guidelines developed pursuant to Section 404(b)(1) of the Clean Water Act, Alternative 2 has been identified as the Least Environmentally Damaging Practicable Alternative (Appendix E).

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 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.

The Sacramento Weir and Bypass were constructed in 1916 and are owned by the State of California. The Sacramento Weir is operated by DWR. The primary purpose of the weir is to protect the City of Sacramento from excessive flood stages in the Sacramento River channel downstream of the American River. The Weir limits flood stages (water surface elevations) in the Sacramento River to project design levels through the Sacramento/West Sacramento area. The project design capacity of the

bypass is 112,000 cfs. Currently, operation of the Sacramento Weir in a flood event is determined by the stage at the I Street Bridge gauge. When the I Street gauge reaches 27.5 feet, the gates of the bypass are manually opened. The number of gates to be opened is determined to meet either of two criteria: (1) to prevent the stage at the I Street gage from exceeding 29 feet, or (2) to hold the stage at the downstream end of the weir to 27.5 feet.

The Sacramento Bypass is operated by CDFW as the Sacramento Bypass Wildlife Area. The Bypass was designated as a wildlife area by the Fish and Game Commission in 1988. The 360-acre Sacramento Bypass Wildlife Area is an important cover and feeding area for wildlife during late fall, winter, and early spring. Vegetation varies throughout the area from mature cottonwood trees, willows, and valley oaks in some locations, to a sparsely-covered sandy soil area on the eastern end. Game birds, raptors, songbirds, and native mammals are all present. CDFW operates the Bypass as a hunting area for waterfowl (when the area is flooded), ring-necked pheasant, and mourning dove.

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. In the Sacramento Bypass, the existing grade slopes towards the southern levee toe drain. Sloping and grading of the bypass expansion will be determined in the preconstruction, engineering, and design (PED) phase with considerations for fish passage and elimination of stranding features.

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.

General assumptions for operation of the expanded Bypass were made for the purpose of this study. However, it is expected that these assumptions would be optimized and refined during the PED phase of the project, prior to construction, through coordination with the State of California. For this study, the increase in Bypass flows through the new weir are assumed to 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.

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	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.

Department of Water Resources

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 (Recommended Plan). These three alternatives are analyzed in this EIS/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 of the Common Features Project Alternatives.

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)
Land Use			
Effect		Acquisition of properties for levee easements along the Sacramento River and Arcade Creek.	Acquisition of properties for levee 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 (Recommended Plan)
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 short term impacts. Long term effects are less than significant with mitigation.	Significant short term impacts. Long term effects are 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.	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	Indirect effects to fish habitat from the removal of vegetation from the levee slopes. Direct effects from the	Indirect effects to fish habitat from the removal of vegetation from the levee slopes. Direct effects from the

96

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)
	migration, spawning, or rearing habitat.	placement of rock at bank protection sites, causing an increase in turbidity.	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 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 effects to Giant Garter Snake (GGS), valley elderberry longhorn beetle, salmonids, green sturgeon, Delta smelt, Western yellow-billed cuckoo, vernal pool crustaceans, and Swainson's Hawks during construction. Indirect effects due to loss of habitat and temporal effects while habitat mitigation establishes. Vegetation Variance for the waterside levee slopes would significantly limit the effects to endangered fish species.	Direct effects to Giant Garter Snake (GGS), valley elderberry longhorn beetle, salmonids, green sturgeon, Delta smelt, Western yellow-billed cuckoo, vernal pool crustaceans, and Swainson's Hawks during construction. Indirect effects due to loss of habitat and temporal effects while habitat mitigation establishes. Vegetation Variance for the waterside levee slopes would significantly limit the effects to endangered fish species. Effects to listed fish species due to increased stranding potential at the Sacramento Bypass.
Significance	Significant	Less than Significant with mitigation	Less than Significant with mitigation
Mitigation	None proposed	Mitigation per the terms of the Biological Opinions (Appendix J). Replace habitat	Mitigation per the terms of the Biological Opinions (Appendix J). Replace habitat

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)
		for species either on-site or in close proximity to lost habitat. Implement BMPs discussed in Section 3.5.6 and conservation measures in the BOs during construction to prevent mortality. Implement green sturgeon modeling and monitoring to improve effects assessment, minimize construction impacts, and mitigate for lost benthic habitat per the terms of the BOs.	for species either on-site or in close proximity to lost habitat. Implement BMPs discussed in Section 3.5.6 and conservation measures in the BOs during construction to prevent mortality. Implement green sturgeon modeling and monitoring to improve effects assessment, minimize construction impacts, and mitigate for lost benthic habitat per the terms of the BOs. Implement fish passage at the Sacramento Bypass, and grade the widened Sacramento Bypass to reduce stranding potential.
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.	Adverse effects resolved with mitigation under NHPA and reduced to less than significant with mitigation under NEPA. Significant and unavoidable under CEQA.	Adverse effects resolved with mitigation under NHPA and reduced to 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.	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	Preparation of a Traffic Control and Road Management Plan and other BMPs listed

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)
		in Section 3.10.6.	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.
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

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)
			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 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.

	No Action Alternative	Alternative 1 – Improve Levees	Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)
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 levee easements.	Disruption to residents alongside construction sites from traffic, noise, and dust. Acquisition of properties for levee 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.

101

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

The baseline environmental conditions assumed in this EIS/EIR 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 EIS/EIR 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

3.2.1 Environmental Setting

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

Existing Conditions

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).

3.2.2 Methodology and Basis of Significance

Methodology

The U.S. Army Corps of Engineers, Sacramento District, Geotechnical Levee Practice SOP-EDG-03 establishes the requirements of engineered fill used for the construction of the levee embankments. The material is expected to be sourced from several sites including: newly identified

borrow sites within approximately 25 miles of the study area; existing borrow sites identified for the Natomas Basin by SAFCA; the DWSC dredge disposal area; the existing levees; and existing commercial sources. A desktop regional borrow study was performed to identify potential borrow sites within 25 miles of the study area, where enough soil could be sourced to satisfy the project needs. Test pits and laboratory testing on materials collected from test pits were provided by SAFCA as part of the NLIP. Additionally, the Sacramento District has studied the DWSC spoil areas as a borrow source several time in the past, and a discussion of that borrow source is included below. Typically projects constructed by the Sacramento District utilize commercial borrow sites near the project area.

Basis of Significance

The thresholds of significance are developed 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 considered were determined to result in a significant impact to geologic resources if they would expose people or structures to substantial effects involving:

- Rupture of a known earthquake fault, strong seismic shaking, or seismic-related ground failure, including liquefaction;
- Landslides, substantial soil erosion, or permanent loss of topsoil;
- Locating the project on an unstable geologic unit, or on a geologic unit that would become unstable as a result of the project; and/or,
- Locating the project on expansive soil, as defined in the Uniform Building Code.

The proposed alternatives would not expose people or structures to substantial effects involving earthquakes, landslides, and expansive soils. Additionally, the proposed measures would not be located on unstable geographic units. As a result, these criteria are not discussed further in this section.

3.2.3 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 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.

The Corps would not excavate potential borrow sites under this scenario; therefore conditions would likely remain consistent with the existing conditions. However, if a levee were to break, the flooding could result in significant effects to soils from the deposition of alluvial soils throughout the flooded area. Additionally, a flood event would result in substantial soil erosion, and could permanently displace substantial amounts of topsoil in flooded areas. As a result, there would be significant effects to geological resources under the No Action Alternative.

3.2.4 Alternative 1 – Improve Levees

The Corps proposes to excavate approximately 1 million cy of borrow material for this alternative. Excavation of these borrow sites could significantly impact geological resources by causing substantial soil erosion or the permanent loss of topsoil. This alternative would not result in impacts to seismic resources.

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. It is also possible that, if appropriate, these lands could be used to mitigate for project impacts.

In addition, levee improvement measures would include substantial construction and earth moving activities over large areas, including excavation, trenching, levee crown degradation, and bank protection construction. These activities would result in temporary disturbance of soil during the construction period, and could expose these disturbed areas to substantial erosion during rain storms following construction, if not properly restored. However, with the implementation of the avoidance and minimization measures discussed in Section 3.2.6 below, any potential impacts to geological resources from excavation of borrow sites and construction disturbance would be less than significant.

There would be minimal effects to geological resources associated with O&M following construction. The Corps would ensure that the construction areas, including the borrow sites, are monitored per the guidelines established in the Habitat Mitigation and Monitoring Plan to ensure that the native grasses associated with the site restoration meets the success criteria identified in the plan (Appendix I). With successful revegetation of the sites, these effects would be less than significant.

3.2.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)

Under Alternative 2, more than 1 million cy of soil would be excavated during construction. However, the potential effects from this action would be consistent with the effects described above for Alternative 1, only of a greater magnitude. Like Alternative 1, these effects would be less than significant with the implementation of the avoidance and minimization measures listed in Section 3.2.6 below.

3.2.6 Mitigation Measures

The following measures would be implemented during construction to reduce potential impacts to geological resources to less than significant:

- Prior to construction, the Corps or its contractor would be required to acquire all applicable permits for construction.
- Prior to construction, a Stormwater Pollution Protection Plan (SWPPP) would be prepared, and best management practices (BMPs) would be proposed to reduce potential erosion and runoff during rain events.
- 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.

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
- Delta Plan

Existing Conditions

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, which are established in the Parkway Plan as Goals and Policies 4.9 to 4.18, include the following:

- 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 363-acre floodway between the Sacramento River and the Yolo Bypass. The 360-acre portion of this floodway situated west of the Sacramento Weir is also designated as the Sacramento Bypass Wildlife Area, which is leased, operated, and managed by CDFW. The wildlife area is open to the public and is used for fishing, hunting, wildlife viewing, and bird watching. Just to the north of the Bypass are various agricultural lands currently in cultivation for orchards and row crops. There is also an abandoned landfill on the northern side of the Bypass near its western end. 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 reviewed 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, the Delta Plan, 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 Plans;
- Physically divide an established community;
- Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere;
- Convert a significant amount of prime farmland, unique farmland, or farmland of statewide importance to non-agricultural use; or,
- Conflict with existing zoning for agricultural use.

The proposed alternatives would not divide an established community or displace substantial numbers of people. As a result, these criteria are not discussed further in this analysis.

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. Additionally, the No Action Alternative would be in conflict with any habitat plans in the study area, because protected habitat would remain at risk during a flood event and could be damaged if a levee were to break. The No Action Alternative would not conflict with existing zoning for agriculture, nor would any agricultural lands be converted under this alternative.

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, the Management Plan for the Wild and Scenic Rivers Act, 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 because it would not allow for the protection of the recreational and fisheries resources that are designated as significant under the Wild and Scenic Rivers Act. As a result, the No Action Alternative would be considered to have a significant effect on land use.

The Delta Plan's Regulatory Policy RR P1 addresses the prioritization of State investments in delta levees and flood risk reduction. Some of the goals stated in this policy include:

- Protect existing urban and adjacent urbanizing areas by providing 200-year flood protection.
- Protect small communities and critical infrastructure of statewide importance (located outside of urban areas).
- Protect floodwater conveyance in and through the Delta to a level consistent with the State Plan of Flood Control for project levees.

The No Action Alternative is inconsistent with these goals since it would not help achieve the Delta Plan's goals cited above. The No Action Alternative does not provide a 200-year level of protection for urban or adjacent urbanizing areas, and allows critical infrastructure of statewide importance to remain at risk of damage during a major flood event. The No Action Alternative would not result in any changes to the conveyance of floodwaters in and through the Delta.

3.3.4 Alternative 1 – Improve Levees

The following subsections describe potential effects to land use associated with construction of Alternative 1. There would be no effects to land use associated with long-term project O&M. Alternative 1 would not result in the permanent conversion of any agricultural lands, nor would it conflict with any agricultural land zoning.

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 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 expected to be less than 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 acknowledges that the Parkway is a management floodway that has a shared purpose of protecting Sacramento from seasonal flooding and supporting recreational use along with natural habitat areas (Parkway Plan, Chapter 4). As such, the Parkway Plan establishes policies that 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.

Further, the Parkway Plan acknowledges that:

Erosion of the berms and banks supporting the levees along the lower American River is an ongoing threat to the stability of the flood control system that has been heightened by the need to convey very high flows through the system for sustained periods as part of the program to provide a high level of flood protection to the urbanized floodplain (Parkway Plan, Chapter 4, "Erosion Control").

The Parkway Plan further establishes that "The Parkway Manager also has an interest in protecting threatened berms that support remnant stands of cottonwood forest and provide recreational access to the river" (Parkway Plan, Chapter 4, "Erosion Control"). 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. The Parkway Plan clearly establishes both the importance and need to provide erosion protection measures within the Parkway; therefore, by proposing to construct these improvements, the ARCF GRR is consistent with these aspects of the Parkway Plan.

Policy 4.16 of the Parkway Plan, as described in the Existing Conditions discussion above, establishes that erosion control projects should 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 Corps is proposing a combination of bank protection measures and launchable rock trench measures to address the need for erosion protection. Each of these measures would involve the removal of riparian vegetation during construction, however the habitat removed under each measure provides different types of habitat values; in areas where bank protection is constructed, bank side habitat would be impacted and proposed mitigation measures would focus on replacing this habitat. In areas where launchable rock trench is constructed, upland habitat would be impacted and the proposed mitigation measures would focus on replacing this habitat type. As a result, the Corps would evaluate each stretch of levee on a site-specific basis during the design phase of the project, including potential site-specific effects and the site's hydraulic conditions, in order to determine the appropriate measure to implement at each site.

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 management objectives, the selection of the measure will be based on a determination of which method would do the most to protect valuable Parkway fish and wildlife resources, and recreational facilities considering both the short term impacts of construction and the long term implementation of any mitigation included in 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 Department of Parks and Recreation (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. 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).

The launchable rock trench measure would allow for the protection of the existing SRA habitat by constructing erosion protection measures against the waterside levee toe. This measure would require the removal of upland riparian scrub habitat and grasses close to the levee in order to construct the trench. However, this measure would also incorporate mitigative features through the installation of plantings on the surface of the trench. More information on the revegetation at the proposed rock trench sites is discussed in Section 3.6.4 below, and in the Habitat Mitigation and Monitoring Plan (Appendix I). Additionally, this measure is consistent with the Parkway Plan in that once installed, these trenches would be completely screened from public view. As a result, once the vegetative features have reached full growth, the rock trenches would provide a natural appearance to the site with the affected habitat values fully restored. 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.

The proposed bank protection measures would require the removal of smaller shrubs and grasses associated with SRA habitat in order to place the rock protection, but impacts on SRA would be minimized by protecting existing large trees in place and incorporating them into the bank protection designs. Additionally, the Corps proposes to incorporate planting berms into these sites, as shown in Chapter 2, to allow for on-site revegetation. More detail on the revegetation proposed at the bank protection sites is discussed in Section 3.6.4 below, and the Habitat Mitigation and Monitoring Plan (Appendix I). With the incorporation of the mitigative features, Alternative 1 would be consistent with the Parkway Plan and effects to Land Use would be less than significant.

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 an existing levee easement and would remain within a levee easement. There would be a change in land use at Magpie Creek. A 79-acre vacant parcel of vernal pools and grasslands would be acquired and protected in perpetuity under a flood 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 (Recommended Plan)

Impacts for Alternative 2 are the same for borrow sites, the American River, and the East Side Tributaries 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

This alternative would add an additional 1,500 feet of weir to the existing Sacramento Weir along the Sacramento River and approximately 315 acres of additional bypass (floodway) space. Primary components of the proposed weir and bypass expansion would include extending the current weir structure, degrading the existing north levee of the Sacramento Bypass, constructing a new levee and seepage berm at the northern terminus of the weir extension, and grading the expanded floodway area. The overall construction "footprint" (e.g. limits of construction) for these expansion features would encompass a total of approximately 427.7 acres.

Table 8 below identifies the existing land uses within the bypass construction footprint and the approximate acres of each existing land use type within the footprint of the new bypass area, the new levee, and the new weir.

Table 8. Land Use Impacts from the Sacramento Weir and Bypass Expansion.

Existing Land Use	ACRES			
	Within New Bypass Footprint	Within New Levee Footprint	Within New Weir Footprint	Totals
Levees (& roads)	43.5	2.5	0.5	**46.5**
Roadways	1.7	0.6	0	**2.3**
Railroad	1.1	1.2	2.8	**5.1**
Agricultural: Row Crops	55.3	43.5	0	**98.8**
Agricultural: Nut Orchards	180.4	55.6	0.7	**236.7**
Other Agricultural Lands	5.6	1.3	0.5	**7.4**
Canals	10.0	3.5	0	**13.5**
Landfill (abandoned)	17.4	0	0	**17.4**
Totals	**315.0**	**108.2**	**4.5**	**427.7**

The following provides a brief description of the existing land uses identified in Table 8:

- Levees – This includes the levee adjacent to the north side of the existing bypass (floodway), a portion of the levee along the west bank of the Sacramento River, and a portion of a levee along the east side of the Yolo bypass. Some of the levee area includes paved and gravel roadways on top of the levee (especially Old River Road, County Road 126, and East Yolo Levee Road). The levee area east of the existing weir includes a large dirt parking area and several trees along its side slopes.
- Roadways – This is limited to a portion of County Road 124. This category does not include small dirt roads in agricultural fields.
- Railroad – A portion of the existing Yolo Shortline Railroad and its apparent right-of-way, which in this area includes an elevated dirt platform (berm) for the railroad tracks.
- Agricultural: row crops – Actively managed agricultural fields used to produce various row crops such as tomatoes and safflower.
- Agricultural: nut orchards – Actively managed agricultural orchards used to produce nut-bearing trees. These trees were too young to identify the species, but potentially are walnut trees.
- Other agricultural lands – Such areas are used for various agricultural purposes, except for growing crops. Examples include; major dirt roads between fields, staging and equipment storage areas, etc. One such area contains large trees.
- Canals – This group includes one large irrigation canal along with portions of other large agricultural irrigation/drainage ditches. It excludes small agricultural ditches.
- Landfill – This is the abandoned "Old Bryte" landfill, now dominated by various grasses and forbs.

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 315 acres of additional bypass space (e.g. floodway). It is anticipated that the additional bypass area would be made available to the CDFW for incorporation into the existing Sacramento Bypass Wildlife Area, thereby expanding the wildlife area by over 85 percent. Assuming this occurs, these 315 acres would be converted from the existing land uses identified in Table 8 to recreational uses presently allowed within the current wildlife area.

A total of approximately 335.5 acres of actively farmed lands, which are also designated as prime farmland, would be eliminated from agricultural uses through the proposed weir and bypass expansion. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. The proposed bypass expansion is located in Yolo County and Section 8-2.2416 of the Yolo County Code

requires agricultural mitigation for changes from agricultural use to a predominantly non-agricultural use. However, land use conversion for public uses is exempt from this mitigation requirement. Yolo County has a total of approximately 250,000 acres of prime farmland. The land use conversion proposed would represent a decrease of approximately 0.13 percent in the total acreage of prime farmland within the county. While the conversion of the existing actively farmed lands (prime farmland) to non-agricultural use would result in only a minor loss of prime farmland in Yolo County, this loss is still considered significant because it would conflict with existing zoning for agricultural use in the footprint of the widened Sacramento Bypass.

It is noted that the draft EIS/EIR indicated that the existing farmland within the expanded bypass would be converted to a floodway and could either be managed as open space/wildlife area or continue as farmland. Some public comments received recommended that agricultural uses should not be allowed within the new floodway (bypass) as this would present land management conflicts and problems within the overall bypass. It is also likely that allowing the production of agricultural crops within the bypass expansion area could detrimentally affect surface water flows through the overall bypass. As such, it was determined that it would be more appropriate to not allow agricultural uses within the bypass expansion.

All property acquisitions necessary for construction of the weir extension and bypass expansion 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. With compliance with these relocation laws and appropriate compensation to impacted landowners, the effect of land use conversion to the affected existing property owners would be less than significant, with mitigation required.

Construction of the proposed weir extension and bypass expansion would directly impact segments of existing roadways, including Old River Road, CR 124, CR 126, and East Yolo Levee Road, as well as a segment of an existing railroad (Yolo Shortline Railroad). The affected portions of the roadways would be relocated and the affected railroad segment would be rebuilt as part of the project. Given this, these localized land uses would only be temporarily impacted and the effects to these transportation land uses would be less than significant, with the required mitigation.

3.3.6 Mitigation Measures

Alternatives 1 and 2 would result in less than significant impacts to land use for the American River measures, with the restoration of the impacted construction footprint and establishment of habitat mitigation, as discussed further in Section 3.6, Section 3.8, and the Habitat Mitigation and Monitoring Plan (Appendix I). Additionally, the Corps would ensure that recreation facilities within the American River Parkway would be restored to pre-project conditions, as discussed further in Section 3.14.

Mitigation for property acquisition on the Sacramento River, East Side Tributaries, and Sacramento Weir and Bypass would be compensation to land owners under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1960. No additional mitigation would be required for land use under the ARCF GRR.

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 Erosion Susceptibility

The *Lower American River, Erosion Susceptibility Analysis for Infrequent Flood Events*, evaluated the potential for erosion of grass-covered levees and overbanks in response to different stream discharges resulting from releases of various magnitudes from Folsom Dam (Ayers, 2004). This study

concluded that the river system is degrading under present operating conditions because the lower American River is starved of sediments by Folsom Dam and Nimbus Dam. Hardpan has been reached in the channel bottom as far downstream as Guy West Bridge (RM 7.0), and this hardpan is slowing further degradation. With the river starved for sediment and unable to further scour its channel the river is now eroding laterally to satisfy its need for sediment. Erosion of the riverbank is occurring even at low flow conditions of 7,000 cfs, which was the peak flow from the 2003 runoff season. Ongoing erosion has scarred the channel banks leaving them susceptible to further erosion, especially during high flow events. Lateral erosion is further reducing the amount of berm separating the main channel from the levee. The loss of vegetation on the berm and bank is leaving bare soil, which is more susceptible to erosion at a lower velocity than if the berm or bank was covered with vegetation.

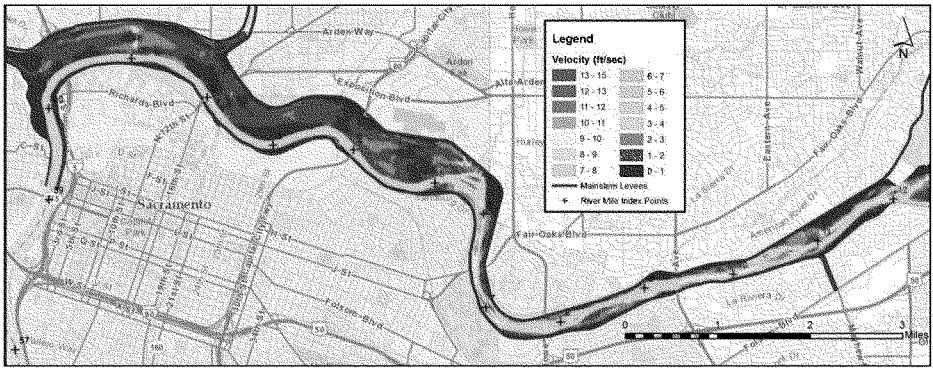


Figure 7. Velocities in the Lower American River at 115,000 cfs.

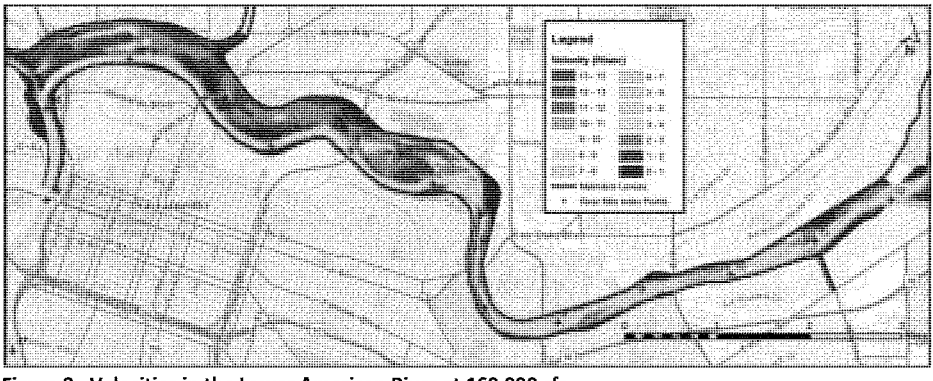


Figure 8. Velocities in the Lower American River at 160,000 cfs.

Figure 7 shows the velocities for a discharge of 115,000 cfs, which average about 6 to 8 feet per second in the channel with maximum velocities ranging up to about 12 feet per second. Figure 8 shows the velocities for a discharge of 160,000 cfs which average about 6 to 9 feet per second in the channel with maximum velocities ranging up to about 13 feet per second. Of concern in both of these figures are the proximities of the relatively high velocities to the levees along the Lower American River. Additionally, the range of the computed velocities is of concern since the magnitude of the velocities is great enough to erode many of the relatively fine grained material present in the channel lining. The results of the analysis indicate that the large discharge events are capable of eroding the material typically found along the Lower American River channel.

Figure 9 shows velocity contours in the area where erosion is greatest, between RM 6 and RM 7.5. As can be seen in Figure 9, velocities reach 11 feet per second for flows of 115,000 cfs, and get as high as 14 feet per second for 160,000 cfs. The study concluded that a flow of 145,000 cfs could cause damage at most of the study's identified priority sites, and could cause a levee failure to occur for at least one of the sites (Ayers, 2004). This reach of river represents the worst conditions regarding velocity (11 to 14 feet per second). Downstream and upstream of this reach, velocities for the same peak releases average between 6 to 9 feet per second.

Bare soil can withstand approximately 1.5 to 2.5 feet per second. Soil with good turf cover can withstand between 3.5 to 8 feet per second. The conditions of grass cover along the American River are not good and erosion occurs at velocities much less than the 11 to 14 feet per second in the RM 6 to RM 7.5 reach. This is illustrated by the fact that emergency erosion repairs have needed to occur as far downstream as near Highway 160 (RM 1.8) and as far upstream as between Watt Avenue and the Mayhew Drain (RM 10.2). Plate 7 shows the existing and proposed erosion protection on the American River.

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.

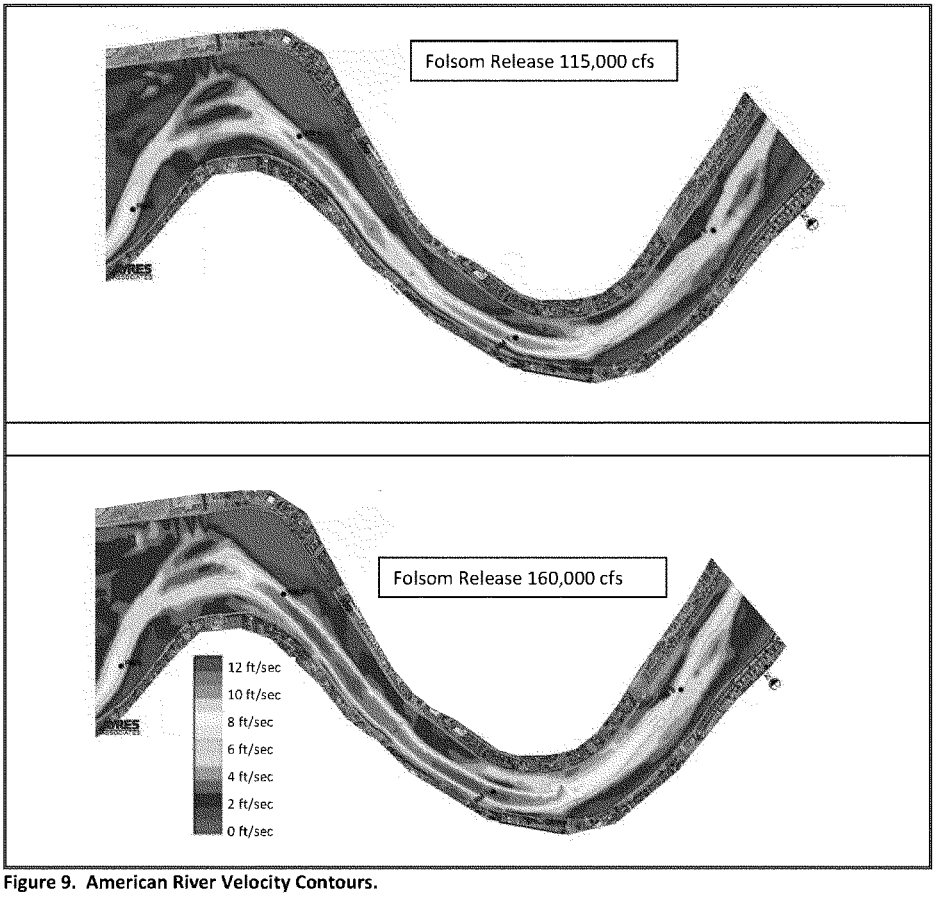


Figure 9. American River Velocity Contours.

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 9 displays the different flow releases from Folsom Dam for the Existing and the Future Without Project (with JFP and dam raise in place).

Table 9. 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 10 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.

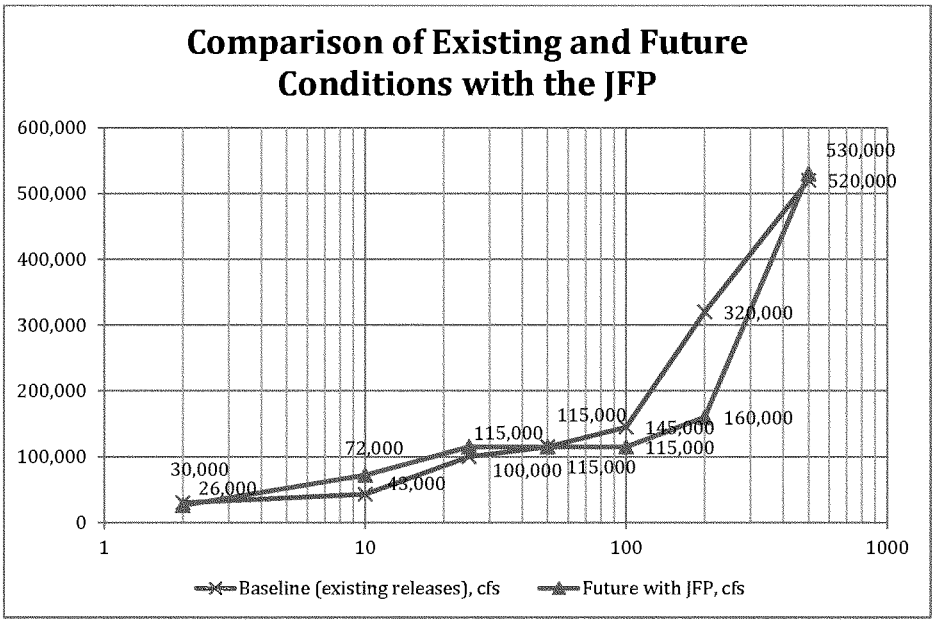


Figure 10. Comparison of Existing and Future Folsom Dam Releases.

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 10.

Table 10. 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.

The proposed alternatives would not place housing or other structures within a 100-year flood hazard area, therefore, these criteria are not discussed in the analysis below.

3.4.3 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 LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However, 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. Flow conditions in the system would be consistent with the future without project condition, as described above. If a levee breach were to occur, people and structures would be exposed to significant risk of loss, injury, or death involving flooding. In addition, significant erosion or siltation could occur due to the substantial increase in flows. Flood flows would contain significant contaminants and would be highly polluted, spreading and exposing people to substantial health and safety risks. 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. As a result, effects to hydrology and hydraulics under the No Action Alternative would be significant.

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. Long-term O&M would not be significantly different under Alternative 1 from existing conditions and would have no impact of hydrology and hydraulics. 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 (Recommended Plan)

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 Recommended Plan 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. Therefore, for events up to and including 115,000 cfs, only the existing weir will be operated per the criteria previously established. For events 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 11 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 events greater than 115,000 cfs, the benefits of the Folsom Dam improvements would be realized in the form of reduced flows compared to the existing condition.

Table 11. 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 (Recommended Plan)**
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 (Recommended Plan)**
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. Therefore, for events up to 115,000 cfs, there would be no change in flow conditions in the Sacramento and Yolo Bypasses. For flood events 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 11 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 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 EIS/EIR.

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

Existing Conditions

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 October 2011. 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

The Porter-Cologne Water Quality Control Act required the identification of the beneficial uses of waters impacted by proposed actions, and the associated effects. Water quality objectives identified within each Basin Plan are established for the reasonable protection of beneficial uses of waters of the State. Designated beneficial uses for the Sacramento River and its tributaries within the study area include the following:

- Municipal and domestic supply;
- Industrial service supply;
- Industrial process supply;
- Agricultural supply;
- Groundwater recharge;
- Navigation;
- Water contact recreation;
- Non-contact water recreation;
- Shellfish harvesting;
- Commercial and sport fishing;
- Warm freshwater habitat;
- Cold freshwater habitat; and,
- Migration of aquatic organisms.

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 12. 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 12. 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 12 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 13 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 13). 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 13). Construction materials such as concrete or other chemicals could affect the pH of the Sacramento River if a discharge were to occur.

Table 13. 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 13 above shows that monthly average EC levels in the Sacramento River remain below this threshold.

3.5.2 Methodology and Basis of Significance

Methodology

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.

Basis of Significance

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. The LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However, 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. 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 EIS/EIR. Under Alternative 1, O&M is not expected to change from existing conditions. As a result, there would be no effects from long-term O&M of the levees in the study area.

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.

Additionally, there is the potential for some increases in water temperature, due to the removal of waterside vegetation during construction. However, the vegetation that would be removed would primarily consist of shrubby vegetation and grasses, which do not significantly contribute to shade. The larger trees in the bank protection footprint, which are the primary contributors to shade, would be protected in place. As a result, short term effects to water temperature are expected to be less than significant. With the new plantings and trees installed during construction growing to contribute to the riparian/shaded corridor over time, the long-term effect is expected to be beneficial to water temperature.

Construction of the bank protection measure is not expected to impact any of the beneficial uses identified above. With the exception of the potential turbidity and water temperature effects discussed above, with the implementation of the BMPs discussed in Section 3.5.6 below, the project is not expected to result in any contamination to surface waters, nor is it expected to result violate any of the Basin Plan water quality objectives identified above. Coordination with the Central Valley RWQCB will occur prior to construction through the Section 401 certification process to ensure that any appropriate measures, to include, but not limited to the BMPs discussed in Section 3.5.6 below, are implemented during the construction period. Impacts associated with recreation uses are described in Section 3.14, and impacts associated with fisheries are discussed in Sections 3.7 and 3.8.

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 water quality effects would be reduced to less than significant.

Sacramento River

Construction of this alternative would have the same effects as those discussed for the American River where bank protection work would occur, including effects associated with turbidity, water temperature, and potential impacts to beneficial uses. The use of barges to install the revetment could cause additional turbidity beyond those effects discussed for the American River above, 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, and contribute to the riparian/shaded corridor long-term. 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. By implementing the avoidance and minimization measures discussed in Section 3.5.6 water quality effects would be reduced to less than significant.

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 effect on water quality.

3.5.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)

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.

Within the expanded bypass, the existing land use is agriculture; there is approximately 13.5 acres of agricultural ditches and canals within this area. These ditches would likely be removed as a part of construction of the new bypass. During construction, the widened bypass area would be graded to ensure that there is positive drainage during flows and to reduce potential stranding pits for fish as water recedes. Following construction of the expanded bypass, the area would be revegetated with native grasses to stabilize soils in the construction footprint.

Additionally, 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.

Following construction, the expanded bypass would be revegetated with native grasses and trees and the area would be monitored, per the requirements established in the Habitat Mitigation and Monitoring Plan, to ensure that the revegetation meets the success criteria defined in the plan (Appendix I). With successful revegetation, it is expected that any effects from erosion and runoff during operation of the widened weir would be less than significant.

3.5.6 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

- Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661, et seq.)
- Federal Wild and Scenic Rivers Act (16 U.S.C. 1217, et seq.)
- State Wild and Scenic Rivers Act (PRC Section 5093.50-5093.70)
- American River Parkway Plan
- 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. The Coordination Act Report (CAR) is included in Appendix A.

Appendix B includes existing habitat maps for the American and Sacramento Rivers. The American River maps were generated to support the Corps' Folsom Dam Water Control Manual Update project. The Sacramento River maps were generated by SAFCA to support their Levee Accreditation Program. The following section includes general descriptions of the habitat types that occur in the study area. The conditions in each segment of the study area follow the habitat discussion.

Habitat Types in the Study Area

Valley Foothill Riparian Habitat

Most valley foothill riparian habitat in the study area (hereafter referred to as "riparian habitat") occurs along the American and Sacramento Rivers, but smaller riparian areas are found at all of the levees in the study area (Appendix B). The overstory of the riparian habitat consists of mature, well-established trees: Fremont cottonwood (*Populus fremontii ssp. fremontii*), valley oak (*Quercus lobata*), black willow (*Salix gooddingii*), and box elder (*Acer negundo var. californicum*). During the surveys, Oregon ash (*Fraxinus latifolia*), western sycamore (*Platanus racemosa*), and white alder (*Alnus rhombifolia*) were also observed. The shrub layer consists of smaller trees and shrubs; representative species observed were poison oak (*Toxicodendron diversilobum*), sandbar willow (*Salix exigua*), and Himalayan blackberry (*Rubus discolor*). Elderberry shrubs (*Sambucus mexicana*), the host plant of the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), which is Federally listed as threatened, were observed in the riparian habitat along the American and Sacramento Rivers.

Wildlife inhabiting the study area are dependent upon the trees associated with riparian habitats in the area for vegetation diversity, microclimate conditions, and the availability of water, food, and cover. Several species of raptors, including red-tailed hawks, red-shouldered hawks, Cooper's hawks, and great horned owls, build their nests in the crowns of cottonwood, valley oak, and other large trees that currently exist on both the landside and waterside of the levees in the study area. Natural cavities and woodpecker holes provide nesting sites for cavity-nesting species, including wood ducks, common mergansers, American kestrels, tree swallows, and western screech owls. Riparian scrub supports large numbers of insects and attracts passerine birds, including several species of warblers and hummingbirds. Additionally, a number of Federally listed species are reliant on riparian corridors, including the valley elderberry longhorn beetle and the western yellow-billed cuckoo.

On the habitat maps in Appendix B, riparian habitat is referred to as a number of different associated sub-habitats. The Sacramento River SAFCA maps refer to riparian habitat as Fremont Cottonwood Forest, Valley Oak Woodland/Trees, and Sandbar Willow Thickets. The American River habitat maps break riparian habitat down to the primary species in each area including Blue Oak Woodland, Cottonwood Woodland, Interior Live Oak Woodland, Mixed Riparian Woodland, Oak Woodland, Riparian Forest, Oak Forest, Black Walnut, and Alder Riparian. Riparian habitat is listed as a sensitive natural community by the CNDDB (2009).

Shaded Riverine Aquatic Habitat

Shaded Riverine Aquatic (SRA) habitat is defined as the near shore aquatic area occurring at the interface between a river and adjacent woody riparian habitat. The principal attributes of this valuable cover type include: (1) the adjacent bank being composed of natural, eroding substrates supporting riparian vegetation that either overhangs or protrudes into the water; and (2) the water containing variable amounts of woody debris, such as leaves, logs, branches, and roots, as well as variable depths, velocities, and currents. On the habitat maps in Appendix B, SRA is not identified as a separate habitat type. SRA occurs throughout the study area along the riverbanks and levees and is contained within the other identified habitat types in these areas.

Oak Woodland

Valley oak woodland is dominated with valley oak, interior live oak, box elder, white alder, Oregon ash, and black walnut. Shrubs in this habitat type include California grape (*Vitis californica*), Himalayan blackberry (*Rubus armeniacus*), and blue elderberry (*Sambucus cerulea*). Oak woodlands are typically found on higher or upland portions of the study area than the riparian habitat discussed above. Oak woodland is considered to be a sensitive habitat under CEQA.

Ruderal Herbaceous

The ruderal herbaceous habitat type consists primarily of non-native annual grasses. The largest non-native annual grassland area occurs near the American River and the East Side Tributaries. The non-native annual grassland is dominated by naturalized annual grasses with intermixed perennial and annual forbs. Grasses commonly observed in the study area are foxtail barley (*Hordeum murinum ssp. leporinum*), ripgut brome (*Bromus diandrus*), Italian ryegrass (*Lolium multiflorum*), and soft chess (*Bromus hordeaceus*). Other grasses observed were wild oats (*Avena spp.*), Bermuda grass (*Cynodon dactylon*), and rattail fescue (*Vulpia myuros var. myuros*). Forbs commonly observed in annual grasslands in the study area are yellow star-thistle (*Centaurea solstitialis*), prickly lettuce (*Lactuca serriola*), bristly ox-tongue (*Picris echioides*), and sweet fennel (*Foeniculum vulgare*). Other forbs observed are perennial peppergrass (*Lepidium latifolium*), Italian thistle (*Carduus pycnocephalus*), horseweed (*Conyza canadensis*), black mustard (*Brassica nigra*), and fireweed (*Epilobium brachycarpum*).

The ruderal herbaceous habitat type is identified in SAFCA's maps for the Sacramento River as Wild Oats Grassland. On the American River habitat maps, this habitat type is identified as Prairie (Appendix B). Within the study area, this habitat type is typically found on and around the levee slopes and anticipated staging areas, borrow sites, and disposal sites.

Wetlands

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes1; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin, L.M. et al, 1979).

Representative species observed in seasonal wetlands include Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), Italian ryegrass (*Lolium multiflorum*), water pepper (*Persicaria hydropiperpoides*), and alkali mallow (*Malvella leprosa*). Wetlands in the study area represent potentially jurisdictional waters of the United States that may be subject to regulation under CWA Section 404. Within the study area, wetlands also include features such as drainage ditches and farm canals, vernal pools, and open water habitat such as rivers and creeks. Vernal pools are discussed further in Section 3.8. Wetlands and vernal pools are considered sensitive habitats under CEQA. Prior to construction, wetland delineations would be conducted at locations of potentially jurisdictional wetlands within the project area to confirm the presence of these sensitive habitats.

Invasive Plant Species

Within the ARCF study area, invasive non-native plant species occur in all plant communities found along the study area. Areas dominated by non-native vegetation are generally associated with recent human disturbance and include: abandoned, fallow, and active agricultural fields; borrow and staging areas; dredger mine tailings; levee slopes; and areas subject to fire, frequent flood inundation, or scour. Non- native weeds dominate some areas, especially along the side slopes of the levees, and the portions of the construction footprint that are immediately adjacent to the toes of the levees on the land and waterside where the area has been previously disturbed. To a lesser degree where there is low diversity of plants found growing on top of and on the slopes of the levees, invasive plants are also found in other nearby plant communities such as riparian, riparian forest, riparian scrub, oak woodland, agriculture and grassland, oak-grassland, and shrub grassland typically having greater plant diversity.

The areas dominated by invasive herbaceous plant species provide poor habitat quality for native wildlife such as voles, mice, garter snakes, jackrabbits, gophers, and for various native and non-native fish species found temporarily using the riparian zone during periods of inundation. The grassland areas also provide foraging habitat for raptors, coyotes, weasels, common king snakes, western rattlesnakes, ground squirrels, southern alligator lizards, and western fence lizards, as well as providing nesting and foraging habitat for migratory song birds. In the more upland areas of a flood plain and in areas extending upslope from it, blue elderberries (*Sambucus cerulea)* and other native shrubs and trees are associated with the grassland area.

Grasslands infested with yellow-star thistle (*Centaurea solstitialis*), pepperweed *(Lepidium latifolium*), and other non-native plants provide limited habitat value, but could be suitable sites for restoring native grasses. Native grasses provide higher value for wildlife. Approximately 548 acres of the Parkway, or 46 percent, are dominated by yellow star-thistle, especially in those agricultural areas with monotypic stands of pepperweed. Mature non-native species that are not invasive could hinder and prevent the natural regeneration of native plants in portions of the Parkway ecosystems and provide habitat of lesser value to native wildlife species.

Several weed populations such as red sesbania (*Sesbania punicea*) is expanding rapidly along the shorelines of streams and ponds. Chinese tallow tree (*Triadica sebifera)*, a recent invasive, is also expanding in riparian habitats, as are longer established invaders such as arundo (*Arundo donax*), Pampas grass (*Cortaderia selloana*), Spanish broom (*Spartium junceum*), French broom (*Genista monspessulana*), Himalayan blackberry (*Rubus armeniacus*), and tamarisk (*Tamarix ramosissima*). Tamarisk can rapidly colonize exposed bar surfaces and stream banks. Other common invasive weed plants include wild oats (*Avena fatua*), soft chess brome (*Bromus hordeaceus*), Italian ryegrass (*Lolium multiflorum*), rip-gut brome (*Bromus diandrus*), fennel (*Foeniculum vulgare*), mare's tail (*Conyza canadensis*), cocklebur (*Xanthium strumarium*), pyracantha (*Pyracantha sp.*), oleander (*Nerium oleander*), poison hemlock (*Conium maculatum*), mustard (*Brassica tournefortii*), and foxtail (*Hordeum*

jubatum). Chinese tallow tree, black locust (*Robinia pseudoacacia*), Siberian elm (*Ulmus pumila*), Chinese elm (*Ulmus parvifolia*), and tree-of-heaven (*Ailanthus altissima*) are common invasive tree species. These invasive species typically outcompete native plant species and have to be controlled aggressively including mitigation and restoration areas. Since 2001, Sacramento County and SAFCA have collaborated on invasive plant management planning efforts, which have guided local efforts towards eradication of all populations of arundo, tamarisk, French broom, Scotch broom (*Cytisus sp.*), Pampas grass, red sesbania, Chinese tallow tree, oleander, and pyracantha. Future phases could include eradication of pepperweed, and trees such as tree-of-heaven, black locust, and elm, and restore it as native grasslands (Sacramento County, 2008).

American River

The American River Parkway contains many vegetation types including: riparian, oak woodland, open water, ruderal herbaceous, wetlands, and limited agriculture. Along the river channel vegetation is primarily considered 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 protected, enhanced, and expanded, where appropriate. The Parkway Plan notes:

> *The American River Parkway is a unique regional asset that shall be managed to balance the goals of controlling flooding; preserving and enhancing native vegetation, native fish species, the naturalistic open space and environmental quality within the urban environment; maintaining and improving water flow and quality; providing adequate habitat connectivity and travel corridors to support migratory and resident wildlife; providing recreational opportunities; and ensuring public safety (Parkway Plan Section 1.1).*

Chapter 3 of the Parkway Plan sets up a framework for vegetation management in the Parkway. It establishes that development in the Parkway must be designed such that impacts to native vegetation are minimized and mitigation measures are incorporated. The framework establishes what types of vegetation are appropriate for development of mitigation and restoration areas within the Parkway. Additionally, it sets up a policy for managing invasive species within the Parkway.

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 king snake, Pacific tree frog, 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/riparian 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 grasses that are clear of trees and shrubby 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 tree frog 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 from addressing waterside vegetation under the requirements of ETL 1110-2-583. As discussed in Section 1.4.5, an engineering analysis was conducted to determine whether allowing the vegetation to remain would pose an unacceptable public safety risk. The analysis determined allowing vegetation on the lower waterside slope to remain would not pose an unacceptable risk and, therefore, that it is a reasonable assumption that a variance would be granted, therefore, this EIS/EIR assumes that most of the trees on the lower one half of the waterside slope to remain in place. If a vegetation variance is not granted, then further NEPA analysis would occur to address the impacts of compliance with 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.
- Substantial 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. As a result, no vegetation variance would be acquired. The LMA would still address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However, 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 substantial vegetation would be lost. This lost habitat would include native wood habitats and sensitive natural communities, such as oak woodland. In addition, Federally protected wetlands could be disrupted or contaminated by polluted flood flows. Any trees removed by the flood flows would be lost and would likely required significant post-flood recovery mitigation in accordance with the local tree ordinances.

This loss would also cause any wildlife in the area to relocate to other areas where the habitat they need is present. As a result, this alternative would result in a substantial reduction in the quality and quantity of habitat for wildlife species. Because we cannot predict when and how large events will occur it is inappropriate to determine at which time the berms will erode. 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". Additionally, flood fighting would occur as described above, and the Sacramento area would be in danger of a levee failure, as described above. The potential loss of the entire Parkway and its associated levees 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. 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.

Infestation of invasive weeds has an influence on hydraulic roughness during high-flow events, decreases the capacity of the floodway, and adversely affects bank erosion and sedimentation processes. The Corps would remove the noxious weeds from the various plant communities prior to construction. For each of the action alternatives, direct effects to stands of grassland habitat with invasive plants would result from clearing and grubbing and rock placement activities once levee improvements and construction begin. The total number of acres of grassland affected would be refined during the design phase. Existing vegetative mapping of the study area in included with this document in Appendix B.

After construction of flood management features are completed, the indirect effects to levee slopes and mitigation areas providing grassland habitat would occur during Operations and Maintenance (O&M) consisting of levee maintenance and minor repair activities where local construction work would repair a small erosion site. These post construction activities include mowing, herbicide application, hand weeding, or physical removal of the grassland. The direct and indirect effects from mowing and applying herbicide to control noxious weeds would occur during the 3-year plant establishment period and extending control methods afterwards by the non-Federal Sponsor and would result in short term effects to wildlife using the grassland areas.

A summary of the total vegetation impacts estimated for Alternative 1 are shown in Table 14 below.

Table 14. Vegetation Impacts for ARCF GRR – Alternative 1.

	GGS Upland ***	GGS Aquatic ***	Riparian **	SRA Habitat ***	Elderberry Shrubs **	Vernal Pools **	Shallow Water**	Green Sturgeon Benthic**	Oak Woodland*	Wetlands
American River North										
Reach A (American River)			22 acres	19,000 LF	284 stems					
Reach B (American River)			0.5 acre		183 stems					0.05 acre
Reach C (American River & NEMDC)									1 acre	
Reach D (Arcade Creek)			6 acres							
Reach E (Arcade Creek)			4.5 acres							
Reach F (NEMDC)									1 acre	
Reach G (Dry/Robla Creek)	*No Measures Proposed*									
Reach H (Dry Robla Creek)	*No Measures Proposed*									
Reach I (Magpie Creek)						0.25 acre				
American River South										
Reach A (American River)			37 acres	6,850 LF	1,437 stems					0.35 acre
Reach B (American River)			2 acres	875 LF	1,144 stems					
Reach C (American River)				3,800 LF	81 stems					
Reach D (Sacramento River)			18.6 acres	9,200 LF	163 stems		5.67 acre			
Reach E (Sacramento River)			13.2 acres	8,850 LF			4.44 acre			
Reach F (Sacramento River)			54.7 acres	21,100 LF			3.88 acre			
Reach G (Sacramento River)			25.8 acres	11,150 LF			0.87 acre			
TOTAL (Alt 1)	**0**	**0**	**184.3 acres**	**80,825 LF**	**3,250 stems**	**0.25 acre**	**14.86 acre**	**20 acres**	**2 acre**	**0.40 acre**

*State Listed **Federal Listed ***State and Federal Listed

American River

Up to 11 miles of intermittent erosion repair work (a combination of bank protection and launchable rock trench) is proposed under Alternative 1 (Plate 7). This work would occur over a 7 year period likely from May through October when birds are likely to be nesting. Once the project is authorized and funded, site-specific surveys of the project areas would occur. These surveys would evaluate the baseline conditions of vegetation prior to the start of construction, refine what mitigation is required based on those conditions, and determine if birds or other potentially impacted wildlife 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.

The estimated acreage of impacts shown in Table 14 above was determined by overlaying the largest possible footprint of the proposed erosion repair work onto aerial photographs of the study area and calculating the habitat within the footprint. Additionally, the habitat maps included in Appendix B were reviewed to determine what other habitat types such as wetlands might be present. Much of this habitat contains riparian and oak woodland trees that have been in the Parkway for 50 to 100 years or more. The Parkway is the largest remaining riparian corridor in Sacramento. However, the Parkway Plan allows for flood control activities to be conducted in order to pass 160,000 cfs through the system. Policy 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.*

The erosion protection work proposed under Alternative 1 would be consistent with the policies in the Parkway Plan. Policy 4.16 of the Parkway Plan, as described in the Existing Conditions discussion above, establishes that erosion control projects should 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." During the preconstruction engineering and design phase of the project, the Corps would evaluate each stretch of levee on a site-specific basis, including the potential environmental effects and the site's hydraulic conditions, in order to determine the appropriate measure (bank protection or launchable rock trench) to implement.

The Corps is proposing a combination of bank protection measures and launchable rock trench measures to address the need for erosion protection. Each of these measures would involve the removal of riparian vegetation during construction, however the habitat removed under each measure provides different types of habitat values; in areas where bank protection is constructed, SRA habitat would be impacted and proposed mitigation measures would focus on replacing this habitat. In areas where launchable rock trench is constructed, upland riparian forest, oak woodland, and ruderal herbaceous habitat could be impacted and the proposed mitigation measures would focus on replacing these habitat types. The impacts associated with each of these measures are discussed more in the subsections below.

Launchable Rock Trench

The construction of the launchable rock trenches would result in the removal of a maximum of 65 acres of riparian habitats within the American River Parkway. This acreage is based on areas where either a launchable rock trench or bank protection could occur; therefore based on site-specific design, it is likely to be refined to less acreage prior to construction. Most of the 65 acres of riparian habitats is located on land designated by the Parkway Plan as Protected Areas or Nature Study Area. The Corps would mitigate for the loss of this 65 acres of riparian habitat by planting the surface of the launchable rock trench with approved riparian vegetation, and by restoring other nearby habitat areas within the Parkway. Locations of other habitat restoration sites within the Parkway would be determined through coordination with County Parks. All on-site and off-site restoration work would be designed in coordination with County Parks.

Any trees planted would take many years to mature to the level where 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 short term impact is considered significant for the temporal loss of riparian habitat. However, with the implementation of the proposed mitigation measures, the long-term impact would be less than significant, once newly planted vegetation is established.

In addition to the 65 acres of riparian habitat, construction would occur on an additional 135 acres of ruderal herbaceous habitats within the Parkway. These additional 135 acres are primarily the levees, patrol roads, and open lands with no trees. These disturbed areas would be restored following construction and would be reseeded with native grasses. As a result, the impacts to these areas would be less than significant, with mitigation.

Additionally, under the launchable rock trench scenario there is approximately 0.4 acre of wetland that could be removed by the project in ARN Reach B and ARS Reach A. However, if bank protection is the appropriate measure for these two locations, then these impacts would not occur. Prior to construction of a launchable rock trench at these locations, a wetland delineation would be conducted to confirm the potential impact. If the wetlands are removed for project construction, then appropriate compensation would occur through the purchase of credits at an approved mitigation bank. With the implementation of this mitigation, effects to wetlands would be less than significant.

Bank Protection

The construction of the bank protection measure would result in impacts to a maximum of 31,000 linear feet of SRA habitat. This estimate is based on areas where either bank protection or launchable rock trench could occur; therefore, based on site-specific designs, this is likely to be refined to a smaller impact prior to construction. The vegetation impacts from bank protection construction would primarily involve the removal of grasses and shrubby vegetation. Large trees would be protected in place during construction. Bank protection sites would be designed to be self mitigating through the installation of a waterside planting berm on the site.

The Corps conducted an analysis of potential bank habitat effects using the Standard Assessment Methodology (SAM) model. SAM results show that plantings in the berm would be expected to provide similar or better habitat values for salmonid species over time compared to the existing condition. More information on the methodology used for the SAM analysis and the results of the analysis are included in Section 3.8 and Appendix G.

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 short term impact is considered significant for the temporal loss of riparian habitat. However, with the implementation of the proposed mitigation measures, the long-term impact would be less than significant, once newly planted vegetation is established.

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 approximately 50,000 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 Mitigation Measures Section, trees would be planted off-site to replace those removed for construction. The removal of these trees is considered a short term significant impact, because it would take many years for the replacement trees to establish to the value of those removed. However, once the replacement trees are established, the long term impact would be less than significant.

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. These trees compose approximately 2 acres of oak woodland habitat on NEMDC, and approximately 10.5 acres of riparian on Arcade Creek. 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 a short term significant impact because new plantings would take many years to grow to the value of those removed. However, once the new plantings are established, the long term effect is expected to be less than significant. Effects to vernal pools at Magpie Creek are discussed in Section 3.8.

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 (Recommended Plan)

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, effects 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. A summary of the total vegetation impacts estimated for Alternative 2 are shown in Table 15 below.

Table 15. Vegetation Impacts for ARCF GRR – Alternative 2.

	GGS Upland ***	GGS Aquatic ***	Riparian **	SRA Habitat ***	Elderberry Shrubs**	Vernal Pools**	Shallow Water**	Green Sturgeon Benthic**	Oak Woodland*	Wetlands
American River North										
Reach A (American River)			22 acres	19,000 LF	284 stems					
Reach B (American River)			0.5 acre		183 stems					0.05 acre
Reach C (American River & NEMDC)									1 acre	
Reach D (Arcade Creek)			6 acres							
Reach E (Arcade Creek)			4.5 acres							
Reach F (NEMDC)									1 acre	
Reach G (Dry/Robla Creek)	*No Measures Proposed*									
Reach H (Dry Robla Creek)	*Na Measures Proposed*									
Reach I (Magpie Creek)						0.25 acre				
American River South										
Reach A (American River)			37 acres	6,850 LF	1,437 stems					0.35 acre
Reach B (American River)			2 acres	875 LF	1,144 stems					
Reach C (American River)			N/A	3,800 LF	81 stems					
Reach D (Sacramento River)			10.6 acres	9,200 LF	163 stems		5.67 acre			
Reach E (Sacramento River)			6.2 acres	8,850 LF	N/A		4.44 acre			
Reach F (Sacramento River)			41.6 acres	21,100 LF	N/A		3.88 acre			
Reach G (Sacramento River)			12.2 acres	11,150 LF	N/A		0.87 acre			
Sacramento Weir and Bypass	30 acres	15 acres	8 acres	1,500 LF						See GGS Aquatic
TOTAL (Alt 2)	**30 acres**	**15 acres**	**150.6 acres**	**82,325 LF**	**3,250 stems**	**0.25 acre**	**14.86 acre**	**20 acres**	**2 acre**	**0.40 acre**

*State Listed **Federal Listed ***State and Federal Listed

169

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. The land could also become an expansion of the Sacramento Bypass Wildlife Area. Long-term O&M of the expanded bypass is expected to be the same as the current Sacramento Bypass. No grading or altering of the lands within the existing bypass will occur as part of the alternative. The expanded bypass will be graded to ensure that water flows naturally with the existing drainage 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.

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. Because the riparian habitat would be permanently lost in the footprint of the new weir, this would be considered a significant impact. 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). Impacts to GGS habitat from the removal of farm ditches and drainage canals are discussed in Section 3.8.

3.6.6 Mitigation Measures

Mitigation measures are similar for both Alternatives 1 and 2 since the impacts for these two alternatives are similar, 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.

After construction of the flood risk management features is completed, the direct effects to non-native grasslands, shrubs, and trees providing poor habitat for wildlife would be compensated by planting/seeding a mixture of native grasses and forbs along the slopes of levees covered with rock only, in open areas next to the levees, and at borrow and staging areas. Soil inoculants contain important spores, mycelium, and mycorrhizal root fragments, which could be added to soils before seeding. Temporary irrigation for the planting installation and following three-year plant establishment period would be provided. The native mixture would provide good habitat for wildlife and their root masses controls erosion better than what non-native mixes would do. Native trees would be planted to replace the invasive ones in accordance with its plant community type. The mitigation seeding and plantings would be monitored during the plant establishment period for success. To the extent possible, mowing and other related levee O&M activities would be timed to avoid significant effects to fish and wildlife including Federally and State-listed species per the time frames stipulated in the Biological Opinions (Appendix J). Limited use of approved herbicides such as 2,4-D could be applied in non-wetland areas. A minimum of a 70-foot buffer to open water is recommended even for wetland-approved herbicides. Care would be taken to minimize drift and potential contamination of wetlands by applying spray treatments to calm, non-windy days.

Appendix I includes the project's Habitat Mitigation, Monitoring, and Adaptive Management Plan (HMMAMP). The purpose of this HMMAMP is to present conceptual mitigation proposals, establish performance standards, and outline adaptive management tasks and costs. Additionally, the project relied heavily on the Habitat Evaluation Procedures (HEP) for the *American River Watershed Investigation, Common Features Modifications, Mayhew Drain Site Project* in order to create a baseline condition for habitat quality within the study area. Using this HEP, the Corps conducted a cost effectiveness/incremental cost analysis (CE/ICA), which is also included in Appendix I. The CE/ICA evaluated five options for habitat mitigation to determine the most cost effective and government best buy options for habitat restoration. These options included conducting all mitigation on-site, conducting all mitigation at a mitigation bank, a combination of on-site and off-site (bank) mitigation (recommended plan), conducting all mitigation at a 1:1 ratio, and conducting all mitigation at a 3:1 ratio. The recommended mitigation plan is the Alternative 2 Combination Plan with a 2:1 ratio, because it is the smallest mitigation proposal that accomplishes the terms and conditions of the Biological Opinions, and the CE/ICA determined that it was a cost effective plan. Further information on proposed habitat mitigation can be found in Appendix I and in the subsections below.

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 a maximum of 65 acres of riparian habitat, approximately 130 acres of replacement habitat would be created to account for the temporal loss of habitat while newly created habitat is growing. 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. 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 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 Sacramento area where riparian trees were removed, including the ARCF WRDA 1996 and 1999 authorized projects, coordination with USFWS under the Fish and Wildlife Coordination Act, and local plans and policies. 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 agencies would be needed during site-specific designs. Lands within the extended Sacramento Bypass could be used to compensate for some of the landside trees being removed. 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, 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 16 acres would be needed to compensate for the removal of the vegetation along the Sacramento River and within the new weir footprint, due to the temporal loss of habitat while the new habitat is establishing. Plantings could be accomplished within the expanded bypass, other nearby available lands, or through the purchase of credits at an approved mitigation bank. 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
- Federal Wild and Scenic Rivers 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 16 below.

Table 16. 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

Common Name	Scientific Name	Origin
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
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 17).

Table 17. Summary of Reach-Specific SRA Analysis.

American River		Sacramento River	
Reach	**Linear Feet (lf) of SRA**	**Reach**	**Linear Feet (lf) of SRA**
ARN A	19,000	D	9,200
ARS A	6,850	E	8,850
ARS B	875	F	21,100
ARS C	3,800	G	11,150
Total	30,525	Total	50,300

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 2006).

The Lower American River is also a designated Wild and Scenic River under both the State and Federal Wild and Scenic Rivers Acts. The anadromous fisheries resources along the Lower American River are one of the designated extraordinary values of the river under this Act.

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 16). 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 G);
- Google Earth;
- Published and unpublished reports; and,
- A field survey on October 26, 2007.

Significance Criteria

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, no vegetation variance would be acquired and full compliance with ETL 1110-2-583 would be required, including the removal of all waterside vegetation, which would significantly impact fish species due to the lack of SRA habitat. The LMA would still address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However 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.

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, which would substantially reduce fish 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. Given the nature of emergency clean-up activities, it is likely that implementation of BMPs and measures to reduce effects on fish would not be possible, and the populations may drop below self-sustaining levels.

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 and eventually cause the levee to fail. 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

The following subsections describe potential effects to fisheries associated with construction of Alternative 1. Under Alternative 1, long-term O&M is expected to continue similar to current practices, as described in Section 2.3.4. There would be no effects to fisheries associated with long-term project O&M.

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.

Nonnative species cause substantial predation mortality on native species. Studies at Clifton Court Forebay estimated predator-related mortality of hatchery-reared fall-run Chinook salmon from about 60% to more than 95%. Although the predation contribution to mortality is uncertain, the estimated mortality suggests that striped bass and other predatory fish, primarily nonnative, pose a threat to juvenile Chinook salmon moving downstream, especially where the stream channel has been altered from natural conditions including at rock revetment sites (DWR 1995). Predators such as striped bass, largemouth bass, and catfish also prey on delta smelt, splittail (USFWS 1996) and possibly longfin smelt. The extent that predation may affect delta smelt is unknown. Predation effects on green sturgeon are unknown.

In an ongoing SRBPP long-term aquatic monitoring fish sampling and habitat characterization report, boat electrofishing was used to document fish presence and estimated index abundance at three different site types: 1) Mitigated Repair Sites (i.e., post-2006 emergency levee repair sites that incorporate habitat mitigation features; n = 11 sites), 2) Unmitigated Repair Sites (i.e., Unmitigated type of levee repair sites that generally consist of rock revetment without additional habitat enhancement; n=4 sites), and 3) Naturalized Sites (i.e., natural bank sites that are not currently have no rock revetment, and are dominated by native riparian or emergent vegetation; n=7 sites) (Corps 2012). Monitoring at these sites allowed the Corps to compare the efficacy of the habitat improvements incorporated into Mitigated Repair Sites to that of non-mitigated repair designs associated with Unmitigated Repair Sites, as well as to non-engineered conditions at Naturalized Sites. Based on analysis of a combined dataset, predator abundance is higher at all Mitigated Repair Sites than at Naturalized Sites, yet among repair sites, predators abundance is lowest at 10:1 Slope/Bench sites, the design type occupied by higher abundances of juvenile Chinook salmon. Highest predator abundance, as documented previously based on single-year analysis in 2011 and 2012, was found at Wetland Trench sites, those locations where Chinook salmon juveniles were least likely to be observed during field sampling. It is unclear whether this is a result of predator-prey interaction or attributable to differences in habitat preference between juvenile Chinook salmon and piscivores. Intermediate predation risk (based on predator abundance) was found at No Bench Repair sites (Corps 2012).

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 are less than 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. Because the long-term condition of the river is expected to recover and provide improved habitat for fish species, the project would not conflict with the extraordinary fisheries designation for the American River under the Federal Wild and Scenic Rivers Act.

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 are not considered structural fixes, 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.

Construction of the proposed measures 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.

Increased sedimentation and turbidity as a result of program construction activities may affect fish behavior by influencing spawning, feeding, or migratory behavior. The survival to emergence of fertilized salmonid eggs decreases with increased sedimentation (Shapovalov and Taft 1954, Cordone and Kelley 1961, Bjornn and Reiser 1991). Sedimentation could, therefore, reduce the quantity of available spawning habitat. However, little spawning habitat is located within the program area and is instead mostly upstream. The amount of habitat for juvenile fish (particularly salmonids) may decrease as sediment settles and fills in spaces between larger cobbles and boulders that are normally used for refuge (Cordone and Kelley 1961, Bjornn and Reiser 1991). Easily accessible invertebrate prey normally found on rocks may be replaced by burrowing organisms, reducing the amount of prey for juvenile salmonids (Bjornn and Reiser 1991). This effect is most relevant to areas upstream of the study area but, nevertheless, could be locally important within the study area.

Program construction may increase turbidity in the adjacent water bodies. Short-term periods of higher turbidity generally do not affect larger juveniles and adults (Cordone and Kelley 1961). For smaller juvenile salmonids, increased turbidity may result in decreased growth because of reduced visual foraging ability and earlier emigration from a water body (Sigler et al. 1984). Smaller size at emigration may increase vulnerability to predation. Migrating adult salmonids may avoid highly turbid water and may not be able to access suitable spawning habitat. For example, Cordone and Kelley (1961: 195) cite studies documenting avoidance of turbid Yuba River waters by migrating Chinook salmon adults; the movement of the salmon into a small tributary of the Yuba River led to considerable disturbance of previously constructed redds (nests) by subsequent spawners because the number of spawners exceeded the amount of habitat.

Increased construction-related suspended sediments may produce a variety of behavioral and physiological effects in salmonids. Newcombe and Jensen (1996) noted that concentration and duration of exposure were of importance in determining effects and modeled response exposure in terms of behavioral effects (ranging from an alarm reaction to avoidance), sublethal effects (ranging from short-term reductions in feeding success to long-term reductions in feeding success), and lethal or paralethal effects (ranging from reduced growth/feeding/density to 80–100% mortality). For adult and juvenile salmonids, Newcombe and Jensen calculated that for a very short-term exposure (1 hour), sublethal effects began at around 20 mg/l (milligrams per liter) of suspended solids and lethal/paralethal effects began at around 20,000 mg/l.

Direct and indirect effects related to increases in sedimentation, suspended solids, and turbidity would be significant, but would be adequately mitigated to a level that is less than significant with the implementation of BMPs discussed in Water Quality (Section 3.5). These BMPs include the Basin Plan turbidity thresholds, which provides that, where ambient turbidity is between 5 and 50 NTUs, projects would not increase turbidity on the Sacramento or American River by more than 20 percent above the ambient conditions.

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.

Proposed measures 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. These 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).

Proposed measures 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. These 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 (Recommended Plan)

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.

Long-term O&M of the new weir and bypass is expected to be consistent with current O&M actions in the existing weir and bypass. However, as design and operation of the new weir and bypass are refined during PED, some changes could occur. If any changes to O&M requirements occur, they would be evaluated to determine if there would be an associated impact, and if those impacts different from what is disclosed in this EIS/EIR, then supplemental NEPA analysis may occur. Indirect effects associated with the Sacramento Weir and Bypass Widening 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.

Currently, the primary input to the Yolo Bypass during storm events is through Fremont Weir in the north, which conveys floodwaters from the Sacramento and Feather Rivers (DWR 2010). The Fremont Weir discharges to the Yolo Bypass on average every two years. During intermittent major storm events additional water enters from the east via the Sacramento Weir and Bypass, adding flow from the American and Sacramento rivers. The last time this occurred was in 2006 and before that in 1997-1998 (USGS 2015). Very little, if anything, is known about the fish passage through the Sacramento Bypass during its infrequent inundation. Most, if not all, fish passage monitoring and research occurs on the Yolo Bypass adjacent to the Sacramento Bypass. When the Sacramento Bypass is operational, there is sufficient flow for fish passage through the Sacramento Bypass to the Yolo Bypass (Schlunegger, personal communication). Studies done on the Yolo Bypass suggest that fish would move into the floodplain during high-flow events and spread throughout the broad expanse of seasonally inundated habitat (Sommer et al. 2005). Similar if not equal habitat in the Sacramento Bypass exists which would suggest that during the infrequent times that the Sacramento Bypass is flooded fish would move through and into the Yolo Bypass. Existing sloping in the Sacramento Bypass is towards the southern levee toe drain. Sloping and grading of the bypass expansion will be determined in the preconstruction, engineering, and design (PED) phase with considerations for fish passage and elimination of stranding features.

Although results suggest that several measures of habitat quality may be better for young salmon in the Yolo Bypass, floodplain habitat carries risks from avian predation and stranding when water levels drop. Some predation occurs as a result of wading birds such as egrets and herons; however these birds are unlikely to have a major population effect as the densities of wading birds are typically low relative to the thousands of hectares of available fish rearing habitat (Sommer et al 2001). The relative importance of stranding mortality is difficult to evaluate because the number of salmon emigrating from the Sacramento River and its tributaries is unknown, despite substantial monitoring efforts by several agencies. After floodwaters recede, the basin empties through the Toe Drain. The floodplain is exceptionally well-drained because of grading for agriculture, which likely helps promote successful emigration of young salmon (Sommer et al. 2001).

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 within the Sacramento Bypass, 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 Mitigation Measures

All 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 general estimated work window of August 1 through November 30. For the purpose of this study however, during PED, the work window will be adjusted on a site specific basis taking into account periods of low fish abundance, and in-water construction 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 G. 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. Table 18 below summarizes the special status species that are addressed in this document, including their status, their general habitat requirements, and their potential to occur in the study area.

Table 18. Special Status Species with the Potential to Occur in the Study Area.

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Invertebrates				
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.
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.
Reptiles				
Giant Garter Snake	*Thamnophis gigas*	Federal/State Threatened	Rivers, Streams, Marshes, Ricefields	May occur in small canals adjacent to levees or in rice fields.
Birds				
Western Yellow-Billed Cuckoo	*Coccyzus americanus occidentalis*	Federal Threatened	Riparian forests with dense deciduous trees and shrubs	Unlikely to occur in the study area.
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.
White-tailed Kite	*Elanus leucurus*	State Fully Protected	Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging.	Known to occur in the study area.

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Purple Martin	*Progne subis*	State Species of Concern	Nests in abandoned woodpecker holes in oaks, cottonwoods, and other deciduous trees in a variety of wooded and riparian habitats. Also nests in vertical drainage holes under elevated freeways and highway bridges.	May occur in the study area.
Fish				
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 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.
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.
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.

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Longfin Smelt	*Spirinchus thaleichthys*	State Threatened	Requires cold, pure freshwater to pure seawater, spawns in freshwater.	Occurs in the Sacramento River below Isleton.
Sacramento splittail	*Pogonichthys macralepidotus*	State species of special concern	Spawning takes place among submerged and flooded vegetation in sloughs and the lower reaches of rivers.	Occurs in the Yolo Bypass when flooded during spawning
Hardhead	*Mylopharodon conocephalus*	State species of special concern	Reside in low to mid-elevation streams and prefer clear, deep pools and runs with slow velocities.	Occurs in the Sacramento and American Rivers.
River lamprey	*Lampetra ayresi*	State species of special concern	Adults live in the ocean and migrate into fresh water to spawn. Juveniles rear in freshwater.	Occurs in the Sacramento and American Rivers.
Plants				
Sanford's Arrowhead	*Sagittaria sanfordii*	California Native Plant Society Rare Plant List	Assorted shallow freshwater marshes and swamps; generally occurs in standing or slow-moving freshwater ponds, marshes, ditches, and sloughs from 0 to 2,000 feet in elevation. Blooms May–October.	Known to occur in Arcade Creek
Wooly Rose-mallow	*Hibiscus lasiocarpos*	California Native Plant Society Rare Plant List	Freshwater marshes and swamps, generally found on wetted river banks and low peat islands in sloughs; known from the Delta watershed, also recorded in riprap on levee slopes, from 0 to 390 feet in elevation. Blooms June–November.	May occur in the study area.

191

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.

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).

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.

Western Yellow-Billed Cuckoo

Western yellow-billed cuckoo is Federally listed as threatened. The cuckoo is typically found in riparian forests with dense deciduous trees and shrubs. Over the last 100 years, western cuckoo population declined dramatically due to extensive loss of suitable breeding habitat, primarily riparian forests and associated bottomlands dominated by willow (Salix spp.), cottonwood (Populus spp.), or mesquite (Prosopis spp.) (Gaines and Laymon 1984, Laymon and Halterman 1987, Hughes 1999, Halterman et al. 2001). Once considered a common breeder in California, by 1940 the Yellow-billed Cuckoo suffered severe population reduction and by 1987 was estimated to occupy only 30 percent of its historical range (Laymon and Halterman 1987).

Nesting usually occurs between late June and late July, but can begin as early as late May and continue until late September (Hughes 1999). Nests consist of a loose platform of twigs, which are built by both sexes and take one to two days to build (Hughes 1999), though occasionally the nest of another species is used (Jay 1911, Bent 1940, Payne 2005).

There are no recent CNDDB occurrences in the vicinity of the action area, but migrant individuals are likely to pass through the area in transit to breeding sites along the Sacramento River north of Colusa. Cuckoos are unlikely to occur in the study area, although potential dispersal and foraging habitat is present in the American River Parkway and along the Sacramento River.

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. Foraging habitat within the study area could include the levee slopes, and any staging areas, borrow sites, or disposal sites. 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.

Burrowing Owl

Western burrowing owls are a California species of special concern and are protected under the MBTA. Western burrowing owls were formerly a common permanent resident throughout much of California, but population declines became noticeable by the 1940s and have continued to the present. Farming has taken a major toll on western burrowing owl populations and their habitat by destroying nesting burrows and exposing breeders and their young to the toxic effects of pesticides (Haug et al. 1993).

Western burrowing owls prefer open, dry, short grassland habitats with few trees and are often associated with burrowing mammals such as California ground squirrels. They occupy burrows, typically abandoned by ground squirrels or other burrowing mammals, but could also use artificial burrows such as abandoned pipes, culverts, and debris piles (CDFG 1995; Haug et al. 1993). Prey includes arthropods, amphibians, small reptiles, small mammals, and birds, particularly horned larks (Haug et al. 1993).

The breeding season usually extends from late February through August. Western burrowing owls often nest in roadside embankments, on levees, and along irrigation canals. This species is more diurnal than most owls and can often be observed during the day standing outside the entrance to its burrow (Haug et al. 1993).

There are numerous nesting occurrences within 10 miles of the study area. Within the study area, burrowing owls could nest in areas with non-native grasslands intermixed with barren ground, such as in some portions of the American River Parkway and the East Side Tributaries. Additionally, the staging areas, borrow sites, and disposal sites could include potential nesting habitat for burrowing owl. The levees provide suitable nesting habitat where ground squirrel burrows are present and open areas near suitable nesting habitat provide suitable foraging habitat. All levee reaches within the study area have potential to support nesting and foraging of this species.

White-Tailed Kite

The white-tailed kite is protected under the MBTA and is a fully protected species under the California Fish and Game Code. White-tailed kites were threatened with extinction in North America during the early 20th century. Populations recovered throughout its range in the United States from small populations that survived in California, Texas, and Florida. However, since the 1980s, many white-tailed kite populations have been declining, apparently because of loss of habitat and increased disturbance of nests (Dunk 1995).

The breeding season generally extends from early February through early August. White-tailed kites usually nest in large native trees, although non-native trees also are occasionally used. Nest trees are generally at the edge of wooded habitat next to open fields. Large trees in areas that have been developed may also be used, although the trees need to be close to open fields for foraging (Dunk 1995). White-tailed kites feed primarily on small mammals including voles, pocket mice, and harvest mice.

CNDDB (2013) records indicate white-tailed kite nesting occurrences within 10 miles of the study area. Large trees in and adjacent to the study area provide suitable nesting habitat, and agricultural fields and other open areas provide suitable foraging habitat. All levee reaches in the study area provide suitable nesting and foraging habitat for this species.

Purple Martin

Purple martin is a California species of special concern. This species breeds locally along the eastern slopes of the Cascade Mountains of California south to extreme southwestern California. The species winters in South America in lowlands east of the Andes south to northern Argentina (rarely) and southern Brazil. Purple martin is the largest swallow in North America and among the largest in the world. These martins inhabit montane forest or Pacific lowlands, restricted to areas with dead snags

containing woodpecker holes, generally patchy and local in occurrence. This species is reported to typically avoid deserts and grasslands (Brown 1997).

Purple martins are diurnal, aerial feeder that feed on insects at higher elevations than other swallows, sometimes up to 490 feet. Because of the height of foraging, individuals are rarely observed foraging, with the exception being late afternoons and near dusk when birds feed low and close to nest sites. The species presumably ranges over areas immediately surrounding nest site, although there is no information on typical travel distance while foraging. Cold, rainy weather in spring forces purple martins, especially migrants, to feed low over ponds and lakes, apparently in pursuit of aquatic insects along water surface (Brown 1997).

Suitable nesting habitat for this species occurs in the riparian forest and woodland areas throughout the study area. The nearest CNDDB (2009) occurrence for this species is for a colony nesting in weep holes under the I-5 Freeway overpass at I Street within 1 mile of the Sacramento River. It is estimated that between 21 to 29 pairs of purple martins nest at this location. Numerous other occurrences are reported within a 10-mile radius for colonies nesting under freeway or street overpasses (CNDDB 2013).

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 (Table 19). 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). The peak period of juvenile emigration through the ARCF GRR study area into the Delta generally occurs between January and April (NMFS 1997) (Table 19). Differences in peak emigration periods between these two locations suggest that juvenile winter-run Chinook salmon may exhibit a sustained residence in the upper or middle reaches of the Sacramento River before entering the lower Sacramento River and the Delta. 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.

Juvenile emigration (downstream migration) past the Red Bluff Diversion Dam (RM 242) begins in late July, peaks during September, and may extend through mid-March (NMFS 1997). The peak period of juvenile emigration through the lower Sacramento River and the project area into the Delta generally occurs between January and April (NMFS 1997) (Table 19). Differences in peak emigration periods between these two locations suggest that juvenile winter-run Chinook salmon may exhibit a sustained residence in the upper or middle reaches of the Sacramento River before entering the lower Sacramento River and the Delta. Although the location and extent of rearing in these lower or middle reaches is unknown, it is believed that the duration of fry presence in an area is directly related to the magnitude of river flows during the rearing period (Stevens 1989). 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.

Table 19. Assumed Life Stage Timing and Distribution of Special Status Fish Species.

Life Stage	Distribution	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Late Fall–Run Chinook Salmon													
Adult Migration	SF Bay to Upper Sac River and Tributaries	■	■	■	■						■	■	■
Spawning	Upper Sacramento River and Tributaries	■	■	■	■								
Egg Incubation	Upper Sacramento River and Tributaries	■	■	■	■	■							
Juvenile Rearing (Natal Stream)	Upper Sacramento River and Tributaries	■	■	■	■	■	■	■	■	■	■	■	■
Smolt Outmigration	Sacramento River and tributaries, Delta	■	■	■	■	■						■	■
Juvenile Movement and Rearing	Upper Sacramento River and Tributaries	■	■	■	■	■	■	■	■	■	■	■	■
Fall-Run Chinook Salmon													
Adult Migration and Holding	SF Bay to Upper Sacramento River and Tributaries						■	■	■	■	■	■	■
Spawning[1]	Upper Sacramento River and Tributaries									■	■	■	■
Egg Incubation[1]	Upper Sacramento River and Tributaries	■	■								■	■	■
Juvenile Rearing (Natal Stream)	Upper Sacramento River and Tributaries	■	■	■								■	■
Smolt Outmigration	Sacramento River and tributaries, Delta			■	■	■	■	■					
Juvenile Movement	Upper Sacramento River and Tributaries to SF Bay		■	■	■	■	■						
Spring-Run Chinook Salmon													
Adult Migration and Holding	SF Bay to Upper Sacramento River and Tributaries			■	■	■	■	■	■	■			
Spawning	Upper Sacramento River and Tributaries								■	■	■		
Egg Incubation	Upper Sacramento River and Tributaries								■	■	■	■	■
Juvenile Rearing (Natal Stream)	Upper Sacramento River and Tributaries	■	■	■	■	■	■	■	■	■	■	■	■
Smolt Outmigration	Sacramento River and tributaries, Delta	■	■	■	■	■	■					■	■
Juvenile Movement	Upper Sacramento River and Tributaries to SF Bay	■	■	■								■	■
Winter-Run Chinook Salmon													
Adult Migration and Holding	SF Bay to Upper Sacramento River	■	■	■	■	■	■						■
Spawning	Upper Sacramento River				■	■	■	■	■				
Egg Incubation	Upper Sacramento River				■	■	■	■	■	■	■		
Juvenile Rearing (Natal Stream)	Upper Sacramento River to SF Bay	■	■	■	■	■		■	■	■	■	■	■
Smolt Outmigration	Sacramento River and tributaries, Delta	■	■	■						■	■	■	■
Juvenile Movement and Rearing	Upper Sacramento River to SF Bay	■	■	■	■	■	■	■	■	■	■	■	■

Life Stage	Distribution	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Central Valley Steelhead													
Adult Migration	SF Bay to Upper Sacramento River and Tributaries	■	■					■	■	■	■	■	■
Spawning	Upper Sacramento River and Tributaries	■	■	■	■								■
Egg Incubation	Upper Sacramento River and Tributaries	■	■	■	■	■	■	■	■				■
Juvenile Rearing	Upper Sacramento River and Tributaries to SF Bay	■	■	■	■	■	■	■	■	■	■	■	■
Smolt Outmigration	Sacramento River and tributaries, Delta	■	■	■	■	■							■
Juvenile Movement	Upper Sacramento River and Tributaries to SF Bay	■	■	■	■	■	■	■	■				■
Delta Smelt													
Adult Migration	Delta	■	■	■	■	■			■	■	■	■	■
Spawning]	Delta, Suisun Marsh	■	■	■	■	■	■						
Larval and Early Juvenile Rearing	Delta, Suisun Marsh	■	■	■	■	■	■						■
Estuarine Rearing: Juveniles/Adults	Lower Delta, Suisun Bay	■	■	■	■	■	■	■	■	■	■	■	■
Green Sturgeon													
Adult Migration	Delta to Upper Sacramento River and Tributaries		■	■	■	■	■	■					
Spawning	Upper Sacramento River and Tributaries				■	■	■	■					
Egg Incubation	Upper Sacramento River and Tributaries				■	■	■	■	■				
Juvenile Movement and Rearing	Sacramento River and Tributaries to SF Bay	■	■	■	■	■	■	■	■	■	■	■	■

Notes: SF Bay = San Francisco Bay.

[1] Spawning and incubation occurs from October to February in the Feather, American, and Mokelumne Rivers

Sources: Brown 1991; Wang and Brown 1993; U.S. Fish and Wildlife Service 1996; McEwan 2001; Moyle 2002; Hallock 1989; U.S. Army Corps of Engineers 2006.

200

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 through the ARCF GRR study area (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).

A small portion of an annual year-class of juvenile spring-run Chinook salmon may emigrate as post-emergent fry (less than 1.8 inches long) and reside in the Delta undergoing smoltification. However, most are believed to rear in the upper river and tributaries during winter and spring, emigrating as juveniles (more than 1.8 inches long). The timing of juvenile emigration from the spawning and rearing reaches can vary depending on tributary of origin and can occur from November through June through the ARCF GRR study area (Table 19). Rearing takes place in their natal streams, the mainstem of the Sacramento River, inundated floodplains (including the Sutter and Yolo bypasses), and the Delta. 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 through the ARCF GRR study area 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) (Table 19).

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 through the ARCF GRR study area 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) (Table 19).

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).

Central Valley steelhead occur in the ARCF GRR study area, either as adults migrating upstream to their spawning habitat, or as juveniles rearing and migrating toward the ocean. Juvenile steelhead tend to use bank habitat more frequently than the main channel, because bank habitat provides increased protection, shade, and food.

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) (Table 19). 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 and potential presence in the ARCF GRR study area from April through mid-May (Moyle 2002) (Table 19). 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 in the upper Sacramento River and lower Feather River outside of the ARCF GRR study area (Table 19). 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 juvenile rearing green sturgeon. Green sturgeon juveniles have been salvaged at the State and Federal fish collection facilities in every month, indicating that they are present in the Delta and possibly in the lower Sacramento River within the project area year-round (Table 19). 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, including through the ARCF GRR study area; 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.

Sanford's Arrowhead

Sanford's Arrowhead is listed on the California Native Plant Society's rare plants list. It occurs in shallow, standing, fresh water and sluggish waterways within marshes, swamps, ponds, vernal pools and lakes, reservoirs, sloughs, ditches, canals, streams and rivers at elevations from 10 to 2,000 feet. It typically flowers from late May to October.

There is one documented occurrence of Sanford's arrowhead in the Arcade Creek channel, between Norwood Avenue and the railroad bridge to the west (CNDDB 2015). This species was also observed in a seasonal wetland located along the waterside of the east NEMDC levee.

Wooly Rose-Mallow

Wooly rose-mallow is listed on the California Native Plant Society's rare plants list. Wooly Rose Mallow is an upright, hairy perennial. Its preferred habitat is moist roadside ditches, wet fields and moist disturbed sites from 0 to 390 feet in elevation. It typically flowers from June to November. This species is known to occur in the Delta watershed, and has been previously recorded growing in riprap on levee slopes south of the study area.

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, review of existing documentation, coordination with USFWS and NMFS, and the use of the Standard Assessment Methodology (SAM) model. 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.

The SAM analysis was conducted at a feasibility level of design; specific project designs will be developed under a future PED phase. In the absence of more specific designs, this SAM analysis was developed using a set of "reasonable worst-case" parameters. The parameters were developed by evaluating the applicability of past levee repair designs to the project reaches. Past levee repairs were conducted under the SRBPP within each of the sub-reaches (Corps 2008, Corps 2013). A Vegetation Variance Request (VVR) was assumed to be in place for the Sacramento and American River reaches. The Corps will attempt to obtain an ETL-approved vegetation variance exempting the Sacramento River sites from vegetation removal in the lower third of the waterside of the levee prior to final construction and design phase. The Corps will be complying with the ETL on the American River via a SWIF. The VVR is not assumed to apply to the Sacramento Bypass. Appendix B of the ARCF GRR BA includes the SAM report and the results from the SAM modeling.

Basis of Significance

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

- Substantial 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.
- Substantial 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 project would not be constructed and the area would continue to be at risk of flooding due to levee failure. The LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system However, 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. 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, which could eventually cause a levee break. The timeframe for which the berms would erode is unknown because it is impossible to determine how much water will pass through the system or predict potential future 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, critical habitat would be lost, including SRA habitat, 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 could result in significant direct effects to listed species, including mortality, long-term habitat loss, or lack of reproductive success.

All of these effects would be considered significant; however, given the uncertainty of the occurrence or magnitude of such an event, potential effects on special status species 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 and 50 shrubs were located along the Sacramento River. 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 10 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 dormant. 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.

Operation and Maintenance

As part of long-term O&M, elderberry shrubs will be trimmed by the three levee maintenance districts. Table 20 describes the maximum amount of elderberry acreage that will be trimmed each year as a result of O&M. Trimming consists 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. Up to a third of a shrub will be trimmed in a single season. Trimming will occur between November 1 and March 15. Loss of habitat will be offset through the development of a conservation area designed in accordance with the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle, USFWS, 9 July 1999.* Each year the local maintaining authority will document the amount of valley elderberry longhorn beetle habitat that they have trimmed and report that number to the Corps to ensure compliance with the Biological Opinion (Appendix J). If the local maintaining agency has a need to exceed the amount of valley elderberry longhorn beetle habitat which needs to be trimmed or affected due to routine maintenance then they will request the Corps reinitiate consultation on this biological opinion for those actions. With the implementation of the mitigation discussed above, O&M activities would result in less than significant impacts to VELB.

Table 20. O&M Elderberry Shrub Effects and Compensation.

O&M Agency	Annual Acreage Trimmed[1]	Life of Project Acreage[2]
American River Flood Control District	0.5 acre	25 acres
Maintenance Area 9	0.2 acre	10 acres
City of Sacramento	0.1 acre	5 acres

[1] Acreage was estimated based on a measurement of 0.009-acre per every 1/3rd of a shrub trimmed.

[2] Life of project is estimated to be 50 years.

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 0.25 acre of land within the construction footprint of the new levee and floodwall that could potentially include vernal pool habitat. This 0.25 acre could be adversely affected from ground disturbing activities, operation of construction vehicles, by construction of the new levee and maintenance road, or due to the alteration of the natural flows of the area due to construction of the new levee.

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 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. The proposed project may affect, but is not likely to adversely affect vernal pool fairy shrimp.

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. The proposed project may affect, but is not likely to adversely affect vernal pool fairy shrimp.

Giant Garter Snake

Effects to GGS under Alternative 1 are not likely to result from construction activities along the East Side Tributaries. The East Side Tributaries (NEMDC, Magpie Creek, and Arcade Creek) have some potential 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 above a pump plant located on the NEMDC just above Dry/Robla Creek. Additionally, Arcade Creek and NEMDC both have segments that include large cover vegetation that would make them undesirable for GGS.

As such, 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. With the implementation of the avoidance and minimization measures, and post construction site restoration, the project actions may affect but are unlikely to adversely affect giant garter snakes. Additionally, construction would occur between May 1 and October 1 during the snake's active season, which minimizes impacts to the species due to activities occurring at a time when the snakes are capable of moving away from construction on their own, rather than during their hibernation period. 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.

Western Yellow-Billed Cuckoo

The project area is unlikely to support western yellow-billed cuckoo nesting habitat due to the narrow riparian corridors along the waterways, with the exception of the American River Parkway. However, migrant individuals are likely to pass through the area in transit to breeding sites along the Sacramento River north of Colusa. Overall, cuckoos are unlikely to occur in the action area, although potential dispersal and foraging habitat is present.

Prior to construction, surveys would be conducted to determine the presence of cuckoos within the project area in accordance with any required USFWS survey protocols and permits at the time of construction. If cuckoos are determined to be present, there is the potential for short term, temporary impacts during construction from dust, noise, and vibration. However, since construction would occur in the summer months when the cuckoo is nesting (June 1 through September 30), and cuckoos are unlikely to be nesting in the study area, these activities would not adversely effect the species.

Potential long-term effects to the cuckoo could result from the loss of 65 acres of riparian habitat in the footprint of the rock trench sites within the American River Parkway. For the American River, impacts to trees would be the width of the launchable rock trenches (currently proposed at approximately 40-feet wide) for a total of approximately 65 acres. This habitat is suitable nesting habitat for the yellow-billed cuckoo due to the significant width of the riparian corridor along the American River Parkway, ranging from approximately 75 feet in some of the more narrow stretches to over 1,000 feet in other locations, however there are no records of the cuckoo nesting in this area. The Corps would compensate for riparian vegetation removed as a result of construction within the Parkway and on-site to the maximum extent practicable. There would remain a significant temporal loss of riparian habitat for the cuckoo during their migration, however in time it is anticipated that with the implementation of the compensation proposed by the Corps, the riparian corridor would recover and would provide a suitable level of habitat for the cuckoo long-term.

Additionally, approximately 110 acres of riparian habitat would be impacted along the Sacramento River; however the Sacramento River's riparian corridor is very narrow (approximately 100 feet wide in most locations) and would not likely provide quality habitat for the cuckoo, who require a minimum of 20 hectares of riparian corridor to nest. However, they are expected to use this area as a migration corridor.

Short term effects to Western yellow-billed cuckoo under Alternative 1 would be significant, due to the temporal loss of nesting habitat along the waterways while the new trees grow at the mitigation sites. However, with the implementation of compensation for the loss of nesting trees, when the new plantings reach the same habitat values as the trees removed as part of construction, the long term effects would be less than significant.

Swainson's Hawks

It is estimated that approximately 175 acres of riparian habitat used by Swainson's hawk for roosting and nesting could be affected by project construction, consistent with the discussion for Western yellow-billed cuckoo above. 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. Additional acreages of Swainson's hawk foraging habitat could be impacted in the project's staging areas, borrow sites, and disposal sites. Much of this habitat is within the Sacramento urban area, where Swainson's hawks nest and forage along the American and Sacramento Rivers. 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. Short term effects to Swainson's hawks under Alternative 1 would be significant, due to the temporal loss of nesting habitat along the waterways while the new trees grow at the mitigation sites. However, with the implementation of compensation for the loss of nesting trees, when the new plantings reach the same habitat values as the trees removed as part of construction, the long term effects would be less than significant.

Burrowing Owl

Construction activities, including grading and clearing activities within or adjacent to potential burrowing owl habitat, could result in nesting failure, death of nestlings, or loss of eggs. 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. Additional acreages of burrowing owl nesting

habitat could be impacted in the project's staging areas, borrow sites, and disposal sites. However, with the implementation of the mitigation measures discussed in Section 3.8.6 below, construction activities would result in less than significant impacts to burrowing owls.

During post-construction levee maintenance activities and maintenance of mitigation plantings, there could be indirect effects to burrowing owls. Driving on dirt roads in close proximity to habitat could disturb the owl due to vibration and dust. However, O&M activities following construction are expected to be consistent with existing O&M practices, so any impacts would likely be consistent with the existing condition. Additionally, these activities would be short-term and the resulting impacts would be temporary and less than significant.

White-Tailed Kite

Construction activities conducted during nesting season, including vegetation removal, could significantly impact the white-tailed kite by removing nesting habitat or causing the species to abandon any active nests. In addition, the short-term loss of approximately 175 acres of riparian habitat on the landside of the levees that could support white-tailed kite nesting and foraging could result in significant effects to this species. With the implementation of the mitigation measures discussed in Section 3.8.6 below, construction activities would result in less than significant impacts to white-tailed kites.

O&M activities following construction could cause noise and physical disturbance to white-tailed kites. However, O&M activities following construction are expected to be consistent with existing O&M practices, so any impacts would likely be consistent with the existing condition. Additionally, these activities would be short-term and the resulting impacts would be temporary and less than significant.

Purple Martin

Construction activities conducted during nesting season, including vegetation removal, could significantly impact the purple martin by removing nesting habitat or causing the species to abandon any active nests. In addition, the short-term loss of approximately 175 acres of riparian habitat on the landside of the levees that could support purple martin nesting and foraging could result in significant effects to this species. With the implementation of the mitigation measures discussed in Section 3.8.6 below, construction activities would result in less than significant impacts to purple martins.

O&M activities following construction could cause noise disturbance and physical disturbance to purple martins. However, O&M activities following construction are expected to be consistent with existing O&M practices, so any impacts would likely be consistent with the existing condition. Additionally, these activities would be short-term and the resulting impacts would be temporary and less than significant.

Winter-Run Chinook Salmon

Construction would occur on approximately 80,000 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 11 through 13). 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. Physical damage or harassment to listed fish species would be low during the months of construction. Adults will not sustain any physical damage due to construction because their size, preference for deep water, and their crepuscular migratory behavior will enable them to avoid most temporary, nearshore disturbance that occurs during typical daylight construction hours. For the purpose of this study restricting in-water activities to an 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. For the purpose of this study however, during PED the work window will be adjusted on a site specific basis taking into account presence of juvenile and adult winter-run Chinook salmon as well as any other condition that could impact rearing and migration.

Winter-run Chinook salmon are expected to show a long term positive response to project actions in the Sacramento River and American River SAM analysis reaches over the lifetime of the project when both IWM and planted benches are incorporated into the with-project conditions. Chinook salmon should exhibit a positive response by year 5 in the winter-spring when most juvenile Chinook salmon are expected in the ARCF GRR project area. Short term habitat deficits are expected within the recommended recovery period for Chinook salmon. Winter-run Chinook salmon are expected to show a small long term negative response to project actions in the Sacramento Bypass SAM analysis reach over the lifetime of the project. Winter-run Chinook salmon should exhibit a negative response by year 1. Short term and long term negative values will result from the loss of aquatic vegetation and over hanging shade at fall/summer/winter/spring habitat conditions during and after the construction of the extension to the Sacramento Bypass Weir (See Appendix B of the ARCF GRR BA for a more detailed analysis).

The study 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 11 through 13 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. Under the ESA, due to the short-term effects during construction, project activities may affect and are likely to adversely effect winter-run Chinook salmon.



Figure 11. Planting Site 4L on the American River after Bank Protection in 2001.



Figure 12. Planting Site 4L on the American River after Bank Protection in 2005.



Figure 13. 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.

With respect to Spring-run Chinook salmon, the SAM analysis is expected to show a long term positive response to project actions in the Sacramento River and American River SAM analysis reaches over the lifetime of the project when both IWM and planted benches are incorporated into the with-project conditions. Chinook salmon should exhibit a positive response by year 5 in the winter-spring when most juvenile Chinook salmon are expected in the ARCF GRR project area. Short term habitat deficits are expected within the recommended recovery period for Chinook salmon. Spring-run Chinook salmon are expected to show a minor long term negative response to project actions in the Sacramento Bypass SAM analysis reach over the lifetime of the project. Spring-run Chinook salmon should exhibit a negative response by year 1. Short term and long term negative values will result from the loss of aquatic vegetation and over hanging shade at fall/summer/winter/spring habitat conditions during and after the construction of the extension to the Sacramento Bypass Weir (See Appendix B of the ARCF GRR BA for a more detailed analysis).

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 less than significant. For the purpose of this study however, during PED the work window will be adjusted on a site specific basis taking into account presence of juvenile and adult spring-run Chinook salmon as well as any other condition that could impact rearing and migration. 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 are expected to show a long term positive response to project actions in the Sacramento River and American River SAM analysis reaches over the lifetime of the project when both IWM and planted benches are incorporated into the with-project conditions. Chinook salmon should exhibit a positive response by year 5 in the winter-spring when most juvenile Chinook salmon are expected in the ARCF GRR project area. Short term habitat deficits are expected within the recommended recovery period for Chinook salmon. (See Appendix B of the ARCF GRR BA for

detailed analysis). Fall-/Late-Fall-run Chinook salmon are expected to show a small long term negative response to project actions in the Sacramento Bypass SAM analysis reach over the lifetime of the project. Fall-/Late Fall-run Chinook salmon should exhibit a negative response by year 1. Short term and long term negative values will result from the loss of aquatic vegetation and over hanging shade at fall/summer/winter/spring habitat conditions during and after the construction of the extension to the Sacramento Bypass Weir (See Appendix B of the ARCF GRR BA for a more detailed analysis).

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 habitat. 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.

Steelhead are expected to show a long term positive response to project actions in the Sacramento River and American River SAM analysis reaches over the lifetime of the project. Steelhead should exhibit a positive response by year 4 in the winter-spring when most juvenile steelhead will be migrating and rearing through the project area. Short term habitat deficits are expected within the recommended recovery period for steelhead. Steelhead are expected to show a small long term negative response to project actions in the Sacramento Bypass SAM analysis reach over the lifetime of the project. Steelhead should exhibit a negative response by year 1. Short term and long term negative SAM values will result from the loss of aquatic vegetation and over hanging shade at fall/summer/winter/spring habitat conditions during and after the construction of the extension to the

Sacramento Bypass Weir (See Appendix B of the ARCF GRR BA for a more detailed analysis). 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, which will be taken into consideration when determining a general estimated time of a August 1 through November 30 work window. For the purpose of this study however, during PED the work window will be adjusted on a site specific basis taking into account presence of juvenile and adult steelhead as well as any other condition that could impact steelhead spawning, rearing, and migration; 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.

Green Sturgeon

Potential project effects that may affect, and are 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 to adult green sturgeon would be minimized during construction.

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.

SRBPP onsite mitigative features were designed to maximize habitat response for salmonid species. SAM values for green sturgeon generally indicate a negative response or no response to typical onsite mitigative features. Green sturgeon are expected to show long term negative response to project actions in the Sacramento River SAM analysis reach for several life stages at all seasonal habitat conditions over the lifetime of the project because the construction of these features would remove benthic feeding habitat for sturgeon. SRBPP onsite mitigative features were designed to maximize habitat response for salmonid species; green sturgeon will exhibit a negative response for juvenile rearing in the summer/fall to these onsite mitigative features. However, during the winter/spring green sturgeon juvenile rearing life stages will exhibit a positive response to these onsite mitigative features (See Appendix B of the ARCF GRR BA for a more detailed analysis).

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.

Due to these adverse effects to juvenile green sturgeon, the Corps is proposing to adaptively manage the project in a number of ways in order to minimize impacts to this species. In particular, preconstruction physical modeling is proposed to assist in determining potential methods of implementing the proposed measures to minimize impacts to salmon. Additionally, new habitat modeling is proposed to better define what those impacts may be. Monitoring would be conducted during and post-construction in order to confirm the impacts estimated to result from the project, and to allow for improvement in minimizing impacts for future construction throughout the estimated 10 year construction period. With the implementation of this process, which is described in more detail in the Habitat Mitigation and Monitoring Plan (Appendix I), the direct and indirect effects to green sturgeon would be reduced to less than significant with mitigation.

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 a general estimated work window between August 1 and November 30. During PED, the work window will be adjusted on a site specific basis taking into account presence of juvenile and adult delta smelt as well as any other condition that could impact delta smelt rearing and migration..

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.

The Corps conducted an analysis of existing shallow water habitat in the ARCF GRR project area, and the effect of the proposed project on that habitat. The results of this analysis are included as Appendix C to the Biological Assessment (AppendixG). This analysis was based on a cross section geometry with the assumption that the sediment or sand will be converted to rock revetment. The conclusion of the analysis was that approximately 14 acres of shallow water habitat would be permanently lost as a result of implementation of the ARCF GRR with 32 acres of spawning habitat being affected by a long-term change in substrate from sand to rock. The footprint could be minimized as site-specific designs are developed during the PED phase of the project.

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 a general estimated work window betweenAugust 1 and November 30. For the purpose of this study however, during PED, the work window will be adjusted on a site specific basis taking into account presence of juvenile and adult delta smelt as well as any other condition that could impact delta smelt rearing and migration.

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 proposed alternative may affect, and is likely to adversely effect the Delta smelt during construction. However, with the implementation of appropriate mitigation and compensation measures, as discussed below, these impacts would be less than significant.

Sanford's Arrowhead

Sanford's arrowhead is known to occur in the Arcade Creek and NEMDC channels. Levee work in these reaches is proposed to remain within the levee prism and would not encroach into the channel; therefore, construction activities in this reach would not result in direct impacts to Sanford's arrowhead. Indirect effects to Sanford's arrowhead could occur during construction due to dust disturbance. However, the mitigation measures proposed in the air quality section (Section 3.11.6) would reduce this impact to less than significant. Long-term O&M activities would likely be confined to the levees and would not encroach on any wetlands or the creek channels. As a result, no effects are expected to occur to Sanford's arrowhead from long-term O&M of the proposed measures. Additional avoidance and minimization measures to reduce any potential impacts to this species are described in Section 3.8.6 below. With the implementation of these measures, effects to Sanford's arrowhead would be less than significant.

Wooly Rose-Mallow

There are no known populations of wooly rose-mallow in the study area, however since they are known to occur on levee banks with riprap, they could potentially be adversely impacted by construction of the proposed project. Clearing and grubbing of the levee slopes, and some long-term O&M activities, such as mowing of the levees, could also remove populations of this plant, if present. Avoidance and minimization measures to reduce the potentially significant effects to this species are described in Section 3.8.6 below. With the implementation of these measures, effects to wooly rose-mallow would be less than significant.

3.8.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)

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. Listed species that would have reduced affects by the implementation of Alternative 2 include VELB, purple martin, white-tailed kite, 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 purple martins, white-tailed kites, and Swainson's hawks would be reduced from 123 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, 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 15 acres of aquatic GGS habitat (drainage ditches and farm canals) would be permanently removed 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 bypass widening is complete. 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. If on-site restoration is not possible, then credits would be purchased at a Service-approved mitigation bank.

Assumptions regarding operation of the new weir and bypass for the purposes of this study are discussed in Section 2.3.4, but would likely be refined during the design phase of the project. 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 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 Area. As a result, impacts to GGS associated with the bypass widening would be less than significant, with the implementation of the mitigation and compensation 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 intermittent flooding of the bypass 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.

Widening of the weir and bypass will increase the entrainment and stranding exposure and rates of juvenile green sturgeon. When the weir is overtopping and water is flowing down the bypass, adult fish are attracted to the flow and follow it upstream in an attempt to reach their holding and spawning habitat. Widening the weir and bypass would increase the amount of water going over the weir and increase the attraction rate of sturgeon, salmon and steelhead. Without fish passage in place, the stranding rates of these fish would increase. This is significant, especially for sturgeon. Population viability modeling, funded in part by the Corps, concluded that without the fish rescue that took place, the loss of the green sturgeon stranded behind the Fremont and Tisdale weirs in 2012 would have significantly reduced the viability the species and increased their extinction risk. The Sacramento Weir poses a similar risk and widening the weir would add to the effect. Given that green sturgeon are long-lived species that have the strongest upstream migration and cohort replacement rates during wet water years and especially after high river flow conditions, the effect of the stranding occurring only two to three times over a 50 year period could be significant. Implementation of the mitigation measures discussed below, including ensuring fish passage and positive drainage in the Sacramento Bypass, would reduce these adverse effects to less than significant. However, the widening of the Sacramento Weir and Bypass may affect, and is likely to adversely effect the green sturgeon.

3.8.6 Mitigation Measures

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

Appendix I includes the project's Habitat Mitigation, Monitoring, and Adaptive Management Plan. The purpose of this HMMAMP is to present conceptual mitigation proposals, establish performance standards, and outline adaptive management tasks and costs. Additionally, the project relied heavily on the Habitat Evaluation Procedures (HEP) for the *American River Watershed Investigation, Common Features Modifications, Mayhew Drain Site Project* in order to create a baseline condition for habitat quality within the study area. Using this HEP, the Corps conducted a cost effectiveness/incremental cost analysis (CE/ICA), which is also included in Appendix I. The CE/ICA evaluated five options for habitat mitigation to determine the most cost effective and government best buy options for habitat restoration. These options included conducting all mitigation on-site, conducting all mitigation at a mitigation bank, a combination of on-site and off-site (bank) mitigation (recommended plan), conducting all mitigation at a 1:1 ratio, and conducting all mitigation at a 3:1 ratio. The recommended mitigation plan is the Alternative 2 Combination Plan with a 2:1 ratio, because it is the smallest mitigation proposal that accomplishes the terms and conditions of the Biological Opinions, and the CE/ICA determined that it was a cost effective plan. Further information on proposed habitat mitigation can be found in Appendix I and in the subsections below.

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.

Table 21. 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 22. 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-elderberries	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

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 21 and 22 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.

The following is a summary of measures that would be implemented during construction 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 as shown in Tables 21 and 22.

- 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 compensation would be planted in the American River Parkway. The Corps has six existing sites which are offsetting previous Corps flood control projects along the lower American River and near Folsom Dam. The Corps will find areas within the lower American River parkway which will either expand existing compensation areas or provide for connectivity between conserved valley elderberry longhorn beetle habitat. Sites within the Parkway will be coordinated with County Parks and the Service during the design phase of

the project. Sites will be designed and developed prior to any effects to valley elderberry longhorn beetle habitat. The Corps will create 69.91 acres of riparian habitat which supports valley elderberry longhorn beetle within the lower American River parkway.

- 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.

Vernal Pool Fairy Shrimp and Tadpole Shrimp

The following measures from the 2004 Biological Opinion from the Magpie Creek Flood Control Project would be implemented to avoid and minimize impacts to potential vernal pools in the vicinity of the Magpie Creek construction area:

- Preservation component: For every acre of habitat directly or indirectly affected, at least two vernal pool credits will be dedicated within a Service-approved ecosystem preservation bank or, based on Service evaluation of site-specific conservation values, three acres of vernal pool habitat may be preserved on the project site or another nonbank site as approved by the Service.
- Creation component: For every acre of habitat directly affected, at least one vernal pool creation credit will be dedicated within a Service-approved habitat creation bank or, based on Service evaluation of site-specific conservation values, two acres of vernal pool habitat will be created and monitored on the project site or another non-bank site as approved by the Service.
- Listed vernal pool crustacean habitat and associated uplands utilized as on-site compensation will be protected from adverse effects and managed in perpetuity or until the Corps, the applicant, and the Service agree on a process to exchange such areas for credits within a Service-approved conservation banking system. Off-site conservation at a Service-approved non-bank location will be protected and managed in perpetuity through a Service-

approved conservation easement, Service-approved management plan, and a sufficient endowment fund to manage the site in perpetuity in accordance with the management plan.

- If habitat is avoided (preserved) on site, then a Service-approved biologist (monitor) will inspect 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 will have the authority to stop all activities that may result in such take or destruction until appropriate corrective measures have been completed. The biologist also will be required to immediately report any unauthorized impacts to the Service and the California Department of Fish and Game.
- Adequate fencing will be placed and maintained around any avoided (preserved) vernal pool habitat to prevent impacts from vehicles.
- All on-site construction personnel will receive instruction regarding the presence of listed species and the importance of avoiding impacts to these species and their habitat.
- The applicant will ensure that activities that are inconsistent with the maintenance of the suitability of remaining habitat and associated on-site watershed are prohibited. This includes, but is not limited to: (i) alteration of existing topography or any other alteration or uses for any purposes, including the exploration for or development of mineral extraction; (ii) placement of any new structures on these parcels; (iii) dumping, burning, and/or burying of rubbish, garbage, or any other wastes or fill materials; (iv) building of any new roads or trails; (v) killing, removal, alteration, or replacement of any existing native vegetation; (vi) placement of storm water drains; (vii) fire protection activities not required to protect existing structures at the project site; and (viii) use of pesticides or other toxic chemicals.

The proposed project will result in 0.25 acre of indirect effects to vernal pools/swales of potentially suitable vernal pool shrimp and vernal pool tadpole shrimp habitat. The applicant has identified and agreed to purchase 0.5 vernal pool preservation credits at a Service-approved conservation bank or Service-approved fund. Credits will be purchased prior to the effect on any vernal pool habitat. The agreed upon conservation responsibilities of the applicant are as follows:

- Prior to any earth-moving activities at the proposed project site, the applicant shall purchase at least 0.5 vernal pool preservation credits within a Service-approved ecosystem preservation bank or fund account.

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 to 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.
- Habitat temporarily affected for more than three or more seasons will be restored and twice as much habitat will be created.
- The Corps has estimated that approximately 15 acres of aquatic habitat (drainage ditches and irrigation canals) and 30 acres of associated upland habitat would be permanently affected due to the widening of the Sacramento Weir and Bypass. Habitat permanently affected in the Sacramento Bypass will be compensated for through the purchase of 135 acres of credits at a USFWS-approved conservation bank. Due to the spatial and temporal loss of habitat, and the lack of permanent on-site replacement, the ecological value associated with doing all mitigation at an off-site location was reduced to an overall 70% habitat value. This reduction is offset by the increase of mitigation credits at ratios specified by USFWS in the Biological Opinion included as Appendix J.
- One year of monitoring will be conducted for the 80.5 acres that are temporarily affected.
- The Corps will purchase credits at a conservation bank prior to any permanent disturbance of giant garter snake habitat.

Western Yellow-Billed Cuckoo, Swainson's Hawk, White-Tailed Kite, and Purple Martin

To avoid and minimize effects to migratory birds, 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.
- 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 migratory birds 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 Western yellow-billed cuckoos, Swainson's hawks, and other migratory birds approximately 268 acres of replacement habitat will be created, as discussed in the vegetation and wildlife section (Section 3.6.6). Due to the temporal loss of habitat while new on site habitat is growing, the ecological value associated with onsite mitigation was reduced to an overall 80% habitat value. This reduction is offset by the increase of mitigation credits at ratios specified by USFWS and NMFS in the Biological Opinions.

Some areas that may be considered for riparian mitigation include 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 County Parks and would 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.

Burrowing Owl

The following avoidance and minimization measures would be implemented to reduce the potential for adverse effects to burrowing owl:

- Prior to the implementation of construction, surveys will be conducted to determine the presence of burrows or signs of burrowing owl presence within the project area. The survey would be conducted in accordance with Appendix D of CDFW's Staff Report on Burrowing Owl Mitigation (CDFG 2012).
- If burrowing owls are observed, coordination would occur with CDFW to determine the appropriate actions to take or any additional avoidance and minimization measures that may need to occur. These measures may include creating a protective buffer around occupied burrows during the duration of the breeding season and biological monitoring of active burrows to ensure that construction activities do not result in adverse effects on nesting burrowing owls.

- If potential burrows are present, all on-site construction personnel shall be instructed regarded the potential presence of burrowing owls, identification of these owls and their habitat, and the importance of minimizing impacts on burrowing owls and their habitat.

Listed Fish Species

The Corps proposes to develop a green sturgeon habitat, mitigation, and monitoring plan (HMMP) in the design phase of the project to address the long-term negative impacts to green sturgeon designated critical habitat with the specific elements that are described below:

- The green sturgeon HMMP shall be developed in coordination with the Interagency Ecological Program (IEP) green sturgeon project work team and consulted on with NMFS prior to the construction of any work within the designated critical habitat of sDPS green sturgeon related to the ARCF GRR.
- The Corps shall either refine the SAM or develop an alternative green sturgeon survival and growth response model based on using and updating the existing Hydrologic Engineering Center Ecosystem Function Model (HEC-EFM) that reflects green sturgeon's preference for benthic habitat.
- The green sturgeon HMMP shall also be developed with measurable objectives for completely offsetting all adverse impacts to all life stages of sDPS green sturgeon (as modeled using refined approaches described above and considering design refinements that occur in the PED phase of project implementation.
- The HMMP shall also, restore or compensate for the number of acres of soft bottom benthic substrate for sDPS green sturgeon permanently lost to project construction. This mitigation shall be coordinated with the Interagency Working Group (IWG) or a Bank Protection Working Group (BPWG) and must be carried out within the lower Sacramento River/North Delta in order to offset the adverse modification to designated critical habitat.
- Mitigation actions shall be initiated prior to the construction activities affecting sDPS green sturgeon and their critical habitat.
- The sDPS green sturgeon HMMP will include measurable performance standards at agreed upon intervals and will be monitored for a period of at least ten years following construction.

The following additional conservation measures would be implemented to reduce the adverse effects to listed Chinook, steelhead, delta smelt, and green sturgeon:

- In-water construction activities (e.g., placement of rock revetment) will be limited to the work window of August 1 through November 30. If the Corps wants to work outside of this

window they will consult with USFWS and NMFS.

- The Corps will purchase delta smelt credits from a USFWS-approved conservation bank to off-set the loss of 14 acres of shallow water habitat, and 13 acres of spawning habitat. This mitigation is assumed to occur through the purchase of credits at a mitigation bank due to the lack of available real estate in the study area for on-site mitigation. Due to the spatial and temporal loss of habitat, the ecological value associated with doing all mitigation at an off site location was reduced to an overall 70% habitat value. This reduction is offset by the increase of mitigation credits at ratios specified by USFWS and NMFS in the Biological Opinions. The Corps proposes to purchase a total of 72 credits to ensure that impacts to Delta smelt are fully mitigated.
- Erosion control measures (BMPs), including Storm Water Pollution Prevention Program and Water Pollution Control Program, that minimize soil or sediment from entering the river. BMPs shall be installed, monitored for effectiveness, and maintained throughout construction operations to minimize effects to Federally listed fish and their designated critical habitat.
- Screen any water pump intakes, as specified by NMFS and USFWS screening specifications. Water pumps will maintain an approach velocity of 0.2 feet per second or less when working in areas that may support delta smelt.
- No grading or altering of the lands within the existing Sacramento Bypass will occur as part of the project.
- The Corps shall participate in an existing IWG or work with other agencies to participate in a new BPWG to coordinate stakeholder input into future flood risk reduction actions associated with the ARCF GRR.
- The Corps shall coordinate with NMFS during PED as future flood risk reduction actions are designed to ensure conservation measures are incorporated to the extent practicable and feasible and projects are designed to maximize ecological benefits.
- The Corps shall include as part of the Project, a Riparian Corridor Improvement Plan with the overall goal of maximizing the ecological function and value of the existing levee system within the Sacramento Metropolitan Area.
- The Corps shall develop a HMMP with an overall goal of ensuring the conservation measures achieve a high level of ecological function and value. The HMMP shall include:
    - Specific goals and objectives and a clear strategy for maintaining all of the project conservation elements for the life of the project.

- Measures to be monitored by the Corps for 10 years following construction and shall update their O&M manual to ensure the HMMP is adopted by the local sponsor to ensure the goals and objectives of the conservation measures are met for the life of the project.
- Include specific goals and objectives and a clear strategy for achieving full compensation for all project-related impacts to listed fish species.
- The Corps shall continue to coordinate with NMFS during all phases of construction, implementation, and monitoring by hosting annual meetings and issuing annual reports throughout the construction period as described in the HMMP.
- The Corps shall host an annual meeting and issue annual reports for five years following completion of project construction.

- The Corps shall ensure that, for salmon and steelhead, the maximum SAM WRI deficits for each seasonal water surface elevation as determined appropriate with input from the IWG or the BPWG are fully offset through the purchase of credits at a NMFS approved conservation bank (as described in this BA).
- The Corps shall minimize the removal of existing riparian vegetation and IWM to the maximum extent practicable, and where appropriate, removed IWM will be anchored back into place or if not feasible, new IWM will be anchored in place.
- The Corps shall ensure that the planting of native vegetation will occur as described in the HMMP. All plantings must be provided with the appropriate amount of water to ensure successful establishment.
- The Corps shall provide a copy of the BO, or similar documentation, to the prime contractor, making the prime contractor responsible for implementing all requirements and obligations included in the documents and to educate and inform all other contractors involved in the project as to the requirements of the BO.
- A NMFS-approved Worker Environmental Awareness Training Program for construction personnel shall be conducted by the NMFS-approved biologist for all construction workers prior to the commencement of construction activities. Written documentation of the training will be submitted to NMFS within 30 days of the completion of training.
- The Corps shall consider installing IWM along future flood risk reduction projects associated with the ARCF GRR at 40 to 80 percent shoreline coverage at all seasonal water surface elevations in coordination with the IWG or the BPWG. The purpose is to maximize the refugia and rearing habitats for juvenile fish.
- The Corps shall protect in place all riparian vegetation on the lower waterside slope of any levee unless removal is specifically approved by NMFS.

- The Corps shall develop a Vegetation Variance for all elements of the ARCF GRR that are adjacent to habitat that is occupied by federally listed salmon, steelhead and green sturgeon, including the main channel of the Sacramento River (as proposed) and the Sacramento Bypass.
- The Corps shall ensure the widening of the Sacramento Bypass is designed and constructed to minimize stranding of fish in the depressions wound within the bypass though grading or construction of drainage channels.
- The Corps, in coordination with the local sponsor, shall ensure that the Habitat Mitigation and Monitoring Plan for the Sacramento Bypass includes baseline post-project monitoring of fish stranding. The monitoring plan shall be developed in coordination with NMFS.
- The Corps shall update the O&M manual to incorporate without detrimental effects to flood operations 1) operations of the Sacramento Weir include a plan that allows for ramp down flows in a manner that minimize juvenile fish stranding in the Sacramento Bypass, (2) integration of Sacramento Weir operations with the Yolo Bypass.
- During Preconstruction Engineering and Design, the Corps, in coordination with the local sponsor, shall coordinate with NMFS to provide an operation of the Sacramento Weir to allow without detrimental effects to flood management operations, for controlled ramp down rates of water into the Sacramento Bypass following peak flows.
- Additional mitigative concerns, not considered in a SAM analysis, will be included in the MMP (See Appendix I) along the Sacramento Bypass reach, including potential adult and juvenile passage issues, loss of shoreline riparian vs. gain in floodplain, and contradicting ESA species habitat requirements. These issues will be considered and appropriate actions will be taken where possible in coordination with other agencies.

For SRA habitat impacted by construction, the following measures would be implemented to compensate for the habitat loss:

- Compensation timing refers to the time between the initiation of construction at a particular site and the attainment of the habitat benefits to protected species from designated compensation sites. In general, compensation time is the time required for on-site plantings to provide significant amounts of shade or structural complexity from instream woody material recruitment. Significant long-term benefits have often been considered as appropriate to offset small short-term losses in habitat for listed species in the past, as long as the overall action contributes to recovery of the listed species. The authority to compensate prior to or concurrent with project construction is given under WRDA 1986 (33 United States Code [USC] §§ 2201–2330).

- For identified designated critical habitat, where feasible all efforts will be made to compensate for impacts where they have occurred or in close proximity. Impacts to designated critical habitat, SRA and instream components combined and the compensation value of replacement habitat will be based on the interagency approved Standard Assessment Model (SAM) used throughout the Sacramento River basin and Delta flood control system.
- Compensation sites would be monitored and vegetation would be replaced as necessary based on performance standards in the Mitigation Monitoring Plan (MMP) as detailed in Appendix I of the EIS/EIR.

Depending on the species of interest (e.g., delta smelt), the severity of the short- term habitat losses due to bank erosion repair actions may not be compensated by long-term gains, whereas longer lived species (e.g., steelhead, Chinook) have longer periods for compensation to be provided. The following compensation time periods (based loosely on life expectancy) should be considered as guidelines for compensation:

- Green sturgeon, 15 years;
- Chinook salmon, 5 years;
- Central Valley steelhead, 4 years; and
- Delta smelt, 1 year.

Special Status Plant Species

The following avoidance and minimization measures would be implemented during construction to reduce potentially significant effects to Sanford's arrowhead and wooly rose-mallow to less than significant. Additionally, the avoidance and minimization measures to address invasive plant species in Section 3.6.6 would also reduce potential impacts to special status plant species.

- Preconstruction surveys would be conducted by a qualified botanist in suitable habitat to determine the presence of any special status plants. Surveys would be conducted at an appropriate time of year during which the species are likely to be detected, which would likely be during the blooming period.
- If special status plant species are found during preconstruction surveys, the habitat would be marked or fenced as an avoidance area during construction. A buffer of 25 feet would be established. If a buffer of 25 feet is not possible, the next maximum possible distance would be fenced off as a buffer.

- If special status plant species cannot be avoided during construction, the Corps would coordinate with the resource agencies to determine additional appropriate mitigation measures.

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

Federal

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

State

- CEQA (Public Resources Code § 21000 et seq.)and CEQA Guidelines (14 California Code of Regulations § 15000 et seq.).

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.

National Register of Historic Places Evaluation Criteria

The criteria applied to evaluate properties for listing in the NRHP (36 C.F.R. § 60.4) are outlined below:

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and

(a) That are associated with events that have made a significant contribution to the broad patterns of our history; or

(b) That are associated with the lives of persons significant in our past; or

(c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) That have yielded, or may be likely to yield, information important in prehistory or history.

Meeting one or more of the criteria for eligibility is not enough to determine a resource as eligible for listing in the NRHP. In order to meet eligibility, a resource must have also retained historic integrity of those features necessary to convey its significance (U.S. Department of the Interior 1997). There are seven aspects of integrity: Location, Design, Setting, Materials, Workmanship, Feeling, and Association. Not all aspects of integrity may be relevant to a particular resource.

Area of Potential Effects

For purposes of complying with Section 106 of the NHPA, 54 U.S.C. § 306108, 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." 36 C.F.R. § 800.16(d).

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 are not limited to: physical modification; intrusion to the visual or esthetic characteristics of landscapes or features; or access to a historic property.

The Programmatic Agreement for this undertaking is covers the ARCF GRR project, as well as NLIP Phase 4b EIS/EIR. As a result, the APE identified in the PA covers a different geographic area than is described as the study area in this EIS/EIR. 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. The APE for the overall ARCF Project is shown in Figure 14 and further described in Appendix C. The APE for the ARCF includes areas within the American River Parkway and along Dry Creek and Robla Creek, because it is anticipated that there may be visual or landscape impacts to potential historic properties in those areas.

The Corps has determined and defined the APE in consultation with the State Historic Preservation Officer (SHPO), in letters dated February 1, 2012 and June 12, 2014.

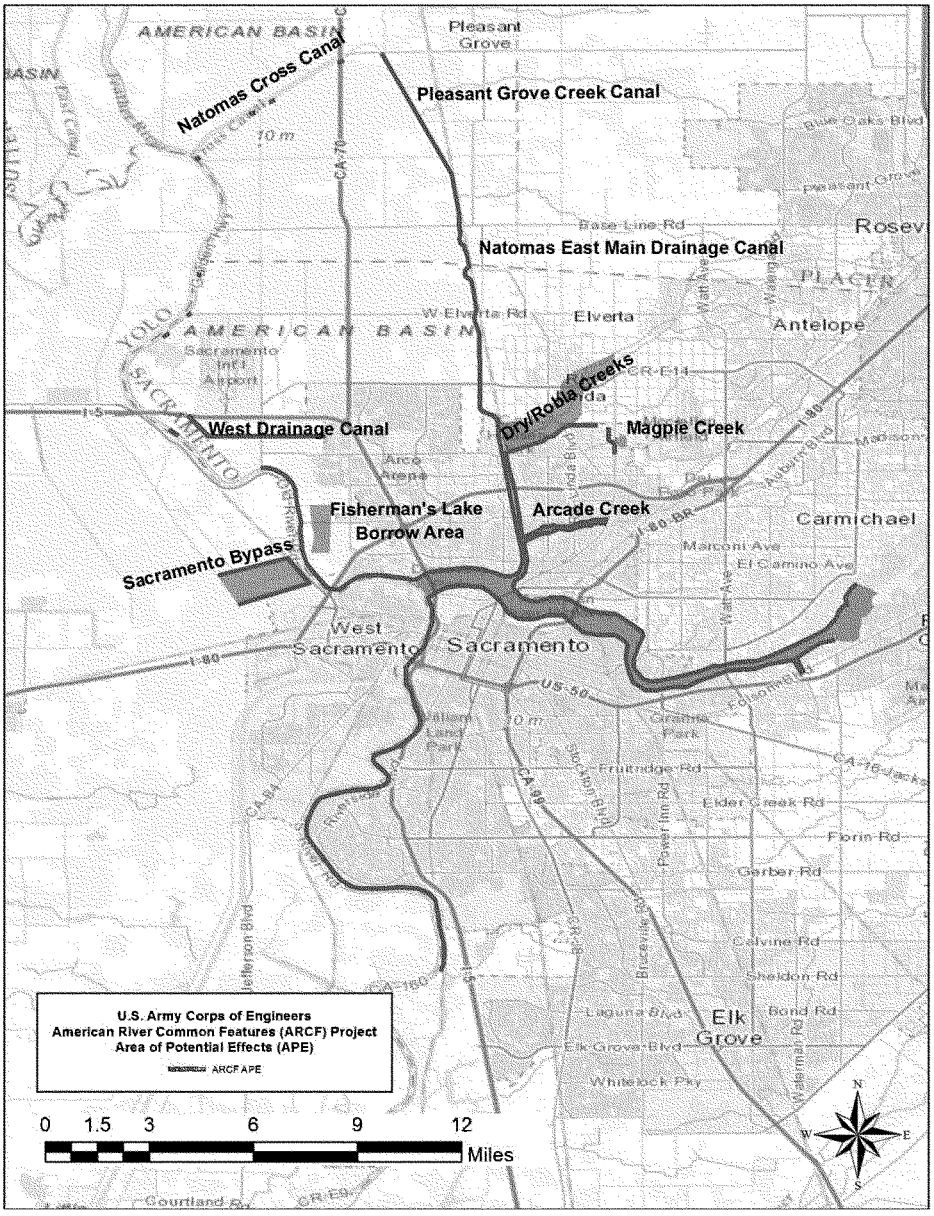


Figure 14. ARCF APE for Compliance with Section 106 of the NHPA.

Environment and Landscape

The ARCF study area is located in the Southern Sacramento River Valley. The Sacramento Valley is a broad, generally flat plane situated between the low mountains of California's Coast Range and the peaks of the Sierra Nevada and Cascade Ranges. The Sacramento Valley comprises the northern half of California's Great Central Valley which includes the San Joaquin River Valley to the south. As the delta formed during the early Holocene, the hydrology of the Sacramento River changed; stream channels filled with sediment and shifted around. By approximately 5000 years before present (BP), the current meander belt of the river was established. Subsequent episodes of erosion, deposition, and stability continued however, with evidence of significant soil deposition associated with large scale floods occurring between 1500 to 1100 BP and 750 to 650 BP.

Historically, the western half of the ARCF study area was dominated by wetlands surrounding patchy riparian habitat along the Sacramento River. To the east, the wetlands gave way to foothill grasslands and limited stands of valley hardwoods, especially oaks. A considerably wider band of riparian habitat bounded the American River, located in much closer proximity to the hardwood forests and groves.

These vegetative zones would have produced varied suites of technological and subsistence resources, plants and game, useful to indigenous populations. In addition, access to permanent sources of water was obviously important to the prehistoric occupants of California. Apart from the basic human need of water for drinking, easy access to fresh water facilitates cooking, the processing of some foods (esp. acorns), and access to aquatic resources including plants, fish, and some birds.

More recently, hydraulic mining during the Gold Rush deposited tremendous volumes of sediment in foothill stream channels. Winter storms in 1861-1862 washed large quantities of these materials into the Sacramento and American Rivers, raising channel beds and causing immense flooding. Subsequent erosion and dredging has deposited much of these mine tailings throughout the floodplain. Modern agricultural practices have also significantly affected the study area. Leveling land for agricultural work destroyed countless mound sites along the river courses, and the native vegetation has been replaced almost entirely by agricultural crops.

Prehistoric and Ethnographic Setting

Well documented prehistoric sites dating from approximately 3,800 to 2,700 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.

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.

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 area (Table 23). This site helped to define late prehistoric chronology of the Nisenan and native occupation over three millennia (Moratto 1984).

Table 23. 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.

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. 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).

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.

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 experienced in the area.

The history of the region is strongly tied to the mining industry and railroads to support mining activities. 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 County region during the historic period. Regional ranching originated on Sutter's New Helvetia rancho near modern day Sacramento 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 by the Corps 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 and 2013 by AECOM Technology Corporation (AECOM).

Previously, in 1990, Far Western conducted surveys of areas along the same route later 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) also performed limited test excavations at 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.

Recent Related Cultural Resources Identification and Treatment in the Project Area

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 AECOM 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, the prehistoric components of seven sites 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 24. 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 24. 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.

Field Surveys

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 at this time. The portions of the study area that have been previously surveyed for cultural resources are shown on Figure 15.

To date, no new surveys have been undertaken for this project. However, surveys will be undertaken as part of the identification efforts, pursuant to a a Programmatic Agreement (PA), which is further described below and in Appendix C. The nature of those surveys will vary and have yet to be determined, but may include intensive pedestrian surveys, subsurface reconnaissance, geoarchaeological studies, and other survey methodologies.

Consultation with Native American Tribes and Identification of Resources

Through consultation with Native American Tribes, several locations within the study area that have been identified as sensitive for the presence of resources and sites that are important to the Tribes. Additional identification efforts, to include continual and ongoing consultation with Native American Tribes, will be conducted as part of compliance with Section 106 of the NHPA, in accordance with the PA (Appendix C).

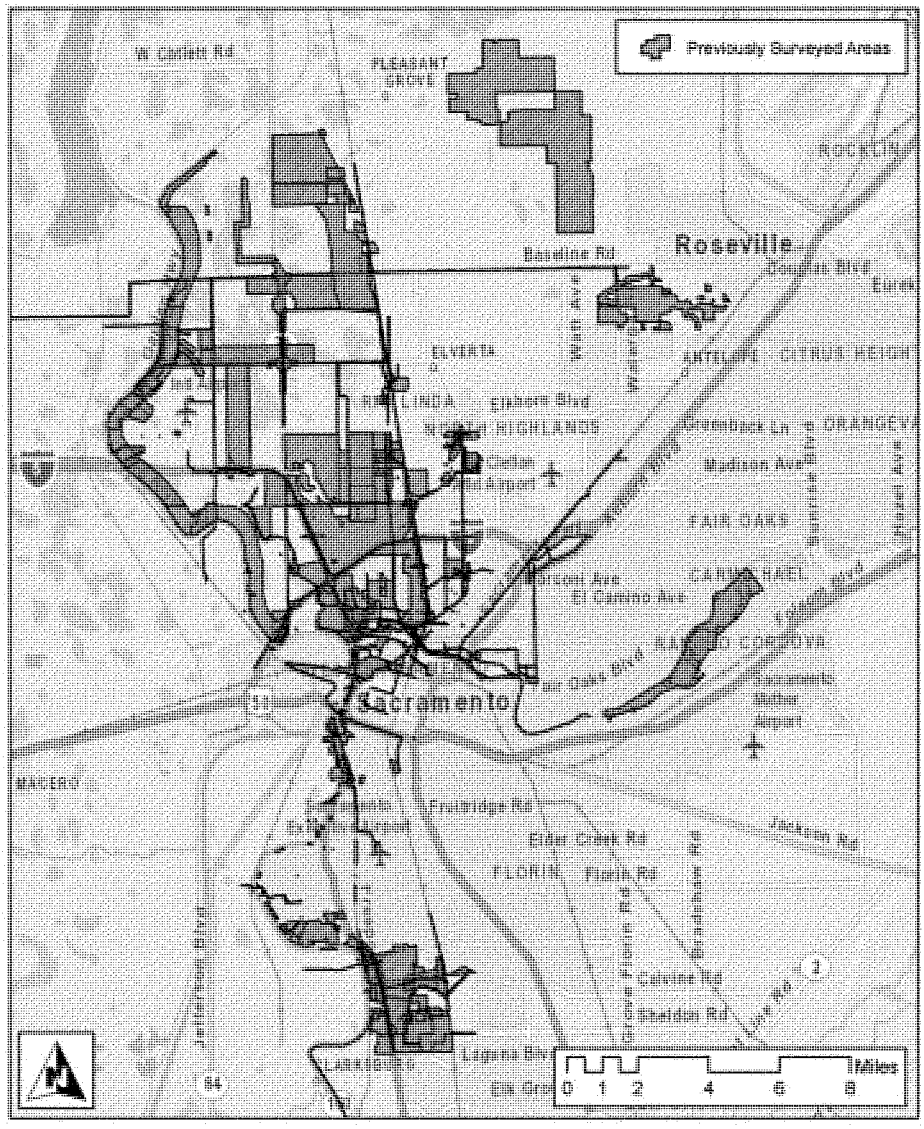


Figure 15. American River Common Features Study Area and Previous Cultural Resource Surveys.

Cultural Resources Site Types

Data from the records and literature search, concerns expressed by Native American Tribes during ongoing consultation efforts, 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 rises or anthropogenic soil buildup 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. 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 a Native American 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 Native Americans. Identification efforts may include background

research, oral history interviews, scientific analysis, and field investigations.

- **Traditional Cultural Landscapes –** As described by the Advisory Council on Historic Preservation (ACHP), the term "traditional cultural landscape" has not been formally defined by the National Park Service. Although there is no single defining feature or set of features that comprise a traditional cultural landscape, such places could be comprised of natural features such as mountains, caves, plateaus, and outcroppings; water courses and bodies such as rivers, streams, lakes, bays, and inlets; views and view sheds from them, including the overlook or similar locations; vegetation that contributes to significance; and manmade features including archeological sites, buildings and structures, circulation features such as trails, land use patterns, evidence of cultural traditions, such as petroglyphs, evidence of burial practices, and markers or monuments, such as cairns, sleeping circles, and geoglyphs.
- **Historic Debris** – This term may refer to a 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, infrastructure construction, mining, 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 that shelter human activity. 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.

Human Remains

Human remains may be encountered within the study area. In the event that human remains are discovered, the CVFPB and landowner shall ensure that Native American human remains and grave goods that are located on state or private land are treated in accordance with the requirements of California State Health and Safety Code, Section 7050.5 and Public Resources Code 5097.98.

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 records 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 Native American Tribes, 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. Due to the large geographic scope of the project, the lack of detailed designs to determine construction specific APEs, and limitations in available funding to complete full identification of potential historic properties prior to approval of the project, 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 PA has been developed by the Corps in consultation with the SHPO, the ACHP, and Native American tribes with concerns in the area as potential Concurring Parties. The PA covers the ARCF Project, as well as segments of NLIP not previously completed. The PA provides a process for the identification and evaluation of historic properties and, if necessary, the resolution of adverse effects to identified historic properties. The PA also provides a process for handling post-review discoveries. Per the PA, all Corps construction activities will avoid archaeological sites/historic properties, both eligible and non-eligible, to the maximum extent practicable. Per the PA, all Corps construction activities will avoid historic properties to the maximum extent practicable.

The draft PA was provided to the California Department of Water Resources (DWR) and the CVFPB on April 11, 2012 and February 22, 2013, and to SAFCA on February 12, 2013, and potentially interested Native Americans on April 5, 2013, June 6, 2013, June 12, 2014, and June 25, 2014 for review and comment as part of the development of the PA. The final PA, executed by signature by the Corps and the SHPO on September 10, 2015, is appended to this EIS/EIR (Appendix C).

3.9.2 Methodology and Basis of Significance

Methodology

Analysis of impacts was based on evaluation of the potential 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. It is only when a cultural resource is determined to be a historic property that the Federal agency is required to make a determination of effect for the undertaking. 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.

For the ARCF Project, the PA is the means by which the Corps will comply with Section 106. The PA includes stipulations that outline the process to identify cultural resources, evaluate cultural resources for their eligibility for inclusion in the NRHP, determine possible effects to historic properties, and, if necessary, mitigate effects to historic properties resulting from implementation of the project.

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 14 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.
- Cause a substantial adverse change in the significance of a historic property through the physical demolition, destruction, relocation, or alteration of the historic property of its immediate surroundings such that the significance of the resource would be materially impaired.

Under California law, effects to a historical resource or unique archaeological resource are considered to be adverse if they:

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

3.9.3 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 LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However 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. 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. In addition, there would be no direct effects to potential historic properties as a result of construction if the project is not built. 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 could threaten the integrity of those resources that may be historic properties. 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, any evaluation of the significance of the effect would be merely speculative .

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 EIS/EIR, 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 25 and the general levee fix site locations (American River, Sacramento River, East Side Tributaries) that would impact each resource are indicated as well. In Table 28, Primary refers to a cultural resource site's assigned identification number. In California, nearly all identified cultural resource sites are given a Primary number when initially recorded, but Trinomial identification numbers are assigned to cultural resources upon receipt of adequate documentation by the California Historic Resources Information System.

Table 25. 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	

Primary	Trinomial	Site Type	Hist	Pre	American River	Sacramento River	East Side Tributaries
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
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	Northern 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

Primary	Trinomial	Site Type	Hist	Pre	American River	Sacramento River	East Side Tributaries
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	

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 estimates 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. Although specific effects to historic properties cannot be determined at this time, effects could include, but is not limited to, the following: temporary visual and auditory effects caused by construction activities, temporary lack of access and/or privacy to areas traditionally used by Native American tribes for ceremonies, temporary and/or permanent effects to the viewshed of TCPs caused by construction activities and associated noise levels, vibration or compression effects caused by construction activities to historic properties located in proximity to construction activities, alteration or destruction of built environment resources, removal of trees and vegetation that may represent plants significant to Native American tribes and used in ceremonies or for other traditional uses.

The adverse 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 Historic Property Treatment Plans (HPTPs). The HPMP and HPTPs may include a number of possible mitigation measures to reduce effects to less than significant. Although adverse effects to historic properties may include demolition and direct or indirect alteration of a cultural resource's characteristics that qualify the resource's eligibility for listing in the NRHP, adverse effects would be resolved by developing HPTPs that specifically address the changes caused by the alternative to the individual resource. Those may include Historic American Building Survey/Historic American Engineering Record/Historic American Landscape Survey (HABS/HAER/HALS), oral histories, historic markers, exhibits, interpretive brochures or publications, or other methods agreed upon by the Corps and SHPO and in consultation with Native American tribes and other interested parties. Further discussion of specific effects anticipated for Alternative 1 and known cultural resources within those parts of the APE are below.

American River

Within the APE identified for erosion repairs on the American River, a number of cultural resources are known (Table 25), 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 25, and possibly to others that may be discovered during the inventory efforts required under the PA. However, with the implementation of the PA, these effects would be reduced to less than significant under NEPA. Effects to historical and unique archaeological resources under CEQA would be potentially significant and unavoidable.

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 25. 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 effects 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. However, with the implementation of the PA, these effects would be reduced to less than significant under NEPA. Effects to historical and unique archaeological resources under CEQA would be potentially significant and unavoidable.

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 25. 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. However, with the implementation of the PA, these effects would be reduced to less than significant under NEPA. Effects to historical and unique archaeological resources under CEQA would be potentially significant and unavoidable.

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 known cultural resources sites and anticipated discoveries 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 adverse 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 effects 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 potential 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. HTRW sites encountered would be removed and properly disposed of prior to land acquisition and would be the responsibility of the local partners. 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. However, with the implementation of the PA, these effects would be reduced to less than significant under NEPA. Effects to historical and unique archaeological resources under CEQA would be potentiallysignificant and unavoidable.

3.9.6 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 to historical and unique archaeological resources 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.

Avoidance of adverse effects to historic properties is the preferred treatment approach. The Corps will consider design refinements of project elements in order to avoid historic properties and project effects that may be adverse. Avoidance of adverse effects to historic properties is a significant part of the Corps planning and cultural resources management for this project as described in the PA. However, it may not be possible to refine the design of the project in order to avoid adverse effects to historic properties. 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 historic properties adversely affected by the project may include data recovery, Historic American Building Survey/Historic American Engineering Record/Historic American Landscape Survey documentation, 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 is 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 26 below.

Table 26. 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 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.

Railroads

The Sacramento area has several railroad crossings, including the Union Pacific Railroad (UPRR), the Western Pacific Railroad (WPRR), the Northern Sacramento Railway, and the Yolo Shortline railroad tracks. The Sacramento Valley Station is a major rail hub utilized by several rail companies, including Amtrak and the Sacramento Regional Transit District light rail. These rail lines connect the greater Sacramento area with goods, services, and public transportation. There is a portion of the Sacramento Southern Railroad located along the Sacramento River that is still in recreational use by the California State Railroad Museum. Potential impacts to this segment of railroad are further discussed in Section 3.14, Recreation.

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. Additionally, there are two railroad crossings on the American River between Highway 160 and Business 80 and one Sacramento Regional Transit light rail track crossing on the Highway 160 American River bridge.

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. Construction would intermittently generate substantial volumes of traffic due to the earthwork involved and the need for materials deliveries. 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.
- Disrupt railroad services for a significant amount of time.

3.10.3 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 LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However 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. 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 and railroads could be inundated with floodwaters, causing disruptions in traffic, inadequate emergency access, deterioration of the roadway condition, and exposing people to public safety hazards. 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 and railroads 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 construction equipment and materials along highways and local roads that provide access to the project levees. Proposed construction actions are not expected to result in a reduction of parking availability, since construction vehicles would be required to park in designated staging areas. 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. There would be no impact to transportation from long-term O&M of Alternative 1.

Evaluation of effects to transportation are based on a maximum of 1 million cubic yards of borrow material and 2.8 million tons of rock being transported for construction. Construction would intermittently generate substantial volumes of traffic due to the earthwork involved and the need for materials deliveries. Traffic patterns would return to existing conditions once construction is completed. Traffic associated with long-term maintenance would not change following construction of the ARCF GRR.

Implementation of Alternative 1 would result in a substantial increase in traffic on local roadways associated with truck haul trips during construction activities. Haul trucks could cause additional damage or deterioration to roadway conditions. In addition, traffic controls would cause or contribute to substantial temporary increases in traffic levels on several roadways, as traffic is detoured, slowed, or disrupted by lane closures. Traffic controls could cause delays during the morning and evening peak commute hours, which could disrupt emergency response times in the vicinity of the construction sites. 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, bicycle commuters, and residents adjacent to the levee structure. 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. Potential borrow sites have also not yet been determined, so the transportation corridors for borrow material are currently unknown. 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. There would be no impacts to railroads or rail transportation along the American River portion of the project.

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 bank protection is proposed 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. There would be no impacts to rail transportation along the Sacramento River portion of the project. Potential impacts to the Sacramento Southern Railroad are further discussed in Section 3.14, Recreation.

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. Construction would not require any closures of the UPRR line adjacent to the NEMDC levee; however, construction vehicles and haul trucks would cross the tracks at access points, which would be coordinated with UPRR prior to construction.

3.10.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)

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. The construction of the Sacramento Weir and Bypass expansion would require fill material in order to construct the new levee. Hauling would occur on existing roads in the rural area of Yolo County. The new weir construction would include a new segment of the Old River Road and the Yolo Shortline railroad tracks. The existing Old River Road would remain in place during the majority of construction; however, due to the limited access the Yolo Shortline Railroad could be temporarily closed and the trains rerouted. Additionally, there would be some temporary closures and service disruptions of the Old River Road when the new segment of road is being connected to the existing road. The East Yolo Levee Road, County Road 124, and County Road 126 would also be rerouted on or around the new segment of levee.

Impacts to traffic under this alternative would be short-term and significant until construction is completed. Once the construction is completed, traffic would return to the pre-project conditions. There would be no impact to transportation from long-term O&M under Alternative 2.

3.10.6 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 would reduce the effects of construction on the roadway system in the project area throughout the construction period.
- Construction contractors would follow the standard construction specifications of affected jurisdictions and obtain the appropriate encroachment permits, if required. The conditions of the encroachment permit would be incorporated into the construction contract and would be enforced by the agency that issues the encroachment permit.
- If rock or other materials are transported by barge on the Sacramento River, appropriate water safety measures would be utilized in order to reduce impacts to recreational boaters.
- 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 would be coordinated with the appropriate jurisdiction and would 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 would be made to accommodate traffic flows. Detour signs would be provided to direct traffic through detours. Advance notice signs of upcoming construction activities would 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.
- Safe pedestrian and bicyclist access would be maintained in or around the construction areas at all times. Construction areas would be secured as required by the applicable jurisdiction to prevent pedestrians and bicyclists from entering the work site, and all stationary equipment would be located as far away as possible from areas where bicyclists and pedestrians are present.

- The construction contractor would notify and consult with emergency service providers to maintain emergency access and facilitate the passage of emergency vehicles on city streets.
- Emergency vehicle access would be made available at all times. Coordination with local emergency responders by the contractor to inform them of the construction activities would be required by the contractor.
- The construction contractor would assess damage to roadways used during construction and will repair all potholes, fractures, or other damages.
- Trains utilizing the Yolo Shortline Railroad would be detoured to a different rail line during construction. If an alternative rail line is not available, railroad services would be continued by transporting goods on public roads using cargo trucks during the extent of closures required by the construction and realignment of the railroad on the new portion of the Sacramento Weir.

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 effects to transportation would be significant during construction due to the volume of trucks on local roadways.

3.11 Air Quality

3.11.1 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. 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 27.

Table 27. 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
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

Pollutant	Averaging Time	National Primary Standard[a]	California Standard[b]	Violation Criteria	
				National	California
	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	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 28. State and Federal Attainment Status.

Criteria Pollutant	Averaging Time	Federal Status	State Status
O_3	1 Hour	N/A	Non-Attainment--Serious
	8 Hour	Non-Attainment--Severe	Non-Attainment--Serious
PM_{10}	24 Hour	Attainment	Attainment
	Annual	N/A	Attainment
$PM_{2.5}$	24 Hour	Non-Attainment*	N/A
	Annual	N/A	Non-Attainment
CO	1 Hour	Attainment	Attainment
	8 Hour	Attainment	Attainment
NO_2	1 Hour	N/A	Attainment
	Annual	Attainment	N/A
SO_2	3 Hour	Attainment	N/A
	24 Hour	Attainment	Attainment
	Annual	Attainment	N/A
Pb	30 Day	N/A	Attainment
	Quarter	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.
- $PM_{2.5}$: 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 considered a local air quality problem, as USEPA has no regulations to address generation of odors. However, local air districts have developed rules that 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 and 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, however construction would not occur until the project is authorized by Congress);
- 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,
- While not required, the Corps will encourage the construction contractors to use off-road construction equipment that meets Tier 4 standards.

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 assumed to be 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 for Alternative 1 in Tables 32 (truck delivery scenario) and 32 (barge delivery scenario) and for Alternative 2 in Tables 36 and 37 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 28); however, the trucking alternative would require a lower overall mitigation fee cost. In the case of the Federal *de minimis* standards (Table 30), the alternative that involves trucking the rip-rap is within the Federal *de minimis* standard, even without mitigation. The barging alternative is assumed to meet the standard using the mitigation provided by the implementation of Enhanced 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 that comply with USEPA 2010 on-road emission standards for PM and NO_X.

Additional air quality analysis for the proposed Sacramento Weir and Bypass Widening is performed separately since the Sacramento Weir construction would be entirely in the YSAQMD jurisdiction. The Sacramento Weir and Bypass Widening portion of the project is only proposed under Alternative 2.

The air quality emissions analysis for the Sacramento Weir and Bypass Widening was developed based on the following assumptions:

- The Sacramento Weir and Bypass Widening would be constructed as three phases over three years: the new levee, the weir, and the deconstruction of the old levee;
- The Sacramento Weir would be constructed on dry land on the portion of land between the railroad and the Old River Road;
- The Old River Road and the railroad would be realigned onto the new weir crown;
- The existing weir would remain in place;
- The new levee would be constructed using soil existing in the Sacramento Bypass, and no new soil would be imported from other borrow sites.

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 29.

Table 29. 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 30.

Table 30. Federal General Conformity *de Minimis* Thresholds.

Air Basin	ROG	NO_X	CO	PM_{10}	$PM_{2.5}$
	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)	100	100	100	None	100

Source: 40 CFR 93.153

3.11.3 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 LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However, 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. 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, create objectionable odors, 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 31 summarizes the emission sources associate with the project construction that would occur in the SMAQMD, YSAQMD, BAAQMD, and FRAQMD.

Table 31. 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 32. 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 and result in a significant effect. Although mitigation measures as recommended by SMAQMD would reduce in NO_X for off-road equipment by 20 percent, construction-related emissions still would exceed the SMAQMD's emission thresholds for NO_X.
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 and 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 sites located north of the project site were captured in the SMAQMD off-site soil estimations.

Table 32. Construction Emissions: Alternative 1, Truck Delivery Scenario.

	Annual Emissions in Tons						Maximum Daily Emissions in Pounds					
Construction Year	**ROG**	**NO_X**	**NO_X* Mitigated**	**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	17.8	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	.56	0.1	0.1	0	6.7	176.2	166.0	34.2	71.8	17.5
Year 2 Total	1.5	23.0	18.4	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	25	100	100	100						
Exceed Threshold?	No	No	No	No	No	No						
Emissions generated in YSAQMD												
Year 2 Off-Site Soil Borrow	0	0.6	.48	0.1	.01	0	6.03	158.8	149.4	30.78	65.67	15.75
CEQA Threshold	10	10	10	NA	NA	NA					80	
Exceed Threshold?	No	No	No								No	
General Conformity *de Minimis* Threshold	25	25	25	100	100	100						
Exceed Threshold?	No	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 33. 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 33. Construction Emissions: Alternative 1, Barge Delivery Scenario.

Construction Year	Annual Emissions in Tons						Maximum Daily Emissions in Pounds					
	ROG	NO_X	NO_X* Mitigated	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	18.1	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	.56	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	3.14	1.67	0.15	0	10.2	95.0	82.9	39.4	3.7	1.7
Year 2 Total	2.4	27.2	21.8	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	NA	85		NA	NA	NA
Exceed Threshold?								Yes				
General Conformity *de Minimis* Threshold	25	25	25	100	100	100						
Exceed Threshold?	No	Yes	No	No	No	No						
Emissions generated in YSAQMD												
Year 2 Off-Site Soil Borrow	0	0.6	.48	0.1	.01	0	6.03	158.8	149.4	30.78	65.67	15.75
Year 2 Barge Delivery	0.24	2.33	1.87	1	.01	0	6.07	56.5	48.9	23.43	2.2	1
Year 2 Total	0.24	2.93	2.35	1.1	.02	0	12.1	215.3	198.3	54.21	67.87	16.75
CEQA Threshold	10	10	10	NA	NA	NA					80	
Exceed Threshold?	No	No	No								No	
General Conformity *de Minimis* Threshold	25	25	25	100	100	100						
Exceed Threshold?	No	No	No	No	No	No						
Emissions generated in BAAQMD **												
Year 2 Barge Delivery	0.45	4.35	3.48	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	100	100	100	100	NA	100						
Exceed Threshold?	No	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 32, 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 (Table 33). 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 2010 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.

Operation and Maintenance

Long-term O&M activities under Alternative 1 would result in limited emissions of criteria pollutants from activities such as driving trucks on the levees for inspections and maintenance actions, mowing of grasses on the levees, and possibly limited heavy earth-moving equipment for repair of any damage to the site. These emissions would be limited to a very temporary timeframe once or twice a year. Any emissions that resulted from long-term O&M activities would not exceed the local, State, or Federal thresholds and would be less than significant.

3.11.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)

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. Although Alternative 2 would reduce the number of levee raises along the Sacramento River compared to Alternative 1, the air quality analysis is based on the worst-case scenario. Therefore, the assumptions based on the distance and delivery of material is the same as described under Alternative 1. Table 34 summarizes the emission sources

associate with the project construction that would occur in the SMAQMD, YSAQMD, BAAQMD, and FRAQMD. Effects associated with long-term O&M in for Alternative 2 would be the same as described for Alternative 1.

Table 34. 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, construction of the new levee, construction of the new portion of the weir, construction of new sections of road and railroad on the top of the new portion of the weir and the new levee, relocation of utilities, degrading and excavating the existing levee, and delivery and installation of rip-rap on the waterside slope of the new levee. Materials for the construction of the new levee would be reused from the existing levee to the greatest extent possible. The potential borrow sites would be located in or adjacent to the Bypass, reducing the number of haul truck trips going to and from the site.

The construction of Alternative 2 would be spread over 10 years. Construction of the Sacramento Weir and Bypass would reduce the need for most of the levee raises along the Sacramento River. Materials required for the levee raises was assumed to be trucked from with-in a 20 miles radius.

Construction Emissions

As discussed under Alternative 1, 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.

Additional air quality analysis for the proposed Sacramento Weir and Bypass Widening has been performed separately since the Sacramento Weir is located entirely in the YSAQMD. The Sacramento Weir and Bypass widening portion of the project is only proposed under Alternative 2.

Maximum daily emissions are estimated for ROG, NO_X, PM_{10}, and $PM_{2.5}$ to evaluate emissions against YSAQMD thresholds. Those results are shown in Table 35. Construction-related emissions from the Sacramento Weir and Bypass widening would exceed the YSAQMD's emission threshold for NO_X. The actual emissions may be reduced by reducing the number and type of large construction vehicles utilized on site at one time and by following the mitigation measures as recommended by SMAQMD; however, the overall construction emissions under the alternative would likely exceed the thresholds and would therefore result in a significant effect. The Corps would be required to pay an off-site mitigation fee for NO_X emissions in the SVAB in order to reduce the effect to a less-than-significant level.

Table 35. Construction Emissions: Alternative 2, Sacramento Bypass and Weir Widening Construction.

	Annual Emissions in Tons						Maximum Daily Emissions in Pounds					
Construction Year	ROG	NO_X	NO_X^* Mitigated	CO	PM_{10}	$PM_{2.5}$	ROG	NO_X	NO_X^* Mitigated	CO	PM_{10}	$PM_{2.5}$
Emissions generated in YSAQMD												
Construction of New Levee	0.7	7.3	5.84	6.5	2.5	0.8	18.5	184.7	147.8	157.9	47.9	15.6
Construction of New Weir	0.8	7.5	6.0	5.9	2.8	0.8	1532	148.6	118.9	114.6	47.0	6.3
Demolition of Old Levee	1.5	14.2	11.4	13.1	3.0	1.1	30.3	297.2	237.8	281.8	52.4	19.7
CEQA Threshold	10	10	10	NA	NA	NA		85	85		80	
Exceed Threshold?	No	Yes	Yes					Yes	Yes		No	
General Conformity *de Minimis* Threshold	25	25	25	100	100	100						
Exceed Threshold?	No	No	No	No	No	No						

Notes:
* Values based on a 20% mitigation for off-road equipment

Although Alternative 2 would reduce the number of levee raises along the Sacramento River compared to Alternative 1, for the purposes of air quality analysis the emissions estimates are assumed to be similar to Alternative 1, because the construction area and duration of construction would be similar under both alternatives. Alternative 1 summarizes the maximum daily emissions estimated for ROG, NO_X, PM_{10}, and $PM_{2.5}$ under the construction scenario that would result in the most combined air emissions. As shown in Table 35, the greatest potential emissions impacts would occur during the demolition of the old levee due to the large number of scrapers and other large construction equipment to displace and redistribute soil. These emissions are combined with the previously analyzed emissions from Alternative 1 in Tables 36 and 37, below.

Table 36. Construction Emissions: Alternative 2, Truck Delivery Scenario With Bypass Widening.

	Annual Emissions in Tons						Maximum Daily Emissions in Pounds					
Construction Year	ROG	NO_X	NO_X^* Mitigated	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	17.8	8.9	7.4	2.0	11.6	159.7	127.8	66.8	29.9	5.4
Year 2 Off-Site Soil Borrow	0	0.7	.56	0.1	0.1	0	6.7	176.2	141.0	34.2	71.8	17.5
Year 2 Total	1.5	23.0	18.4	9.0	7.5	2.0	18.3	335.9	268.8	101	101.7	22.9
CEQA Threshold								85				
Exceed Threshold?								Yes				
General Conformity *de minimis* Threshold	25	25	25	100	100	100						
Exceed Threshold?	No	No	No	No	No	No						
Emissions generated in YSAQMD												
Year 2 Off-Site Soil Borrow	0	0.6	.48	0.1	.01	0	6.03	158.8	127.0	30.78	65.67	15.75
Bypass Widening: Levee Demolition	1.5	14.2	11.4	13.1	3.0	1.1	30.3	297.2	237.8	281.8	52.4	19.7
Total	1.5	14.8	11.8	13.2	3.01	1.1	36.6	456.0	364.8	312.58	118.07	35.45
CEQA Threshold	10	10	10	NA	NA	NA		85	85		80	
Exceed Threshold?	No	Yes	Yes					Yes	Yes		No	
General Conformity *de Minimis* Threshold	25	25	25	100	100	100						
Exceed Threshold?	No	No	No	No	No	No						

Notes:
* Values based on a 20% mitigation for off-road equipment

Table 37 shows the maximum daily emission under the barge delivery scenario with the Sacramento Bypass and Weir widening segment added. Under this scenario, emissions would exceed SMAQMD's and BAAQMD's NO_X thresholds and 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.

Table 37. Construction Emissions: Alternative 2, Barge Delivery Scenario With Bypass Widening.

	Annual Emissions in Tons						Maximum Daily Emissions in Pounds					
Construction Year	ROG	NO_X	NO_X^* Mitigated	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	18.1	10.7	6.25	1.6	11.6	159.7	127.8	66.8	29.9	5.4
Year 2 Off-Site Soil Borrow	0	0.7	.56	0.1	0.1	0	6.7	176.2	141.0	34.2	71.8	17.5
Year 2 Barge Delivery	0.41	3.92	3.1	1.67	0.15	0	10.2	95.0	76.0	39.4	3.7	1.7
Year 2 Total	2.4	27.2	21.8	12.5	6.5	1.6	28.5	430.9	344.8	140.4	105.4	24.6
CEQA Threshold	NA	NA	NA	NA	NA	NA	NA	85	85	NA	NA	NA
Exceed Threshold?								Yes	Yes			
General Conformity *de Minimis* Threshold	25	25	25	100	100	100						
Exceed Threshold?	No	Yes	No	No	No	No						
Emissions generated in YSAQMD												
Year 2 Off-Site Soil Borrow	0	0.6	.48	0.1	.01	0	6.03	158.8	127.0	30.8	65.7	15.75
Year 2 Barge Delivery	0.24	2.33	1.9	1	.01	0	6.07	56.5	45.2	23.43	2.2	1
Bypass Widening Levee Demolition	1.5	14.2	11.4	13.1	3.0	1.1	30.3	297.2	237.8	281.8	52.4	19.7
Year 2 Total	1.74	17.1	13.8	14.2	3.02	1.1	42.4	512.5	410.0	336.0	120.3	36.45
CEQA Threshold	10	10	10	NA	NA	NA					80	
Exceed Threshold?	No	Yes	Yes								Yes	
General Conformity *de Minimis* Threshold	25	25	25	100	100	100						
Exceed Threshold?	No	No	No	No	No	No						
Emissions generated in BAAQMD**												
Year 2 Barge Delivery	0.45	4.35	3.5	1.85	.16	0	11.3	105.3	84.24	91.2	4.1	1.84
CEQA Threshold							54	54	54		82	54
Exceed Threshold?							No	Yes	Yes		No	No
General Conformity *de Minimis* Threshold	100	100	100	100	NA	100						
Exceed Threshold?	No	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.

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 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 2015). 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.

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

The Corps will require that all off-road construction equipment comply with SMAQMD's enhanced exhaust controls (20% NO_X and 45% PM reductions). The Corps will encourage their construction contractors to use off-road diesel-powered construction equipment greater than 50 horsepower that meets Tier-4 off-road emission standards 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 2010 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.

NO_X Mitigation Fee to SMAQMD

As of July 1, 2015, the mitigation fee rate is $18,030 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.

NO_X Mitigation Fee to BAAQMD

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

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

- 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 all GHGs and GHG 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. On December 18, 2014, CEQ released revised draft guidance that applies to all proposed Federal agency actions, including land and resource management actions. This guidance states that "Agencies are required to consider direct, indirect, and cumulative effects when analyzing any proposed Federal actions and projecting their environmental consequences" and "climate change is a particularly complex challenge given its global nature and inherent interrelationships...however, analyzing the proposed action's climate impacts and the effects...can provide useful information to decision makers" (CEQ, 2014). Implementation of 40 CFR Part 98 is referred to as the Greenhouse Gas Reporting Program. The purpose of the rule is to collect accurate and timely GHG data to inform future policy decisions (EPA, 2012).

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.

Precipitation

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).

Snowpack

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.

Sea Level Rise

Sea level rise has been a persistent trend for decades, and is expected to continue beyond the end of the century. Past trends provide valuable insight in preparing for future environmental change, but by themselves are insufficient for assessing the risks associated with an uncertain future. A wide range of estimates for future global mean sea level rise are scattered throughout scientific literature, but aside from the IPCC there is no coordinated interagency effort to identify sea level rise estimates for the purpose of planning, policy, and management. Current predictions of global mean sea level rise state that increases in sea level could be between 8 inches to six feet by year 2100 (NOAA, 2012).

Although the Sacramento region is an inland basin and is unlikely to be directly impacted by sea level rise, the potential inundation of low lying areas in the Bay area and parts of the Delta could increase the likelihood of salinity intrusion and river bank erosion due to increased tidal influx. Additionally, continued land subsidence in the Delta could increase the risk of sea water intrusion further inland than current predictions.

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 38 outlines the most recent global, national, statewide, and local GHG inventories to help contextualize the magnitude of potential project-related emissions.

Table 38. 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 "worse-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 3.11.
- On-Road Vehicles: CO_2 emissions generated from the on-road vehicle trips were estimated, following the same assumptions described in Section 3.11.
- 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 3.11.

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. In January 2008, the SMAQD made a resolution to adopt guidance published by the California Air Pollution Control Officers Association, entitled "CEQA and Climate Change, Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act" (CAPCOA, 2008). This resolution adopted the following recommended greenhouse gas thresholds of significance:

- Construction phase of projects: 1,100 metric tons of CO_2e per year;
- Operational phase of land development projects: 1,100 metric tons of CO_2e per year; and,
- Stationary source projects: 10,000 direct metric tons of CO_2e per year.

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.

3.12.3 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 LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However, itwould 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 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 increase GHG emissions to above the stated thresholds, 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, which would be in violation with applicable climate change plans that require efforts to reduce GHGs, as practicable, during construction activities. 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

Currently, SMAQMD recommends a construction emission threshold of 1,100 metric tons (MT) of CO_2e per year (SMAQMD 2014). Additionally, YSAQMD collaborated with SMAQMD in order to determine an established threshold of significance for GHG to be used in CEQA analysis. Although this threshold is still in concept design, the working group determined that a 21.7 percent reduction of emissions by 2020 would conform to the CARB goals of AB 32. The working group also proposed a "screening level" that considers smaller projects (less than 1,100 MT CO_2e per year) less than significant (YSAQMD 2014). At this time, since this threshold is still in concept design, the Corps is not adopting reduction threshold; however, should the Corps conduct any supplemental NEPA/CEQA analysis prior to construction, the Corps will incorporate any applicable thresholds that are established at that time. 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 39. The total construction project would exceed the SMAQMD and YSAQMD threshold of 1,100 MT CO_2e per year, but project-wide GHG emissions would be well below the BAAQMD's GHG threshold of 10,000 MT CO_2e per year. Implementation of mitigation measures would further reduce GHG emissions during construction to the maximum extent practicable. For any emissions not reduced through proposed mitigation, the Corps would purchase carbon offset credits in coordination with SMAQMD and YSAQMD, as needed. With these offset credits, impacts to climate change from construction would be reduced to 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. Effects to Climate Change from long-term O&M activities would be the same as discussed in Section 3.11.4 for Air Quality. These impacts would be less than significant, and no mitigation would be required.

Table 39. Construction GHG Emissions for All Alternatives, Truck and Barge Delivery Scenarios.

Construction Year	Total GHG Emissions (MT/year of CO_2e)			
	SMAQMD	YSAQMD	BAAQMD	Project-Wide
Alternative 1 and 2, Truck Delivery 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
Bypass Widening and Demolition of Old Levee	0	2,910.86	0	2,910.86
Year 2 Total	3,305.9	3,002.06	0	6,307.96
Alternative 1 and 2, Barge Delivery 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
Bypass Widening and Demolition of Old Levee	0	2910.86	0	2910.86
Year 2 Total	2,170.7	3,090.46	164.7	5,425.76
BAAQMD Threshold	1,100	1,100	10,000	
Exceed Threshold?	Yes	Yes	No	

3.12.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)

The estimated construction GHG emissions for Alternative 2 are shown in Table 39. 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. Implementation of mitigation measures would further reduce GHG emissions. Effects to Climate Change from long-term O&M activities would be the same as discussed in Section 3.11.4 for Air Quality. These impacts would be less than significant, and no mitigation would be required.

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 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 SMAQMD or CEQ's significance thresholds applicable at the time of construction. Carbon offset credits shall be purchased from programs that have been approved by SMAQMD.

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 40 summarizes typical A-weighted sound levels.

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.

Table 40. 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

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 41 summarizes typical vibration levels generated by construction equipment).

Table 41. 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 41:

$$PPV = PPV_{ref}\left(\frac{25}{distance}\right)^{1.5}$$

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 42 summarizes typical human response to steady state vibration such as that produced by typical non-impact construction activity.

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
0.10	Strongly perceptible
0.035	Distinctly perceptible
0.012	Slightly perceptible

Source: CalTrans 2004

Table 43 summarizes typical human response to transient vibration that is usually associated with transitory impact construction sources such as pile driving activity.

Table 43. 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 44 summarizes vibration damage thresholds.

Table 44. 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 project would not be constructed and the area would continue to be at risk of flooding due to levee failure or overtopping. The LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However, 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, 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 ordinances, and expose sensitive receptors near the rivers to excessive noise leves and groundborne vibration from the placement of riprap to repair levels. As a result, effects under the No Action Alternative would be considered significant and unavoidable.

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 45 below.

Table 45. 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 46 summarizes ground vibration levels generated by typical construction equipment.

Table 46. 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 47 summarizes typical human response to prolonged, steady state vibration such as that produced by typical non-impact construction equipment during earthmoving activities.

Table 47. 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 48 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 48, 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 48. 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 49 below shows estimated noise levels for erosion protection construction activities. According to the estimates in Table 52, 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 49. 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 50 below lists estimated noise levels from construction activities proposed for the Sacramento River levees.

Table 50. 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 50, 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 50. Mitigation measures would be implemented to further reduce these construction noise levels to less than significant.

Borrow Sites

The final selection of borrow sites for the proposed alternatives will not be established until the PED phase of the project, therefore it is not possible to fully analyze impacts from noise associated with borrow activities at this time. Potential effects from noise associated with borrow activities would be taken into account in selecting the final borrow sites, including the presence of any sensitive receptors in the near vicinity of proposed borrow sites. There would be potential impacts from the operation of construction equipment at borrow sites. However, these activities would occur in accordance with established noise ordinances in the area. The avoidance and minimization measures discussed in Section 3.13.6 below would be implemented at borrow sites, as appropriate, to reduce potential noise impacts to less than significant. If identification of borrow sites results in noise effects that include: (1) substantial changes in the proposed action that are relevant to environmental concerns, or (2) significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts, then supplemental NEPA/CEQA analysis may occur, as appropriate.

3.13.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)

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 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)
- National Wild and Scenic Rivers Act (16 U.S.C. 1271 et. seq.)
- 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. Additionally, the American River Parkway's recreational uses are designated as an outstanding remarkable value of the river under the Federal Wild and Scenic Rivers Act.

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 itself has several large outdoor meeting venues and hosts several Parkway events every year, including large concerts. The park also features a boat launch and an archery range. 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. Close to Fair Oaks Boulevard and Howe Avenue, Paradise Beach is located at the end of Carlson Drive in the River Park neighborhood. The park offers a sandy beach area and is a popular spot for swimming. Visitors can also hike along many informal dirt trails through cottonwood forests and view a variety of wildlife.

Campus Commons Golf Course. Built in 1972, the 1,699 yard Campus Commons Golf Course is a public nine-hole executive course located just northeast of California State University Sacramento, along the American River.

Guy West Bridge. The Guy West Bridge, built in 1967, is a pedestrian-only suspension bridge crossing the Lower American River. It is modeled after the 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 the communities 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. There is a portion of the Sacramento Southern Railroad located along the Sacramento River that has been in recreational use by the California State Railroad Museum since 1984. Excursion trains operate from the California State Railroad Museum Saturdays and Sundays during the summer months (April through September).

Designated parks along the Sacramento River 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 located just downstream of Old Sacramento, the Riverfront Promenade offers 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 Area. 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 Wildlife Area 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 project would not be constructed and the area would continue to be at risk of flooding due to levee failure or overtopping. The LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system However, 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. 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, including the levee system, would be lost. This same degree of loss could also occur as the result of a single very large event if existing erosion problems are not addressed. The No Action Alternative would result in inconsistencies and non-compliance with the American River Parkway Plan. The Parkway Plan's Flood Control Policy states that:

> *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 (Parkway Plan Policy 4.16).*

The effects of the No Action Alternative would cause significant impacts to recreation facilities 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

While the site-specific designs have not been conducted to determine which erosion protection measure is appropriate along each reach of the Parkway, certain assumptions can be made:

- Access to the American River for the purposes of erosion control construction would require some temporary closures of portions of the recreation trail during construction activities.

- Haul trucks would use portions of the recreational trail to bring materials to the construction sites, reducing accessibility to recreationists.
- Some areas within the Parkway itself would be construction staging areas.
- The presence of construction equipment and haul trucks would reduce the quality of recreational experiences.

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 the construction would not take place in all areas of the Parkway at once, 10 years of intermittent construction would be considered a significant effect to recreation activities because it would reduce the quality of existing recreation activities. Closures and detours of the recreational trail could impact multiple events such as Eppie's Great Race, the American River Parkway Half Marathon, or the Jed Smith Ultra Classic in addition to multiple other fun runs and events. While recreational access points, boat launches, parks, and recreation sites such as the Campus Commons Golf Course would remain open to the greatest extent practicable, recreational activities could be impacted by construction equipment and material delivery during construction.

Portions of the road on top of the levee would be closed to recreational 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 conflict 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.

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 be

rerouted or accessible a short distance away from the construction site, there would still be an overall reduction in the recreation quality with continuous construction over a 10 year period and, therefore, the effect would be significant. 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.

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 measures, 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.

Sacramento River

Construction of levee improvements would have potential short-term effects to recreation along the Sacramento River, especially during the construction of Reach D because the recreational trail is almost exclusively on the levee crown in this reach. Construction activities could impact the operation of the Sacramento Southern Railroad as portions of the railroad are located on or adjacent to the levee. Construction would also occur during summer months when parks and trails are at the peak use time, and when the Southern Railroad excursion train is in operation.

Further, paved parking areas in the vicinity of Miller Park and Garcia Bend Park could be used for staging of equipment and other construction activities. Boat ramps and recreational access to the parks would remain open during construction, but could be impacted by construction equipment using the same access during levee 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 reaches 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.

Borrow Sites

The final selection of borrow sites for the proposed alternatives will not be established until the preconstruction engineering and design phase of the project, therefore it is not possible to fully analyze recreation impacts associated with borrow activities at this time. Potential recreation effects associated with borrow activities would be taken into account in selecting the final borrow sites, including the presence of any recreation sites or resources in the near vicinity of proposed borrow sites. If identification of borrow sites results in recreation effects that include: (1) substantial changes in the proposed action that are relevant to environmental concerns, or (2) significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts, then supplemental NEPA/CEQA analysis may occur, as appropriate.

3.14.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)

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. 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.

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. It is likely that hunting activities would be prohibited in the areas undergoing

active construction for the safety of the construction workers, however there would likely be a conflict only during degrading of the existing levee and construction of the new Sacramento Bypass north levee. It is anticipated that construction of the new Sacramento Weir would not conflict with any existing hunting activities in the Bypass because the existing levee would remain in place during construction of the new weir, creating a barrier between hunting activities and the construction area. There also could be a reduction in the overall experience of the wildlife area due to disturbed soil and the presence of construction equipment during the levee work.

There would be short-term term significant effects at the Sacramento Bypass, as described above; however, there would be no long-term effects because the area would be returned to the pre-construction conditions once construction is complete. Additionally, the expanded bypass would create additional recreation area, which would be a long-term benefit to recreation.

3.14.6 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 16 through 20 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 16. View of American River from Bike Trail. (Source: Tim Davis 2013)

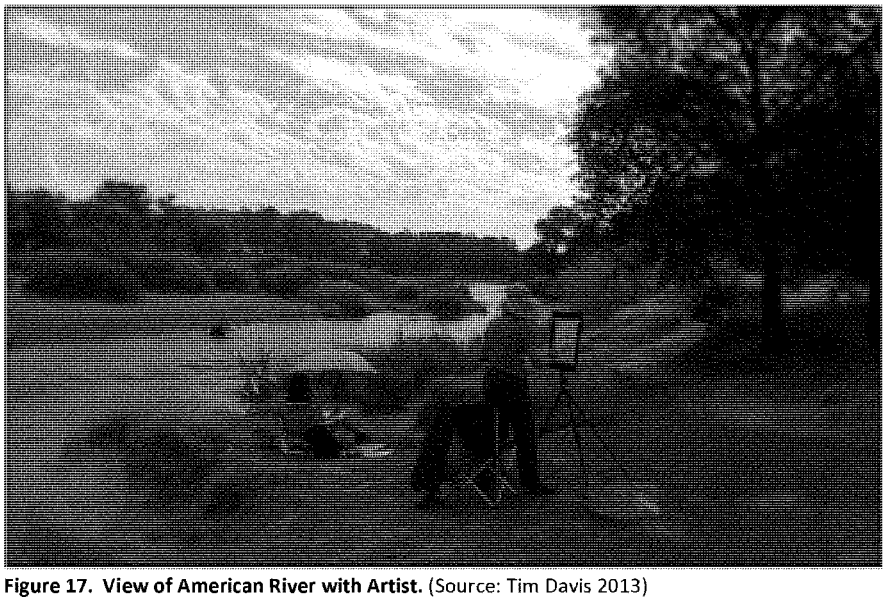


Figure 17. View of American River with Artist. (Source: Tim Davis 2013)

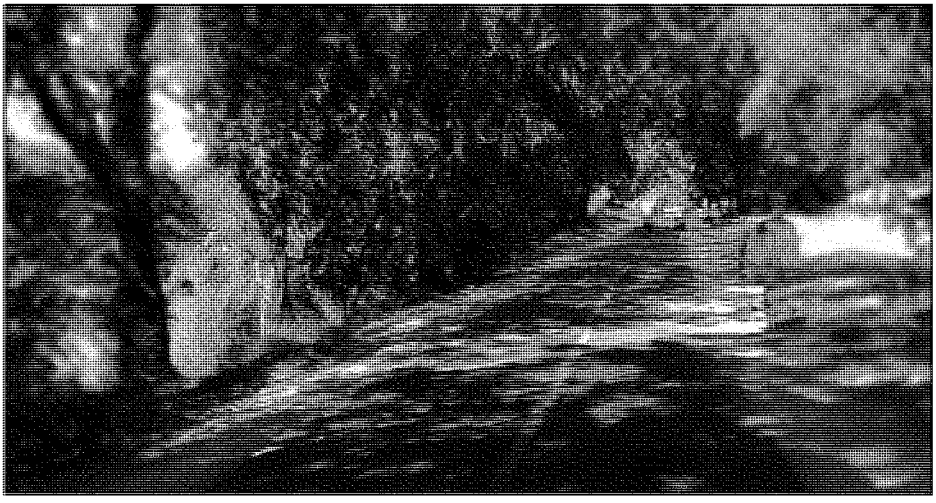


Figure 18. American River Bike Trail with Cyclist and Jogger. (Source: Tim Davis 2013)

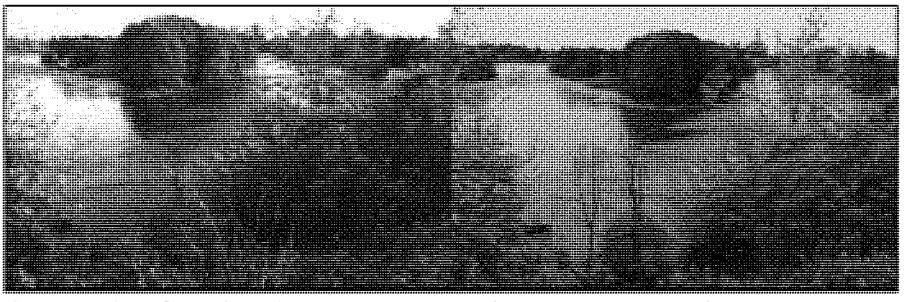


Figure 19. View of American River near Watt Avenue. (Source: Tim Davis 2013)



Figure 20. 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 21 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 21. 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 22 and 23 are pictures of a typical view of this area.



Figure 22. Natomas East Main Drain Canal.

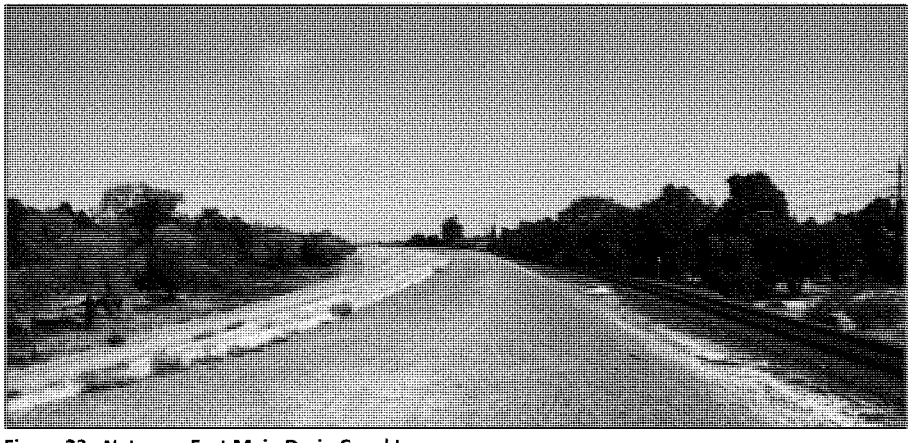


Figure 23. Natomas East Main Drain Canal Levee.

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 24 and 25 are pictures of a typical view of this area.



Figure 24. Arcade Creek.

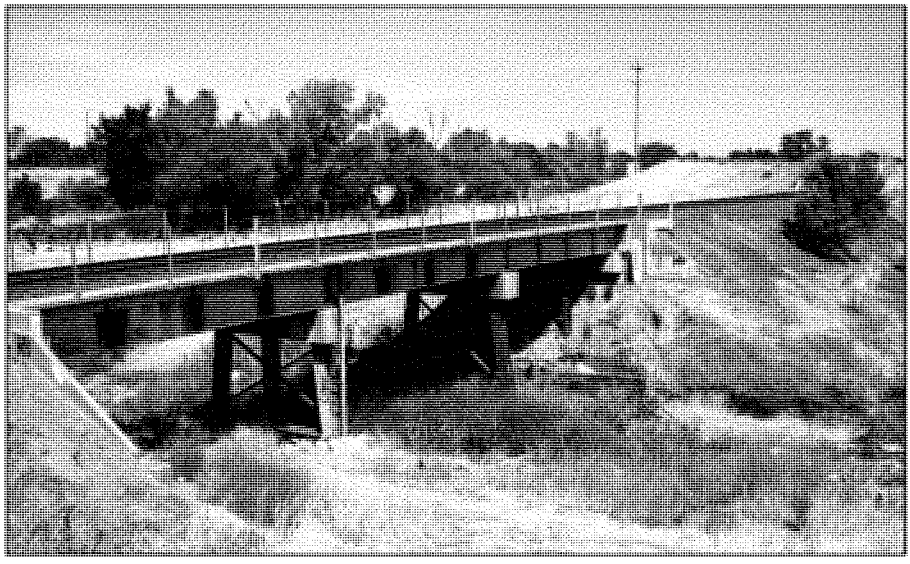


Figure 25. Arcade Creek at its Confluence with NEMDC.

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 26 is a typical view of this area.



Figure 26. 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, and that portion of the floodway (bypass) west of the Sacramento Weir is designated as the Sacramento Bypass Wildlife Area. This wildlife area is operated and managed by the CDFW. Agricultural land within the Yolo Bypass borders the west end of the Sacramento Bypass (the bypass outfall), and agricultural land is adjacent to the north side of the northern bypass levee. The Sacramento Weir serves as its eastern boundary, separating the Bypass from the Sacramento River, although the floodway formed by the bypass continues for several feet east of the weir before intersecting the river. The California Highway Patrol (CHP) Academy and agricultural land are adjacent to the south side of the southern levee of the Bypass.

The primary viewers using the Sacramento Bypass area are recreationists. Recreational uses within the bypass proper (e.g. the Sacramento Bypass Wildlife Area) include hunting, fishing, bird and wildlife watching, and simply enjoying the open space. Recreational uses on the crown of the bypass levees include walking, running, jogging, and bird watching. Boating and fishing are common recreational uses along the Sacramento River where it borders the Bypass. Viewers using the levees of the bypass for recreation have expansive views of the open space within the bypass in many locations and can also see the agricultural fields adjacent to the bypass levees. In a few locations along the crown of the southern bypass levee, 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 mountains within the Coastal Range to the west are more common. Views of the bypass floodway from the bypass levees are obscured by trees in several places, particularly from the crown of the northern levee. Views also differ seasonally, offering different views when vegetation is dormant or in leaf. Standing within the bypass itself, views of the Sacramento River are limited to the area east of the weir and the areas beyond the flanking levees cannot be seen due to the height of these levees.

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 27 through 29 are pictures of this area during a high water event.



Figure 27. Sacramento Weir.

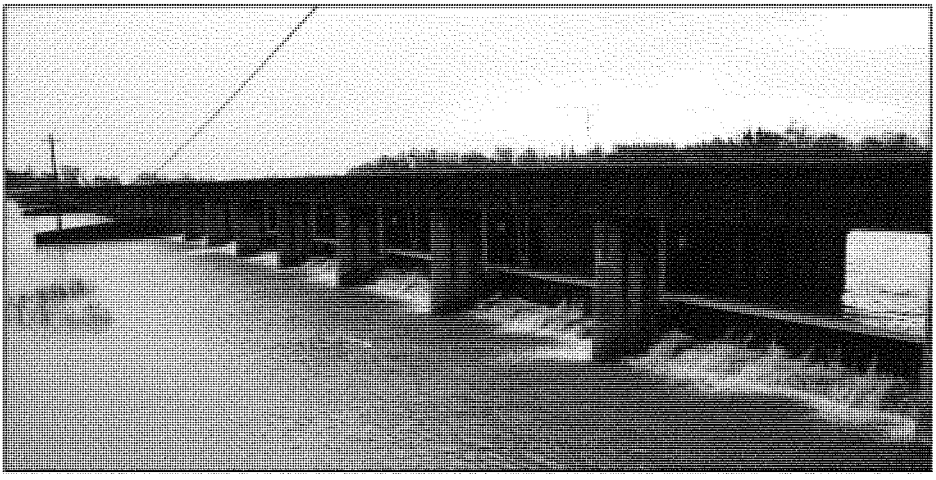


Figure 28. Sacramento Weir in High Water Event.



Figure 29. 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. The LMA would still address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However, 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 visual resources.

Over time the berms within the American River Parkway would erode, and vegetation would be lost. Because we cannot predict when and how large events will occur it is inappropriate to determine at which time the berms will erode. Additionally, flood fighting would occur as described above, and the Sacramento area would be in danger of a levee failure, as described above. The potential loss of the entire Parkway and its associated levees would be considered a significant impact because it would permanently degrade the visual quality of the American River and would substantially damage the scenic resources along the rivers. Additionally, the No Action Alternative would be in conflict with the flood control policies of the American River Parkway Plan. These effects would be significant under the No Action Alternative.

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 for both recreationists using the Parkway, and for the residents living adjacent to 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, because the location of the construction would change from year-to-year, 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. Long-term effects to vegetative visual resources would be less than significant with the implementation of mitigation. However, there would remain a significant and unavoidable short-term effect to visual resources from this vegetation removal..

Over time, there would be some locations where the river bank erodes to a degree that the rock trench would launch. In this scenario, rocks in the trench would spill over the eroded bank as designed (e.g. the rocks would be "launched"). There would then be a relatively continuous revetment slope from near the water side of the levee toe to the margin of the eroded river channel under this scenario. In such locations, the visual resource quality and value would be substantially degraded. Some trees and shrubs could potentially re-colonize the revetment slope over several years, but it is also likely that some slopes would remain devoid of significant vegetation. In either case, there would be a long term adverse impact to visual resources, mainly apparent to persons travelling on or swimming in the river or

to parkway users near the affected river bank segment. Such long term effects, while significant, would be less detrimental compared to the no action alternative. Under the no action alternative, there would be no revetment to help halt the progress of bank erosion thereby leading to a significantly greater loss of land and vegetation along the river bank and a greater adverse impact to visual resources.

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. It would likely take 3 to 5 years to establish the vegetation at these sites. Figures 11 through 13 are pictures of a site similar to some of the proposed bank protection sites, illustrating what the site looked like 4 years after construction and 9 years after construction. The visual value of river bank protection areas similar to that shown in the aforementioned photographs would take a few years to be restored to conditions similar to those present prior to installation of the bank protection. In some cases once vegetation has fully developed, the visual quality of some currently eroded bank segments may be enhanced by the proposed bank protection through the establishment of a relatively stable assemblage of trees and shrubs. In other cases, the affected bank protection sites would provide a relatively natural looking environment similar to existing conditions, with the exception that some of the rock protection would still be visible, particularly when the river's water level is low. The rock bank would be most visible from the river itself, thereby degrading the visual quality of the river bank from the standpoint of observers on the river. Overall, the proposed bank protection would result in a significant short term adverse impact to visual resources. Once vegetation has been established, however, it is anticipated this impact would be less than significant.

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 would 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. While effects to visual resources from waterside bank protection construction are considered less than significant with mitigation, the overall project would have a significant effect to visual resources due to the effects to residents during construction detailed above, which cannot be mitigated.

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 Creek, Robla Creek, and Magpie Creek 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 some of 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 (Recommended Plan)

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, to construct the new weir, and to conduct the grading within the bypass. 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. Similarly, construction of the new northern levee and seepage berm would require the relocation of CR 126, CR 124, and East Yolo Levee Road. Construction activities would be visible to people driving on these roadways as well, although it is noted that East Yolo Levee Road is gated in this area and not accessible to the general public.

Grading plans for the bypass expansion have not yet been prepared. However, it is anticipated that earthwork and grading within portions of the existing bypass could be substantial in order to acquire material for the levee, to achieve the desired drainage pattern and flow regimes within the overall expanded bypass, and to help avoid or minimize entrainment of fish as can presently occur within the existing bypass. These activities could substantially degrade the visual quality of the existing bypass through the removal of trees and other vegetation and through general topographic disturbance. Grading and other earthwork necessary along the Sacramento River necessary to extend the existing weir would require the removal of a narrow band of scattered trees and shrubs fringing the west bank of the river. North of the existing northern bypass levee, row crop fields and orchards would be eliminated during construction of the expanded bypass, the weir extension, and the new northern levee and seepage berm.

Construction would last approximately 3 years. Visual quality of the area during construction would be impaired and degraded during the construction phase; however this would be a relatively short term impact and is considered less than significant. The loss of trees and shrubs along the bank of the Sacramento River would be a long term impact, although it would not have a substantial effect on the overall scenic value of the river, because the visual quality of this area is already disrupted by the existing weir. Earthwork within the existing bypass would also have a long term impact to visual resources due to the loss of an undetermined number/extent of trees and shrubs.

These impacts would be mitigated by planting native trees and shrubs within portions of the existing bypass and the bypass expansion, as described below. Native grasses and forbs would be seeded in the disturbed portions of the existing bypass and throughout the bypass expansion. The planted grasses and forbs would quickly establish a ground cover similar to, or in some cases better than, the existing vegetative ground cover. It would take several years for the planted trees and shrubs to reach the height of many of the trees and shrubs that would be eliminated during project construction. However, it is probable that the existing visual quality of the bypass would be restored on a long term basis and therefore long term impacts to visual resources would be less than significant. To the contrary, the proposed work would increase the acreage of the bypass by more than 85 percent compared to existing conditions and, with the mitigation described, would enhance the natural visual attributes of the area. The conversion of agricultural fields to open space bypass lands would not significantly affect visual resources since a large expanse of similar agricultural fields (row crops and orchards) would remain on the north side of the new northern levee and seepage berm.

3.15.6 Mitigation Measures

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 11 through 13, 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 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.

Sacramento Weir and Bypass

Significant effects to visual resources during construction cannot be avoided and cannot be mitigated. Construction equipment will move within the footprint of the bypass expansion and weir extension, within the existing bypass, and along a segment of the Sacramento River during construction activities to access sites and transport materials. Once construction is complete, vehicle movement would be similar to pre-project conditions.

Native trees and shrubs within the existing bypass would be avoided during construction as much as practicable to help minimize visual impacts. The loss of ground cover in the existing and expanded bypass would be mitigated by planting native grasses and forbs in areas disturbed by construction, except within the footprint of the extended weir. The loss of existing native trees and

shrubs within the existing bypass, along the bank of the Sacramento River, and within small portions of the agricultural lands directly impacted by the project would be mitigated by planting native trees and shrubs within certain portions of the expanded bypass. This mitigation would be coordinated with USFWS and CDFW. With implementation of these mitigation measures, the long term effects to visual resources would be reduced to 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 from 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 project would not be constructed and the area would continue to be at risk of flooding due to levee failure or overtopping. The LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However, 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. 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, and would therefore require the construction or expansion of solid waste disposal facilities in the study area.

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. Additionally, because of the increased risk to public safety during an emergency flood event , there would be a need for more emergency services, such as police protection, fire protection, and other emergency response personnel. These effects would be significant under the No Action Alternative.

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 (Recommended Plan)

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 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 EIS/EIR; 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 State 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 the No Action Alternative the project would not be constructed and there would be no measures constructed on existing hazardous material sites. Additionally, there would be no potential releases of hazardous materials as a result of construction activities. The study area would continue to be at risk of flooding due to levee failure or overtopping. The LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However, 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. Sites within the study area would continue to exist and would be the responsibility of regulating agencies to continue the handling of these sites. The potential would exist, however, for these sites to be adversely affected by a future flood event or levee failure. In addition, new hazardous waste spills could occur during a flood event.

High flows could inundate utility lines, natural gas supply lines, and water or wastewater piping or facilities, destroying or damaging the lines, which could lead to widespread contamination. If the project is not constructed and a levee failure was to occur, there would be a significant amount of debris produced from the flooded properties. This would include hazardous and toxic waste. The potential for the spread of hazardous wastes from both new and existing sites would be a significant effect under the No Action Alternative and no mitigation would be possible.

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. Additionally, because of the increased risk to public safety during an emergency flood event , there would be a need for more emergency services, such as police protection, fire protection, and other emergency response personnel. These effects would be significant under the No Action 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. With the implementation of the mitigation measures discussed below, effects from HTRWs along the American River would be less than significant.

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. With the implementation of the mitigation measures discussed below, effects from HTRWs along the Sacramento River would be less than significant.

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. With the implementation of the mitigation measures discussed below, effects from HTRWs along the East Side Tributaries would be less than significant.

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. With the implementation of the mitigation measures discussed below, effects from HTRWs at the borrow sites would be less than significant.

3.17.5 Alternative 2 – Sacramento Bypass and Improve Levees (Recommended Plan)

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 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 the project would not be constructed and the area would continue to be at risk of flooding due to levee failure or overtopping. The LMA would address vegetation and encroachments over time under the SWIF agreement, which would improve the condition of the levee system. However, 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. If a flood were to occur, many homes and businesses within the city of Sacramento would be destroyed or damaged, resulting in significant socioeconomic impacts from displacement of homes and people. 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. There would be no growth inducing effect under the No Action Alternative.

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 in an urban area, no change in population is expected. The study area is 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.

Environmental Justice

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 (Recommended Plan)

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 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

Methodology

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 51 presents the general geographic areas associated with the different resources addressed in the EIS/EIR. 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 51. 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 evaluated in a supplemental EA/EIR included the construction of a temporary traffic light, modification to dirt access haul road, installation of the stilling basin drain, and use of a a new batch plant at a nearby staging area 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.

Folsom Dam Water Control Manual Update

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. The BDCP could contribute to beneficial cumulative effects by increasing suitable habitat for fish and wildlife species.

In April 2015, DWR announced a new proposed alternative to separate the conveyance facility and habitat restoration measures into two separate efforts: California WaterFix and California EcoRestore (DWR 2015). Under the new proposed alternative, proposed restoration measures are reduced and the timeline would be accelerated. The Recirculated Draft EIR/Supplemental Draft EIS was released for public comment in summer/fall 2015.

Central Valley Project Biological Opinions

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, other local projects would be complying with the Corps' vegetation policy and could result in the removal of vegetation along waterways for projects that do not receive a vegetation variance.

The 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

Valley Elderberry Longhorn Beetle

Concurrent construction of multiple projects over the next 10 to 15 years within the Sacramento Metropolitan area would likely cause mortality to beetles due to construction operations. Construction activities for the multiple projects would occur each year during the flight season of beetles. Since construction activities would be adjacent to known VELB locations it is likely that some mortality may occur. The exact number injured or killed is unknown but would likely be minimal due to the exceptional flight ability of the beetle to avoid construction vehicles. No designated critical habitat would be affected with the construction of any of the projects.

Shrubs within the each project footprint would be transplanted to areas in close proximately to the current locations. Additionally, compensation would be located within the vicinity of impacted shrubs. Transplanting of shrubs and planting of seedlings and natives within the project vicinity would provide connectivity for the beetle. Connectivity is a primary cause of the beetle decline and an important element in the recovery and sustainability for the beetle. The transplanting of shrubs and compensation within the same area as the potential impacts would result in adverse effects to the beetle but not result in jeopardy to the valley elderberry longhorn beetle.

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

The ARCF GRR estimates that approximately 0.25 acre of vernal pool habitat could be impacted by project construction. However, the Corps proposes to offset this impact through the purchase of credits at a mitigation bank. None of the other related projects discussed above involve activities in known vernal pool habitats. As a result, the ARCF GRR would not contribute to a cumulative effect on vernal pool fairy shrimp or vernal pool tadpole shrimp, and no additional mitigation beyond the measures discussed in Section 3.8.6 would be required.

Giant Garter Snake

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.

Special Status Migratory Bird Species

Concurrent construction of multiple projects over the next 10 to 15 years within the Sacramento Metropolitan area would result in adverse effects to special status migratory bird species such as Swainson's hawk, Western yellow-billed cuckoo, and white-tailed kite through the removal of trees within the riparian corridors. Construction activities for the multiple projects would occur each year during nesting season, which could disrupt nesting birds. No designated critical habitat would be affected with the construction of any of the projects.

Prior to construction, each project would be required to conduct surveys to determine the presence of nesting birds. If nesting birds are present, additional measures would be proposed by each of the projects, which may include biological monitoring and buffers around nesting trees. Additionally, any tree removal would likely occur outside of the nesting season. Each project would be required to compensate for the loss of nesting trees. Planting of seedlings and native trees within the project vicinity would provide some habitat connectivity for these bird species and would likely improve the habitat in the area long-term by filling gaps in the riparian canopy. While the short term impact would be significant, over time these compensation measures within the same area as the potential impacts would result in less than significant effects to migratory birds.

Burrowing Owl

Concurrent construction of multiple projects over the next 10 to 15 years within the Sacramento Metropolitan area could result in adverse effects to burrowing owls through the disturbance of potential burrow habitat within the riparian corridors. Construction activities for the multiple projects would occur each year during nesting season, which could disrupt nesting owls. Prior to construction, each project would be required to conduct surveys to determine the presence of burrowing owls. If nesting owls are present, additional measures would be proposed by each of the projects, which may include biological monitoring and buffers around burrow sites. Additionally, any tree removal would likely occur outside of the nesting season. There is the potential that these projects could result in significant impacts to burrowing owls, including disturbance of nesting owls, and mortality to owls if their presence is unknown. However, with the implementation of appropriate mitigation and minimization measures, it is unlikely that the proposed actions would combine to contribute to a significant cumulative effect to burrowing owls.

Special Status Salmonid Species

Special status salmonid 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 salmonids. 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.

Reciept of a vegetation variance would allow trees to remain in place along the lower one-third of the levee and protect essential habitat for many special-status species. Beyond the existing trees being left in place, plants would be installed within the planting berm and potentially provide habitat where none currently exists 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.

Green Sturgeon

Green sturgeon use the Sacramento River 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 green sturgeon. These effects could contribute to species decline and losses of habitat that have led to the need to protect this species under the Federal and State ESA.

In particular, the combination of the ARCF GRR, SRBPP, and West Sacramento projects could combine to contribute to adverse effects to green sturgeon in the study area. These projects involve the placement of bank protection to address erosion in the study area, and in doing so could adversely impact the food source of the green sturgeon by covering benthic substrate with rock. However, the extent of impact to this species is not easily defined due to the lack of scientific knowledge in this area of the Sacramento River system. These projects are working to adaptively manage their implementation to minimize impacts on the species through modeling efforts during the design phase, and monitoring during the construction phase of the projects. More information on the Corps' mitigation efforts for green sturgeon is included in the Habitat Mitigation and Monitoring Plan (Appendix I). With the implementation of the Corps' proposed mitigation and compensation efforts for both the West Sacramento and ARCF GRR projects, significant cumulative effects on green sturgeon would be minimized as discussed above and replacement habitat compensation would be created for the remaining unavoidable impacts.

Delta Smelt

With the implementation of site specific designs, the local projects would provide long term net benefits to delta smelt. However, there are four specific significant threats to the delta smelt that have been identified by the USFWS: direct entrainments by State and Federal water export facilities, summer and fall increases in salinity, summer and fall increases in water clarity, or effects from introduced species.

Implementation of the various projects would not affect direct entrainments by State and Federal water export facilities. The only potential effect could result from the release of more water down the Sacramento Bypass into the Yolo Bypass during high water events, as a result of construction of the ARCF GRR project. The excess water that would normally be moving downriver through the Sacramento area would enter the system farther down in the Delta area. Since adult delta smelt are moving up the system to spawn at this time this would not affect entrainment in the water export facilities. Summer and fall increases in salinity is driven more by low flow drought years and water releases in the Sacramento tributaries then site specific designs for erosion protection in the project areas. Summer and fall increases in water clarity are associated with, among other factors, invasive

nonnative clam species and non-native plant species, which are generally located down in the Delta below the project areas, that are filtering out vital chlorophyll and plankton that would normally increase turbidity which helps the delta smelt avoid predators. As mentioned above the erosion repair activities of these combined projects would likely reduce the sediment supply for riverine reaches directly downstream because the erosion repair is holding the bank or levee in place. However, as explained above, from a system sediment perspective, the bank material the ARCF GRR project is 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. As a result, it is unlikely that the combination of the ARCF GRR, West Sacramento, and SRBPP projects would contribute to cause significant impacts to Delta smelt, with the implementation of proposed mitigation measures to reduce construction-related impacts.

Special Status Plant Species

Concurrent construction of multiple projects over the next 10 to 15 years within the Sacramento Metropolitan area could result in adverse effects to special status plant species, including Sanford's arrowhead and wooly rose-mallow through the disturbance of their habitat. Construction activities could result in disturbance through dust, or even mortality if their presence is not properly established before the commencement of construction activities. Prior to construction, each project would be required to conduct surveys to determine the presence of special status plant species. These surveys would need to occur during the blooming period of each species. If special status plants are present, additional measures would be proposed by each of the projects, which may include biological monitoring and buffers around habitat areas. There is the potential that these projects could result in significant impacts to these species if their presence is unknown. However, with the implementation of appropriate mitigation and minimization measures, it is unlikely that the proposed actions would combine to contribute to a significant cumulative effect to special status plant species.

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. Resolution of all adverse effects across multiple projects is unlikely considering the nature of finite cultural resources that may be lost or damaged by the implementation of these projects. Although mitigation would minimize these impacts, there is still likely a significant cumulative effect to cultural resources.

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 viewscape 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.
- Direct, indirect, and/or cumulative effects that result in the loss of historic properties.

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 destruction of historic properties or the reduction in their ability to convey their significance is irreversible. Additionally, the loss of information that could be gained by the destruction of historic properties is irretrievable.

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 EIS/EIR, 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.

4.7 Resource Agency Recommendations and Responses

4.7.1 USFWS Coordination Act Report Recommendations and Responses

USFWS submitted a draft CAR for the ARCF GRR project in September 2013. The recommendations from that CAR are presented below and the Corps responses follow each recommendation. The draft CAR is included in Appendix A. The USFWS recommends that the Corps:

- Avoid impacts to native trees, shrubs, and aquatic vegetation. Any native trees or shrubs removed with a diameter at breast height of 2 inches or greater should be replaced on-site, in-kind with container plantings so that the combined diameter of the container plantings is equal to the combined diameter of the trees removed. These replacement plantings should be monitored for 5 years or until they are determined to be established and self-sustaining. The planting site(s) should be protected in perpetuity.

  Response: The Corps would avoid impacts to trees, shrubs, and aquatic vegetation to the maximum extent possible through the receipt of a vegetation variance, and the implementation of the SWIF by the LMA. Vegetation would only be removed from the construction footprint. Replacement plantings would be installed either on-site or at an off-site restoration area coordinated with USFWS and monitored per the recommendations.

- Avoid the loss of SRA cover by planting native woody vegetation within the bank protection areas. Work with the Service, NMFS, and CDFW to develop planting and monitoring plans, and with DWR and SAFCA to develop a variance to allow vegetation within the Corps' vegetation free zone to remain in place, especially in areas designed for rock slope protection.

Response: The Corps would avoid the loss of SRA cover through the receipt of a vegetation variance, which would allow large trees to remain on the lower waterside slope of the levee. In addition, where feasible, bank protection sites would be designed with a planting berm, and native woody vegetation would be installed on-site.

- Avoid impacts to migratory birds nesting in trees along the access routes and adjacent to the proposed repair sites by conducting pre-construction surveys for active nests along proposed haul roads, staging areas, and construction sites. This would especially apply if construction beings in spring or early summer. Work activity around active nests should be avoided until the young have fledged.

  Response: The Corps would conduct pre-construction migratory bird surveys along all proposed haul routes, staging areas, and construction sites. If active nests are present, the Corps would coordinate with USFWS regarding avoidance and minimization measures to implement during construction, such as avoiding nesting areas or monitoring.

- Avoid future impacts to the site by ensuring all fill material is free of contaminants.

  Response: The Corps would test potential borrow sites prior to construction to ensure that all borrow material is free from contaminants.

- Minimize project impacts by reseeding all disturbed areas, including staging areas, at the completion of construction with native forbs and grasses. Reseeding should be conducted just prior to the rainy season to enhance germination and plant establishment.

  Response: All disturbed areas would be reseeded with native grasses at the completion of construction per the recommendations above.

- Minimize the impact of removal and trimming of all trees and shrubs by having these activities supervised and/or completed by a certified arborist.

  Response: All tree removal activities would be monitored or completed by a certified arborist.

- Compensate the loss of oak woodland, riparian forest, riparian scrub-shrub, and emergent wetland at a ratio of at least 2:1. If on-site compensation at a ratio of 2:1 is not possible, the Corps should work with the Service and other resource agencies on the development of a suitable off-site compensation area. For the loss of other cover-types, the Corps should work with the Service and other resource agencies on the development of compensation success benchmarks to ensure that goals are achieved.

Response: Compensation for the loss of habitat would be at a 2:1 ratio. Off-site restoration areas would be coordinated with the Service. Success benchmarks are established in the Habitat Mitigation and Monitoring Plan included with this EIS/EIR as Appendix I and would be further coordinated with the resource agencies during the design phase of the project.

- All impacted areas should be planted with a diverse mix of woody and herbaceous riparian vegetation. Sites should be diverse (a mix of riparian forest and scrub-shrub) and fit into the surrounding landscape. The planting plan should take into account what is missing from the surrounding vegetation and attempt to create heterogeneous habitats. The Corps should develop a baseline map of existing vegetation communities. Given the amount of rock already placed and the amount proposed for placement, this can serve to create diverse and heterogeneous habitats.

  Response: The Corps will ensure that the restoration areas are planted with a diverse mix of woody and herbaceous riparian vegetation and will attempt to create diverse, heterogeneous habitats.

- Include within the planting contract a provision for the contractor to plant understory species after some of the woody canopy has established. Studies have shown that planting late successional understory species after woody canopy cover has been established provides better success for establishing these understory plants. Incorporating these species within the planting mix provides more diverse habitat for wildlife species (Johnston 2009).

  Response: The Corps will include a provision in the planting contract for the contractor to plant understory species later in the contracting period, after woody canopy cover has had time to establish.

- Consult with the Service on project effects on the giant garter snake, the delta smelt and its critical habitat, and the valley elderberry longhorn beetle and its critical habitat.

  Response: The Corps has consulted with USFWS on the project and a Biological Opinion is included in Appendix J of this document.

- Contact NMFS for possible effects of the project on Federally listed species under their jurisdiction.

  Response: The Corps has consulted with NMFS on the project and a Biological Opinion is included in Appendix J of this document.

- Contact CDFW regarding possible effects of the project on State-listed species.

  Response: The Corps provided CDFW a copy of this EIS/EIR during the public review period. CDFW provided comments on the analysis and the Corps has addressed those comments, as appropriate. Further coordination with CDFW will occur during the design phase of the project.

4.7.2 NMFS Essential Fish Habitat Recommendations and Responses

NMFS submitted a final BO for the ARCF GRR project on September 9, 2015. The Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) conservation recommendations are presented below with Corps responses.

- Fully implementing these EFH conservation recommendations will protect, by avoiding or minimizing the adverse short-term habitat effects described in Section 3.2 of the BO. The Corps should mitigate for WRI deficits by offsetting the maximum deficits. Below is a summary of WRI that should be mitigated to minimize the adverse effects of the Common Features GRR to Pacific coast salmon species. The Corps should offset deficits either onsite or at a NMFS approvedconservation bank. The mitigation should be at a 1:1 ratio if conducted prior to the compensation timing schedule described in the Analytical Approach section of the BO, or at a 3:1 ratio if carried out any later. (Note from Corps: Please see the NMFS BO in Appendix J for the 23 identified WRI deficits that result from the recommended plan).

  Response: The Corps shall ensure that, for salmon, the 23 maximum Standard Assessment Methodology Weighted Response Indices deficits for each seasonal water surface elevation, as determined appropriate with input from the Interagency Working Group or the Bank Protection Working Group, are fully offset. The effects would be offset through habitat improvements within the ARCF GRR project area or through the purchase of credits at a NMFS approved conservation bank, as described in the Biological Assessment. The Corps will mitigate at a 1:1 ratio if conducted prior to the compensation timing schedule described in the Analytical Approach section of the BO, or at a 3:1 ratio if carried out any later.

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.

5.1 Federal Laws, Regulations, and Policies

Clean Air Act of 1972, as amended (42 U.S.C. 7401, et seq.)

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 Appendix D), 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.

Clean Water Act of 1972, as amended (33 U.S.C. 1251, et seq.)

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. The Corps will request a Section 401 water quality certification from the Central Valley RWQCB during the preconstruction engineering and design phase of the project due to the level of design detail needed in order to complete this consultation.

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 project's alternatives, 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. Additionally, in the Section 404(b)(1) Analysis, Alternative 2 is identified as the Least Environmentally Damaging Practicable Alternative.

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.)

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. In a letter dated June 27, 2014, the Corps initiated formal Section 7 consultation with USFWS and NMFS and submitted a biological assessment that includes the Corps' determination of may affect, likely to adversely affect listed species (salmonids, steelhead, green sturgeon, Delta smelt, valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, Western yellow-billed cuckoo, and giant garter snake) and their critical habitat (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 April 2015. The Biological Opinion from NMFS was received on September 9, 2015. The Biological Opinion from USFWS was received on September 11, 2015. With receipt of these opinions from the services, and implementation of the enclosed reasonable and prudent measures and terms and conditions, the ARCF GRR is in full compliance with the Federal ESA.

Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661, et seq.)

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 the Coordination Act Report (CAR) is provided in Appendix A. The Corps has considered all recommendations provided in the CAR. The USFWS' recommendations and the Corps response are provided in Section 4.7 of this document.

Magnuson-Stevens Fishery Conservation and Management Act (16. U.S.C. 1801, et seq.)

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). The ARCF project and its potential effects to EFH are being coordinated with the NFMS under the Magnuson-Stevens Act, and the Corps received EFH conservation recommendations from NMFS on September 9, 2015. On September 24, 2015, the Corps transmitted a letter to NMFS responding to the recommendations from NMFS. As a result, the ARCF GRR project is in full compliance with the Magnuson-Stevens Act.

Migratory Bird Treaty Act of 1936, as amended (16 U.S.C. 703, et seq.)

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, and subsequent avoidance of nesting birds, the project would be in compliance with this Act.

Executive Order 11988, Flood Plain Management

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. In the GRR, an EO 19988 consistency analysis was conducted in addition to an evaluation of residual flood damage. It was concluded that there is substantial evidence that Alternative 2 would accommodate anticipated growth in the project area in a manner that would be consistent with adopted local and regional growth management plans and with the State's emerging State Plan of Flood Control. There is substantial evidence that the Recommended Plan would accommodate planned regional growth in a manner that would be consistent with emerging smart growth principles. Thus, the project, while accommodating planned regional growth, is not growth inducing itself and is compliant with EO 11988.

The objective of the study is to reduce flood risk and its associated consequences on the public health, safety, and property in the study area. In order to achieve this objective, the study recommends improvements to the ARS and ARN basin levees. These two basins are essentially built-out; however, infill development is ongoing. There are no development restrictions in these basins and so this infill development would occur even without implementation of this recommended plan. Therefore, the project does not trigger or induce development that would not otherwise occur.

Alternative 2 is consistent with the requirements of the EO 11988 since there is no practicable alternative to improving the levees, which are the first line of defense for reducing the risk of flooding in the established urban area. The consistency of these recommendations is further demonstrated by the reduction in the probability of flooding in the study area and the associated societal, economic, and environmental hazards posed by flooding. Alternative 2 would reduce the risk associated with floods thereby minimizing the impacts of floods on human safety, health, and welfare. Alternative 2 also recommends widening the Sacramento Weir and Bypass which would assist in the restoration and

preservation of the natural and beneficial values of the base floodplain. As a result, the proposed project is in compliance with this EO.

Executive Order 11990, Protection of Wetlands

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

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.

Executive Order 13112: Invasive Species

EO 13112, signed February 3, 1999, directs all Federal agencies to prevent and control the introduction of invasive species in a cost-effective and environmentally sound manner. The order established the National Invasive Species Council, which is composed of Federal agencies and departments, and the supporting Invasive Species Advisory Committee, which is composed of state, local, and private entities. The Council's national invasive species management plan recommends objectives and measures to implement this EO and to prevent the introduction and spread of invasive species (National Invasive Species Council, 2008). EO 13112 requires consideration of invasive species in NEPA analyses, including their identification and distribution, their potential effects, and measures to prevent or eradicate them. This discussion is included in Section 3.6, Vegetation and Wildlife, including proposed measures to prevent the spread of invasive species during construction of the proposed alternative. As a result, the ARCF GRR is in compliance with this EO.

Farmland Protection Policy Act (7 U.S.C. 4201, et seq.)

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 considered Prime Farmland under the Williamson Act, as discussed in the State laws below. 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. The Corps has completed NRCS Form DA 1006 and included it as Appendix K of this document. 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.)

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. Full compliance will be achieved when this 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. The preferred alternative would bring the American River South Basin to a 1 in 147 Annual Exceedance Probability (AEP)and the American River North Basin to a 1 in 256 AEP.

National Historic Preservation Act of 1966, as amended (54 U.S.C. 300101)

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, a records and literature search, through consultation, or by other means, 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 was 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 draft PA appended to the DEIS/DEIR. Additional comments from the SHPO provided in August and September 2015 were incorporated into the final PA, which was signed and executed by the Corps and the SHPO on September 10, 2015. 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. The final PA was filed with the ACHP on October 30, 2015 and the ACHP acknowledged receipt in a letter dated November 2, 2015. 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. The executed PA is included in Appendix C.

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 Native Americans included the treatment of American Indian remains discovered during construction of the project, involvement of American Indian tribal monitors during construction, the opportunities for Native Americans to review and comment on archaeological survey reports and determinations of eligibility and affect, and the involvement of Native Americans 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. In letters dated December 7, 2015, the executed PA was transmitted to Native Americans, inviting them to sign the PA as concurring parties. 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 implementation 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. In letters dated December 7, 2015, the executed PA was transmitted to selected organizations, inviting them to sign the PA as concurring parties.

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 executed 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. The PA was executed and signed by the Corps and the SHPO on September 10, 2015 and 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 is 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.)

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, the management plan for the Wild and Scenic Rivers Act. 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). However, due to the significant impacts to the recreation facilities within the American River Parkway, there would be direct and adverse effects to the recreational outstandingly remarkable value which is designated for the river under the Wild and Scenic Rivers Act. There would be a direct effect to the extraordinary fisheries value due to construction-related impacts, but the fisheries habitat would improve over the baseline condition with the implementation of the project due to the planting berms and additional SRA habitat that is designed into the bank protection sites. The National Park Service issued comments on the draft EIS/EIR and their comments were addressed in this final EIS/EIR, as appropriate. The final EIS/EIR will be submitted back to the National Park Service, in coordination under this Act.

5.2 State of California Laws, Regulations, and Policies

Alquist-Priolo Earthquake Fault Zoning Act

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

The California Clean Air Act was signed into law in 1988 and, clearly spells 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.

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

This Act requires the non-Federal partner to consider the potential adverse affects to State-listed species. As a joint NEPA/CEQA document, this EIS/EIR 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, however, impacts to giant garter snake are primarily addressed through Federal ESA coordination with USFWS. Additionally, the project has the potential to effect State-listed bird species, such as Swainson's hawk, burrowing owl, and purple martin, if nests are present at the construction sites. 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 avoidance or minimization measures that would need to be implemented to protect State-listed species. The Corps anticipates that implementation of these measures would avoid the need for any additional permits or incidental take statements from CDFW. As a result, the ARCF would be in full compliance with this Act once these surveys are conducted and coordination has occurred.

California Environmental Quality Act

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

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

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

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 have implemented 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

To announce the start of the Common Features General Reevaluation Study, a notice of intent (NOI) to prepare the ARCF GRR EIS was posted in the Federal Register (Vol. 73, No. 41) on February 29, 2008. The CVFPB published the NOP with the State Clearinghouse on February 27, 2008. The recipients were invited to comment on the results of the earlier completed reconnaissance study and to provide input to the feasibility study, including the scoping of the environmental issues that should be addressed throughout the study. 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. The meeting locations, dates and times were as follows:

- March 5, Scottish Rite Center—6 151 H Street, Sacramento (5 to 7 p.m.).
- March 10, Library Galleria—828 I Street, Sacramento (3 to 6 p.m.).
- March 12, Elk's Lodge— 6446 Riverside Boulevard, Sacramento (5 to 7 p.m.).
- March 13, Sierra Health Foundation— 1321 Garden Highway, Sacramento (5 to 7 p.m.).

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 52), and copies of the posters for the March 2008 scoping meetings.

Table 52. 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.	

The Corps considered CalTrans' scoping comments in the following ways:

- The Corps is considering the use of waterside barges to construct the bank protection sites on the Sacramento River in order to reduce damages to roadways associated with the hauling of rock.
- Maps of the study area were provided to CalTrans through the submittal of the draft EIS/EIR to public review, as discussed in Section 6.1.2 below.
- A Traffic Management Plan and all appropriate permits would be prepared and coordinated during the project's design phase and would be in place, as appropriate, prior to the start of construction.

6.1.2 Public Review

The draft GRR and EIS/EIR were circulated for public review beginning on March 13, 2015. The notice of availability (NOA) was published in the Federal Register on March 13, 2015. The draft GRR and EIS/EIR were made available both on the Sacramento District, Corps of Engineers website as well as on the website for the Central Valley Flood Protection Board. Hard copies of the draft GRR and EIS/EIR were provided to area libraries. Letters and/or DVD copies of the GRR and EIS/EIR were sent to interested parties, local residents, and to the agencies and elected officials listed in Section 6.4 of the EIS/EIR. Public workshops were held during the review period to provide additional opportunities for comments on the draft documents. All comments received during the public review period were considered and incorporated into the final GRR and EIS/EIR as appropriate. The meeting locations, dates and times were as follows:

- April 8, Hagginwood Community Center—3270 Marysville Blvd, Sacramento (5 to 7 p.m.).
- April 9, Elk's Lodge— 6446 Riverside Boulevard, Sacramento (5 to 7 p.m.).
- April 15, Library Galleria—828 I Street, Sacramento (3 to 5 p.m.).
- April 17, Arden-Dimick Library— 891 Watt Ave., Sacramento (5 to 7 p.m.).

A total of 137 people attended the four meetings. Comments were solicited at the meetings and documented through the use of court reporters and comment cards at the meetings. Additionally, comments could be submitted through mail or electronic mail. Oral and written comments were submitted throughout the series of meetings by local, State, and Federal agencies, community organizations, and individuals.

The most significant public comments on the draft documents focused on: 1) access to recreational features during and after construction; 2) design, placement and justification for rock erosion protection along the American and Sacramento Rivers; 3) effects to vegetation as a result of the recommendations; 4) clear presentation of the anticipated level of the performance of the project; and 5) coordination with stakeholders in future phases of the project. The full array of comments and the associated responses to them are included in the Public Involvement Appendix (Appendix F).

Comments on the draft documents received from reviewers and the public were incorporated in to the final documents as appropriate. Many of the comments requested greater clarity and the documents were modified in response to these requests. The comments did not result in a recommendation of a different plan.

6.1.2 Final Public Review

The final GRR and EIS/EIR were circulated for public review beginning on January 22, 2016. The notice of availability (NOA) was published in the Federal Register on January 22, 2016. The final GRR and EIS/EIR were made available both on the Sacramento District, Corps of Engineers website. Hard copies of the final GRR and EIS/EIR were provided to area libraries. Letters and/or DVD or hard copies of the GRR and EIS/EIR were sent to interested parties, local residents, and to the agencies and elected officials listed in Section 6.4 of the EIS/EIR. All comments received during the public review period were considered and incorporated into the final GRR and EIS/EIR, as appropriate.

Public comments on the final documents focused in part on: 1) access to recreational features during and after construction; 2) design, placement, and justification for rock erosion protection along the American and Sacramento Rivers; 3) effects to vegetation as a result of the alternatives; and 4) coordination with stakeholders in future phases of the project. The comments and the responses to them are summarized in the Public Involvement Appendix (Appendix F)

6.1.3 Next Steps in the Environmental Review Process

After considering the additional comments on the final GRR and EIS/EIR, 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 of the project and subsequent appropriation of funds to design and construct the project.

6.1.4 Major Areas of Controversy

Based on the comments received, the major areas of public controversy associated with the project are:

- 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;
- Impacts to cultural resources and tribe/tribal concerns.

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 Native Americans included the treatment of American Indian remains discovered during construction of the project, involvement of American Indian tribal monitors during construction, the opportunities for Native Americans to review and comment on archaeological survey reports and determinations of eligibility and affect, and the involvement of Native Americans 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. Documents pertaining to 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 has coordinated with USFWS throughout the planning phase of the study to help analyze potential effects to endangered species and biological resources under the Fish and Wildlife Coordination Act. The CAR is included as Appendix A of this document. A biological assessment was prepared and transmitted to USFWS and NMFS on April 3, 2015 (Appendix G). Consultation pursuant to Section 7 of the Endangered Species Act (ESA) has been on-going as part of the ARCF GRR study phase. The Biological Opinion from NMFS was received on September 9, 2015. The Biological Opinion from USFWS was received on September 11, 2015. With receipt of these opinions from the services, and implementation of the enclosed reasonable and prudent measures and terms and conditions, the ARCF GRR is in full compliance with the Federal ESA. In addition, the Corps coordinated with NMFS under the Magnuson-Stevens Fishery and Conservation Act to address impacts to Essential Fish Habitat. The final Biological Opinions from both agencies are included with this document as Appendix J.

This document has been coordinated with the CVFPB and SAFCA as the non-Federal and local sponsors to ensure that the project is supportable by both agencies, and to ensure appropriate compliance with State and local laws and regulations.

Coordination with the SHPO was conducted during the early planning phase of this study and has continued through development of this document and the PA to comply with Section 106 of the NHPA..

Coordination with the SMAQMD occurred regularly throughout the planning phase to ensure that the project was addressing all appropriate air quality laws and regulations. In addition, coordination occurred with the U.S. EPA during the public review period.

The draft EIS/EIR was provided to the National Park Service for review under the Federal Wild and Scenic Rivers Act. The National Park Service issued comments on the draft EIS/EIR and the Corps

has included responses to their comments in Appendix F. Additional analysis of effects to the American River Parkway in accordance with the Federal Wild and Scenic Rivers Act has been included throughout the final EIS/EIR. The Corps will coordinate further with the National Park Service during site-specific design development on the American River in order to ensure compliance with the Federal Wild and Scenic Rivers Act.

This document was circulated to those listed in Section 6.4 for public comments. Comments received were incorporated, as appropriate. The officials and agencies listed in Section 6.4 will also receive a copy of the final EIS/EIR upon its release.

6.4 List of Recipients

The following Federal, State, and local agencies and organizations received copies of the draft EIS/EIR 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. These agencies and representatives will also receive copies of the final EIS/EIR during the 30-day public review period.

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
- National Park Service

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
- Sacramento Municipal Utility District
- Yolo-Solano Air Quality Management District

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This EIS/EIR was prepared by the U.S. Army Corps of Engineers, Sacramento District. The following is a list of individuals representing the Corps who prepared sections of the EIS/EIR, provided significant background materials, provided project description engineering details, participated in preparing the EIS/EIR, or conducted internal technical reviews of the EIS/EIR.

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9.0 INDEX

Affected Environment 60
Agency Coordination 20
Air Quality 237, 358
Alquist-Priolo Earthquake Fault Zoning Act 380
Alternative 1 ..... 32, 35
Alternative 2 ..... 46, 47, 51
Alternative Formulation and Screening 25
Alternatives 25
American River Parkway 292
Appendices xi
Area of Potential Effects 203
Attainment Status 241
Auburn Dam 27
Authority 16
Authorized Project Features 5
Background 3
Bank Protection 36, 38, 41
Biological Opinion 401
Borrow Sites 75
California Clean Air Act 380
California Department of Fish and Game 399, 404
California Department of Water Resources 142, 395
California Endangered Species Act 381
California Environmental Quality Act 15, 381
California Seismic Hazards Mapping Act 382
California Surface Mining and Reclamation Act 382
California Water Code 383
Central Valley Project 406
Central Valley Steelhead 165, 399
Channel Stability 86
Chinook Salmon 160, 164, 176, 179
Clean Air Act 368
Clean Water Act 369
Climate Change 262, 358
Community Outreach 20
Comparison of Alternatives 52
Construction Emissions ..... x, 249, 250, 251, 254, 255, 256, 257
Construction GHG Emissions 274
Construction Noise Levels 289
Construction Schedule 35, 51
Contents i
Criteria Pollutants 238
Cultural Resources 202, 213, 357
Cumulative Effects 344

Cutoff Wall 39, 40
CVP 406
Delta 160, 161, 402, 404, 405, 407
Delta Smelt 166, 182
East Side Tributaries 43
Endangered Species Act 370
Environmental Consequences 60
Environmental Justice 339, 343, 373
Erosion 9
Executive Order 11988, Flood Plain Management 372
Executive Order 11990, Protection of Wetlands 373
Farmland Protection Policy Act 375
Federal Laws 368
Field Survey Results 211
Figures viii
Fish and Wildlife Coordination Act 371
Fisheries 134, 353
Folsom Dam 14
Fugitive Dust 252, 258, 259
Future Without Project Condition 26, 90
Geological Resources 60
Geomorphic Conditions 84
Giant Garter Snake 156, 172, 193
Green Sturgeon 167, 181
Groundwater Resources 97
Growth Inducing Impacts 360
Hazardous Wastes and Materials 332
Historic Setting 209
Hydrology and Hydraulics 83
I Street Bridge Diversion Structure 30
Introduction 1
Irreversible and Irretrievable Commitment of Resources 363
Issues of Known Controversy 20
Land Use 69
Launchable Rock Trench 36, 38, 42
Levee Geometry 38
List of Preparers 409, 410
List of Recipients 390
Magnuson-Stevens Fishery Conservation and Management Act 371
Magpie Creek Diversion Canal 44
Major Areas of Controversy 388
Migratory Bird Treaty Act 372
Minerals 65
National Environmental Policy Act 15, 375
National Flood Insurance Program 375
National Historic Preservation Act 376
National Marine Fisheries Service 161, 399, 400, 401

Native American Consultation 388
No Action Alternative 31
Noise 275, 359
Non-Structural Measures 31
Old Bryte Landfill 72
Organization 21
Overtopping 10
Past, Present, and Reasonably Foreseeable Future Projects 346
Plates x
Porter-Cologne Water Quality Control Act 383
Prehistoric and Ethnographic Setting 206
Programmatic Agreement 217, 378
Project Location 2
Public Involvement 385
Purpose and Need 7
Records Search 210
Recreation 292, 359
References 393
Relationship of Short-Term Uses and Long-Term Productivity 362
Reoperation of Upstream Reservoirs 30
Sacramento River Bank Protection Project 401, 404
Sacramento Weir and Bypass 48
SAM 404
Scope 1
Scoping Meetings 385
Sedimentation 85
Seepage 8
Seismicity 62
Socioeconomics 339
Soils 64
Special Status Species 150, 353
Stability 10
Standard Assessment Methodology 404
State Water Project 395, 406
Steelhead 165, 180
Study Area 2
Surface Water Hydrology 90
Swainson's Hawk 157, 174, 194
SWIF 13
Tables ix
Toxic Air Contaminants 242, 252, 258
Transitory Storage 29
Transportation and Circulation 227
turbidity 143, 145
U.S. Fish and Wildlife Service 397, 405, 406
Unavoidable Adverse Effects 361
Underseepage 8

Uniform Relocation Assistance and Real Property Acquisition Policies Act 379
Upstream Storage 27
Utilities 323
Valley Elderberry Longhorn Beetle 155, 170, 187
Vegetation and Encroachment Compliance 11
Vegetation and Wildlife 110, 352
vegetation variance 14
Vernal Pool Fairy Shrimp 155, 172, 191
Vernal Pool Tadpole Shrimp 156, 172
Vibration 279, 286
Visual Resources 303, 360
Water Quality 97, 352
Wild and Scenic Rivers Act 380
Yolo Bypass Improvements 29

PLATES

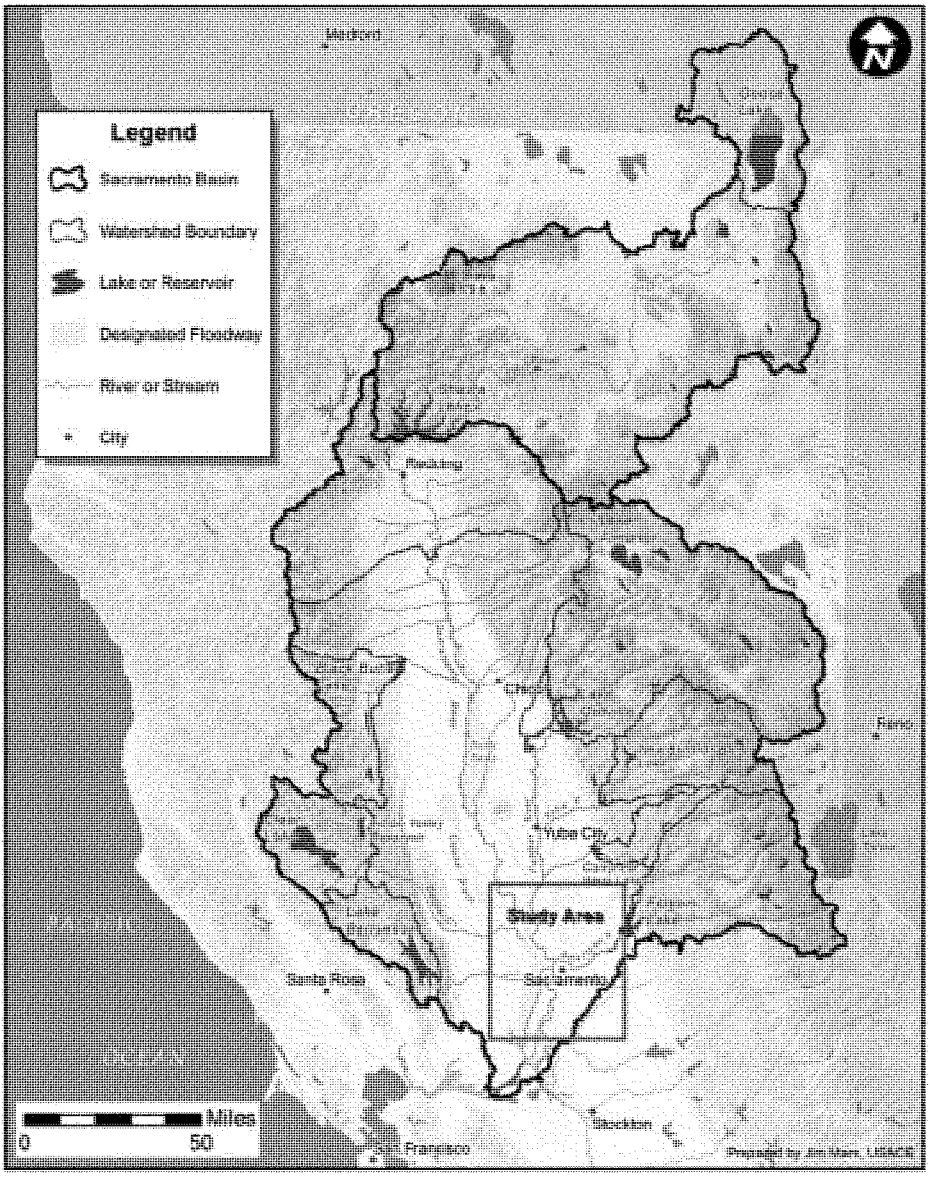


Plate 1. Watershed Map

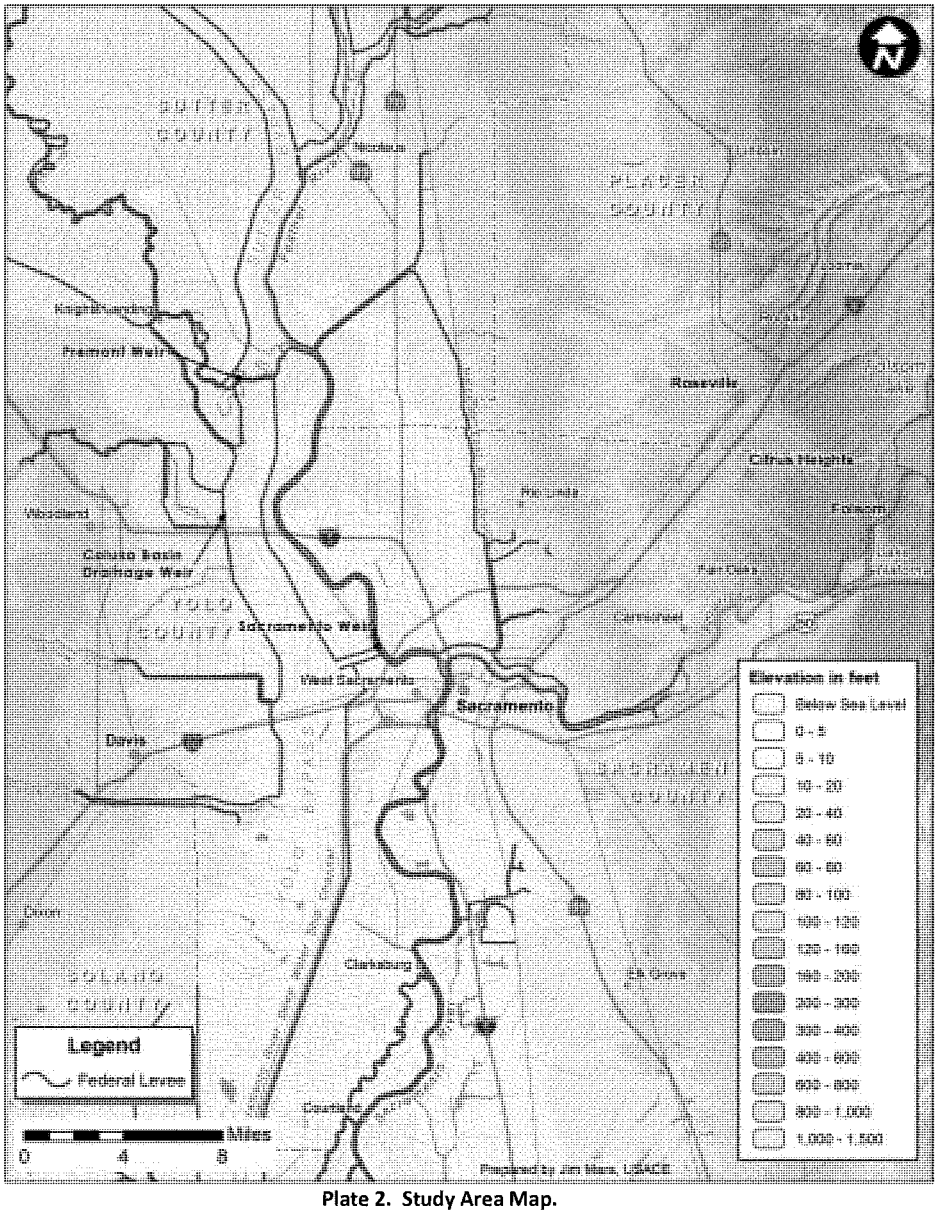
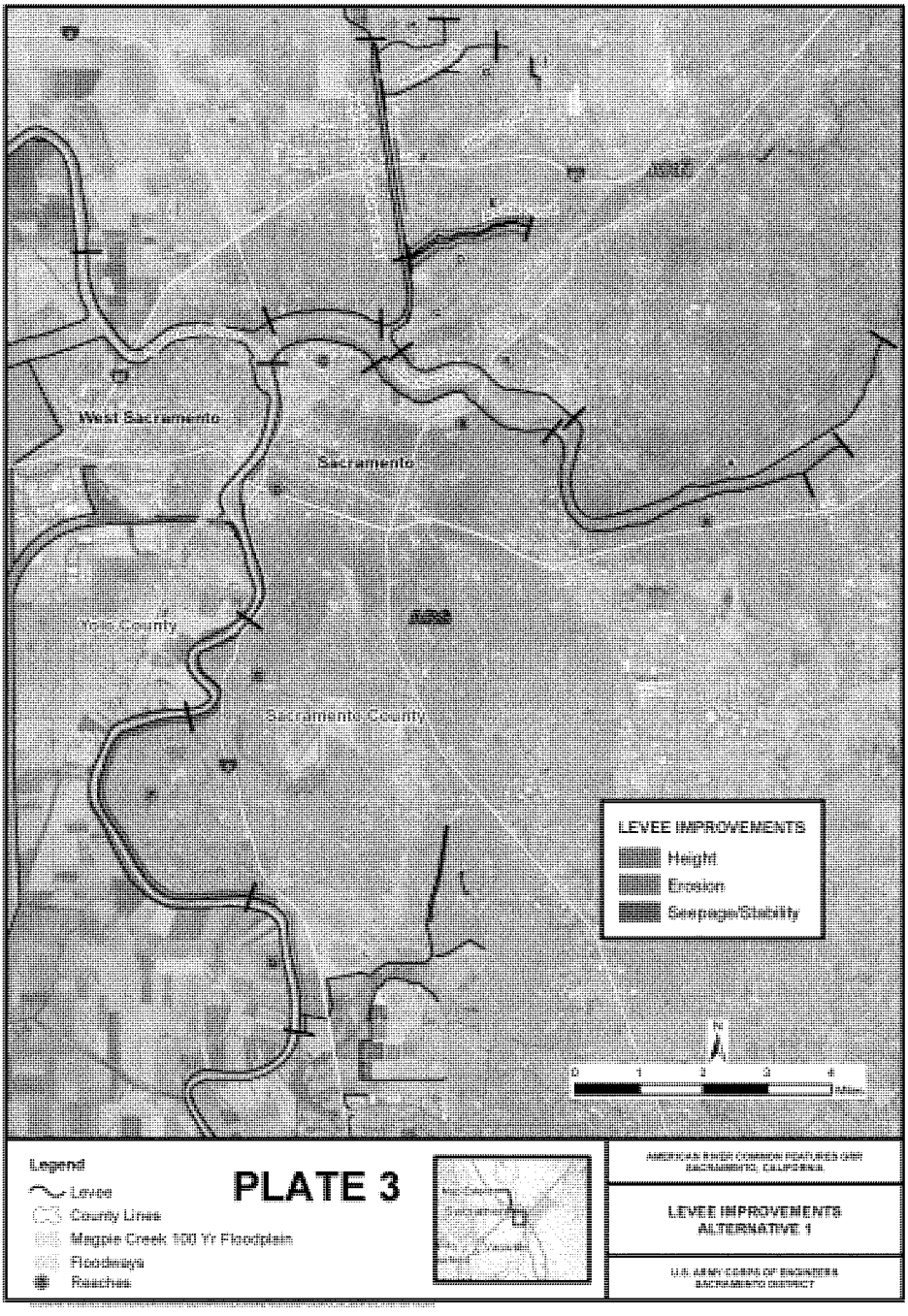
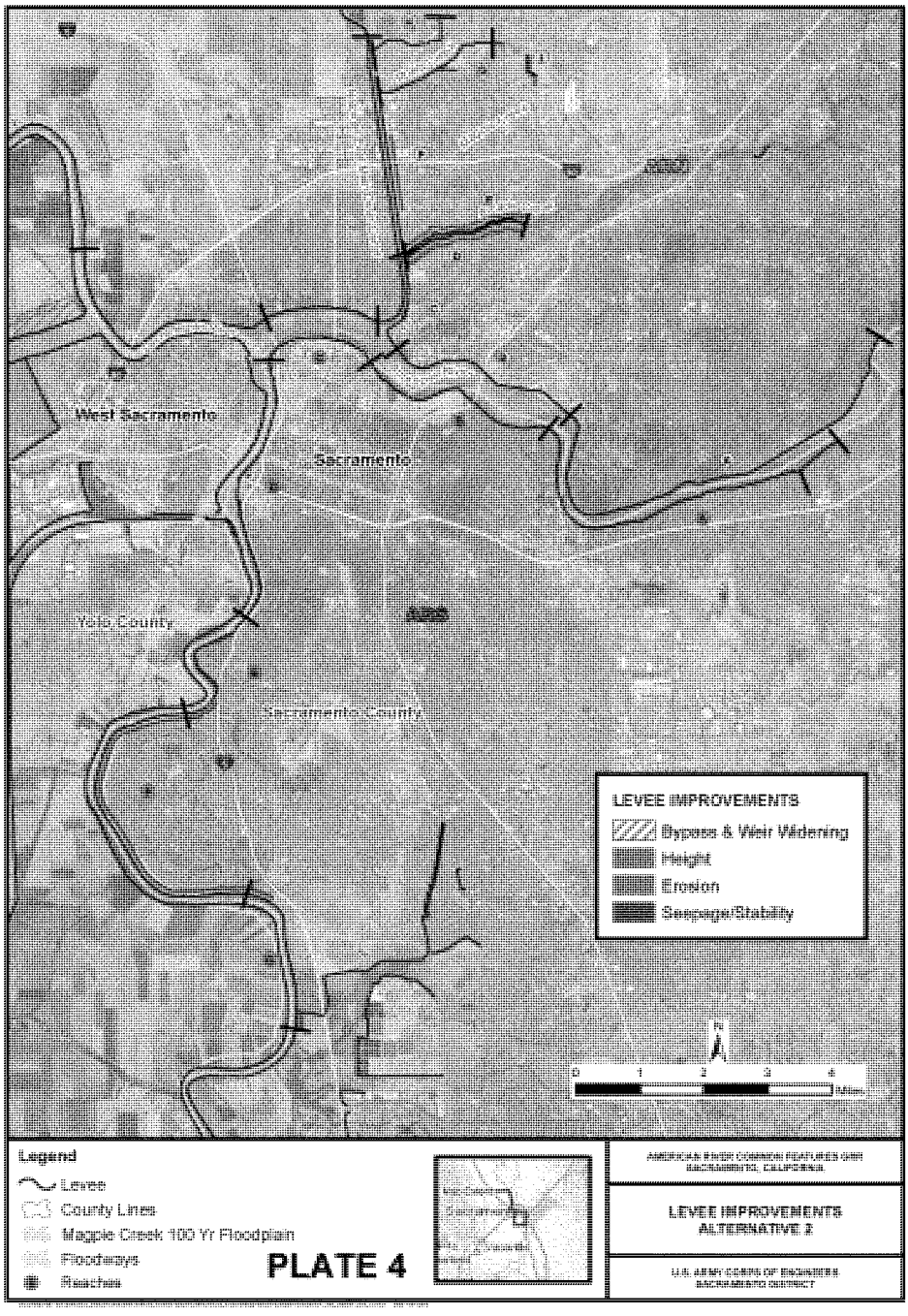
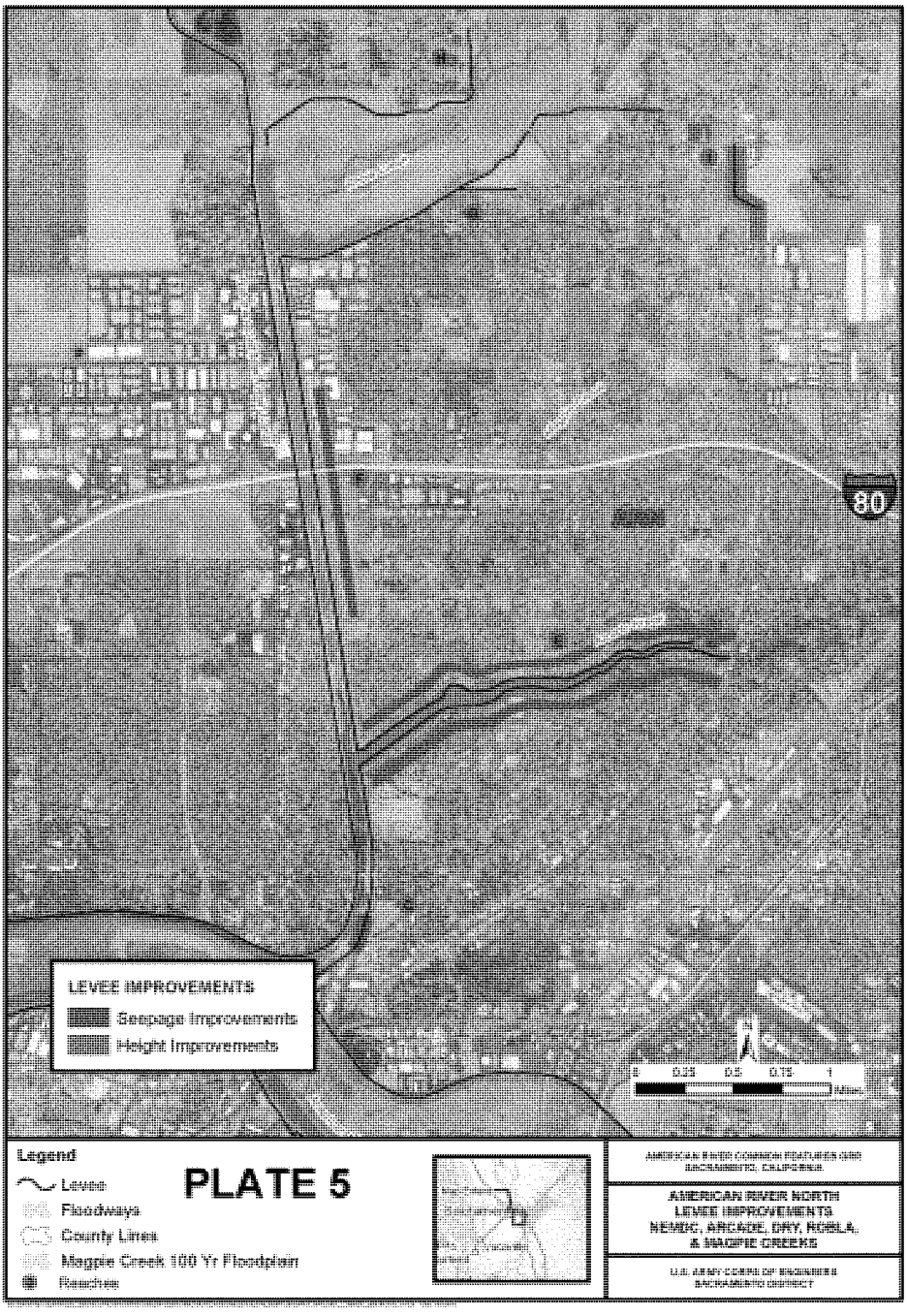


Plate 2. Study Area Map.


West Sacramento
Sacramento
Yolo County
Sacramento County
LEVEE IMPROVEMENTS
Height
Erosion
Seepage/Stability
N
0
1
2
3
4
Miles
Legend
Levee
County Lines
Magpie Creek 100 Yr Floodplain
Floodways
Ranchos
PLATE 3
AMERICAN RIVER COMMON FEATURES GRR
SACRAMENTO, CALIFORNIA
LEVEE IMPROVEMENTS
ALTERNATIVE 1
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT


West Sacramento
Sacramento
Yolo County
Sacramento County
LEVEE IMPROVEMENTS
Bypass & Weir Widening
Height
Erosion
Seepage/Stability
0 1 2 3 4
Miles
Legend
Levee
County Lines
Maggie Creek 100 Yr Floodplain
Floodways
Reaches
PLATE 4
AMERICA RIVER COMMON FEATURES GRR
SACRAMENTO, CALIFORNIA
LEVEE IMPROVEMENTS
ALTERNATIVE 2
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT


LEVEE IMPROVEMENTS
Seepage Improvements
Height Improvements
80
0
0.25
0.5
0.75
1
Miles
Legend
Levee
Floodways
County Lines
Maggie Creek 100 Yr Floodplain
Reaches
PLATE 5
AMERICAN RIVER COMMON FEATURES GRR
SACRAMENTO, CALIFORNIA
AMERICAN RIVER NORTH
LEVEE IMPROVEMENTS
NEMDC, ARCADE, DRY, ROBLA,
& MAGPIE CREEKS
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

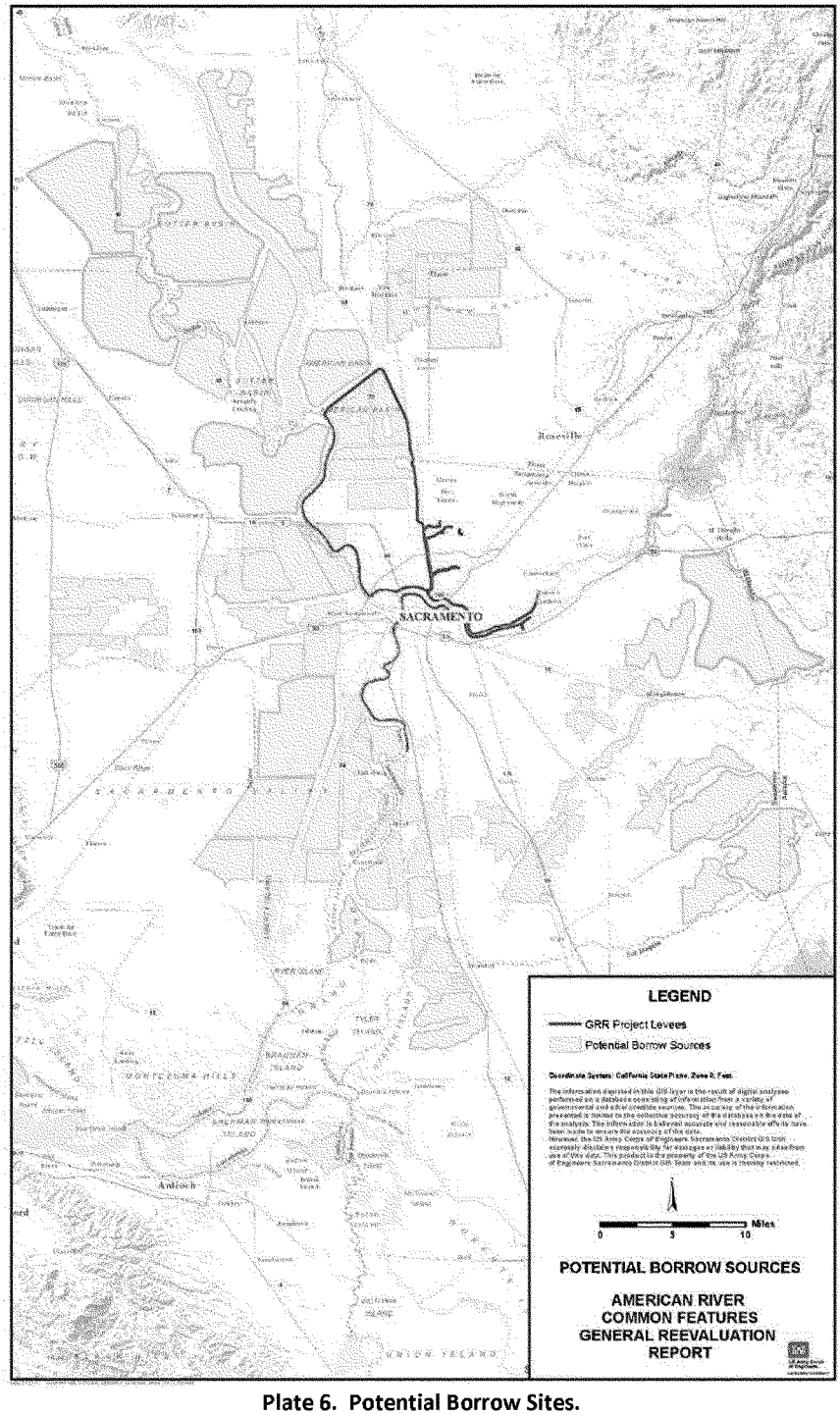
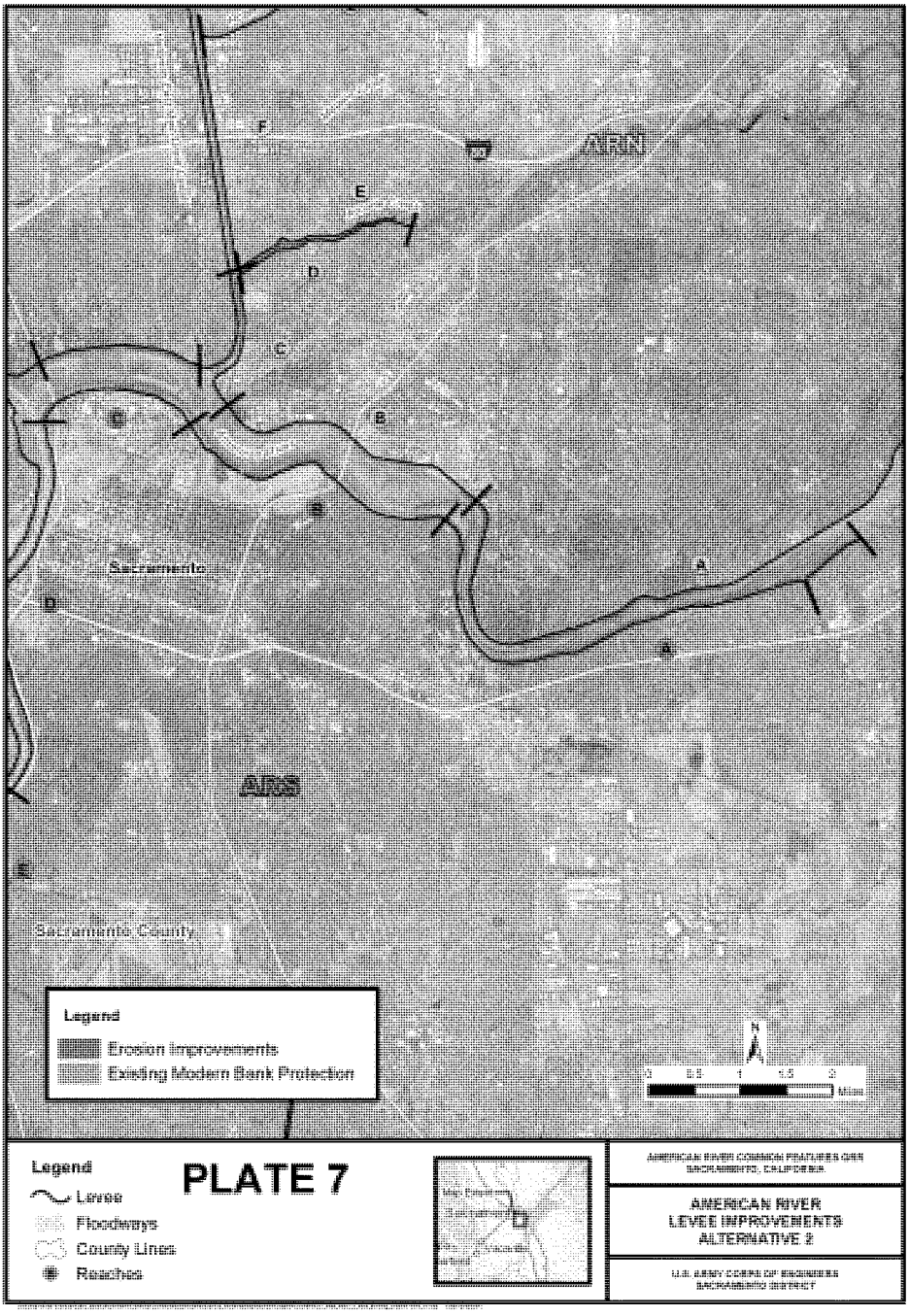


Plate 6. Potential Borrow Sites.


F
E
D
C
B
A
Sacramento
ARNR
ARNS
Sacramento County
Legend
Erosion Improvements
Existing Modern Bank Protection
N
0
0.5
1
1.5
2
Miles
Legend
Levee
Floodways
County Lines
Reaches
PLATE 7
AMERICAN RIVER COMMON FEATURES GRR
SACRAMENTO, CALIFORNIA
AMERICAN RIVER
LEVEE IMPROVEMENTS
ALTERNATIVE 2
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

APPENDICES

APPENDIX A

COORDINATION ACT REPORT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Suite W-2605
Sacramento, California 95825-1846

In Reply Refer to:
08ESMF00-
2013-CPA-0020

OCT - 5 2015

Alicia E. Kirchner
Chief, Planning Division
Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814-2922

Dear Ms. Kirchner:

The U.S. Army Corps of Engineers' (Corps) has requested coordination under the Fish and Wildlife Coordination Act (FWCA) for the American River Common Features General Re-evaluation Report (GRR) project. The proposed flood risk management construction would occur along the lower American River and the Sacramento River in Sacramento County, California. The enclosed report constitutes the U.S. Fish and Wildlife Service's draft FWCA report for the proposed project. A draft FWCA report was provided to the Corps and other state and federal resource agencies on September 20, 2013. We did not receive any comments on the draft FWCA report.

If you have any questions regarding this report on the proposed project, please contact Jennifer Hobbs, Fish and Wildlife Biologist, at (916) 414-6541.

Sincerely,

for Jennifer M. Norris
Field Supervisor

Enclosure:

cc:
Anne Baker, COE, Sacramento, CA
Amy Kennedy, CDFW, Rancho Cordova, CA
Howard Brown, NOAA Fisheries, Sacramento, CA
Steve Schoenberg, Bay Delta Fish and Wildlife Office, Sacramento, CA

FISH AND WILDLIFE COORDINATION ACT REPORT
AMERICAN RIVER COMMON FEATURES
GENERAL RE-EVALUATION REPORT PROJECT

OCTOBER 2015

BACKGROUND

In February 1986, major storms in northern California caused record flows along the American River. Water releases from Folsom Reservoir into the American River, in combination with high flows on the Sacramento River, almost caused catastrophic flooding to the city of Sacramento and surrounding areas. The result of the February 1986 storms raised concerns over the adequacy of the existing flood control system, which led to a series of investigations to provide additional flood protection to the Sacramento area.

The U.S. Army Corps of Engineers (Corps) completed an initial feasibility study in December 1991 for the American River and Natomas Basin areas. The feasibility report recommended the construction of a concrete gravity flood detention dam just downstream of the confluence of the North and Middle Forks of the American River, and for levee improvements downstream of Folsom Dam. Due to environmental and cost concerns, Congress chose not to authorize the proposed detention dam and instead directed the Corps to supplement the analysis of flood control options considered in the 1991 study.

A supplemental study was completed and presented in the *Supplemental Information Report American River Watershed Project, California*, dated March 1996. The report presented three possible flood control plans: (1) the construction of the concrete gravity flood detention dam recommended in the 1991 report; (2) Folsom Dam improvements; and (3) a stepped release plan for Folsom Dam releases. The report also concluded that levee improvements downstream of Folsom Dam were needed and that these levee improvements were "common" to all three plans. Under the Water Resources Development Act of 1996 (WRDA 96), Congress authorized the American River Common Features Project (Common Features Project), which included levee modifications on both banks of the American River, levee modifications along the east bank of the Sacramento River downstream from the Natomas Cross Canal, installation of streamflow gauges upstream from Folsom Reservoir, modification of the flood warning system along the lower American River, and continued interim reoperation of Folsom Reservoir for flood control.

In 1999, Congress decided to authorize improvements to Folsom Dam to control a 200-year flood event with a peak release of 160,000 cubic feet per second (cfs) from the dam. By doing this, improvements to levees downstream of Folsom Dam could be fine-tuned to work closely with the Folsom Dam improvements being discussed by Congress. Subsequently, the Common Features Project was modified by the Water Resources Development Act of 1999 (WRDA 99) to include additional features so the American River could safely convey an emergency release of 160,000 cfs. Also authorized under WRDA 99 was the Folsom Dam Modification project, which would allow for larger releases from Folsom Dam earlier in a flood event. At the same time, Congress also directed the Corps to review additional modifications to the flood storage of Folsom Dam to maximize the use of the dam for flood damage reduction prior to consideration of any additional storage on the American River. The Folsom Dam Raise project was subsequently authorized by Congress in 2004.

Major construction components for the Common Features Project under the WRDA 96 authorization include construction of seepage remediation along about 22 miles of the American River levees. Under the WRDA 99 authorization, the major construction components include construction of seepage remediation and levee raises along four stretches of the American River. All Common Features Project features authorized under WRDA 96 and WRDA 99 have been constructed or are in design analysis for construction, and the U.S. Fish and Wildlife Service (Service) has previously coordinated with the Corps on the various aspects of the Common Features Project.

Deep under-seepage became a significant concern along the American River levees following a flood event in 1997. Since the levee improvements along the American River were still in the design phase, remediation of deep under-seepage needed to be included in the design plans. This additional effort led to considerable cost increases over what was originally authorized by Congress for the Common Features Project, including the WRDA 99 improvements that had already increased the cost of the original WRDA 96 authorization.

The Folsom Dam Post Authorization Change Report and the Economic Re-evaluation Report for Folsom Dam Improvements revealed that additional levee improvements were needed on the American and Sacramento Rivers in order to truly capture the benefits of the Folsom Dam projects. These levee deficiencies consisted primarily of erosion concerns on the American River, and seepage, stability, erosion, and height deficiencies on the Sacramento River downstream of its confluence with the American River. However, the full extent of these levee deficiencies was not known and additional re-evaluation studies were needed for the flood basins that comprise the city of Sacramento.

The purpose of the Common Features Project is to reduce the flood risk for the city of Sacramento. The following problems were identified within the Sacramento levee system:

- seepage and underseepage;
- levee erosion;
- levee stability;
- levee overtopping;
- access for maintenance and flood fighting;
- vegetation and encroachments;
- releases from Folsom Dam;
- floodplain management; and
- additional upstream storage from existing reservoirs.

DESCRIPTION OF PROJECT AREA

The project area is located along the Sacramento and American River watersheds. The Sacramento River watershed covers 26,000 square miles in central and 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 Sacramento and includes portions of Placer, El Dorado, Alpine, and Sacramento counties. The American River watershed includes Folsom Dam and Folsom 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 form a floodplain covering roughly 110,000 acres at their confluence. This floodplain includes most of the developed portions of the city of Sacramento.

The American River Common Features GRR study area includes: about 12 miles of the north and south banks of the American River immediately upstream of its confluence with the Sacramento River; the east bank of the Natomas East Main Drainage Canal (NEMDC), Dry Creek, Robla Creek, Arcade Creek, and the Magpie Creek Diversion Channel (collectively referred to as the East Side Tributaries); the east bank of the Sacramento River downstream from the American River to the town of Freeport, where the levee ties into the Beach Lake levee; and the Sacramento Weir and Bypass, which is located along the north edge of the city of West Sacramento.

Within the greater project area, there are four distinct flood basins: the American River North Basin, the American River South Basin, the Sacramento Bypass and the Natomas Basin. These basins are described in further detail below.

The American River North Basin is located north of the American River and east of the city of Natomas, and includes the North Sacramento and Arden Arcade communities. Project construction in this basin includes the levees on the north bank of the American River, levees on the east bank of NEMDC, and levees along Arcade Creek, Dry/Robla Creek, and the Magpie Creek Diversion Channel.

The American River South Basin is located south of the American River and east of the Sacramento River. Communities protected by these project levees include Downtown Sacramento, Land Park, Pocket-Meadowview, East Sacramento, South Sacramento and Rancho Cordova. Project construction in this basin would be limited to the south bank of the American River and the east bank of the Sacramento River.

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

The Natomas Basin is located in the northern portion of the study area and is located east of the Sacramento River, west of NEMDC, and north of the American River. The Natomas Basin is considered to be a part of the study area, as described by the GRR; however, the proposed measures to raise the height of the Natomas Basin levees were previously analyzed in the Natomas Levee Improvement Program, Phase 4b Landside Improvements Project (NLIP Phase 4b Project) in 2010. Therefore, the Natomas Basin will not be analyzed in this document.

PROJECT DESCRIPTION

The purpose of the Common Features GRR is to determine if there is a Federal interest in modifying the authorized Common Features Project for flood risk management in the greater Sacramento area. National Environmental Policy Act (NEPA) evaluation is required when a major Federal action is under consideration and may have impacts on the quality of the natural and human environment. The Corps has determined that the proposed project may have significant effects on the environment and therefore, an EIS is required.

The Common Features GRR has identified 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 would 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 water is highly urbanized and the flooding could be up to 20 feet deep.

A wide variety of management measures were developed and then evaluated and screened to address the planning objectives to remedy the Sacramento area levee problems. Formulation strategies were then developed to address various combinations of the planning objectives and planning constraints. The formulation strategies used to address the objectives and constraints included measures to reduce flood stages, address seepage and underseepage, address stability, address erosion, address maintenance/emergency response access, and achieve the urban levee level of protection. 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. From this final array of alternatives, a tentatively selected plan was identified.

No Action Alternative

The Corps is required to consider a No Action Alternative 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 Corps or by local interests to achieve the planning objectives over and above those elements of the previously authorized Common Features Project.

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. As a result, if a high flow 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 the flood waters recede. Within the study area are many transportation corridors that could be flooded as well if the levees were to fail.

Alternative 1: Fix Levees in Place

Alternative 1 involves the construction of fix-in-place levee remediation measures to address seepage, stability, erosion, and overtopping concerns identified for the American and Sacramento river levees, and the East Side Tributaries. In addition, Alternative 1 would include levee raises for the Natomas Basin, which were analyzed under NEPA in the NLIP Phase 4b Project EIS/EIR in 2010. As a result, this FWCA report incorporates the analysis of the levee raise by reference, but is not discussed within this report.
Due to the urban nature and proximity of existing development within the American River North and South Basins, Alternative 1 proposes fix in place remediation. The purpose of this alternative would be to improve the flood damage reduction system to safely convey flows to a level that

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Due to the urban nature and proximity of existing development within the American River North and South Basins, Alternative 1 proposes fix in place remediation. The purpose of this alternative would be to improve the flood damage reduction system to safely convey flows to a level that

maximizes net benefits. Table 1 summarizes the levee problems discussed above and the proposed remediation measure for each waterway.

Table 1. 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	Bank Protection, Launchable Rock Trench	Levee Raise
NEMDC	Cutoff Wall	Cutoff Wall	—	Floodwall
Arcade Creek	Cutoff Wall	Cutoff Wall	—	Floodwall
Dry and Robla Creeks	—	—	—	Floodwall
Magpie Creek	—	—	—	Floodwall

In addition to the proposed levee improvement measures shown in Table 1, the following measures and policies would be addressed during construction.

- The Corps' standard levee footprint would be established during construction of structural improvements on all levees that are out of compliance. The standard levee footprint consists of a 20 foot crown width, a 3H:1V waterside slope, and a 2H:1V landside slope, when possible. If the 3H:1V waterside slope is not possible, than a minimum 2H:1V waterside slope would be established instead.

- A 10 foot landside maintenance access would be established, when possible.

- Compliance with Corps levee vegetation requirements would be established. The vegetation requirements include a 15 foot waterside, landside and vertical vegetation-free zone. When possible, a variance would be sought to allow vegetation to remain. If granted, the variance would allow for vegetation to remain on the lower waterside slope and within the waterside 15 foot vegetation-free zone. No vegetation would be permitted on the landside slope.

    - A vegetation variance would be requested to provide compliance for the Sacramento River portion of this project.

    - 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 Common Features GRR project. American River vegetation compliance would occur under a System-

1 Seepage, stability, and overtopping measures were addressed in the American River Common Features WRDA 96 and WRDA 99 construction projects.

Wide Improvement Framework by the local sponsors.

- The East Side Tributaries would be brought into vegetation compliance during construction in those levee reaches.

- Utility encroachments would be brought into compliance with Corps policy. Utilities that penetrate the levee would be removed and replaced with one of two fixes: a surface line over the levee prism or a through-levee line equipped with positive closure devices.

- Private encroachments would be removed by the non-Federal local sponsor or property owner prior to construction.

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 by waterway under Alternative 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 to the river bank and levee, which could potentially undermine the levee foundation. There are two measures proposed to address erosion on the American River levees: bank protection and a launchable rock trench. Both of these measures are described in detail in the subsections below. These measures would be implemented for all of the proposed alternatives discussed in this document.

Bank Protection

This measure consists of placing rock protection on the river's bank, and in some locations, on the levee slope to prevent erosion. The location of rock placement would be based on site-specific analysis. 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 deleterious 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 to the 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 the excavator that would be placing material. The revetment would be placed at a slope varying from 2V:1H to 3V:1H, depending on the site specific conditions. A large rock berm would be placed in the water up to an elevation slightly above the mean summer water surface and a planting trench would be established on the rock berm surface for re-vegetation purposes. An excavator would either be working from the top of bank placing revetment on the bank and in the water, or from on top of the rock berm that is established.

Launchable Rock Trench

The launchable rock filled trench is 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. The vegetation would be removed from the footprint of the trench and the levee slope prior to excavation. The trench configuration would include a 2H:1V landslide slope and a 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 disposed of. 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 the amount of rock required.

After excavation, the trench would be filled with revetment that would be imported from an off-site location via haul trucks. After rock placement, the trench would be covered with a minimum of 3 feet of stockpiled soil for a planting berm. Rock placed on the levee slope would be covered with 2 feet of stockpiled soil. All disturbed areas would be reseeded with native grasses and small shrubs where appropriate. Trees would be permitted on the berm if planted outside the specified vegetation free zone.

Sacramento River

Levees along the Sacramento River require improvements to address seepage, stability, and erosion. In addition, these levees require height improvements in order to convey additional flows that exceed the current design levels. To provide access for levee construction, inspection, maintenance, monitoring, and flood-fighting, some properties would need to be acquired.

Where the existing levee 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 access. 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 and front end loaders 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' current levee footprint requirements; or, in order to construct the levee to the existing footprint, a retaining wall may be constructed at the landside levee toe. This measure would raise the levee landward of the existing levee without reducing the levee crown width or disturbing the waterside slope. Retaining walls would range from 4 to 6 feet high and would require landside slope benching to establish the additional fill into the levee section. The levee crown patrol road would be re-established and a new road at the levee toe would be added 10 feet landward of the retaining wall.

Cutoff Walls

To address seepage concerns, a cutoff wall would be constructed through the levee crown. The cutoff wall would be installed by one of two methods: conventional open trench cutoff walls or 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 seepage. The open trench method can be

used to install a cutoff wall to a depth of about 85 feet. For cutoff walls of greater depth, the DSM method would be utilized.

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

Open Trench Cutoff Walls

Under the open trench method, a trench 3 feet wide would be excavated at the top of levee centerline and into the subsurface materials up to 85 feet deep with a long boom excavator. As the trench is excavated, it is 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 the use of a crane that supports a set of two to four mixing augers used to drill through the levee crown and subsurface to a maximum depth of about 140 feet. As the augers are inserted and withdrawn, a cement bentonite grout would be injected through the augers and mixed with 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

Bank protection on the Sacramento River would be addressed by construction of the launchable rock trench method described for the American River above, or by standard bank protection, which 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 the streambed to a height determined by site-specific analysis. The sites would be prepared by removing vegetation along the levee slopes at either end of the site for construction of a temporary access ramp if needed. The ramp would then be constructed using imported borrow material that would be trucked onsite.

The placement of rock onto the levee slope would occur from atop the levee and/or from the waterside 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 waterside of the levee.

The revetment would be placed via the methods discussed above on existing banks 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 re-vegetation of the site.

NEMDC

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 these problems. The open trench cutoff walls would be constructed as described for the Sacramento River levee described above.

The NEMDC east levee also has height issues which would be addressed by construction of a floodwall. 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 construction. The heights of the floodwalls vary from 1 to 4 feet, as required by water surface elevations. Constructing the floodwall raise would require doweling into the existing concrete floodwall and adding reinforced concrete to the floodwall section. 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 flood event exceeds the current design. A cutoff wall would also be constructed to address seepage for portions of the creek. 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 majority of the levees on Arcade Creek have existing floodwalls; however, there remains a height issue in this reach. A 1 to 4 foot floodwall raise would allow the levees to pass flood events greater than the current design level. Construction of the floodwall would be consistent with the description for NEMDC above.

Dry and Robla Creeks

The Dry Creek and Robla Creek levees require improvements to address overtopping for when flood events exceed the design level. Height improvements would be made 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 construction. The height of the floodwalls would vary 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 and the levee crown would be graded away from the wall and be surfaced with aggregate base.

Magpie Creek Diversion Channel

A number of features are proposed for the Magpie Creek Diversion Channel under Alternative 1. These features include the following:

- Strengthening the existing project levee;
- Construction of a 3 to 4 foot tall floodwall along the top of the existing levee for a distance of about 2,100 feet. Construction of the floodwall would be consistent with the description for NEMDC above;
- Construction of a new 1,000-foot-long levee along Raley Boulevard, south of the Magpie Creek bridge;
- Construction of a 79 acre flood detention basin on both sides of Raley Boulevard, primarily through the purchase of properties to preserve the existing floodplain; and
- Raley Boulevard improvements, including widening the Magpie Creek Bridge, raising the elevation of the roadway, and removing the Don Julio Creek culvert.

Alternative 2: Fix Levees in Place and Widen the Sacramento Weir and Bypass

Alternative 2 would include all of the levee improvements discussed in Alternative 1 above, except for 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. The levees along the American River, NEMDC, Arcade Creek, Dry Creek, Robla Creek, and the Magpie Creek Diversion Channel would be improved to address identified seepage, stability, erosion, and height concerns through methods described under Alternative 1 above. The levees along the Sacramento River would be improved to address identified seepage, stability, and erosion concerns through the measures described under Alternative 1 above. Due to the urban nature of the project area and proximity of development to the levees, the majority of the levee repairs would be fixed in place.

In addition, Alternative 2 would include levee raises for the Natomas Basin. The Natomas Basin levee raises are proposed under the Common Features Project GRR for authorization; however, these measures were analyzed under NEPA for the NLIP Phase 4b Project EIS/EIR in 2010.

The following sections contain more detailed information on the specific features and reaches included in this alternative. Table 2 summarizes the levee problems discussed above and the proposed measure for each waterway.

Table 2. Alternative 2 Proposed Remediation Measures by Waterway

Waterway	Seepage Measures	Stability Measures	Erosion Protection Measures	Overtopping Measures
American River[2]	—	—	Bank Protection, Launchable Rock Trench	—
Sacramento River	Cutoff Wall	Cutoff Wall	Bank Protection, Launchable Rock Trench	Sacramento Bypass and Weir Widening
NEMDC	Cutoff Wall	Cutoff Wall	—	Floodwall
Arcade Creek	Cutoff Wall	Cutoff Wall	—	Floodwall
Dry and Robla Creeks	—	—	—	Floodwall
Magpie Creek	—	—	—	Floodwall, Levee Raise

Sacramento Weir and Bypass

The existing Sacramento Weir and Bypass, which allow high flows in the Sacramento River to be diverted into the Yolo Bypass, would be expanded to roughly twice the current width to accommodate increased bypass flows. The existing north levee of the Sacramento Bypass would be degraded and a new levee would be constructed about 1,500 feet to the north. The existing Sacramento Weir would be expanded to match the wider bypass. The new north levee of the bypass would include a 300-foot-wide seepage berm on the landside, with a system of relief wells. An existing high tide relief well site near the existing north levee would be remediated by the non-Federal sponsor prior to construction.

American River

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

East Side Tributaries

Measures for NEMDC, Arcade Creek, Dry Creek, Robla Creek, and the Magpie Creek Diversion Channel under Alternative 2 would address seepage, slope stability, and erosion control. These measures were identified and described in Alternative 1 and would also be included in Alternative 2. Implementation of these measures under Alternative 2 would be consistent with the description in Alternative 1.

2 Seepage, stability, and overtopping measures were addressed in the American River Common Features WRDA 96 and WRDA 99 construction projects.

Sacramento River

The measures for the Sacramento River levees under Alternative 2 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, there would be no need to address the levee height problems. Therefore, the measures from Alternative 1 that would be implemented under Alternative 2 for the Sacramento River levees would include: (1) installation of cutoff walls to address seepage concerns; (2) slope reshaping to address stability concerns; and (3) bank protection or launchable rock trench measures to address erosion. The description of these measures can be found above under Alternative 1 for the Sacramento River.

BIOLOGICAL RESOURCES

American River

The American River Parkway (Parkway) contains many vegetation types including riparian scrub, riparian forest, oak woodland, open water, grasslands, and some agriculture. Along the river channel, vegetation is primarily considered shaded riverine aquatic (SRA) cover. Trees adjacent to the channel are mainly oaks and cottonwoods with a thick understory of vines, shrubs, and herbaceous vegetation.

The 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 the Corps and other agency projects for valley elderberry longhorn beetle. There are also some areas within the Parkway that have been used to compensate for loss of riparian habitat or oak woodlands from projects. Vegetation on the landside of the levee is mostly non-native ornamentals and landscape plantings that were planted beyond the legal property and fence lines of residents.

Habitats in the project area around the American River support various wildlife species. Mammal species include mule deer, coyote, black-tailed jackrabbit, striped skunk, and a variety of rodents. Common bird species include American robin, spotted towhee, dark-eyed junco, black phoebe, California towhee, ash-throated flycatcher, northern flicker, mourning dove, California quail, house finch, American and lesser goldfinches, Bewick's and house wrens, northern mockingbird, yellow-billed magpie, red-winged and Brewer's blackbirds, oak titmouse, and Anna's hummingbird. Common raptors include red-tailed hawk, Cooper's hawk, red-shouldered hawk, American kestrel, and great horned owl. Reptile and amphibian species found within 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, which are dominated by annual grassland, provide foraging habitat and cover for California ground squirrel, pocket gopher, and western meadowlark.

The lower American River supports a diverse and abundant fish community; altogether, at least 41 species of fish are known to inhabit the river (USFWS 1986). In recognition of its "outstanding and

remarkable" fishery resources, the entire lower American River was included in the Wild and Scenic Rivers System in 1981, which provides some protection for these resources (USFWS 1991). Four anadromous species are important from a commercial and recreational perspective. The lower river supports a large run of fall-run Chinook salmon, a species with both commercial and recreational values. The salmon run is sustained by natural reproduction in the river, and by hatchery production at the Nimbus Salmon and Steelhead Hatchery, operated by the California Department of Fish and Wildlife (CDFW). The average annual production of fall-run Chinook salmon in the American River from 1992-2009 is 109,574 (USFWS 2013).

Steelhead, a popular sport fish, are largely sustained in the river by production from the Nimbus Hatchery, because summer water temperatures often exceed the tolerances of juvenile steelhead, which typically spend about 1 year in the river. American shad and striped bass enter the river to spawn; these two species, introduced into the Sacramento River system in the late 1800s, now support popular sport fisheries. In addition to species of economic interest, the lower American River supports many nongame species, including Sacramento pikeminnow, Sacramento sucker, tule perch, and hardhead (USFWS 1994).

NEMDC

This canal is a narrow channel with many trees in the lower portion. As the canal heads north the channel widens and has less woody vegetation. The levee slopes on the east side of the canal are clear of vegetation due to maintenance practices. The west side of this canal is not part of this project as it is part of the NLIP Phase 4b Project.

Arcade Creek

The levees along Arcade 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

The Dry and Robla Creeks 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. There are scattered wetlands 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 Diversion Channel

The project area of Magpie Creek Diversion Channel begins in an industrial area where the channel contains primary grasses. Upstream, the area becomes open space before it intersects with Raley Boulevard and additional industrial development. Seasonal wetlands in the area include natural vernal pools and other areas with standing water that provide a similar biological function as natural vernal pools. Wildlife in this area includes jack rabbits, skunks, beavers, and coyotes that also use

the surrounding undeveloped area. Avian species that utilize this habitat include herons and waterfowl. Amphibian and reptile species include treefrog and common garter snake.

Sacramento River

Vegetation along the Sacramento River is mostly SRA cover consisting of oaks and cottonwoods with shrub understory. There are intermittent locations along the waterline with no trees due to revetment. The Sacramento River Bank Protection Project has repaired some erosion sites along this section of the river using rock revetment on the slope and creating small vegetated 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. Though a narrow riparian corridor, this area does function as a migratory corridor for wildlife as the area to the east is completely developed with housing. It is important to maintain a corridor to provide connectivity along the Sacramento River.

The Sacramento River contains a variety of habitat characteristics that are important to many fish species. Streamside vegetation provides SRA cover and aids in temperature control, streambank stability, and habitat complexity. Cover is used by all life stages of anadromous fish for shelter and provides habitat for salmonids, Sacramento splittail, delta smelt, black bass and sunfish.

Root structures of riparian vegetation can provide bank stability and shelter for juvenile fish. Woody debris can provide shelter from predation and refugia from stream flow. Riparian vegetation also influences the food chain of a stream, providing organic detritus and terrestrial insects. Terrestrial organisms falling from overhanging branches contribute to the food base of the aquatic community. Salmonids in particular are primarily insectivores and feed mainly on drifting food organisms.

In general, the Sacramento River channel provides a migratory pathway to many anadromous fish and provides seasonal rearing habitat to many other native fish species. Native anadromous fish species include Chinook salmon, green and white sturgeon, Pacific and river lamprey, and steelhead. Native resident fish species include delta smelt, hardhead, hitch, prickly sculpin, Sacramento blackfish, Sacramento pikeminnow, Sacramento splittail, Sacramento sucker, threespine stickleback and tule perch. Non-native anadromous species, such as American shad and striped bass, provide recreational sport fishing opportunities. Non-native resident fish species include several species of catfish, black bass, sunfish and minnows. Some non-native species may provide recreational fishing opportunities, such as largemouth, smallmouth, and striped bass, yet these species also prey upon native juvenile species that use nearshore habitats.

Sacramento Bypass and Weir

The Sacramento Bypass is a 360 acre area that is an important cover and feeding area for wildlife during the late fall, winter and early spring. Vegetation varies from scattered trees, such as mature cottonwoods, willows and valley oaks, to a sparsely covered sand soil area on the eastern end. There are also wetlands within the bypass. Game birds, raptors, songbirds, and native mammals are all present in this area.

The footprint of the expanded weir contains 8 acres of scattered trees along the road, railroad tracks, and levee slope. Primary wildlife use this area is avian species, beavers, skunks, and rabbits. The trees along the river provide shade for many native and non-native species. These trees are also used by various avian species for nesting.

Threatened and Endangered Species

Potentially affected federally-listed species within the project area include the valley elderberry longhorn beetle, giant garter snake, delta smelt, Central Valley steelhead, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and green sturgeon. The valley elderberry longhorn beetle, giant garter snake, delta smelt, yellow-billed cuckoo, and least Bell's vireo fall under the jurisdiction of the Service. The National Marine Fisheries Service (NMFS) is responsible for the listed salmonids and green sturgeon.

The riverbank and associated nearshore aquatic area that would be affected by the proposed action constitute portions of the designated critical habitat of the delta smelt. Indirect effects of the proposed action may also extend to other portions of this critical habitat. The Corps completed section 7 consultation with the Service. The consultation is included as Appendix 1.

In addition, the bank protection action area constitutes elements of essential fish habitat (EFH). EFH is the aquatic habitat (water and substrate) necessary to fish for spawning, breeding, feeding and or growth to maturity that will allow a level of production needed to support a long-term, sustainable commercial fishery and contribute to a health ecosystem. Consultation with NMFS regarding EFH is required for all commercially-harvested runs of salmon, including all runs of salmon in the project's action area.

Future Conditions Without the Project (No Action Alternative)

American River

Under the No Action Alternative, the Corps would not participate in construction of the proposed project. There would be no construction related effects to the vegetation and wildlife. However, looking over the past several decades the largest and most frequent flows come down the American River system, some of the floodplain in the Parkway has eroded away. During the 50 year life span of the project it is expected that larger flows would be released from Folsom Dam and sustained for longer periods, leading to potential loss of floodplain and the vegetation on it within the Parkway. While erosion and accretion within the riverine system is a normal and healthy process, Folsom Dam has cutoff sediment supply to the lower American River which creates a sediment starved section of the river. Sediment starvation means that accretion would not occur and the loss of floodplain and its ability to support habitat 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 would occur, it is not possible to determine when the floodplain would erode. The loss of the Parkway vegetation and wildlife habitat would be considered a significant impact.

East Side Tributaries

Under the No Action Alternative, the Corps would not participate in construction of the proposed project. There would be no construction related effects to the vegetation and wildlife. The riparian habitat on Arcade Creek between Norwood Avenue and Rio Linda Boulevard would remain. The other creeks do not contain much vegetation; however, the little vegetation that does exist would not be removed. Wildlife in these creek areas would not be disturbed due to construction activities.

Sacramento River

Under the No Action Alternative, the Corps would not participate in construction of the proposed project. There would be no construction related effects to the vegetation and wildlife. The banks along the Sacramento River are very erosive and without some kind of erosion control measures, the banks 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 fighting 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 the rock could prevent and/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 could be lost and wildlife could 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 could have significant impacts to vegetation and wildlife, particularly to the functioning of a migratory corridor.

While this area of the project does not provide large patches of habitat, it does serve as a migratory corridor for wildlife from further south in the Sacramento-San Joaquin Delta to areas further north along the Sacramento River, such as the Parkway. Riparian corridors can be especially important for reptiles, amphibians, and small mammals.

Future Conditions With the Project

Impacts to vegetation and wildlife within the project area are evaluated based on data collected from tree surveys conducted in 2011, site visits, Google Earth, and the American River Parkway Plan (Parkway Plan). The goals and objectives of the Parkway Plan and how construction of the project would impact those goals and objectives were considered in the impact analysis. Table 3 summarizes the impacts to vegetation by basin and reach.

Alternative 1: Fix Levees in Place

American River

The construction of rock trenches along the American River would result in the removal of about 65 acres of riparian habitat within the Parkway. This acreage was determined by overlaying the largest possible footprint onto an aerial photograph 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 the city of Sacramento. In addition, construction would also impact 135 acres of grassland, which include the levees, patrol

roads, and open lands. Project construction along the American River would be intermittent and would occur over a 7 year period. Trees would not be removed all at one time, they would be removed at each trench site as the trench is constructed.

Table 3. Potential Impacts by Flood Basin and Reach

Waterway	Impacts
American River	65 acres of riparian habitat
	135 acres of grassland habitat
East Side Tributaries	2 acres oak woodland
	4 acres of grassland
	10.5 acres riparian
Sacramento River	70 acres of riparian
Sacramento Bypass	300 acres of agricultural fields and drainage canals
	8 acres of riparian vegetation

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 project, 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 where 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. Construction would likely occur from May through October when birds are nesting. Once the project is authorized and funded, surveys of the project areas would occur to determine if migratory birds are nesting in areas which may be impacted during construction.

East Side Tributaries

Riparain and oak woodland along Arcade Creek and the NEMDC would need to be removed to construct the project. These 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. Any 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. 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 impacts to about 4 acres of grasses along the creek channels and levee slopes. Once construction is complete, the areas would be planted with a 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.

Sacramento River

Under this alternative 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 on the top one half would be removed. Levee degradation will result in the loss of 70 acres of riparian habitat. These trees are located on the top half of the levee, so they provide a small amount of SRA cover and habitat for many avian species. They also contribute to the width of the riparian corridor. On average the current width of the riparian corridor along the Sacramento River is 100 feet. Riparian loss will remove about 60 feet of those 100 feet. The construction and planting of the berm as part of the erosion repair will create an additional 25 feet to the width of the riparian corridor. There will still be a net loss of 35 feet from the riparian corridor. The loss of this 35 feet from the width of the riparian habitat can cause increased predation because the narrower corridor will increase edge effects. Additionally, smaller widths of habitat make it more likely that stochastic events will affect the habitat and loss of the vegetation could result in complete removal of the riparian corridor diminishing connectivity. It will be important for the Corps and the non-federal and local sponsors to ensure that the remaining riparian habitat remains, regeneration occurs (it may need to be helped through active planting), and non-native vegetation does not become established within the corridor.

On the waterside of the levee, 930 large trees would be left in place on the lower one-third and rock would be placed around the base of the trees. The trees that would remain in place are scattered over 31,130 linear feet (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.

On the landside of the levee all trees would be removed on the levee slope and within 15 feet of the levee toe to comply with the Corps vegetation policy. Within this 15 feet compliance area, a 10-foot wide landside operations, maintenance, and emergency access corridor would be established. There are 670 trees of various species and size within this landside area that would be removed and not be replaced on-site. 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 ornamental groundcovers installed by adjacent private property owners. In some places landscaping has been extended beyond the fence or property lines and up the levee slopes. Degrading of the levee would 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 vegetation free zone would be maintained vegetation free, except for the native grasses.

The loss of woody vegetation would affect avian species. 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.

Alternative 2 – Fix Levees and Widen the Sacramento Weir and Bypass

The footprints of all features in this alternative are the same as Alternative 1 with the added feature of widening the Sacramento Weir and Bypass. Areas that no longer require a raise would still maintain the same footprint since the purpose of the raise would instead be accomplished via the installation of a retaining wall at the toe of the levee. Therefore, the effects to vegetation and wildlife are the same as those for Alternative 1, with the addition of those associated with the Sacramento Weir and Bypass.

Sacramento Weir and Bypass

Habitat within the existing Bypass would remain the same as the existing conditions. The Bypass would be expanded by about 300 acres, which would become open space and would likely become similar habitat for wildlife as the existing Bypass. Operations of the new weir and bypass would be determined after construction is complete. No grading or altering of the lands within the existing bypass would occur as part of this alternative. Since the southern side of the bypass is lowest in elevation, water would naturally flow to the existing area and continue to support existing vegetation and wildlife. Due to the natural flow of water in the Bypass, existing wetlands 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 would no longer be farmed. 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 Area.

There are 8 acres of riparian vegetation that would be removed to construct the weir structure. The 8 acre area contains both the Old River Road and Union Pacific Railroad train tracks. Avian species are the primary wildlife in this area with some small animals like fox and coyotes, which pass through the area to access the river. Included within the 8 acres are 1,500 linear feet of vegetation along the Sacramento River which may be removed to allow the river to flow freely into the weir. Both native and non-native fish species use this area of the river. During construction there would be direct effects to wildlife as the human activities associated with the construction would likely cause any wildlife to relocate to other open space lands to avoid the disturbance; however, the expansion of the Sacramento Weir and Bypass would have a positive effect on vegetation and wildlife once construction is complete and lands are converted from farming activities to open space.

DISCUSSION

Service Mitigation Policy

The recommendations provided herein for the protection of fish and wildlife resources are in accordance with the Service's Mitigation Policy as published in the Federal Register 46:15; January 23, 1981).

The Mitigation Policy provides Service personnel with guidance in making recommendations to protect or conserve fish and wildlife resources. The policy helps ensure consistent and effective Service recommendations, while allowing agencies and developers to anticipate Service recommendations and plan early for mitigation needs. The intent of the policy is to ensure

protection and conservation of the most important and valuable fish and wildlife resources, while allowing reasonable and balanced use of the Nation's natural resources.

Under the Mitigation Policy, resources are assigned to one of four distinct Resource Categories, each having a mitigation planning goal which is consistent with the fish and wildlife values involved. The Resource Categories cover a range of habitat values from those considered to be unique and irreplaceable to those believed to be much more common and of relatively lesser value to fish and wildlife. However, the Mitigation Policy does not apply to threatened and endangered species, Service recommendations for completed Federal projects or projects permitted or licensed prior to enactment of Service authorities, or Service recommendations related to the enhancement of fish and wildlife resources.

In applying the Mitigation Policy during an impact assessment, the Service first identifies each specific habitat or cover-type that may be impacted by the project. Evaluation species which utilize each habitat or cover-type are then selected for Resource Category analysis. Selection of evaluation species can be based on several criteria, as follows: (1) species known to be sensitive to specific land- and water-use actions; (2) species that play a key role in nutrient cycling or energy flow; (3) species that utilize a common environmental resource; or (4) species that are associated with Important Resource Problems, such as anadromous fish and migratory birds, as designated by the Director or Regional Directors of the Service. Based on the relative importance of each specific habitat to its selected evaluation species, and the habitat's relative abundance, the appropriate Resource Category and associated mitigation planning goal are determined.

Mitigation planning goals range from "no loss of existing habitat value" (i.e., Resource Category 1) to "minimize loss of habitat value" (i.e., Resource Category 4). The planning goal of Resource Category 2 is "no net loss of in-kind habitat value." To achieve this goal, any unavoidable losses would need to be replaced in-kind. "In-kind replacement" means providing or managing substitute resources to replace the habitat value of the resources lost, where such substitute resources are physically and biologically the same or closely approximate those lost. The planning goal of Resource Category 3 is "no net loss of habitat while minimizing loss of in-kind value." To achieve this goal any unavoidable losses will be replaced in-kind or if it is not desirable or possible out-of-kind mitigation would be allowed. The planning goal of Resource Category 4 is "minimize loss of habitat value." To achieve this goal the Service will recommend ways to rectify, reduce, or minimize loss of habitat value.

In addition to mitigation planning goals based on habitat values, Region 8 of the Service, which includes California, has a mitigation planning goal of no net loss of acreage and value for wetland habitat. This goal is applied in all impact analyses.

In recommending mitigation for adverse impacts to fish and wildlife habitat, the Service uses the same sequential mitigation steps recommended in the Council on Environmental Quality's regulations. These mitigation steps (in order of preference) are: avoidance, minimization, rectifying, reducing or eliminating impacts over time, and compensation.

Ten fish and/or wildlife habitats were identified in the project area which had potential for impacts from the project: oak woodland, riparian forest, riparian scrub-shrub, SRA cover, shallow open water, emergent wetland, annual grassland, agriculture (non-rice cultivation), ornamental landscape,

and other. The resource categories, evaluation species, and mitigation planning goal for the habitats impacted by the project are summarized in Table 4.

The evaluation species selected for the oak woodland that would be impacted are acorn woodpecker, turkey, and mule deer. Acorn woodpeckers utilize oak woodlands for nearly all their life requisites; 50-60 percent of the acorn woodpecker's annual diet consists of acorns. Acorn woodpeckers can also represent impacts to other canopy-dwelling species. Turkeys forage and breed in oak woodlands and are abundant in the project area. Mule deer also heavily depend on acorns as a dietary item in the fall and spring; the abundance of acorns and other browse influence the seasonal pattern of habitat use by deer. These latter species represent species which utilize the ground component of the habitat and both have important non-consumptive human uses (i.e., wildlife viewing and bird watching). Based on the high value of oak woodlands to the evaluation species, and their declining abundance, the Service has determined oak woodlands which would be affected by the project should be placed in Resource Category 2, with an associated mitigation planning goal of "no net loss of in-kind habitat value or acreage."

The evaluation species selected for the riparian forest that would be impacted by the project are Swainson's hawks, wood ducks, and Bullock's orioles. Riparian forest vegetation provides important cover, and roosting, foraging, and nesting habitat for these species. Large diameter trees also provide nesting sites for species such as wood ducks and Swainson's hawks. Riparian woodland cover-types are of generally high value to the evaluation species, and are overall, extremely scare (less than 2% remaining from pre-development conditions). Therefore, the Service finds that any riparian forest cover-type that would be impacted by the project should be placed in Resource Category 2, with an associated mitigation planning goal of "no net loss of in-kind habitat value or acreage." In addition, the Service's regional goal of no net loss of wetland acreage or habitat values, whichever is greater, would apply to this habitat type.
The evaluation species selected for the riparian scrub-shrub vegetation that would be impacted by the project is the yellow warbler. Riparian scrub-shrub vegetation provides important cover, and roosting, foraging, and nesting habitat for this species. Riparian cover-types are generally of high value to the evaluation species, and are overall extremely scarce (less than 2% remaining from pre-development conditions). Therefore, the Service finds that any riparian scrub-shrub cover-type that would be impacted by the project should be placed in Resource Category 2, with an associated mitigation planning goal of "no net loss of in-kind habitat value or acreage." In addition, the Service's regional goal of no net loss of wetland acreage or habitat values, whichever is greater, would apply to this habitat type.

The evaluation species selected for SRA cover that would be affected by the project are juvenile salmonids (salmon and steelhead) and the heron and egret family (family Ardeidae). Salmonids were selected because large declines in their numbers are among the most important resource issues in the region, and because of their very high commercial and sport fishing values. Herons and egrets were selected because of the Service's responsibilities for their management under the Migratory Bird Treaty Act, their relatively high value for non-consumptive human uses, such as bird watching, and their value as indicator species for the many birds which use SRA cover.

Table 4. Resource categories, evaluation species, and mitigation planning goal for the habitats possibly impacted by the proposed American River Common Features General Re-evaluation Report, Sacramento County, California.

COVER-TYPE	EVALUATION SPECIES	RESOURCE CATEGORY	MITIGATION GOAL
Oak Woodland	Acorn woodpecker Turkey Deer	2	No net loss of in-kind habitat value or acreage.
Riparian Forest	Swainson's hawk Wood duck Bullock's oriole	2	No net loss of in-kind habitat value or acreage.
Riparian Scrub-Shrub	Yellow warbler	2	No net loss of in-kind habitat value or acreage.
SRA Cover	Juvenile salmonids Herons and Egrets	1	No loss of existing habitat value.
Emergent Wetland	Marsh Wren	2	No net loss of in-kind habitat value or acreage.
Shallow Open Water	Egret Sunfish	2	No net loss of in-kind habitat value or acreage.
Annual Grassland	Red-tailed hawk	3	No net loss of habitat value while minimizing loss of in-kind habitat value.
Agriculture (non-rice cultivation)	White-tailed kite California vole	4	Minimize loss of habitat value.
Ornamental Landscape	None	4	Minimize loss of habitat value.
Other	None	4	Minimize loss of habitat value.

In 1992, the Service designated SRA cover that is impacted by bank protection activities within the Sacramento Bank Protection Project action area as Resource Category 1 (USFWS 1992). Under Resource Category 1, habitat to be impacted is high value, unique, and irreplaceable on a national basis or in the eco-region, and the Service's mitigation planning goal is for no loss of existing habitat value.

The evaluation species selected for the emergent wetland cover-type is the marsh wren. Drainage wetland habitat provides important cover, foraging, nesting, and roosting habitat for such water associated birds as well as some amphibians and aquatic mammals. Insects and spiders are taken from vegetation, the wetland floor, and while in flight (Gutzwiller and Anderson 1987). For protection from predators, the marsh wren usually constructs nests in reedy vegetation about 15

inches above water that is 2 to 3 feet deep (Gutzwiller and Anderson 1987). Because of the medium to high value of this habitat to the evaluation species, and its relative scarcity, the Service designates any emergent wetland habitat within the project area as Resource Category 2, with its associated mitigation planning goal of "no net loss of in-kind habitat value or acreage."

The evaluation species selected for the shallow open water cover-type is the egret and sunfish. Shallow, open water is important to a number of regionally important fish and wildlife. For example, wading birds (e.g., herons and egrets) use it for feeding, as do a number of gamefish, including sunfish, catfish and striped bass. It is also part of the critical habitat designated for federally listed delta smelt and Sacramento River winter-run Chinook salmon. Such shallow water is generally removed when typical bank protection is done, especially when the bank is reshaped. The result is likely to be higher velocities and deeper water along the new shoreline. Compounding the problem is the large amount of riprap that has already been placed in the vicinity of the proposed action, thus effectively removing many miles of shallow, open water. In concert with past Sacramento River Bank Protection Project planning, the Service is designating such habitat that would be impacted as Resource Category 2, with an associated planning goal of "no net loss of in-kind habitat value or acreage."

The evaluation species selected for the annual grassland cover-type is the red-tailed hawk, which utilizes these areas for foraging. This species was selected because of the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and their overall high non-consumptive values to humans. Annual grassland areas potentially impacted by the project vary in their relative values to the evaluation species, depending on the degree of human disturbance, plant species composition, and juxtaposition to other foraging and nesting areas. Therefore, the Service designates the annual grassland cover-type in the project area as Resource Category 3. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

The evaluation species selected for the agriculture, non-rice cultivation, cover-type is the white-tailed kite (formerly black-shouldered kite) and the California vole. The white-tailed kite in California is a common species of open and cultivated bottomland and is an obligate predator on diurnal small mammals (Faanes and Howard 1987). Movements and nesting of the white-tailed kite is largely governed by concentrations of mice and voles (Faanes and Howard 1987). The California vole is a widespread and common herbivore in California (Brylski 1990), and its abundance and distribution, along with daytime activity, make it an important prey species. Because this habitat is not native, and is managed for crop production unless fallowed, the Service designates the agriculture cover-type in the project area as Resource Category 4. Our associated mitigation planning goal for these areas is "minimize loss of habitat value."

No evaluation species were identified for the ornamental landscape or "other" cover-types. The ornamental landscape is typically vegetation which occurs along the fence line of adjacent private properties and is maintained by individual landowners. The "other" cover-type encompasses those areas which do not fall within the other cover-types such as gravel and paved roads, parking areas, buildings, bare ground, riprap, etc. Generally these cover-types would not provide any significant habitat value for wildlife species. Therefore, the Service designates the ornamental landscape and "other" cover-types in the project area as Resource Category 4. Our associated mitigation planning goal for these areas is "minimize loss of habitat value."

The recommendations below are based on preliminary construction designs provided by the Corps for the Common Features GRR. Once the specific project designs are developed, the Service's recommendations will be refined.

RECOMMENDATIONS

The Service recommends:

1. Avoid the loss of SRA cover by planting native woody vegetation within the bank protection areas. Work with the Service, NMFS, and California Department of Fish and Wildlife (CDFW) to develop planting and monitoring plans, and with DWR and SAFCA to develop a variance to allow vegetation within the Corps' vegetation free zone to remain in place, especially in areas designed for rock slope protection.

2. Woody vegetation that needs to be removed within the construction footprint should be removed during the non-nesting season to avoid affecting active bird nests.

3. Avoid impacts to migratory birds nesting in trees along the access routes and adjacent to the proposed repair sites by conducting pre-construction surveys for active nests along proposed haul roads, staging areas, and construction sites. This would especially apply if construction begins in spring or early summer. Work activity around active nests should be avoided until the young have fledged. The following protocol from the CDFW for Swainson's hawk would suffice for the pre-construction survey for raptors.

   A focused survey for Swainson's hawk nests will be conducted by a qualified biologist during the nesting season (February 1 to August 31) to identify active nests within 0.25 mile of the project area. The survey will be conducted no less than 14 days and no more than 30 days prior to the beginning of construction. If nesting Swainson's hawks are found within 0.25 mile of the project area, no construction will occur during the active nesting season of February 1 to August 31, or until the young have fledged (as determined by a qualified biologist), unless otherwise negotiated with the California Department of Fish and Wildlife. If work is begun and completed between September 1 and February 28, a survey is not required.

4. Avoid future impacts to the site by ensuring all fill material is free of contaminants.

5. Minimize project impacts by reseeding all disturbed areas, including staging areas, at the completion of construction with native forbs and grasses. Reseeding should be conducted just prior to the rainy season to enhance germination and plant establishment. The reseeding mix should include species used by and beneficial for native pollinators. The Service can work with you in developing this seed mix.

6. Minimize the impact of removal and trimming of all trees and shrubs by having these activities supervised and/or completed by a certified arborist.

7. Compensate the loss of oak woodland, riparian forest, riparian scrub-scrub, and emergent wetland at a ratio of at least 2:1. The Corps should work with the Service and other resource agencies on the development of a riparian plan that will evaluate locations for riparian vegetation planting based on land use in the lower American River Parkway, effects from known future projects, such as the reoperation of Folsom Dam, where existing riparian and

valley elderberry longhorn beetle habitat exists, creating and maintaining connectivity between large riparian patches, and coordination with Sacramento County Parks. For the loss of other cover-types, the Corps should work with the Service and other resource agencies on the development of compensation success benchmarks to ensure that goals are achieved.

8. All bank protection areas should be planted with a diverse mix of woody and herbaceous riparian vegetation. Sites should be diverse (a mix of riparian forest and scrub-shrub) and fit into the surrounding landscape. The planting plan should take into account what is missing from the surrounding vegetation and attempt to create heterogeneous habitats. The Corps should develop a baseline map of existing vegetation communities. Given the amount of rock already placed and the amount proposed for placement, this can serve to create diverse and heterogeneous habitats.

9. Include within the planting contract a provision for the contractor to plant understory species after some of the woody canopy has established. Studies have shown that planting late successional understory species after woody species canopy cover has been established provides better success for establishing these understory plants. Incorporating these species within the planting mix provides more diverse habitat for wildlife species (Johnston 2009).

10. Contact the California Department of Fish and Wildlife regarding possible effects of the project on State listed species.

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APPENDIX 1

U.S. FISH AND WILDLIFE ENDANGERED SPECIES CONSULTATION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Suite W-2605
Sacramento, California 95825-1846

In Reply Refer to:
08ESMF00-
2014-F-0518

SEP 11 2015

Ms. Alicia E Kirchner
Chief, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814

Subject: Formal Consultation on the American River Common Features (AFRC) Project, Sacramento County, California

Dear Ms. Kirchner:

This letter is in response to the U.S. Army Corps of Engineers (Corps) April 3, 2015, request for consultation with the U.S. Fish and Wildlife Service (Service) on the proposed American River Common Features General Reevaluation Report (ARCF GRR) project in Sacramento County, California. You request was received by the Service on April 7, 2015. The Corps originally initiated consultation on June 30, 2014; however, the Service responded on July 23, 2014, with a request for additional information regarding the project description and the effects analysis the Corps had completed. The April 3, 2015, letter and biological assessment began the formal consultation period. This response is provided under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act).

The Federal action on which we are consulting is the ARCF GRR, which includes levee improvements and bank protection along the Sacramento River, levee improvements along Arcade, Magpie, and Dry/Robla Creeks, widening the Sacramento Bypass and Weir, and bank protection along the lower American River. Pursuant to 50 CFR 402.12(j), you submitted a biological assessment for our review and requested concurrence with the findings presented therein. These findings conclude that the proposed project may affect and is not likely to adversely affect the vernal pool fairy shrimp (*Branchinecta lynchi*) and vernal pool tadpole shrimp (*Lepidurus packardi*); may affect likely to adversely affect the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), delta smelt (*Hypomesus transpacificus*) (smelt) and its critical habitat; the giant garter snake (*Thamnophis gigas*); and the yellow-billed cuckoo (*Coccyzus americanus occidentalis*). The project is outside of critical habitat designated for the valley elderberry longhorn beetle and critical habitat proposed for the yellow-billed cuckoo.

The Corps previously consulted with the Service on the Magpie Creek Flood Control Project and on September 15, 2004 a biological opinion regarding effects to the vernal pool fairy shrimp, vernal pool tadpole shrimp, and giant garter snake (File # 1-1-04-F-0132) was provided. The project described in the 2004 biological opinion is exactly the same as the Magpie Creek portion of the

project description in the Common Features biological assessment. Because the environmental baseline for vernal pool fairy shrimp and vernal pool tadpole shrimp has not changed from the baseline that was analyzed in the 2004 biological opinion and the project description remains the same, effects to and take of vernal pool fairy shrimp and vernal pool tadpole shrimp are addressed i the September 15, 2004, biological opinion. More recent information regarding the status of the habitat along Magpie Creek for giant garter snake has changed from the 2004 biological opinion. This opinion addresses those changes and any potential effects to the giant garter snake.

Seasonal wetlands, which may provide suitable habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp, occur in the vicinity of the Robla Creek woodland mitigation site A, however any vernal pools in this area would be avoided by these activities. The Corps will implement a 250-foot buffer between vernal pools and vegetation planting. Planting activities will be done in the fall when the wetlands are dry and will use best management practices to ensure that sediment does not enter the seasonal wetlands. The Service concurs that with your determination of may affect, not likely to adversely affect vernal pool fairy shrimp and vernal pool tadpole shrimp at the Robla Creek woodland mitigation site A.

This biological opinion is based on information provided in the Corps' letter requesting consultation and the biological assessment. A complete administrative record is on file at the Service's Sacramento Fish and Wildlife Office.

CONSULTATION HISTORY

September 4, 2013: The Service commented on the April 2013 draft biological assessment.

April 8, 2014: The Service commented on the October 2013 draft biological assessment.

June 30, 2014: The Corps initiated section 7 consultation with the Service.

July 23, 2014: The Service sent a letter in response to the Corps initiation requesting additional information.

April 3, 2015: The Corps provided an updated biological assessment with responses to the Service's July 23, 2014, request for additional information.

August 31, 2015: The Corps provided a revised biological assessment that addressed questions the Service had regarding the project description.

BIOLOGICAL OPINION

Description of the Action

Congress directed the Corps to investigate the feasibility of reducing flood risk of the city of Sacramento. The Corps completed feasibility studies in 1991 and 1996, recommending a concrete gravity flood detention dam on the north fork of the American River at the Auburn site along with levee improvements downstream of Folsom Dam. Other plans evaluated in the report were Folsom Dam improvements and a stepped release plan for Folsom Dam releases. These additional plans also included levee improvements downstream of Folsom Dam. 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 (WRDA) of 1996 and a decision on Auburn Dam was deferred

to a later date. Major construction components of ARCF in the WRDA 1996 authorization included construction of seepage remediation along about 22 miles of American River levees and construction of levee strengthening and raising of 12 miles of Sacramento River levee in Natomas.

Following the 1986 flood, 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. In addition, both the north and south bank of the American River from RM 0 to about RM 11.4 experienced seepage. Seepage on the Sacramento River was so extensive that Congress, soon after the 1986 flood event, 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.

Shortly thereafter, the Sacramento Valley experienced a flood event in 1997. Considerable seepage occurred on the Sacramento River as well as on the American River. Seepage on the American River was expected because remediation measures had yet to be constructed, but the occurrence of significant seepage on the Sacramento River in the reach remediated as part of the Sac Urban Project was alarming and confirmed that deep underseepage was also of significant concern. As a result, seepage remediation on the American River (then in the late 1990s in the design phase) would need to be designed to remediate both through- and deep underseepage.

In 1999, Congress decided not to authorize Auburn Dam, but instead authorized improvements for Folsom Dam. By doing this, improvements to levees downstream of Folsom Dam could be fine-tuned to work closely with the Folsom improvements being discussed by Congress. Therefore, the ARCF project was modified by WRDA 1999 to include additional necessary features for the American River so that it could safely convey the proposed emergency release of 160,000 cubic feet per second (cfs) from Folsom Dam. Major construction components for the ARCF project in the WRDA 1999 authorization include construction of seepage remediation and levee raise along four stretches of the American River, and construction of levee strengthening and raising of 5.5 miles of Natomas Cross Canal levee in Natomas. All American River features authorized in WRDA 1996 and 1999 have been constructed or are in design analysis for construction within a year or two.

The purpose of the ARCF project is to reduce the flood risk for the city of Sacramento. The following problems were identified within the Sacramento levee system:

- Seepage and underseepage;
- Levee erosion;
- Levee stability;
- Levee overtopping;
- Access for maintenance and flood fighting;
- Vegetation and encroachments;
- Releases from Folsom Dam;
- Floodplain management; and
- Additional upstream storage from existing reservoirs.

In order to evaluate the effects to listed species, the Corps looked at the largest foreseeable footprint. As the Corps moves into the design phase of the project, footprint changes will likely reduce the effects to listed species.

The project is designed to allow for the release of 160,000 cubic feet per second (cfs) from Folsom Dam. The levees along the American River are unable to withstand these maximum flows for extended periods of time without increased risk of erosion and potential failure. The exact location where erosion will occur and to what extent erosion will occur during any given event is unknown. Erosion within the American River Parkway will be addressed as part of the Folsom Dam Water Control Manual Update currently under evaluation and a biological assessment is being prepared to initiate section 7 consultation with both the Service and National Marine Fisheries Service (NMFS). Therefore, the effects of erosion along the lower American River and effects of increased Yolo Bypass flooding frequency due to changes in operations from Folsom Dam are not analyzed in this project description. This is because construction of the American River and Sacramento Bypass measures, which are dependent on releases from Folsom Dam, will not occur until after a biological opinion is received for the Water Control Manual Update. Sacramento River and East Side Tributaries measures are necessary to improve the flood risk management system in the Sacramento area regardless of the change in operation at Folsom Dam and are not dependent on Folsom Dam operations for their implementation. As a result, construction in these areas could occur regardless of the Folsom Dam Water Control Manual Update schedule.

The Corps' project involves the construction of fix-in-place levee remediation measures to address seepage, stability, erosion, and height concerns identified for the Sacramento River and American River levees, Natomas East Main Drainage Canal (NEMDC), Arcade, Dry/Robla, and Magpie Creeks (Figure 1). Most height concerns along the Sacramento River will be addressed by a widening of the Sacramento Weir and Bypass to divert more flows into the Yolo Bypass. Due to the urban nature and proximity of existing development within the American River North and South basins the Corps is planning fix in place remediation. This would improve the flood damage reduction system to safely convey flows to a level that maximizes net benefits. Table 1 summarizes the levee problems discussed above and the proposed measure for each waterway.

Sacramento Area Flood Control Agency (SAFCA), the project's local sponsor, will complete some portions of the Federal project. SAFCA is seeking permission from the Corps pursuant to 33 USC §408 (Section 408) for alteration of the Federal levees along the NEMDC and Arcade Creek.

In addition to the proposed levee improvements measures shown in Table 1, the following measures and policies would be addressed during construction:

- The non-Federal (Department of Water Resources (DWR)) will bring the levees into compliance with the Corps' standard levee footprint using a System Wide Implementation Framework (SWIF) process. A SWIF is a plan developed by the levee sponsor(s) and accepted by the Corps to implement system-wide improvements to a levee system (or multiple levee systems within a watershed) to address system-wide issues, including correction of unacceptable inspection items, in a prioritized way to optimize flood risk reduction. The standard levee footprint consists of a 20 foot crown width, 3:1 waterside

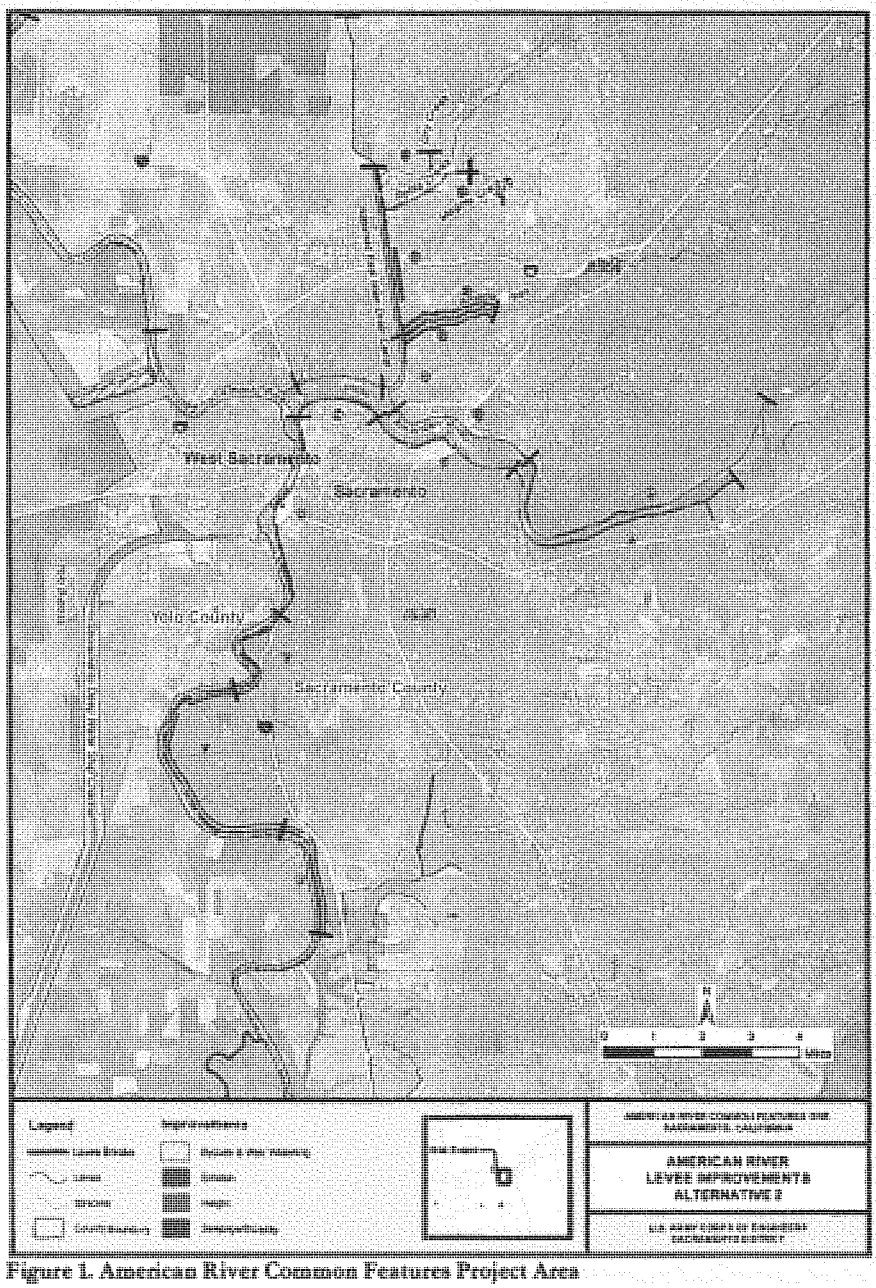


Figure 1. American River Common Features Project Area

Table 1. Remediation by Waterway.

Waterway	Seepage Measures	Stability Measures	Erosion Protection Measures	Overtopping Measures
American River[1]	---	---	Bank Protection, Launchable Rock Trench (31,000 linear feet)	---
Sacramento River	Cutoff Wall (50,300 linear feet)	Cutoff Wall (50,300 linear feet)	Bank Protection (50,300 linear feet)	Sacramento Bypass and Weir Widening, Levee Raise (1,500 feet)
NEMDC	Cutoff Wall (6,000 linear feet)	Cutoff Wall	---	Floodwall (15,600 linear feet)
Arcade Creek	Cutoff Wall (22,000 linear feet)	Cutoff Wall	---	Floodwall (22,000 linear feet)
Dry/Robla Creeks	---	---	---	Floodwall (2,500 linear feet)
Magpie Creek[2]	---	---	---	Floodwall, Levee Raise

[1]American River seepage, stability, and overtopping measures were addressed in a previous construction project.

[2]In addition to the floodwall, Magpie Creek will include construction of a new levee (3,100 linear feet) along Raley Boulevard south of the creek, and construction of a detention basin on both sides of Raley Boulevard (79 acres). In addition, 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.

slope and 2:1 landside slope, when possible. If the 3:1 waterside slope is not possible, then a minimum 2:1 waterside slope would be established instead.

- Engineering Technical Letter 1110-2-583 (ETL) vegetation compliance would occur under a SWIF by the local maintaining agency (LMA). The intent of the SWIF is to collaboratively work with the resource agencies and levee sponsors to transition existing levees to Corps standards while maintaining Public Law (PL) 84-99 rehabilitation assistance and adhering to the Act and other environmental laws. 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 including ensuring that both environmental and levee safety considerations are adequately served.
- The vegetation requirements for the SWIF include a 15-foot waterside, landside, and vertical vegetation-free zone. Trees that pose an unacceptable risk to levee integrity will be removed and the root balls and roots will be remediated. Trees that do not pose a threat will not be removed. Vegetation on the landside slope would only be removed within the construction

footprint (up to ½ levee degrade) and the remaining vegetation would be dealt with under the SWIF process.

- Utility encroachments will be brought into compliance with Corps policy. Utilities that penetrate the levee would be removed and replaced with one of two fixes: (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 sponsor prior to construction.
- The Sacramento District of the Corps will pursue a vegetation variance which will allow vegetation on the lower ½ of the levee slope to 15 feet waterward of the waterside levee toe to remain in place. The Sacramento District has conducted an evaluation which examined the safety, structural integrity, and functionality of the levees that will be retained and not compromised if a tree were to fall and result in scouring of the root ball area. The results show that the tree fall and scour did not significantly affect levee performance, and the levee meets Corps seepage and slope stability criteria assuming the entire project is constructed.

American River

Levees along the American River require improvements to address erosion. The proposed measures for these levees consist of waterside armoring to prevent erosion to the river bank and levee, which could potentially undermine the levee foundation. There are two measures proposed for the American River levees: (1) a maximum of 31,000 linear feet (LF) of bank protection, and (2) a maximum of 65 acres/45,000 LF of launchable rock trench. Both of these measures are described in detail in the subsections below. These numbers are maximized because there is some overlap identified to account for the uncertainty of site-specific conditions. For example, for some reaches both bank protection and launchable rock trench impacts were estimated even though both measures will not be constructed in the same reach.

Bank Protection

This measure consists of placing rock revetment on the river's bank to prevent erosion. It entails installing revetment along the stream bank based on site-specific analysis (Figure 2). When necessary, the eroded portion of the bank will be filled and compacted prior to the rock placement. The sites will be prepared by clearing and stripping of loose material and understory growth prior to construction. In most cases, large vegetation will be permitted to remain at these sites. Temporary access ramps will be constructed, if needed, using imported borrow material that would be trucked on site.

The placement of rock onto the bank will occur from a land based staging area using long reach excavators and loader. The loader brings 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 waterside of the levee.

The revetment will 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 planting berm will be constructed in the rock to allow for revegetation of the site. The planting berm varies in width from 5 to 15 feet. In all cases the planting will occur outside the vegetation free zone as required by the ETL.

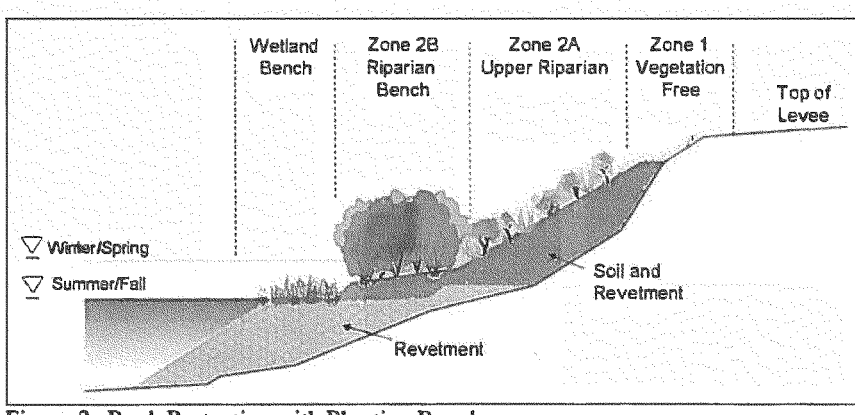


Figure 2. Bank Protection with Planting Bench.

Launchable Rock Trench

For the purposes of this project description, it is assumed that 65 acres of the lower American River will have a launchable rock trench fix. The remainder will be the bank protection described above. This measure includes construction of a launchable rock filled trench, designed to deploy once erosion has removed the bank material beneath it (Figure 3). All launchable rock trenches will be constructed outside of the natural river channel. The vegetation will be removed from the footprint of the trench and the levee slope prior to excavation of the trench. The trench configuration will include a 2:1 landside slope and 1:1 waterside slope and will be excavated at the toe of the existing levee. All soil removed during trench excavation will be stockpiled for potential reuse. The bottom of the trench will 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 will be filled with revetment that will be imported from an offsite commercial location. After rock placement the trench will be covered with a minimum of 3 feet of the stockpiled soil for a planting berm. Rock placed on the levee slope will be covered with 2 feet of stockpiled soil. All disturbed areas will be reseeded with native grasses and small shrubs where appropriate. Trees and shrubs could be permitted on the trench if planted outside the specified vegetation free zone as required by the ETL.

Sacramento River

Levees along the Sacramento River require improvements to address seepage, stability, and erosion. About 50,300 LF of bank protection and cutoff wall or slope stability work is proposed for the Sacramento River. In addition, these levees require a total of one mile of intermittent height improvements in order to convey additional flows that exceed current design levels.

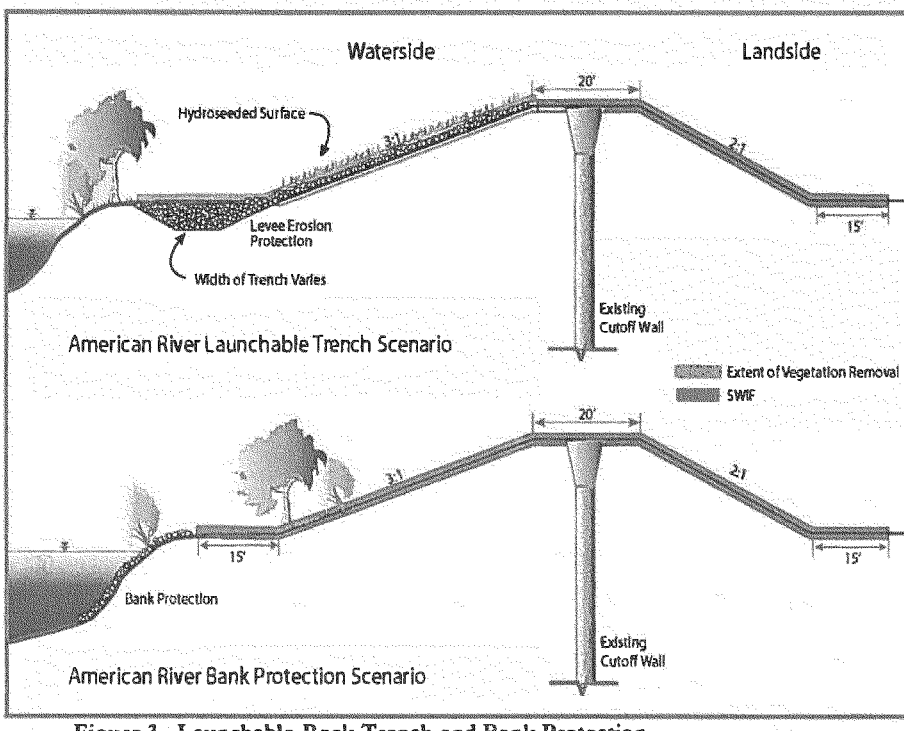


Figure 3. Launchable Rock Trench and Bank Protection.

Where the existing levee does not meet the levee design requirements, as discussed above, slope flattening, crown widening, and/or a minimal amount of levee raise is required. This improvement measure addresses problems with slope stability, geometry, height and levee crest access and maintenance. To begin levee embankment grading, loose material and vegetation understory will be cleared, grubbed, stripped, and where necessary, portions of the existing embankment will be excavated to allow for bench cuts and keyways to tie in additional embankment fill. Excavated and borrow material (from nearby borrow sites) will be stockpiled at staging areas. Haul trucks and front end loaders will bring borrow materials to the site, which will then be spread evenly and compacted according to levee design plans.

The levee will be raised about 1 to 2 feet resulting in the levee footprint extending out a maximum of 5 feet on the landside from the existing levee. The levee crown patrol road will be re-established at the completion of construction.

Cutoff Walls

To address seepage concerns, a cutoff wall will be constructed through the levee crown. The cutoff wall will 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 will 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 about 85 feet. For cutoff walls of greater depth the DSM method will be utilized.

Prior to any cutoff wall construction method, the construction site and any staging areas will be cleared, grubbed, and stripped. The levee crown will be degraded up to half the levee height to create a large enough working platform (about 30 feet) and to reduce the risk of hydraulically fracturing the levee embankment from the insertion of slurry fluids. This method of slurry wall installation will also reduce the risk of slurry mixture following seepage paths and leaking into the river or into landside properties.

Open Trench Cutoff Wall

Under the open trench method, a trench about 3 feet wide will be excavated at the top of levee centerline and into the subsurface materials up to 85 feet deep with a long boom excavator. As the trench is excavated, it is 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 was hardened, it will be capped and the levee embankment will 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 about 140 feet. As the augers are inserted and withdrawn, a cement bentonite grout will be injected through the augers and mixed with the native soils. An overlapping series of mixed columns will be drilled to create a continuous seepage cutoff barrier. A degrade of up to one half the levee height will be required for construction of the DSM wall. For both methods, once the slurry has hardened it will be capped and the levee embankment will be reconstructed with impervious or semi-impervious soil.

Bank Protection

Proposed bank protection along the Sacramento River will address erosion concerns. Studies have shown that the Sacramento River levees have a medium to high risk of breach due to erosion. Bank protection will be addressed by standard bank protection with planting berm. 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, where necessary, and installing revetment along the waterside levee slope and streambank from streambed to a height determined by site-specific analysis. Large trees on the lower half of the waterside slope will be protected in place to retain shaded riverine aquatic (SRA) habitat. The sites will be prepared by removing vegetation along the levee slopes at either end of the site for construction of a temporary access ramp, if needed. The ramp will then be constructed using imported commercial borrow material that will be trucked on site.

The placement of rock onto the levee slope will occur from atop the levee and/or from the waterside by means of barges. Rock required within the channel, both below and slightly above the water line at the time of placement, will be placed by an excavator located on a barge. Construction will require two barges: one barge would carry the excavator, while the other barge will hold the stockpile of rock to be placed on the channel slopes. Rock required on the upper portions of the slopes will be placed by an excavator located on top of the levee. Rock placement from atop the levee will 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 waterside of the levee.

The revetment will 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 will be constructed in the rock to allow for some revegetation of the site.

Natomas East Main Drain Canal

The east levee of the NEMDC requires 6,000 LF of improvements to address seepage and stability at locations where historic creeks had intersected the current levee alignment. A cutoff wall will be constructed at this location to address the seepage and stability problems. The cutoff wall will be constructed by one of the methods described in the Sacramento River section above. SAFCA is proposing to construct 1,700 LF of cutoff wall beginning just south of the confluence of Arcade Creek and extending south along the NEMDC. The Corps will construct the remaining 4,300 LF of cutoff wall.

Arcade Creek

The Arcade Creek levees require improvements to address seepage, slope stability, and overtopping when the event exceeds the current design. A centerline cutoff wall will be constructed to address seepage along 22,000 LF of the Arcade Creek levees. Levees from Rio Linda Boulevard to Marysville Boulevard will have a cutoff wall constructed at the waterside toe of the levee. Construction of the waterside toe cutoff wall will require constructing a work bench along the toe of the levee. Excavation for the bench will extend deep enough below existing grade to remove organic material and soft, unsuitable foundation soils. Bench excavation will also extend into the existing waterside slope of the levee as needed. Riprap will be placed on the waterside benches after construction of the waterside toe cutoff wall. Some portions of the Arcade Creek north levee will require more substantial excavation and reconstruction of the waterside slope to provide a low permeable seepage levee slope barrier. Bench fill material will be integrated with the slope reconstruction fill to provide an integral seepage barrier with the cutoff wall over the full height of the levee slope. A small section of levee will have a sheet pile cutoff wall at the centerline of the levee, rather than the waterside toe cutoff wall.

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 will be replaced with a conduit or box culvert and then backfilled. This will lengthen the seepage path and improve the stability of the levee. Additionally, pressure relief wells will be installed along the landside toe of the levee along the north levee west of Norwood Avenue.

The majority of the Arcade Creek levees have existing floodwalls, however there remains a height issue in this reach. A 1 to 4-foot floodwall will allow the levees to pass flood events greater than the current design level. The floodwall will be placed on the waterside hinge point of the levee and will be designed to disturb a minimal amount of waterside slope and levee crown for construction. The waterside slope will be re-established to its existing slope and the levee crown will grade away from the wall and be surfaced with aggregate base.

Dry and Robla Creeks

The Dry and Robla Creeks levees require improvements to address overtopping when flood events exceed the design level. Height improvements will be made with a new floodwall constructed to a height of 4 to 6 feet along 2,500 LF of the south levee. The floodwall will be placed at the waterside hinge point of the levee and will be designed to disturb a minimal amount of waterside slope and levee crown for construction. Construction of the floodwall will be consistent with the description for Arcade Creek above. The waterside slope will be re-established to its existing slope and the levee crown will grade away from the wall and be surfaced with aggregate base.

Magpie Creek Diversion Canal

The Magpie Creek Diversion Canal project description is the same as was described in the September 15, 2004 biological opinion.

Sacramento Weir and Bypass

The Sacramento Weir was completed in 1916. It is the only weir in the Sacramento River Flood Control Project that is manually operated; all others overflow by gravity on their own. It is located along the right bank of the Sacramento River about 4 miles upstream of the Tower Bridge, and about 2 miles upstream from the confluence with the American River. Its primary purpose is to protect the city of Sacramento from excessive flood stages in the Sacramento River channel downstream of the American River. The weir limits flood stages (water surface elevations) in the Sacramento River to project design levels through the Sacramento/West Sacramento area. Downstream of the Sacramento Weir, the design flood capacity of the American River is 5,000 cfs higher than that of the Sacramento River. Flows from the American River channel during a major flood event often exceed the capacity of the Sacramento River downstream of the confluence. When this occurs, floodwaters flow upstream from the mouth of the American River to the Sacramento Weir.

The project design capacity of the weir is 112,000 cfs. It is currently 1,920 feet long and consists of 48 gates to divert floodwaters to the west through the mile-long Sacramento Bypass to the Yolo Bypass. Each gate has 38 vertical wooden plank "needles" (4 inches thick by 1 foot wide by 6 feet long).

Though the weir crest elevation is 24.75 feet, the weir gates are not opened until the river reaches 27.5 feet at the I Street gage with a forecast to continue rising. This gage is about 1,000 feet upstream from the I Street Bridge and about 3,500 feet upstream from the mouth of the American River. The number of gates to be opened is determined by the National Weather Service/DWR river forecasting team to meet either of two criteria: (1) to prevent the stage at the I Street gage from exceeding 29 feet, or (2) to hold the stage at the downstream end of the weir to 27.5 feet (DWR 2010). The weir gates are then closed as rapidly as practicable once the stage at the weir drops below 25 feet. This provides "flushing" flows to re-suspend sediment deposited in the Sacramento River between the Sacramento Weir and the American River during the low flow periods when the weir is open during the peak of the flood event (DWR 2010).

The Sacramento Weir and Bypass will be expanded to roughly twice their current width to accommodate increased bypass flows. The existing north levee of the Sacramento Bypass will be degraded and a new levee would be constructed 1,500 feet to the north. The existing Sacramento Weir will be expanded to match the wider bypass. At this time, it is not known whether the new segment of weir will be constructed consistent with the 1916 design described above, or whether it

will be designed to be a gravity-type weir. The new north levee of the bypass will be designed to be consistent with the existing Sacramento Bypass north levee; however, it will also include a 300-foot-wide seepage berm on the landside with a system of relief wells. A hazardous, toxic, and radiological waste site near the existing north levee will be remediated by the non-Federal sponsor prior to construction.

Operation of the new segment of the Sacramento Weir will occur during high water situations only, when the American River flows exceed 115,000 cfs. The existing Sacramento Weir will be operating at the pre-existing conditions described above. There are not expected to be any water quality impacts, though this has not been specifically modeled. The approximate change in water diversions, which are shown in Table 2, will vary based on the size of the flood event. The frequency of water diversion is expected to be the same, dependent on the stream gage at the I Street Bridge reaching 27.5 feet.

The widened portion of the Sacramento Weir will only be operated when the release from Folsom Dam is above 115,000 cfs. With the Folsom Dam improvements in place, releases from Folsom Dam will be above 115,000 cfs for flood events greater than the 100-year event. Therefore, for events up to and including the 100-year event, only the existing weir will be operated per the criteria previously established. For events greater than the 100-year event, when the release from Folsom Dam will go above 115,000 cfs, the new weir will be opened. Therefore, for events up to the 100-year event there will be no change in flow conditions in the Sacramento and Yolo Bypasses.

Table 2. Comparison of 10-, 100-, and 200-year Frequency Flows under Various Conditions

10-Year Event	Existing Condition	Future Without Project Condition	Future With Project Condition
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 Sacramento Bypass	270,000 cfs	296,000 cfs	296,000 cfs
100-Year Event	Existing Condition	Future Without Project Condition	Future With Project Condition
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 Sacramento Bypass	555,000 cfs	535,000 cfs	535,000 cfs
200-Year Event	Existing Condition	Future Without Project Condition	Future With Project Condition
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 Sacramento Bypass	656,000 cfs	631,000 cfs	643,000 cfs

For the 200-year event, there will be an increase in flows in the Sacramento Bypass of about 15,000 cfs. In the Yolo Bypass, this equates to an increase of about 0.10-foot of water surface elevation. During the 200-year event, the Yolo Bypass is already flooded from levee to levee. The addition of these flows will equate to about 0.5-foot of additional width on the Yolo Bypass levee slopes.

High Hazard Levee Encroachment and Vegetation Removal

The National Flood Insurance Program (NFIP) standards for levee accreditation and the State's ULDC both require removal or modification of encroachments that pose an unacceptably high risk to the performance and safety of a levee either by undermining its structural integrity or by interfering with necessary inspection, operation, and maintenance activities. To address this requirement, SAFCA has identified and evaluated all of the encroachments in the NEMDC, Robla Creek, and Arcade Creek area. Each of these encroachments has been evaluated and based on this evaluation the encroachments have been classified as either:

- High-risk – poses a threat to levee integrity, removable prior to the levee being accredited;
- High-risk – impedes operation, maintenance, and inspection, removable within 3 years after the levee is accredited; or
- Low-risk – not identified as high hazard.

High-risk encroachments to be removed are limited to residential landscaping located at 10 locations along the landside of the south and north levees of Arcade Creek and along the Robla Creek south levee.

Vegetation on levees must be modified or removed if it presents an unacceptable risk to the structural integrity or impedes operation and maintenance of the levee. Eight high-risk trees along Arcade Creek have been identified for removal. All of the trees are either nonnative (7) or snags (1). Five are located on the waterside of the levees. These trees are in addition to any trees that will be removed as a result of implementation of levee improvements in the Arcade Creek area.

Utility Relocation

Existing encroachments and penetrations within the NEMDC and Arcade Creek have been inventoried by SAFCA. Many utilities will be avoided, however some utilities may need to be temporarily removed or relocated prior to construction. Temporary bypass pumping may be required for sanitary sewers. SAFCA and the construction contractors will coordinate with utility owners to manage the utilities in advance of construction. Disturbed utilities will be restored after construction consistent with Central Valley Flood Protection Board requirements.

Stormwater Pollution Prevention

Temporary erosion/runoff best management control measures would be implemented during construction to minimize stormwater pollution resulting from erosion and sediment migration from the construction, borrow, and staging areas. These temporary control measures may include implementing construction staging in a manner that minimizes the amount of area disturbed at any one time; secondary containment for storage of fuel and oil; and the management of stockpiles and disturbed areas by means of earth berms, diversion ditches, straw wattles, straw bales, silt fences, gravel filters, mulching, revegetation, and temporary covers as appropriate. Erosion and stormwater pollution control measures will be consistent with National Pollutant Discharge Elimination System (NPDES) permit requirements and included in a Stormwater Pollution Prevention Plan (SWPPP).

After completion of construction activities, the temporary facilities (construction trailers and batch plants) will be removed and the site would be restored to pre-project conditions. Site restoration activities for areas disturbed by construction activities, including borrow areas and staging areas, will

include a combination of regrading, reseeding, constructing permanent diversion ditches, using straw wattles and bales, and applying straw mulch and other measures deemed appropriate.

Borrow Sites, Haul Routes, and Staging Areas

Borrow Sites - It is estimated that a maximum of 1 million cubic yards (cy) of borrow material will be needed to construct the project. Detailed studies of the borrow needs have not been completed. Actual volumes exported from any single borrow site will be adjusted to match demands for fill. Borrow sites will be selected that avoid effects to endangered species or their habitat.

To identify potential locations for borrow material soil maps and land use maps were obtained for a 20-mile radius surrounding the project area. Except as discussed below for Arcade Creek and NEMDC, eventual borrow site selection will include the following criteria: avoid threatened and endangered species effects and habitat, current land use patterns, and soil types.

Excavation limits on the borrow sites will 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 will be no steeper than 3:1. Excavation depths from the borrow sites will be determined based on available suitable material. The borrow sites will be stripped of top material and excavated to appropriate depths. Once material is extracted, borrow sites will be returned to their existing use whenever possible, or these lands could be used to mitigate for project effects, if appropriate.

Because SAFCA has completed more detailed design and studies for work along NEMDC and Arcade Creek the borrow site has been selected. Borrow site 2 is located along the east side of the NEMDC north of where the levee repairs will occur. About 27,000 cubic yards of material will be excavated from the 5.5-acre borrow site in order to construct levee improvements along the NEMDC and Arcade Creek. Following borrow activities the site will be contoured to create about 0.5 acre of tule bench, set an elevation the will provide aquatic habitat all year, 1.0 acre of higher bench with seasonal wetlands, that will flood in the winter and spring, and 3.5 acres of native grassland.

Clean rock will be commercially acquired in order to construct the American and Sacramento River bank protection sites. For the Sacramento River, rock will be acquired from a commercial source in the Bay Area and barged up the Sacramento River to the construction sites. Rock for the American river sites will be acquired from a commercial source within a 50-mile radius and will be hauled in trucks to the construction sites.

Haul Routes – Haul routes will be determined during the design phase and will depend on what borrow sites and staging areas are selected. Haul routes will be selected based on existing commercial routes and levee roads. Haul routes will be selected that avoid effects to federally listed species.

For Arcade Creek and NEMDC, haul trucks will leave borrow site 2 and use East Levee Road from the borrow site down to a point just north of the existing Del Paso/Main Avenue Bridge over NEMDC. Temporary bridges crossing the NEMDC and Arcade Creek will be used to allow haul trucks to reach repair sites. Railroad car undercarriages on temporary abutment supports will be one option for temporary bridge crossings.

Staging Areas – Staging areas will be selected that do not require the removal of vegetation or habitat that is used by threatened or endangered species or effect threatened or endangered species. Four potential staging areas have been identified for improvements along Arcade Creek. All four

areas will require little preparation other than surface striping and temporary connection roads and ramps to the levee crown. The primary use of staging areas will be for temporary trailers, parking, and material staging. Additionally, there will need to be space to process material and an area where excavated soils and imported soils will be spread out and processed material. Importing, processing, and exporting material for levee reconstruction will be continuous activities once the work flow is established during the start of the construction season. Staging areas will be returned to pre-project conditions following construction activities unless the owner agrees to some grade raising to help dispose of excess construction soils.

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, the DWR, and the City of Sacramento. The applicable O&M Manual for the Sacramento area levees is the Standard Operation and Maintenance Manual for the Sacramento Flood Control Project. Typical levee O&M in the Sacramento in the Sacramento area 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.
- Post-construction, groundwater levels will be monitored using the piezometers.

The Corps will work with local maintaining agencies to develop the maintenance activities necessary for long-term operations and maintenance. This will occur during the preconstruction engineering and design phase of the project. The Corps will evaluate if these maintenance activities will affect any Federally-listed species and reinitiate section 7 consultation if there will be adverse effects to listed species. Currently, the Corps only has a project description for activities that will affect valley elderberry longhorn beetle habitat. This is included below.

Following construction, the O&M manual for these reaches will be adjusted to reflect the vegetation variance and the SWIF plan. Under the adjusted O&M manual, large trees that are protected in place under the variance will be allowed to remain on the waterside slopes and additional vegetation will be planted on the planting benches.

Vegetation maintenance includes keeping maintenance roads clear of overhanging branches. Some of the vegetation along the levees includes elderberry shrubs. As part of long-term O&M, elderberry shrubs will be trimmed by the three levee maintenance districts. Table 3 describes the maximum amount of elderberry acreage that will be trimmed each year as a result of O&M. Trimming consists 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. Up to a third of a shrub will be trimmed in a single season. Trimming will occur between November 1 and March 15. Loss of habitat will be offset through the development of a conservation area as described in the conservation measures below. Each year the local maintaining agency will document the amount of valley elderberry longhorn beetle habitat that they have trimmed and report that number to the Corps to ensure compliance with this biological opinion. If the local maintaining agency has a need to exceed the amount of valley elderberry longhorn beetle

habitat which needs to be trimmed or affected due to routine maintenance, then they will request the Corps reinitiate consultation on this biological opinion for those actions.

Table 3. O&M by Maintaining Agency

Local Maintaining Agency	Levee Systems Covered	Annual Acreage of Trimmed Elderberry Shrubs*	Total Acreage of Elderberry Shrubs Trimmed over the 50 Year Life of the Project
American River Flood Control District	Lower American River, Dry/Robla Creek, Arcade Creek, NEMDC	0.5	25
Maintenance Area 9	Sacramento River east levee between Sutterville Road and the Beach Lake Levee	0.2	10
City of Sacramento	Sacramento River East Levee between the confluence of the American River and Sutterville Road	0.1	5

*acreage based on an estimated average shrub of 0.027 acre and no more than 1/3 of a shrub trimmed any given year.

Valley Elderberry Longhorn Beetle Habitat

Valley elderberry longhorn beetles are closely associated with elderberry shrubs. In 2011, the Corps conducted surveys and mapped all of the elderberry shrubs on the levees and 15 feet on either side of the levee. Elderberry shrubs were located along the American River and Sacramento River. The Corps counted shrub clusters and used elderberry stem counts from previous projects in the area to estimate a standard number and size of elderberry stems per shrub cluster. Tables 4 and 5 list the stem counts for shrubs along the American River and Sacramento River respectively. While shrubs exist along Arcade Creek or Magpie Creek, the Corps and SAFCA will avoid effects to the beetle by following the conservation measures below.

Table 4. American River Elderberry Shrub Effects and Compensation

Location	Stems	Exit Holes	No. of Stems	Elderberry Ratios	Elderberry Plantings	Associated Native Planting	Associated Native Ratios
riparian	> or = 1" & < or = 3"	no	1,998	2	3,996	3,996	1
		yes	0	4	0	0	2
riparian	> 3" & < 5"	no	790	3	2,370	2,370	1
		yes	16	6	96	192	2
Riparian	> or = 5"	no	312	4	1,248	1,248	1
		yes	23	8	184	368	2
TOTAL			**3,139**		**7,894**	**8,174**	
				total basins or credits=	1,606.8		
				total acres for compensation	66.40		

Table 5. Sacramento River Elderberry Shrub Effects and Compensation

Location	Stems	Exit Holes	No. of Stems	Elderberry Ratios	Elderberry Plantings	Associated Native Plantings	Associated Native Ratios
riparian	> or = 1" & < or = 3"	no	104	2	208	208	1
		yes	0	4	0	0	2
riparian	> 3" & < 5"	no	40	3	120	120	1
		yes	1	6	6	12	2
riparian	> or = 5"	no	16	4	64	64	1
		yes	2	8	16	32	2
TOTAL			163		414	436	
				total basins or credits=	85		
				total acres need for compensation	3.51		

Delta Smelt Habitat

The American River lacks suitable turbidity making it unsuitable for delta smelt. Due to the higher temperatures within Arcade Creek, Magpie Creek, and NEMDC it is also unlikely that delta smelt will use these tributaries. Therefore, suitable delta smelt habitat occurs within the Sacramento River in the reach where erosion protection will occur. The Corps has calculated that there will be a complete loss of 14 acres of shallow water habitat due to the placement of riprap and a change of substrate from natural soil to riprap on 32 acres.

Giant Garter Snake Habitat

Giant garter snakes are not known to use large rivers such as the American and Sacramento Rivers. Given the close proximity to urban development, high level of human disturbance, presence of riparian vegetation along the banks of most channel reaches, and lack of extensive marsh or rice to the east, giant garter snakes are unlikely to occur in Arcade Creek, Dry Creek, Robla Creek, Magpie Creek, or the southern section of the NEMDC (south of where Dry Creek enters). North of Dry Creek, the NEMDC has less woody vegetation, less urban development, and large areas of open grassland along the landside of the levee with rice farming occurring to the west of the grasslands. Therefore, there is potential for the snake to occur either in the upland or within the NEMDC north of where Dry Creek enters. Work in this location will involve removal of borrow material at borrow site 2 (5.5 acres of upland habitat).

Habitat for the giant garter snake also exists north of the existing Sacramento Bypass north levee. The land north of the Sacramento Bypass is currently agricultural fields producing row crops and nut orchards. Existing giant garter snake aquatic habitat occurs in drainage ditches and farm canals and the surrounding upland habitat. About 15 acres of aquatic habitat will be filled making it and the associated 30 acres of upland habitat unavailable to the giant garter snake. The Sacramento Bypass also has a toe drain along the levee with 25 acres of aquatic and 50 acres of upland habitat that will be relocated to the toe of the new Sacramento Bypass levee.

Yellow-billed Cuckoo Habitat

Yellow-billed cuckoos use riparian habitat for foraging and nesting. Suitable habitat occurs within the lower American River. The project will affect 65 acres of riparian habitat that could be used by the yellow-billed cuckoo. While riparian habitat occurs along Arcade Creek, Magpie Creek, and NEMDC it is very narrow and cuckoos are not likely to use these areas. Riparian habitat occurs along the Sacramento River and in some areas may be of such a width that a cuckoo could stop and use it during migration, but it is not wide enough to support a nesting pair of cuckoos. The Corps will remove 110 acres of riparian habitat along the Sacramento River and disturb an additional 50 acres of riparian habitat by removing the understory and placing rock around the large trees. The Sacramento Bypass does not have suitable habitat for the yellow-billed cuckoo. But riparian habitat does exist north of the existing Sacramento Weir along the Sacramento River (8 acres). Cuckoos have been observed in the Yolo Bypass in recent years (Ebird 2015).

Conservation Measures

Valley Elderberry Longhorn Beetle

- The Corps assumes complete avoidance of the valley elderberry longhorn beetle when a 100-foot (or wider) buffer is established and maintained around elderberry shrubs.
- When work will occur within the 100-foot buffer, 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.
- Elderberry shrubs that cannot be avoided would be transplanted to an appropriate riparian area at least 100 feet from construction activities.
- Elderberry shrubs will be surveyed prior to construction to ensure that the actual effects match the estimated effects of this biological opinion. If the Corps will effect more valley elderberry longhorn beetle habitat than estimated than they will reinitiate consultation with the Service.
- If possible, elderberry shrubs would be transplanted during their dormant season (November through the first two weeks in February). If transplantation occurs during the growing season, increased mitigation will apply.
- Elderberry compensation will be planted in the American River Parkway. The Corps has six existing sites which are offsetting previous Corps flood control projects along the lower American River and near Folsom Dam. The Corps will find areas within the lower American River parkway which will either expand existing compensation areas or provide for connectivity between conserved valley elderberry longhorn beetle habitat. Sites within the lower American River parkway will be coordinated with Sacramento County Parks and the Service during the design phase of the project. Sites will be designed and developed prior to any effects to valley elderberry

longhorn beetle habitat. The Corps will create 69.91 acres of riparian habitat which supports valley elderberry longhorn beetle within the lower American River parkway for the transplantation of elderberry shrubs. In addition, the local sponsors will create an additional 40 acres of land to benefit the valley elderberry longhorn beetle or purchase 40 acres of credits at a Service approved conservation bank to offset the loss of habitat due to trimming of elderberry shrubs along the lower American River, Sacramento River, Dry/Robla Creeks, Arcade Creek, Magpie Creek, and NEMDC.

- Management of these lands will include all measures specified in the Service's conservation guidelines (1999a) related to weed and litter control, fencing, and the placement of signs.
- Monitoring will occur for 10 consecutive years or for 7 non-consecutive years over a 15-year period. Annual monitoring reports will be submitted to the Service.
- Compensation areas will be protected in perpetuity and have a funding source for maintenance (endowment).

Giant Garter Snake

- Unless approved otherwise by the Service, 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 be given a Service-approved worker environmental awareness program.
- A survey for giant garter snakes will be conducted within 24 hours prior to construction beginning in potential giant garter snake habitat. Should there be any interruption in work for greater than 2 weeks, a biologist will resurvey the area within 24 hours prior to the restart of construction.
- Giant garter snakes encountered during construction 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.
- Habitat temporarily affected for one season (the 5.5 acre borrow site along the NEMDC and the 75 acres along the toe drain of the Sacramento Bypass levee) will be restored after construction by applying appropriate erosion control techniques and replanting/seeding with appropriate native plants. If for any reason construction extends into another active season the Corps will replace the habitat on-site and purchase credits at a ratio of 1:1 at a Service approved conservation bank.
- Habitat temporarily affected for more than three or more seasons will be restored and twice as much habitat will be created.
- Habitat permanently affected in the Sacramento Bypass in the form of drainage ditches and irrigation canals will be compensated for through the purchase of 135 acres of credits at a Service approved conservation bank.
- One year of monitoring will be conducted for the 80.5 acres that are temporarily affected.

- The Corps will purchase credits at a conservation bank prior to any permanent disturbance of giant garter snake habitat.
- A biological monitor will be on-site during all ground disturbing activities at borrow site 2.
- Exclusionary fencing will be placed, at least 10 days prior to the beginning of ground disturbing activities after May 1, to exclude giant garter snakes from entering areas where upland disturbance (borrow site 2 and Sacramento Bypass) will occur during the active season (May 1 to October 1). Prior to fencing installation, the fence line will be mowed (with a minimum height of 6 inches) in order to conduct a surface survey of potential burrows. Fencing will be installed with a minimum of 6 inches buried in the ground and a minimum of 24 inches above ground. Fence staking will be installed on the inside of the exclusion area. One-way escape funnels will be installed every 50 to 100 feet and sealed along the fence line to provide an escape for any giant garter snake that may be within the exclusion area. The fencing will enclose the entirety of the site, or additional exclusionary fencing can be extended 200 to 400 feet beyond the proposed entrance area. The fencing will be inspected before the start of each work day and maintained by the contractor until completion of the project. The fencing will be removed only when project activities are completed.

Yellow-Billed Cuckoo

- Prior to construction, surveys will be conducted to determine the presence of yellow-billed cuckoos within the project area in accordance with any required Service survey protocols and permits at the time of construction.
- If surveys find cuckoos in the area, vegetation removal will be done outside of the cuckoo nesting season.
- Riparian habitat that is removed due to project construction along the American River will be replanted within the American River parkway. The Corps intends to expand existing conserved riparian lands within the parkway that could support the yellow-billed cuckoo. The design of replacement riparian areas will be coordinated with the Service to ensure that the habitat benefits both valley elderberry longhorn beetles and yellow-billed cuckoos.

Fisheries Conservation Measures

- In-water construction activities (e.g., placement of rock revetment) will be limited to the work window of August 1 through November 30. If the Corps wants to work outside of this window they will consult with National Marine Fisheries Service (NMFS) and/or the Service.
- The Corps will purchase 42 acres of delta smelt credits from a Service-approved conservation bank to off-set the loss of 14 acres of shallow water habitat.
- The Corps will purchase an additional 32 acres of delta smelt credits from a Service-approved conservation bank to off-set the loss of spawning habitat due to the placement of riprap on the river bed.
- Erosion control measures (BMPs), including Storm Water Pollution Prevention Program and Water Pollution Control Program, that minimize soil or sediment from entering the river shall be installed, monitored for effectiveness, and maintained

throughout construction operations to minimize effects to federally listed fish and their designated critical habitat.

- Screen any water pump intakes, as specified by NMFS and the Service screening specifications. Water pumps will maintain an approach velocity of 0.2 feet per second or less when working in areas that may support delta smelt.
- The Corps shall include as part of the project, a Riparian Corridor Improvement Plan with the overall goal of maximizing the ecological function and value of the existing levee system within the Sacramento Metropolitan area.

Additional Minimization and Conservation Measures

- Obtain an ETL approved vegetation variance exempting sites from vegetation removal prior to final design and construction phase for the Sacramento River.
- Construction will be scheduled when listed terrestrial and aquatic species will be least likely to occur in the project area. If construction needs to extend into the timeframe that species are present, then coordination/reinitiation with the Service will occur.
- Compensation for impacts to native riparian habitat will occur on a 2:1 basis on-site or in close proximity to the impact area. Riparian vegetation impacted under the SAFCA 408/404 actions will be replaced on a 3:1 canopy cover acreage basis.
- Stockpile all liquid chemicals and supplies at a designated impermeable membrane fuel and refueling station with a 110% containment system.
- Stockpile construction materials such as portable equipment, vehicles, and supplies, at designated construction staging areas and barges, exclusive of any riparian and wetland areas.
- Implement BMPs to prevent slurry from seeping out to the river and require piping systems on the landside of the levee.
- Project related vehicles will observe a 20-mile-per-hour speed limit within construction areas, except on County roads and on State and federal highways.
- Site access will be limited to the smallest area possible in order to minimize disturbance. Litter, debris, unused materials, equipment, and supplies will be removed from the project area daily. Such materials or waste will be deposited at an appropriate disposal or storage site.
- Immediately (within 24 hours) cleanup and report any spills of hazardous materials to the resource agencies. Any such spills, and the success of the efforts to clean them up, shall also be reported in post-construction compliance reports.
- Designating a Service approved biologist as a point-of-contact for any contractor who might incidentally take a living, or find a dead, injured, or entrapped threatened or endangered species. This representative shall be identified to the employees and contractors during an all employee education program conducted by the Corps.

Action Area

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the purposes of the effects assessment, the action area encompasses the Sacramento River from the Sacramento Bypass downstream to River Mile 45, the Yolo Bypass south the confluence of the Sacramento Bypass, the lower American River from Arden Way to the confluence of the Sacramento River, Arcade Creek from Marysville Boulevard to the confluence of the NEMDC, the NEMDC from the south Dry

Creek levee to just south of the NEMDC Arcade Creek confluence, the southern Dry Creek levee between Dry Creek Road and Rose Street, the borrow site along the NEMDC, and any borrow sites. Additionally, we are including a buffer of 300 feet from construction to account for effects to listed species due to dust and noise.

Analytical Framework for the Jeopardy Analysis

The following analysis relies on four components to support the jeopardy determination for the giant garter snake, valley elderberry longhorn beetle, yellow-billed cuckoo, and delta smelt: (1) the *Status of the Species*, which evaluates the species' range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the species in the action area, the factors responsible for that condition, and the role of the action area in the species' survival and recovery; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on these species; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on these species.

In accordance with the implementing regulations for section 7 and Service policy, the jeopardy determination is made in the following manner: the effects of the proposed Federal action are evaluated in the context of the aggregate effects of all factors that have contributed to the current status of the delta smelt, valley elderberry longhorn beetle, giant garter snake, and yellow-billed cuckoo. Additionally, for non-Federal activities in the action area, we will evaluate those actions likely to affect the species in the future, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both its survival and recovery in the wild.

The following analysis places an emphasis on using the rang-wide survival and recovery needs of the delta smelt, valley elderberry longhorn beetle, giant garter snake, and yellow-billed cuckoo, and the role of the action area in providing for those needs as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Analytical Framework Adverse Modification

This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.2. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to critical habitat.

In accordance with policy and regulation, the adverse modification analysis in this biological opinion relies on four components: (1) the *Status of the Critical Habitat*, which evaluates the range-wide condition of critical habitat for the delta smelt in terms of primary constituent elements (PCE)s, the factors responsible for that condition, and the intended recovery function of the critical habitat at the provincial and range-wide scale; (2) the *Environmental Baseline*, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs and how that will influence the recovery role of affected critical habitat units and; (4) *Cummulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how that will influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on the delta smelt critical habitat are evaluated in the context of the range-wide condition of the critical habitat at the provincial and range-wide scales, taking into account any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the delta smelt.

The analysis in this biological opinion places an emphasis on using the intended range-wide recovery function of delta smelt critical habitat and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

Status of the Species and Environmental Baseline

Valley Elderberry Longhorn Beetle Status of the Species

Please refer to the *Withdrawl of the Proposed Rule to Remove the Valley Elderberry Longhorn Beetle from the Federal List of Endangered and Threatened Wildlife* (Service 2014) for the current status of the species. Ongoing threats to the valley elderberry longhorn beetle include habitat loss due to flood control projects, development projects, and invasive species. While these threats continue to affect the valley elderberry longhorn beetle throughout its range, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the valley elderberry longhorn beetle.

Valley Elderberry Longhorn Beetle Environmental Baseline

The project footprint along both the Sacramento River and the American River contain riparian vegetation. The beetle is known in numerous locations along the American River parkway (CNDD 2015). Suitable habitat for the beetle in the form of elderberry shrubs occurs within the action area along the Sacramento River, the American River, and Arcade Creek.

Sacramento River - Riparian habitat along the Sacramento River, south of the city of Sacramento, occurs in narrow bands along the riverbank and levee. Generally an overstory layer is present composed of cottonwood, sycamore, and oak trees. Shrubs occur as a mid-story layer including buttonbush, blue elderberry, white alder, and Oregon ash. Elderberry shrubs occur randomly along the reach of river proposed for improvements. The Corps has documented at least 73 elderberry shrubs along the Sacramento River reach where construction is proposed. Natural river processes of erosion and accretion effect elderberry shrubs which is the host plant of the valley elderberry longhorn beetle by eroding away bank and potentially elderberry shrubs. Levee maintenance can adversely affect elderberries within this stretch of the Sacramento River either by pruning or drift of herbicides used along the levee slope.

American River – The valley elderberry longhorn beetles have been identfied along the lower American River Parkway in the CNDDB (2015). Additionally, the Corps has designed and built six sites along the lower American River as habitat for the valley elderberry longhorn beetle. These sites extend from RM 0.9 up to RM 21. Levee maintenance can adversely affect elderberry shrubs, though the largest threat to valley elderberry longhorn beetle is fires that have been started in the parkway and burned habitat that supports valley elderberry longhorn beetles.

Delta Smelt Status of Species

Listing Status: The Service proposed to list the delta smelt as threatened with proposed critical habitat on October 3, 1991 (56 FR 50075). The Service listed the delta smelt as threatened on March 5, 1993 (58 FR 12854), and designated critical habitat for this species on December 19, 1994 (59 FR 65256). The delta smelt was one of eight fish species addressed in the *Recovery Plan for the Sacramento–San Joaquin Delta Native Fishes* (Service 1996). This recovery plan is currently under revision. A 5-year status review of the delta smelt was completed on March 31, 2004 (Service 2004). The 2004 review affirmed the need to retain the delta smelt as a threatened species. A 12-month finding on a petition to reclassify the delta smelt was completed on April 7, 2010 (75 FR 17667). After reviewing all available scientific and commercial information, the Service determined that re-classifying the delta smelt from a threatened to an endangered species was warranted, but precluded by other higher priority listing actions (Service 2010).

Distribution: The delta smelt is endemic to the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta) in California, and is restricted to the area from San Pablo Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties (Moyle 2002). Their range extends from San Pablo Bay upstream to Verona on the Sacramento River and Mossdale on the San Joaquin River. The delta smelt was formerly considered to be one of the most common pelagic fish in the upper Sacramento-San Joaquin Estuary.

Description: Live delta smelt are nearly translucent with a steely-blue sheen to their sides and have been characterized to have a pronounced odor reminiscent of cucumber (Moyle 2002). Although delta smelt have been recorded to reach lengths of up to 120 millimeters (mm) (4.7 in) (Moyle 2002), mean fork length of the delta smelt from 1974 to 1991 was measured to be 64.1 ± 0.1 mm. Since then, catch data from 1992 - 2004 showed mean fork length decreased to 54.1 ± .01 mm (Bennett 2005; Sweetnam 1999). Delta smelt are also identifiable by their relatively large eye to head size (Moyle 2002). Delta smelt have a small, translucent adipose fin located between the dorsal and caudal fins.

The delta smelt is one of six species currently recognized in the *Hypomesus* genus (Bennet 2005). Genetic analyses have confirmed that *H. transpacificus* presently exists as a single intermixing population (Stanley *et al.* 1995; Trenham *et al.* 1998; Fisch *et al.* 2011). Within the genus, delta smelt is most closely related to surf smelt (*H. pretiosis*), a species common along the western coast of North America. Despite morphological similarities, the delta smelt is less-closely related to the wakasagi (*H. nipponensis*), an andadromous western Pacific species introduced to Central Valley reservoirs in 1959, and may be seasonally sympatric with delta smelt in the estuary (Trenham *et al.* 1998). Allozyme studies have demonstrated that wakasagi and delta smelt are genetically distinct and presumably derived from different marine ancestors (Stanley *et al.* 1995).

Life History and Biology

Adult-Spawning: Adult delta smelt spawn during the late winter and spring months, with most spawning occurring during April through mid-May (Moyle 2002). Spawning occurs primarily in sloughs and shallow edge areas in the Delta. Delta smelt spawning has also been recorded in Suisun Marsh and the Napa River (Moyle 2002). Most spawning occurs at temperatures between 12-18°C. Although spawning may occur at temperatures up to 22°C, hatching success of the larvae is very low (Bennett 2005).

Fecundity of females ranges from about 1,200 to 2,600 eggs, and is correlated with female size (Moyle 2002). Moyle *et al.* (1992) considered delta smelt fecundity to be "relatively low." However,

based on Winemiller and Rose (1992), delta smelt fecundity is fairly haigh for a fish its size. Captive delta smelt can spawn up to 4-5 times. While most adults do not survive to spawn a second season, a few (<5 percent) do (Moyle 2002; Bennett 2005). Those that do survive are typically larger (90-110 mm Standard Length[sdl]) females that may contribute disproportionately to the population's egg supply (Moyle 2002 and references therein). Two-year-old females may have 3-6 times as many ova as first year spawners.

Most of what is known about delta smelt spawning habitat in the wild is inferred from the location of spent females and young larvae captured in the California Department of Fish and Wildlife Spring Kodiak Trawl (SKT) and 20-mm Survey, respectively. In the laboratory, delta smelt spawned at night (Baskerville-Bridges *et al.* 2000; Mager *et al.* 2004). Other smelts, including marine beach spawning species and estuarine populations and the landlocked Lake Washington longfin smelt, are secretive spawners, entering spawning areas during the night and leaving before dawn. If this behavior is exhibited by delta smelt, then delta smelt distribution based on the SKT, which is conducted during daylight hours in offshore habitats, may reflect general regions of spawning activity, but not actual spawning sites.

Delta smelt spawning has only been directly observed in the laboratory and eggs have not been found in the wild. Consequently, what is known about the mechanics of delta smelt spawning is derived from laboratory observations and observations of related smelt species. Delta smelt eggs are 1 mm diameter and are adhesive and negatively buoyant (Moyle 1976, 2002; Mager *et al.* 2004; Wang 1986, 2007). Laboratory observations indicate that delta smelt are broadcast spawners, discharging eggs and milt close to the bottom over substrates of sand and/or pebble in current (DWR and Reclamation 1994; Brown and Kimmerer 2002; Lindberg *et al.* 2003; Wang 2007). Spawning over gravel or sand can also aid in the oxygenation of delta smelt eggs. Eggs that may have been laid in silt or muddy substrates might get buried or smothered, preventing their oxygenation from water flow (Lindberg pers. comm. 2011). The eggs of surf smelts and other beach spawning smelts adhere to sand particles, which keeps them negatively buoyant but not immobile, as the sand may move ("tumble") with water currents and turbulence (Hay 2007). It is not known whether delta smelt eggs "tumble incubate" in the wild, but tumbling of eggs may moderately disperse them, which might induce predation risk within a localized area.

The locations in the Delta where newly hatched larvae are present, most likely indicates spawning occurrence. The 20-mm trawl has captured small (~5 mm sdl) larvae in Cache Slough, the lower Sacramento River, San Joaquin River, and at the confluence of these two rivers (e.g., 20-mm trawl survey 1 in 2005). Larger larvae and juveniles (size > 23 mm sdl), which are more efficintly sampled by the 20-mm trawl gear, have been captured in Cache Slough and the Sacramento Deep Water Ship Channel in July (e.g. 20-mm trawl survey 9 in 2008). Because they are small fish inhabiting pelagic habitats with strong tidal and river currents, delta smelt larval distribution depends on both the spawning area from which they originate and the effect of transport processes caused by flows. Larval distribution is further affected by water salinity and temperature. Hydrodynamic simulations reveal that tidal action and other factors may cause substantial mixing of water with variable salinity and temperature among regions of the Delta (Monson *et al.* 2007). This could result in rapid dispersion of larvae away from spawning sites.

The timing of spawning may affect delta smelt population dynamics. Lindberg (2011) has suggested that smelt larvae that hatch early, around late February, have an advantage over larvae hatched during late spawning in May. Early season larvae have a longer growing season and may be able to grow larger faster during more favorable habitat conditions in the late winter and early spring. An early growing season may result in higher survivorship and a stronger spawning capability for that

generation. Larvae hatched later in the season have a shorter growing season which effectively reduces survivorship and spawning success for the following spawning season.

Larval Development: Mager *et al.* (2004) reported that embryonic development to hatching takes 11-13 days at 14-16° C for delta smelt, and Baskerville-Bridges *et al.* (2000) reported hatching of delta smelt eggs after 8-10 days at temperatures between 15-17° C. Lindberg *et al.* (2003) reported high hatching rates of delta smelt eggs in the laboratory at 15° C, and Wang (2007) reported high hatching rates at temperatures between 14-17° C. Hatching success peaks near 15°C (Bennett 2005) and swim bladder inflation occurring at 60-70 days post hatch at 16-17°C (Mager *et al.* 2004). At hatching and during the succeeding three days, larvae are buoyant, swim actively near the water surface, and do not react to bright direct light (Mager *et al.* 2004). As development continues, newly hatched delta smelt become semi-buoyant and sink in stagnant water. However, larvae are unlikely to encounter stagnant water in the wild.

Growth rates of wild-caught delta smelt larvae are faster than laboratory-cultured individuals. Mager *et al.* (2004) reported growth rates of captive-raised delta smelt reared at near-optimum temperatrues (16-17°C). Their fish were about 12 mm long after 40 days and about 20 mm long after 70 days. In contrast, analyses of otoliths indicated that wild delta smelt larvae were 15-25 mm, or nearly twice as long at 40 days of age (Bennett 2005). By 70 days, most wild fish were 30-40 mm long and beyond the larval stage. This suggests there is a strong selective pressure for rapid larval growth in nature, a situation that is typical for fish in general (Houde 1987). Successful feeding seems to depend on a high density of food organisms and turbidity, and increases with stronger light conditions (Baskerville-Bridges *et al.* 2000; Mager *et al.* 2004; Baskerville-Bridges *et al.* 2004). The food available to larval fishes is constrained by mouth gape and status of fin development. Larval delta smelt cannot capture as many kinds of prey as larger individuals, but all life stages have small gapes that limit their range of potential prey. Prey availability is also constrained by habitat use, which affects what types of prey are encountered. Larval delta smelt are visual feeders. They find and select individual prey organisms and their ability to see prey in the water is enhanced by turbidity (Baskerville-Bridges *et al.* 2004). Thus, delta smelt diets are largely comprised of small crustacea that inhabit the estuary's turbid, low-salinity, open-water habitats (i.e., zooplankton). Larval delta smelt have particularly restricted diets (Nobriga 2002). They do not feed on the full array of zooplankton with which they co-occur; they mainly consume three copepods, *Eurytemora affinis*, *Pseudodiaptomus forbesi*, and freshwater species of the family Cyclopidae. Further, the diets of first-feeding delta smelt larvae are largely restricted to the larval stages of these copepods; older, larger life stages of the copepods are increasingly targeted as the delta smelt larvae grow, their gape increases, and they become stronger swimmers.

The triggers for and duration of delta smelt larval movement from spawning areas to rearing areas are not known. Hay (2007) noted that eulachon larvae are probably flushed into estuaries from upstream spawning areas within the first day after hatching, but downstream movement of delta smelt larvae occurs much later. Most larvae gradually move downstream toward the two parts per thousand (ppt) isohaline (X2). X2 is scaled as the distance in kilometers from the Golden Gate Bridge (Jassby *et al.* 1995).

At all life stages, delta smelt are found in greatest abundance in the water column and usually not in close association with the shoreline. They inhabit open, surface waters of the Delta and Suisun Bay, where they presumably aggregate in loose schools where conditions are favorable (Moyle 2002). In years of moderate to high Delta outflow (above normal to wet water years), delta smelt larvae are abundant in the Napa River, Suisun Bay and Montezuma Slough, but the degree to which these larvae are produced by locally spawning fish versus the degree to which they originate upstream and are transported by tidal currents to the bay and marsh is uncertain.

Juveniles: Young-of-the-year delta smelt rear in the low-salinity zone (LSZ) from late spring through fall and early winter. Once in the rearing area growth is rapid, and juvenile fish are 40-50 mm sdl long by early August (Erkkila *et al.* 1950; Ganssle 1966; Radtke 1966). They reach adult size (55-70 mm sdl) by early fall (Moyle 2002). Delta smelt growth during the fall months slows considerably (only 3-9 mm total), presumably because most of the energy ingested is being directed towards gonadal development (Erkkila *et al.* 1950; Radtke 1966).

Delta Smelt Population Dynamics and Abundance Trends

As a consequence of channelization, water operations, and agriculture in the Delta there has been a change to the physical appearance, water salinity, water clarity, and hydrology in the Delta such that most life stages of the delta smelt are now distributed across a smaller area than historically (Arthur *et al.* 1996; Feyrer *et al.* 2007). Wang (1991) noted in a 1989 and 1990 study of delta smelt larval distribution that, in general, the San Joaquin River was used more intensively for spawning than the Sacramento River. Nobriga *et al.* (2008) found that delta smelt capture probabilities in the Summer Townet Survey (TNS) are highest at specific conductance levels of 1,000 to 5,000 $\mu S\ cm^{-1}$ (approximately 0.6 to 3.0 practical salinity unit [psu]). Similarly, Feyrer *et al.* (2007) found a decreasing relationship between abundance of delta smelt in the Fall Midwater Trawl (FMWT) and specific conductance during September through December. The location of the low salinity zone (LSZ) and changes in delta smelt habitat quality in the San Francisco Estuary can be indexed by changes in X2. The LSZ historically had the highest primary productivity and is where zooplankton populations (on which delta smelt feed) were historically most dense (Knutson and Orsi 1983; Orsi and Mecum 1986). However, this has not always been true since the invasion of the overbite clam (Kimmerer and Orsi 1996). The abundance of many local aquatic species has tended to increase in years when winter-spring outflow has high and Z2 was pushed seaward (Jassby *et al.* 1995), implying that the quantity and quality (overall suitability) of estuarine habitat increases in years when outflows are high. However, delta smelt is not one of the species whose abundance has statistically covaried with winter-spring freshwater flows (Stevens and Miller 1983; Moyle *et al.* 1992; Kimmerer 2002a; Bennett 2005).

The distribution of juvenile delta smelt has also changed over the last several decades. During the years 1970 through 1978, delta smelt catches in the TNS survey declined rapidly to zero in the Central and South Delta and have remained near zero since. A similar shift in FMWT catches occurred after 1981 (Arthur *et al.* 1996). This portion of the Delta has also had a long-term trend increase in water clarity during July through December (Arthur *et al.* 1996; Feyrer *et al.* 2007; Nobriga *et al.* 2008).

The CDFW has conducted several long-term monitoring surveys that have been used to index the relative abundance of delta smelt. The 20-mm Survey has been conducted every year since 1995. This survey targets late-stage delta smelt larvae. Most sampling has occurred April-June. The TNS has been conducted nearly every year since 1959. This survey targets 38-mm striped bass, but collects similar-sized juvenile delta smelt. Most sampling has occurred June-August. The Fall Midwater Trawl Survey has been conducted nearly every year since 1967. This survey also targets age-0 striped bass, but collects delta smelt > 40 mm in length. The FMWT samples monthly, September-December. The relative abundance index data and maps of the sampling stations used in these surveys are available at http://www.CDFW.ca.gov/delta/. The methods that underlie the surveys have been described previously (Stevens and Miller 1983; Moyle *et al.* 1992; Dege and Brown 2004). The delta smelt catch data and relative abundance indices derived from these sampling programs have been used in numerous publications (e.g., Stevens and Miller 1983; Moyle *et al.* 1992; Jassby *et al.* 1995; Kimmerer 2002b; Dege and Brown 2004; Bennett 2005; Feyrer *et al.* 2007; Sommer *et al.* 2007; Kimmerer 2008; Newman 2008; Nobriga *et al.* 2008; Kimmerer *et al.* 2009; Mac

Nally *et al.* 2010; Thomson *et al.* 2010; Feyrer *et al.* 2011; Maunder and Deriso 2011). These abundance index time series document the long-term decline of the delta smelt.

Early statistical assessments of delta smelt population dynamics concluded that at best, the relative abundance of the adult delta smelt population had only a very weak influence on subsequent juvenile abundance (Sweetnam and Stevens 1993). Thus, early attempts to describe abundance variation in delta smelt ignored stock-recruit effects and researchers looked for environmental variables that were directly correlated with interannual abundance variation (e.g., Stevens and Miller 1983; Moyle *et al.* 1992; Sweetnam and Stevens 1993; Herbold 1994; Jassby *et al.* 1995). Because delta smelt live in a habitat that varies in size and quality with Delta outflow, the authors cited above searched for a linkage between Delta outflow (or X2) and the TNS and FMWT indices. Generally, these analyses did not find strong support for an outflow-abundance linkage. These analyses led to a prevailing conceptual model that multiple interacting factors had caused the delta smelt decline (Moyle *et al.* 1992; Bennett and Moyle 1996; Bennett 2005). It has also recently been noted that delta smelt's FMWT index is partly influenced by explanation for why few analyses could consistently link springtime environmental conditions to delta smelt's fall index.

One published exception to the multi-factor hypothesis was proposed by Gilbert (2010), who posited that nutrient pollution was the root cause of all the food web and fish assemblage changes that caused the decline of delta smelt and other pelagic fishes. However, the statistical approach she used to support her hypothesis was not appropriate and the untransformed data sets do not support this hypothesized chain of consequences stemming solely from wastewater inputs to the Delta (Jassby *et al.* in press). It is now recognized that delta smelt abundance plays an important role in subsequent abundance (Bennett 2005; Maunder and Deriso 2011). Bennett (2005) assessed (1) the influence of adult stock as indexed by the FMWT versus the next generation of juveniles indexed by the following calendar year's TNS; (2) the influence of the juvenile stock indexed by the TNS versus the subsequent adult stock indexed a few months later in the FMWT; (3) the influence of the FMWT on the following year's FMWT and on the FMWT two years later, and (4) he did the same for the TNS data. He concluded that (1) two-year-old delta smelt might play an important role in delta smelt population dynamics, (2) it was not clear wheter juvenile production was a density-independent or density-dependent function of adult abundance, and (3) adult production was a density-dependent function of juvenile abundance and the carrying capacity of the estuary to support this life-stage transition had declined over time. These conclusions are also supported by Maunder and Deriso (2011).

The concept of density-dependence and how it has affected the delta smelt is important because it may be used as a reason not to protect particular life stages from sources of mortality. Bennet (2005) concluded it was (statistically) unclear whether density-dependence occurs between generations. He also noted that the delta smelt indices strongly suggest that density-dependence has occurred, at least over the long-term, during the juvenile stage. The uncertainty about density-dependence between generations results because statistical assessments of the relationship between the adult stock and the next generation of recruits (juveniles_ result in similar fits for linear (density-independent) and nonlinear (density-dependent) relationships (Bennett 2005; Maunder and Deriso 2011).

One reason for this is that delta smelt population dynamics may have changed over time. Previous papers have reported a delta smelt step-decline during 1981-1982 (Kimmerer 2002a; Thomson *et al.* 2010). Prior to this decline, the stock-recruit data are consistent with "Ricker" type density-dependence where increasing adult abundance resulted in decreased juvenile abundance. Since the decline, recruitment has been positively and essentially linearly related to prior adult abundance, suggesting that reproduction has been basically density-independent for about the past 30 years.

This means that since the early 1980s, more adults translates into more juveniles and fewer adults translates into fewer juveniles without being 'compensated for' by density-dependence. In contrast to the transition among generations, the weight of scientific evidence strongly supports the hypothesis that, at least over the history of Interagency Ecological Program (IEP) fish monitoring, delta smelt has experienced density-dependence during the juvenile stage of its life cycle, i.e., between the summer and fall (Bennett 2005; Maunder and Deriso 2011). This has been inferred because, statistically, the FMWT index does not increase linearly with increases in the summer townet index. Rather, the best-fitting relationships between the summer townet index and the FMWT index show that the FMWT indices approach an asymptote as the summer townet increases or possibly even declines at the highest summer townet indices.

From a species conservation perspective, the most relevant aspect of this juvenile density dependence is that the carrying capacity of the estuary for delta smelt has declined (Bennett 2005). Thus, the delta smelt population decline has occurred for two basic reasons. First, the compensatory density-dependence that historically enabled juvenile abundance to rebound from low adult numbers stopped happening. This change had occurred by the early 1980s as described above. The reason is still not known, but the consequence of the change is that for the past several decades, adult abundance drives juvenile production in a largely density-independent manner. Thus, if numbers of adults or adult fecundity decline, juvenile production will also decline (Kimmerer 2011). Second, because juvenile carrying capacity has declined, juvenile production hits a 'ceiling' at a lower abundance than it once did. This limits adult abundance and possibly per capita fecundity, which cycles around and limits the abundance of the next generation of juveniles. The mechanism causing carrying capacity to decline is likely due to the long-term accumulation of deleterious habitat changes, both physical and biological, during the summer-fall (Bennett *et al.* 2008; Feyrer *et al.* 2007; 2011; Maunder and Deriso 2011).

Habitat

The existing physical appearance and hydrodynamics of the Delta have changed substantially from the environment in which native fish species like delta smelt evolved. The Delta once consisted of tidal marshes with networks of diffuse dendritic channels connected to floodplains of wetlands and upland areas (Moyle 2002). The in-Delta channels were further connected to drainages of larger and smaller rivers and creeks entering the Delta from the upland areas. In the absence of upstream reservoirs, freshwater inflow from smaller rivers and creeks and the Sacramento and San Joaquin Rivers were highly seasonal and more strongly and reliably affected by precipitation patterns than they are today. Consequently, variation in hydrology, salinity, turbidity, and other characteristics of the Delta aquatic ecosystem was greater in the past than it is today (Kimmerer 2002a). For instance, in the early 1900s, the location of maximum salinity intrusion into the Delta during dry periods varied from Chipps Island in the lower Delta to Stockton along the San Joaquin River and Merritt Island in the Sacramento River. Operations of upstream reservoirs have reduced spring flows while releases of water for Delta water export and increased flood control storage have increased late summer and fall inflows (Knowles 2002), though Delta outflows have been tightly constrained during late summer-fall for several decades. The following is a brief description of the changes that have occurred to delta smelt's habitat that are relevant to the environmental baseline for this consultation.

Changes to the LSZ: There have been documented changes to the delta smelt's LSZ habitat that have led to present-day, baseline habitat conditions. The close association of delta smelt with the San Francisco estuary LSZ has been known for many years (Stevens and Miller 1983; Moyle *et al.* 1992). Peterson (2003) developed a conceptual model that hypothesized how, "stationary and dynamic components of estuarine habitats" interacted to influence fisheries production in tidal river estuaries.

Peterson's model suggests that when the dynamic and static aspects of estuarine habitat sufficiently overlap, foraging, growth, density, and survival are all high, and that enables fish production to outpace losses to predators. The result is high levels of successful recruitment of new individuals. The model also hypothesizes that when the dynamic and static aspects of an estuarine habitat do not sufficiently overlap, foraging, growth, density, and survival are impaired such that losses to predators increase and recruitment of new individuals decreases. This model was developed specifically for species spawned in marine environments that were subsequently transported into estuaries. However, the concept of X2, which was developed in the San Francisco estuary to describe how freshwater flow affected estuarine habitat (Jassby *et al.* 1995), played a role in the intellectual development of Peterson's model. The Peterson model also provides a useful framework to conceptualize delta smelt's LSZ habitat.

Currently available information indicates that delta smelt habitat is most suitable for the fish when low-salinity water is near 20°C, highly turbid, oxygen saturated, low in contaminants, supports high densities of calanoid copepods and mysid shrimp (Moyle *et al.* 1992; Lott 1998; Nobriga 2002), and occurs over comparatively static 'landscapes' that support sandy beaches and bathymetric variation that enables the fish and their prey to aggregate (Kimmerer *et al.* 2002a; Bennett *et al.* 2002; Hobbs *et al.* 2006). Almost every component listed above has been degraded over time (see below). The Service has determined that this accumulation of habitat change is the fundamental reason or mechanism that has caused delta smelt to decline.

Alterations to estuarine bathymetry and salinity distribution (~ 1850-present): The position of the LSZ, where delta smelt rear, has changed over the years. The first major change in the LSZ was the conversion of the landscape over which tides oscillate and river flows vary (Moyle *et al.* 2010). The ancestral Delta was a large tidal marsh-floodplain habitat totaling approximately 700,000 acres. Most of the historic wetlands within the system were diked and reclaimed for agriculture or other human uses by 1920 (Atwater *et al.* 1979). Channels were dredged deep (~12 meters[m]) to accommodate shipping traffic from the Pacific Ocean and San Francisco Bay to ports in Sacramento and Stockton. These changes left Suisun Bay and the confluence of the Sacramento-San Joaquin Rivers as the largest and most bathymetrically variable places in the LSZ. This region remained a highly productive nursery for many decades (Stevens and Miller 1983; Moyle *et al.* 1992; Jassby *et al.* 1995). However, the deepened channels created to support shipping and flood control, requires more freshwater outflow to maintain the LSZ in the large Suisun Bay and River confluence than was once required (Gartrell 2010). The construction of the CVP and SWP not only provided water supply for urban, agricultural and industrial users, but also provided water needed to combat salinity intrusion into the Delta, which was observed by the early 20th century. California's demand for freshwater (keeps) continues to increase, thus seasonal salinity intrusion perpetually reduces the temporal overlap of the LSZ (indexed by X2) within the Suisun Bay (region), especially in the fall (Feyrer *et al.* 2007; 2011). Consequently, the second major habitat change in the Delta has been in the frequency with which the LSZ is maintained in Suisun Bay for any given amount of precipitation. There was a step-decline in the LSZ in 1977 from which it has never recovered for more than a few years at a time. Based on model forecasts of climate change and water demand, this trend is expected to continue (Feyrer *et al.* 2011).

Summer and fall environmental quality has decreased overall in the Delta because outflows are lower and water transparency is higher. These changes may be due to increased upstream water diversions for flooding rice fields (Kawakami *et al.* 2008). The confluence of the Sacramento and San Joaquin Rivers has, as a result, become increasingly important as a rearing location for delta smelt, with physical environmental conditions constricting the species range to a relatively narrow area (Feyrer *et al.* 2007; Nobriga *et al.* 2008). This has increased the likelihood that most of the

juvenile population is exposed to chronic and cyclic environmental stressors, or catastrophic events. For instance, all seven delta smelt collected during the September 2007 FMWT survey were captured at statistically significantly higher salinities than what would be expected based upon historical distribution data generated by Feyrer *et al.* (2007). During the same year, the annual bloom of toxic cyanobacteria (Microcystis aeruginosa) spread far downstream to the west Delta and beyond during the summer (Peggy Lehman, pers comm). This has been suggested as an explanation for the anomaly in the distribution of delta smelt relative to water salinity levels (US Bureau of Reclamation 2008).

Bank Protection (Levees): The placement of riprap bank protection has led to the loss of riparian habitat, large woody debris, shallow water habitat, and natural channel migration. Bank stabilization and riprapping has been shown to change natural river processes such as erosion and accretion which reduces habitat complexity; creates a smooth, hydraulically enhanced surface that is not conducive to the habitat requirements of fish including delta smelt; stops woody vegetation from entering the river and reduces the long-term recruitment of large woody debris; inhibits plant growth through a change is substrate; lowers the amount of outside food sources because of the lack of riparian and wetland vegetation for aquatic invertebrates; and increases stream edge velocities which decreases available refuge areas for fish (Service 2000). More than half of the Sacramento River's lower 194 miles have been riprapped, mostly under the Corps Sacramento River bank Protection Project. Today most of the riparian forests and wetlands have been removed and the Sacramento River has been constrained to not allow natural erosion and accretion to occur.

Turbidity: From 1999 to present, the Delta experienced a change in estuarine turbidity that culminated in an estuary-wide step-decline in 1999 (Schoellhamer 2011). For decades, the turbidity of the modified estuary had been sustained by very large sediment deposits resulting mainly from gold mining in the latter 19th century. Sediments continued to accumulate into the mid-20th century, keeping the water relatively turbid even as sediment loads from the Sacramento River basin declined due to dam and levee construction (Wright and Schoellhamer 2005). The flushing of the sediment deposits may also have made the estuary deeper overall and thus a less suitable nursery from the 'static' bathymetric perspective (Schroeter 2008).

Delta smelt are associated with highly turbid waters; there is a negative correlation between the frequency of delta smelt occurrence in survey trawls during the summer, fall and early winter and water clarity. For example, the likelihood of delta smelt occurrence in trawls at a given sampling station decreases with increasing Secchi depth at the stations (Feyrer *et al.* 2007, Nobriga *et al.* 2008). This is very consistent with behavioral observations of captive delta smelt (Nobriga and Herbold 2008). Few daylight trawls catch delta smelt at Secchi depths over 0.5 m and capture probabilities for delta smelt are highest at 0.40 m depth or less. First-feeding delta smelt larvae require relatively turbid (muddy) waters to capture prey, but older fish do not require turbidity to capture prey and very high turbidity may even have some inhibitory effect on prey consumption (Hasenbein *et al.* 2013). Delta smelt may also use turbidity as cover from predators; this was hypothesized based on long-term monitoring of the distribution of fish in the wild (e.g., Feyrer *et al.* 2007) and recently supported by a laboratory experiment (Ferrari *et al.* 2014).

Temperature: Temperature also affects delta smelt distribution. Swanson and Cech (1995) and Swanson *et al.* (2000) indicate delta smelt tolerate temperatures (<8° C to >25° C), however warmer water temperatures >25° C restrict their distribution more than colder water temperatures (Nobriga and Herbold 2008). Delta smelt of all sizes are found in the main channels of the Delta and Suisun Marsh and the open waters of Suisun Bay where the water is well oxygenated and temperatures are usually less than 25° C in summer (Nobriga *et al.* 2008). Currently, delta smelt are subjected to thermally stressful temperatures every summer, and all available regional climate change projections

predict central California will be warmer still in the coming decades (Dettinger 2005). We expect warmer estuary temperatures to be yet another significant conservation challenge based on climate change models. Warmer water temperatures would increase delta smelt mortality and constrict suitable habitat throughout the Delta during the summer months. Higher temperatures would shrink delta smelt distribution into the fall, limiting their presence to Suisun Bay and in waters with less than optimal salinities (Brown *et al.* 2013). Water temperatures are presently above 20°C for most of the summer in core habitat areas, sometimes even exceeding the nominal lethal limit of 25°C for short periods. Coldwater fishes begin to have behavioral impairments (Marine and Cech 2004) and lose competitive abilities (Taniguchi *et al.* 1998) prior to reaching their thermal tolerance limits. Thus, the estuary can already be considered thermally stressful to delta smelt and can only become more so if temperatures warm in the coming decades.

Foraging Ecology: Delta smelt feed primarily on small planktonic crustaceans, and occasionally on insect larvae (Moyle 2002). Juvenile-stage delta smelt prey upon copepods, cladocerans, amphipods, and insect larvae (Moyle 2002). Historically, the main prey of delta smelt was the euryhaline copepod *Eurytemora affinis* and the euryhaline mysid *Neomysis mercedis*. The slightly larger *Pseudodiaptomus forbesi* has replaced *E. affinis* as a major prey source of delta smelt since its introduction into the Bay-Delta, especially in summer, when it replaces *E. affinis* in the plankton community (Baxter *et al.* 2008; Moyle 2002). The most common copepod in the estuary now is a small nonnative species, *Limnoithona tetraspina*. It has been suggested that *L. tetraspina* may be an inferior food for pelagic fishes including delta smelt because of its small size and generally sedentary behavior (Bouley and Kimmerer 2006). Experimental studies addressing this issue have suggested that smelt larvae will attack *L. tetraspina* until they grow large enough to successfully capture larger copepods; also, growth rate of delta smelt fed *L. tetraspina* was lower than that of smelt fed the larger copepods (Sullivan *et al.*, unpublished). *L. tetraspina* is sometimes consumed in large numbers by juvenile delta smelt during late summer when this copepod is abundant in the LSZ (Slater and Baxter 2014). *Acartiella sinensis*, a calanoid copepod species that invaded the Delta at the same time as *L. tetraspina*, also occurs at high densities in Suisun Bay and in the western Delta over the last decade. Delta smelt eat these newer copepods, but *Pseudodiaptomus* remains their dominant prey (Baxter *et al.* 2008).

River flows influence estuarine salinity gradients and water residence times and thereby affect both habitat suitability for benthos and the transport of pelagic plankton upon which delta smelt feed. High tributary flow leads to lower residence time of water in the Delta, which generally results in lower plankton biomass (Kimmerer 2004). In contrast, higher residence times, which result from low tributary flows, can result in higher plankton biomass but water diversions, overbite clam grazing (Jassby *et al.* 2002) and possibly contaminants (Baxter *et al.* 2008) remove a lot of plankton biomass when residence times are high. These factors all affect food availability for planktivorous fishes that utilize the zooplankton in Delta channels. Delta smelt cannot occupy much of the Delta anymore during the summer (Nobriga *et al.* 2008). Thus, there is the potential for mismatches between regions of high zooplankton abundance in the Delta and delta smelt distribution now that the overbite clam has decimated LSZ zooplankton densities.

The delta smelt compete with and are prey for several native and introduced fish species in the Delta. The introduced Mississippi silverside may prey on delta smelt eggs and/or larvae and compete for copepod prey (Bennett and Moyle 1996; Bennett 2005). Young striped bass also use the LSZ for rearing and may compete for copepod prey and eat delta smelt. Centrarchid fishes and coded wire tagged Chinook salmon smolts released in the Delta for survival experiments since the early 1980s may potentially also prey on larval delta smelt (Brandes and McLain 2001; Nobriga and Chotkowski 2000). Studies during the early 1960s found delta smelt were only an occasional prey fish for striped bass, black crappie and white catfish (Turner and Kelley 1966). However, delta smelt

were a comparatively rare fish even then, so it is not surprising they were a rare prey. Striped bass appear to have switched to piscivorous feeding habits at smaller sizes than they historically did, following severe declines in the abundance of mysid shrimp (Feyrer *et al.* 2003). Nobriga and Feyrer (2008) showed that Mississippi silverside, which is similar in size to delta smelt, was only eaten by subadult striped bass less than 400-mm fork length. While largemouth bass are not pelagic, they have been shown to consume some pelagic fishes (Nobriga and Feyrer 2007).

Other Stressors

Aquatic Macrophytes: For many decades, the Delta's waterways were turbid and growth of submerged plants was apparently unremarkable. That began to change in the mid-1980s, when the Delta was invaded by the non-native plant, *Egeria densa*, a fast-growing aquatic macrophyte that has now taken hold in many shallow habitats throughout the Delta (Brown and Michnuik 2007; Hestir 2010). *Egeria densa* and other non-native species of submerged aquatic vegetation (SAV) grow most rapidly in the summer and late fall when water temperatures are warm (> 20°C) and outflow is relatively low (Hestir 2010). The large canopies formed by these plants have physical and biological consequences for the ecosystem (Kimmerer *et al.* 2008). First, the dense nature of SAV promotes sedimentation of particulate matter from the water column, which increases water transparency that then limits the amount of habitat available for delta smelt (Feyrer *et al.* 2007; Nobriga *et al.* 2008). Second, dense SAV canopies provide habitat for a suite of non-native fishes that occupy the littoral and shallow habitats of the Delta, displacing native fishes (Nobriga *et al.* 2005; Brown and Michniuk 2007). Finally, the rise in SAV colonization over the last three decades has led to a shift in the dominant trophic pathways that fuel fish production in the Delta. Until the latter 1980s, the food web of most fishes was often dominated by mysid shrimp (Feyrer *et al.* 2003) that were subsidized by phytoplankton food sources (Rast and Sutton 1989). Now, most littoral and demeral fishes of the Delta have diets dominated by the epibenthic amphipods that eat SAV detritus or the epiphytic algae attached to SAV (Grimaldo *et al.* 2009).

E. densa and other non-native submerged aquatic vegetation (e.g., *Myriophyllum spicatum*) can affect delta smelt in direct and indirect ways. Directly, submerged aquatic vegetation can over whelm littoral habitats (inter-tidal shoals and beaches) where delta smelt may spawn making them unsuitable for spawning. Indirectly, submerged aquatic vegetation decreases turbidity (by trapping suspended sediment) which has contributed to a decrease in both juvenile and adult smelt habitat (Feyrer *et al.* 2007; Nobriga *et al.* 2008). Increased water transparency may delay feeding and may also make delta smelt more susceptible to predation pressure.

Predators: Delta smelt is a rare fish and has been a rare fish (compared to other species) for at least the past several decades (Nobriga and Herbold 2008). Therefore, it has also been rare in examinations of predator stomach contents. Delta smelt were occasional prey fish for striped bass, black crappie, and white catfish in the early 1960s (Turner and Kelly 1966) but went undetected in a recent study of predator stomach contents (Nobriga and Feyrer 2007). The predator with the highest historical documentation of predation on delta smelt is striped bass (*Morone saxatilis*; Stevens 1963; 1966; Thomas 1967). In these studies, striped bass were confirmed to prey on both juvenile and adult delta smelt. Striped bass are widely distributed in pelagic areas of the San Francisco Bay-Delta and parts of its watershed, and thus striped bass distribution fully encompasses the distribution of delta smelt juveniles and adults (Nobriga *et al.* 2013). Striped bass also tend to aggregate in the vicinity of water diversion structures, where delta smelt are frequently entrained (Nobriga and Feyrer 2007). No inverse correlations between the abundance of striped bass and the relative abundance of delta smelt have been found to date using a variety of statistical approaches (Mac Nally et al 2010; Thomson *et al.* 2010; Maunder and Deriso 2011; Miller *et al.* 2012; Nobriga et al 2013). Although the relative rarity of delta smelt in the estuary food web would presumably make

them a n incidental prey item for striped bass, it is possible that striped bass abundance and demand for prey are always high enough to limit delta smelt population growth rate (Nobriga *et al.* 2013).

Fish eggs and larvae can be opportunistically preyed upon by many invertebrate and vertebrate animals. There has always been a very long list of potential predators of delta smelt's eggs and larvae. One of these is the nonnative Mississippi silverside (*Menidia audens*), which like delta smelt is and annual fish with a maximum length near 100 mm (4 inches). Mississippi silversides may be both predators and competitors of delta smelt (Bennett 2005). Mississippi silversides were first introduced to the San Francisco Bay-Delta in the mid-1970s, and have increased dramatically in numbers since the mid-1980s. They forage in schools around the shoreline habitats and tidal marsh channels of the San Francisco Bay-Delta, where they are exceptionally common (Matern *et al.* 2002); Nobriga *et al.* 2005; Gewant and Bollens 2012). They readily consume delta smelt larvae in aquarium tests Bennett (20025_ concluded that "delta smelt are at high risk of eggs or larvae co-occur with schools of foraging silversides."

Another known predator is the largemouth bass are freshwater fish that prefer clear waters along shorelines (littoral habitat) with relatively dense water plants (Nobriga and Feyrer 2007; Brown and Michniuk 2007; Baxter *et al.* 2008). This is a suite of habitat characteristics that is distinctly different from those described above for delta smelt. Thus, unlike delta smelt and striped bass, delta smelt and largemouth bass have different habitat requirements (e.g., Nobriga *et al.* 2005) and their distributions do not strongly overlap. However, there has been a major increase in the Delta's largemouth bass population since the early 1990's that is believed to have been facilitated by the spread of the introduced plant *Egeria densa*, which provides rearing habitat for the bass (Baxter *et al.* 2008). Despite increases in largemouth bass populations and habitat, Nobriga and Feyrer (2007) did not find delta smelt as largemouth bass prey. Nor have more recent and extensive surveys of largemouth bass stomach contents. In captivity however, even young juvenile largemouth bass will attempt to consume delta smelt (Ferrari *et al.* 2014) so they presumably represent a predation threat when the species closely co-occur in the wild. In contrast to the situation for striped bass, several researchers have found inverse correlations between the relative abundance of largemouth bass or multi-species indices that included largemouth bass and the relative abundance of delta smelt (MacNally *et al.* 2010; Thomson *et al.* 2010; Maunder and Deriso 2011). At this time however, there is no way to determine whether these correlations are causative (predation by largemouth bass caused delta smelt to decline) or not (delta smelt simply use different habitats than largemouth bass and delta smelt habitat has decreased whil largemouth bass habitat has increased).

Other potential predators of eggs and larvae of smelt in littoral habitats are yelllowfin goby, entrarchids, and Chinook salmon. Potential native predators of juvenile and adult delta smelt would also have included numerous bird and fish species and this may be reflected in delta smelt's annual life-history. Annual fish species, also known as "opportunistic strategists", are adapted to high mortality rates in the adult stage (Winemiller and Rose 1992). This high mortality is usually due to predation or highly unpredictable environmental conditions, both of which could have characterized the ancestral niche of delta smelt.

Predation is a common source of density-dependent mortality in fish populations (Rose *et al.* 2001). Thus, it is possible that predation was a mechanism that historically generated the density-dependence observable in delta smelt population dynamics that has been noted by Bennett (2005) and Maunder and Deriso (2011). As is the case with other fishes, the vulnerability of delta smelt to predators may be influence primarily by habitat suitability. It is widely documented that pelagic fishes, including many smelt species, experience lower predation risks under turbid water conditions (Thetmeyer and Kils 1995; Utne-Palm 2002; Horpilla *et al.* 2004). Growth rates, a result of feeding

success plus water temperature, are also well known to affect fishes' cumulative vulnerability to predation (Sogard 1997).

Competition: It has been hypothesized that delta smelt are adversely affected by competition from other introduced fish species that use overlapping habitats, including Mississippi silversides, (Bennett and Moyle 1995) striped bass, and wakasagi (Sweetnam 1999). Laboratory studies show that delta smelt growth is inhibited when reared with Mississippi silversides (Bennett 2005) but there is no empirical evidence to support the conclusion that competition between these species is a factor that influences the abundance of delta smelt in the wild. There is some speculation that the overbite clam competes with delta smelt for copepod nauplii (Nobriga and Herbold 2008). It is unknown how intensively overbite clam grazing and delta smelt directly compete for food, but overbite clam consumption of shared prey resources does have other ecosystem consequences that appear to have affected delta smelt indirectly.

Microcystis. Large blooms of toxic blue-green algae, *Microcystis aeruginosa*, were first detected in the Delta during the summer of 1999 (Lehman *et al.* 2005). Since then *M. aeruginosa* has bloomed each year, forming large colonies throughout most of the Delta and increasingly down into eastern Suisun Bay. Blooms typically occur between late spring and early fall (peak in the summer) when temperatures are above 20°C. *M. aeruginosa* can produce natural toxins that pose animal and human health risks if contacted or ingested directly. It is unclear whether microcystins and other toxins produced by local blooms are acutely toxic to fishes at current concentrations; however, the toxins accumulate in fish and their prey. During the summer of 2005, Age-0 striped bass and Mississippi silversides that were co-occurring with the *Microcystis* bloom showed various forms of liver damage (Lehman *et al.* 2010). When ingested with food, microcystins have been experimentally shown to cause substantial impairment of health in threadfin shad (Acuna *et al.* 2012). In addition, the copepods that delta smelt eat are particularly susceptible to these toxins (Ger 2008; Ger *et al.* 2010). An investigation of food web effects and fish toxicity concluded that even at low abundances, *M. aeruginosa* may impact estuarine fish productivity through both toxicity and food web impacts (Lehman *et al.* 2010). *M. aeruginosa* is most likely to affect juvenile delta smelt during summer blooms. Microcystis blooms may also decrease dissolved oxygen to lethal levels for fish (Saiki *et al.* 1998), although delta smelt do not strongly overlap the densest *Microcystis* concentrations, so dissolved oxygen is not likely a problem. *Microcystis* blooms are a symptom of eutrophication and high ammonia to nitrate ratios in the water.

Contaminants: Contaminants can change ecosystem functions and productivity through numerous pathways. However, contaminant loading and its ecosystem effects within the Delta are not well understood. Although a number of contaminant issues were first investigated during the Pelagic Organism Decline (POD) years, concern over contaminants in the Delta is not new. There are long-standing concerns related to mercury and selenium levels in the watershed, Delta, and San Francisco Bay (Linville *et al.* 2002; Davis *et al.* 2003). Phytoplankton growth rate may, at times, be inhibited by high concentrations of herbicides (Edmunds *et al.* 1999). New evidence indicates that phytoplankton growth rate is chronically inhibited by ammonium concentrations in and upstream of Suisun Bay (Wilkerson *et al.* 2006, Dugdale *et al.* 2007). Contaminant-related toxicity to invertebrates has been noted in water and sediments from the Delta and associated watersheds (e.g., Kuivila and Foe 1995, Giddings 2000, Werner *et al.* 2000, Weston *et al.* 2004). Undiluted drain water from agricultural drains in the San Joaquin River watershed can be acutely toxic (quickly lethal) to fish and have chronic effects on growth (Saiki *et al.* 1992).

Evidence for mortality of young striped bass due to discharge of agricultural drainage water containing rice herbicides into the Sacramento River (Bailey *et al.* 1994) led to new regulations for

water discharges. Bio assays using caged Sacramento sucker (Catostomus occidentalis) have revealed deoxyribonucleic acid strand breakage associated with runoff events in the watershed and Delta (Whitehead *et al.* 2004). Kuivila and Moon (2004) found that peak desities of larval and juvenile delta smelt sometimes coincided in time and space with elevated concentrations of dissolved pesticides in the spring. These periods of co-occurrence lasted for up to 2-3 weeks, but concentrations of individual pesticides were low and much less than would be expected to cause acute mortality. However, the effects of exposure to the complex mixtures of pesticides actually present are unknown.

Current science suggests the possible link between contaminants and the POD may be the effects of contaminant exposure on prey items, resulting in an indirect effect on the survival of POD species (Johnson *et al.* 2010). The POD investigators initiated several studies beginning in 2005 to address the possible role of contaminants and disease in the declines of Delta fish and other aquatic species. Their primary study consists of twice-monthly monitoring of ambient water toxicity at fifteen sites in the Delta and Suisun Bay. In 2005 and 2006, standard bioassays using the amphipod *Hyalella azteca* had low (<5 percent) frequency of occurrence of toxicity (Werner *et al.* 2008). The results indicated that 2007, a dry year, showed a higher incidence of toxic events than in the previous (wetter) year, 2006 (Werner *et al.* 2010). Parallel testing with the addition of piperonyl butoxide, an enzyme inhibitor, indicated that both organophosphate and pyrethroid pesticides may have contributed to the pulses of toxicity. Most of the tests that were positive for *H. azteca* toxicity have come from water samples from the lower Sacramento River.

Pyrethroids are of particular concern because of their widespread use, and their tendency to be genotoxic (DNA damaging) to fishes at low doses (in the range of micrograms per liter) (Campana *et al.* 1999). The pyrethroid esfenvalerate is associated with delayed spawning and reduced larval survival of bluegill sunfish (*Lepomis macrochirus*) (Tanner and Knuth 1996) and increased susceptibility of juvenile Chinook salmon (*Oncorhynchus tshawytscha*) to disease (Clifford *et al.* 2005). In addition, synthetic pyrethroids may interfere with nerve cell function, which could eventually result in paralysis (Bradbury and Coats 1989; Shafer and Meyer 2004). Weston and Lydy (2010) found the largest source of pyrethroids flowing into the Delta to be coming from the Sacramento Regional Waste water Treatment Plant, where only secondary treatment occurs. Their data not only indicate the presence of these contaminants, but the concentrations found exceeded acute toxicity thresholds for the amphipod *Hyalella azteca*. This is of substantial concern because the use of insecticides flowing into the Delta. Furthermore, this was not the case for the Stockton Wastewater Treatment facility, where tertiary treatment occurs, suggesting that different treatment methods may remove or retain pyretroids differently (Baxter *et al.* 2010).

In conjunction with the POD investigation, larval delta smelt bioassays were conducted simultaneously with a subset of the invertebrate bioassays. The water samples for these tests were collected from six sites within the Delta during May-August of 2006 and 2007. Results from 2006 indicated that delta smelt are highly sensitive to high levels of ammonia, low turbidity, and low salinity. There is some preliminary indication that reduced survival may be due to disease organisms (Werner *et al.* 2008). No significant mortality of larval delta smelt was found in the 2006 bioassays, but there were two instances of significant mortality in June and July of 2007. In both cases, the water samples were collected from sites along the Sacramento River and had relatively low turbidity and salinity levels and moderate levels of ammonia. It is also important to note that no significant *H. azteca* mortality was detected in these water samples. While H. Azteca tests are very useful for detecting biologically relevant levels of water column toxicity for zooplankton, interpretation of the *H. azteca* test results with respect to fish should proceed with great caution. The relevance of the bioassay results to field conditions remains to be determined. Werner *et al.* (2010b) conducted *in situ* testing in the laboratory and compared contaminant sensitivity of delta smelt to common bioassay organisms, including *H. azteca*. The investigations included contaminants commonly observed in the

Delta, such as organophosphate and pyrethroid insecticides, copper, and total ammonia. In the laboratory, delta smelt were 1.8 to >11 times more sensitive than fathead minnow to ammonia, copper and all insecticides tested (except permethrin). The invertebrates tested were more sensitive to contaminants than delta smelt or fathead minnows. *Eurytemora affinis* and *Ceriodaphnia dubia* were the most sensitive to total ammonia. *C. dubia* was the most sensitive to copper and organophosphates pesticides. *H. azteca* was the most sensitive test organism to pyrethroids. Toxicity was not detected for the Sacramento River at Hood or the San Joaquin River at Rough and Ready Island during the 2009 in situ testing period. Delta smelt survival was low in treatment and control waters. Werner *et al.* (2010b) concluded that larval smelt may be too sensitive to salinity, temperature and transport stress for *in situ* exposures and recommended using surrogate species in future tests.

Persistent confinement of the spawning population of delta smelt to the Sacramento River increases the likelihood that a substantial portion of the spawners will be affected by a catastrophic event or localized chronic threat. For instance, large volumes of highly concentrated ammonia released into the Sacramento River from the Sacramento Regional County Sanitation District may affect embryo survival or inhibit prey production. Further, agricultural field in the Yolo Bypass and surrounding areas are regularly sprayed by pesticides, and water samples taken from Cache Slough sometimes exhibited toxicity to *H. azteca* (Werner *et al.* 2008; 2010). The thresholds of toxicity for delta smelt for most of the known contaminants have not been determined, but the exposure to a combination of different compounds increases the likelihood of adverse effects. The extent to which delta smelt larvae are exposed to contaminants varies with flow entering the Delta. Flow pulses during spawning increase exposure to many pesticides (Kuivila and Moon 2004) but decrease ammonia concentrations from wastewater treatment plants.

The POD investigations into potential contaminant effects also include the use of biomarkers that have been used previously to evaluate toxic effects on POD fishes (Bennett and Moyle 1996, Bennett 2005). The results to date have been mixed. A pathogen survey of 105 adult delta smelt, sampled from January through May, at several sites in the Delta, found that disease did not appear to overtly influence the health of the surveyed population for that year (Foott and Bigelow 2010). Histopathological and viral evaluation of young longfin smelt collected in 2006 indicated no histological abnormalities associated with exposure to toxics or disease (Foott *et al.* 2006). There was also no evidence of viral infection or high parasite loads. Similarly, young threadfin shad showed no histological evidence of contaminant effects or of viral infections (Foott *et al.* 2006). Parasites were noted in threadfin shad gills at a high frequency but the infections were not considered severe. Both longfin smelt and threadfin shad were considered healthy in 2006. Adult delta smelt collected from the Delta during the winter of 2005 also were considered healthy, showing little histopathological evidence for starvation or disease (Teh 2007). However, there was some evidence of low frequency endocrine disruption. In 2005, nine of 144 (six percent) of adult delta smelt males sampled were intersex, having immature oocytes in their testes (Teh 2007). Bennett (2005) reported that about 10 percent of the delta smelt analyzed for histopathological anomalies in 1999-2000 showed evidence of deleterious contaminant exposure. In contrast, 30-60 percent of these fish had liver glycogen depletion consistent with food limitation.

In contrast, preliminary histopathological analyses have found evidence of significant disease in other species and for POD species collected from other areas of the estuary. Massive intestinal infections with an unidentified myxosporean were found in yellowfin goby (*Acanthogobius flavimanus*) collected from Suisun Marsh. Severe viral infection was also found in Mississippi silverside and juvenile delta smelt collected from Suisun Bay during summer 2005. Lastly, preliminary evidence suggests that contaminants and disease may impair survival of age-0 striped bass. Baxter *et al.* 2008 found high occurrence and severity of parasitic infections, inflammatory conditions, and muscle

degeneration in young striped bass collected in 2005; levels were lower in 2006. Several biomarkers of contaminant exposure including P450 activity (i.e., detoxification enzymes in liver), acetylcholinesterase activity (i.e., enzyme activity in brain), and vitellogenin induction (i.e., presence of egg yolk protein in blood of males) were also reported from striped bass collected in 2006 (Ostrach 2008).

Delta smelt can also be exposed to other toxic substances. Recent toxicological research has provided dose-response curves for several contaminants (Connon *et al.* 2009; 2011). This research has also shown that gene expression changes and impairment of delta smelt swimming performance occur at contaminant concentrations lower than levels that cause mortality.

Climate Change: Climate change is likely already impacting the delta smelt. Climate change may affect the delta smelt directly by creating physiological stress, the primary impacts of climate change on the species are expected to be through changes in the availability and distribution of delta smelt habitat.

The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). The term "climate" refers to the mean and variability of different types of weather conditions over time, with 30 years of being a typical period for such measurements (IPCC 2013a). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (for example, temperature or precipitation) that persists for an extended period, whether the change is due to natural variability or human activity (IPCC 2013a). Scientific measurements spanning several decades demonstrate that changes in climate are occurring, and that the rate of change has increased since the 1950s. Examples include warming of the global climate system, and substantial increases in precipitation in some regions of the world and decreases in other regions.

Scientific measurements spanning several decades demonstrate that changes in climate are occurring, and that the rate of change has increased since the 1950s. Examples include warming of the global climate system, and substantial increases in precipitation in some regions of the world and decreases in other regions (for these and other examples, see Solomon *et al.* 2007;; IPCC 2013b;; IPCC 2014). Results of scientific analyses presented by the IPCC show that most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate and is "very likely" (defined by the IPCC as 90 percent or higher probability) due to the observed increase in greenhouse gas (GHG) concentrations in the atmosphere as a result of human activities, particularly carbon dioxide emissions from use of fossil fuels (Solomon *et al.* 2007; IPCC 2013b). Further confirmation of the role of GHGs comes from analyses by Huber and Knutti (2011), whom concluded it is extremely likely that approximately 75 percent of global warming since 1950 has been caused by human activities.

Scientists use a variety of climate models, which include consideration of natural processes and variability, as well as various scenarios of potential levels and timing of GHG emissions, to evaluate the causes of changes already observed and to project future changes in temperature and other climate conditions (Meehl *et al.* 2007, entire; Ganguly *et al.* 2009; Prinn *et al.* 2011). All combinations of models and emissions scenarios yield very similar projections of increases in the most common measure of climate change, average global surface temperature (commonly known as global warming), until about 2030. Although projections of the magnitude and rate of warming differ after about 2030, the overall trajectory of all the projections is one of increasing global warming through the end of this century, even for the projections based on scenarios that assume that GHG emissions will stabilize or decline. Thus, there is strong scientific support for projections that warming will continue through the 21st century, and that the magnitude and rate of change will be

influenced substantially by the extent of GHG emissions (Meehl *et al.* 2007; Ganguly *et al.* 2009; Prinn *et al.* 2011; IPCC 2013b). See IPCC 2013b (entire), for a summary of other global projections of climate-related changes, such as frequency of heat waves and changes in precipitation.

Current Drought Conditions and Relative Abundance. California is experiencing its fourth consecutive dry water-year due to low rainfall and low snowpack. On January 17, 2014, the Governor of California declared a State of Emergency due to the drought and directed state officials to take all necessary actions to make water immediately available (Office of the Governor 2014). As of June 2015, the Governor's drought declaration remains in place and the current drought conditions are comparable to the driest years on record in California. The severity of California's drought has been exacerbated by record warm temperatures and below-normal precipitation in 2015, resulting in a severely reduced snowpack. During the last two years, Federal and state governments (Bureau of Reclamation and California Department of Water Resources) have taken actions to ensure the reduced water quality and supply does not reach a level of concern for human health and safety, while complying with biological opinions. The actions taken include the 2015 placement of a salinity rock barrier on West False River and numerous Temporary Urgency Change Orders to modify requirements under Decision 1641 to meet certain water quality objectives, reduction of river flows caused by low reservoir storage, and river temperature requirements.

Drought conditions and some drought management actions have decreased suitable and available aquatic habitat in the Delta for delta smelt breeding and survival, thereby reducing the overall population in the Delta. Fish surveys indicate that the relative abundance of delta smelt is very low. In the last five years, the FMWT, TNS, and 20mm survey results have produced some of the lowest adult and larval delta smelt abundance indexes on record (CDFW 2013, 2014, 2015). The 2014 FMWT abundance index which determines the relative population status for the delta smelt was set at 9, which is the lowest index on record. The low index numbers and relatively few occurrences represent the additive impact of drought to the delta smelt and its habitat.

Status of the Delta Smelt Critical Habitat

The Service designated critical habitat for the delta smelt on December 19, 1994 (Service 1994). The geographic area encompassed by the designation includes 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 existing contiguous waters contained within the legal Delta (as defined in section 12220 of the California Water Code) (Service 1994).

Conservation Role of Delta Smelt Critical Habitat

The Service's primary objective in designating critical habitat was to identify the key components of delta smelt habitat that support successful spawning, larval and juvenile transport, rearing, and adult migration. Delta smelt are endemic to the Bay-Delta and the vast majority only live one year. Thus, regardless of annual hydrology, the Delta must provide suitable habitat all year, every year. Different regions of the Delta provide different habitat conditions for different life stages, but those habitat conditions must be present when needed, and have sufficient connectivity to provide migratory pathways and the flow of energy, materials and organisms among the habitat components. The entire Delta and Suisun Bay are designated as critical habitat; over the course of a year, the entire habitat is occupied.

Description of the Primary Constituent Elements

In designating critical habitat for the delta smelt, the Service identified the following primary constituent elements (PCEs) essential to the conservation of the species:

Primary Constituent Element 1: "Physical habitat" is defined as the structural components of habitat. Because delta smelt is a pelagic fish, spawning substrate is the only known important structural component of habitat. It is possible that depth variation is an important structural characteristic of pelagic habitat that helps fish maintain position within the estuary's low-salinity zone (LSZ) (Bennett *et al.* 2002, Hobbs *et al.* 2006).

Primary Constituent Element 2: "Water" is defined as water of suitable quality to support various delta smelt life stages with the abiotic elements that allow for survival and reproduction. Delta smelt inhabit open waters of the Delta and Suisun Bay. Certain conditions of temperature, turbidity, and food availability characterize suitable pelagic habitat for delta smelt. Factors such as high entrainment risk and contaminant exposure can degrade this PCE even when the basic water quality is consistent with suitable habitat.

Primary Constituent Element 3: "River flow" is defined as transport flow to facilitate spawning migrations and transport of offspring to LSZ rearing habitats. River flow includes both inflow to and outflow from the Delta, both of which influence the movement of migrating adult, larval, and juvenile delta smelt. Inflow, outflow, and Old and Middle Rivers flow influence the vulnerability of delta smelt larvae, juveniles, and adults to entrainment at Banks and Jones. River flow interacts with the fourth primary constituent element, salinity, by influencing the extent and location of the highly productive LSZ where delta smelt rear.

Primary Constituent Element 4: "Salinity" is defined as the LSZ nursery habitat. The LSZ is where freshwater transitions into brackish water; the LSZ is defined as 0.5-6.0 psu (parts per thousand salinity) (Kimmerer 2004). The 2 psu isohaline is a specific point within the LSZ where the average daily salinity at the bottom of the water is 2 psu (Jassby *et al.* 1995). By local convention the location of the LSZ is described in terms of the distance from the 2 psu isohaline to the Golden Gate Bridge (X2); X2 is an indicator of habitat suitability for many San Francisco Estuary organisms and is associated with variance in abundance of diverse components of the ecosystem (Jassby *et al.* 1995, Kimmerer 2002a). The LSZ expands and moves downstream when river flows into the estuary are high. Similarly, it contracts and moves upstream when river flows are low. During the past 40 years, monthly average X2 has varied from San Pablo Bay (45 kilometers) to as far upstream as Rio Vista on the Sacramento River (95 kilometers). At all times of year, the location of X2 influences both the area and quality of habitat available for delta smelt to successfully complete their life cycle. In general, delta smelt habitat quality and surface area are greater when X2 is located in Suisun Bay. Both habitat quality and quantity diminish the more frequently and further the LSZ moves upstream, toward the confluence.

Overview of Delta Smelt Habitat Requirements and the Primary Constituent Elements

Delta smelt live their entire lives in the tidally-influenced fresh- and brackish waters of the San Francisco Estuary (Moyle 2002). Delta smelt are an open-water, or pelagic, species. They do not associate strongly with structure. They may use nearshore habitats for spawning (PCE #1), but free-swimming life stages mainly occupy offshore waters (PCE #2). Thus, the distribution of the population is strongly influenced by river flows through the estuary (PCE #3) because the quantity of fresh water flowing through the estuary changes the amount and location of suitable low-salinity,

open-water habitat (PCE #4). This is true for all life stages. During periods of high river flow into the estuary, delta smelt distribution can transiently extend as far west as the Napa River and San Pablo Bay. Delta smelt distribution is highly constricted near the Sacramento-San Joaquin river confluence during periods of low river flow into the estuary (Feyrer *et al.* 2007). In the 1994 designation of critical habitat, the best available science held that the delta smelt population was responding to variation in spring X2.

Alterations to Estuarine Bathymetry (PCE # 1) (~ 1850-present)

The first major change in the LSZ was the conversion of the landscape over which tides oscillate and river flows vary (Nichols *et al.* 1986). The ancestral Delta was a large tidal marsh-floodplain habitat totaling approximately 300,000 acres. Most of the wetlands were diked and reclaimed for agriculture or other human use by the 1920s. The physical habitat modifications of the Delta and Suisun Bay were mostly due to land reclamation and urbanization. Water conveyance projects and river channelization have had some influence on the regional physical habitat by armoring levees with riprap, building conveyance channels like the Delta Cross Channel, storage reservoirs like Clifton Court Forebay, and by building and operating temporary barriers in the south Delta and permanent gates and water distribution systems in Suisun Marsh.

In the 1930s to 1960s, the shipping channels were dredged deeper (~12 m) to accommodate shipping traffic from the Pacific Ocean and San Francisco Bay to ports in Sacramento and Stockton. These changes left Suisun Bay and the Sacramento-San Joaquin river confluence region as the largest and most bathymetrically variable places in the LSZ. This region remained a highly productive nursery for many decades (Stevens and Miller 1983; Moyle *et al.* 1992; Jassby *et al.* 1995). However, the deeper landscape created to support shipping and flood control requires more freshwater outflow to maintain the LSZ in the large Suisun Bay/river confluence region than was once required (Gartrell 2010).

Seasonal salinity intrusion reduces the temporal overlap of the LSZ (indexed by X2) with the Suisun Bay region, especially in the fall (Feyrer *et al.* 2007, 2010). Thus, the second major change has been in the frequency with which the LSZ is maintained in Suisun Bay for any given amount of precipitation. This metric showed a step-decline in 1977 from which it has never recovered for more than a few years at a time. Based on model forecasts of climate change and water demand, this trend is expected to continue (Feyrer *et al.* 2011). As such this alteration of PCE # 1 also affects the other PCEs, particularly PCE # 4. The major landscape factor affecting this interaction was the dredging of shipping channels.

Spawning delta smelt require all four PCEs, but spawners and embryos are the life stage that is believed to most require a specific structural component of habitat. Spawning delta smelt require sandy or small gravel substrates for egg deposition (Bennett 2005). The major invasive species effect on physical habitat is the dense growth of submerged aquatic vegetation in the Delta. These plants carpet large areas in parts of the Delta such as Frank's Tract. The vegetation beds act as mechanical filters removing turbidity and possibly other water quality components as the tides and river flows move water over them (Hestir 2010). Thus, the proliferation of submerged aquatic plants has likely also reduced the area of nearshore habitat suitable for delta smelt spawning.

Alterations to Water (PCE # 2)

PCE # 2 is primarily referring to a few key water quality components (other than salinity) that influence spawning and rearing habitat suitability for delta smelt. Research to date indicates that water quality conditions are more important than physical habitat conditions for predicting where

delta smelt occur (Feyrer *et al.* 2007; Nobriga *et al.* 2008) probably because delta smelt is a pelagic fish except during its egg/embryo stage. However, the interaction of water quality and bathymetry is thought to generally affect estuarine habitat suitability (Peterson 2003) and there is evidence that delta smelt habitat is optimized when appropriate water quality conditions overlap the Suisun Bay region (Moyle *et al.* 1992; Hobbs *et al.* 2006; Feyrer *et al.* 2011). This is discussed further in the section about PCE # 4 (salinity).

Changing predation pressure (1879 to present): Noting is known about the historical predators of delta smelt or their possible influence on delta smelt. Fish eggs and larvae can be opportunistically preyed upon by many invertebrate and vertebrate animals so there has always been a very long list of potential predators of delta smelt's eggs and larvae. Potential native predators of juvenile and adult delta smelt would also have included numerous bird and fish species and this may be reflected in delta smelt's annual life-history. Annual fish species, also known as "opportunistic strategists", are adapted to high mortality rates in the adult stage (Winemiller and Rose 1992). This high mortality is usually due to predation or highly unpredictable environmental conditions, both of which could have characterized the ancestral niche of delta smelt.

The introduction of striped bass into the San Francisco Estuary in 1879 added a permanently resident, large piscivorous fish to the low-salinity zone: a habitat that is not known to have had an equivalent predator prior to the establishment of striped bass (Moyle 2002). This likely changed predation rates on delta smelt, but there are no data available to confirm this hypothesis. For many decades the estuary supported higher striped bass and delta smelt numbers than it does currently. This is evidence that delta smelt is able to successfully coexist with striped bass.

The current influence of striped bass and other predators on delta smelt population dynamics is also not known mainly because quantitative descriptions of predator impacts on rare prey are extremely difficult to generate. Delta smelt were observed in the stomach contents of striped bass and other fishes in the 1960s (Stevens 1963; Turner and Kelley 1966), but have not been observed in more recent studies (Feyrer *et al.* 2003; Nobriga and Feyrer 2007). Predation is a common source of density-dependent mortality in fish populations (Rose *et al.* 2001). Thus, it is possible that predation was a mechanism that historically generated the density-dependence observed in delta smelt population dynamics (Bennett 2005; Maunder and Deriso 2011). Because it is generally true for fishes, the vulnerability of delta smelt to predators is influenced primarily by habitat conditions. Turbidity may be a key mediatory of delta smelt's vulnerability to predators (Nobriga *et al.* 2005; 2008). Growth rates, an interactive outcome of feeding success and water temperature, are also well known to affect fishes' cumulative vulnerability to predation (Sogard 1997). Thus, predation rate is best characterized as an aspect food web function linked to PCE # 2.

Food web alterations attributable to the overbite clam (1987-present): The next major change to PCE #2 occurred following the invasion of the estuary by overbite clam (*Corbula amurensis*). The overbite clam was first detected in 1986 and from 1987-1990 its influence on the ecosystem became evident. Since 1987, there has been a step-decline in phytoplankton biomass (Alpine and Cloern 1992; Jassby *et al.* 2002). Phytoplankton in the LSZ is an important component of the pelagic food web that delta smelt are a part of because a key part of the diet of delta smelt's prey is phytoplankton. Not only does the overbite clam reduce food for delta smelt's prey, it can also graze directly on the larval stages of the copepods eaten by delta smelt (e.g., Kimmerer *et al.* 1994). The grazing pressure applied by the overbite clam rippled through the historical zooplankton community that fueled fishery production in the LSZ (Kimmerer and Orsi 1996; Orsi and Mecum 1996; Kimmerer 2002b; Feyrer *et al.* 2003). This major change in the way energy moved through the ecosystem has likely facilitated the numerous invasions of the estuary by suppressing the production of historically

dominant zooplankton, which increases the opportunity for invasion by other species that are less dependent on high densities of LSZ phytoplankton.

The distribution and abundance of several LSZ fishes have changed since 1987 (Kimmerer 2002b; Kimmereer 2006; Rosenfield and Baxter 2007; Mac Nally *et al.* 2010). Surprisingly, the changes in phytoplankton and zooplankton production have not been as evident for delta smelt as for other organisms (Kimmer 2002b; Kimmerer 2006; Sommer *et al.* 2007; Mac Nally *et al.* 2010). Nonetheless, delta smelt collected in the FMWT have been persistently smaller since the overbite clam invasion (Sweetnam 1999; Bennett 2005). This is evidence for reduced growth rates that could have been caused by food web changes stemming from overbite clam grazing. The Service considers the prey density aspect of the estuarine food web to be a component of PCE #3 ("Water"). The Central Valley Project and State Water Project entrain some food web production (about 4.5 percent on a daily average basis was attributed to all water diversions in the Delta; Jassby *et al.* 2002). However, prey densities have been most strongly affected by clam grazing (Kimmerer *et al.* 1994; Jassby *et al.* 2002). Urban wastewater input, *Microcystis* blooms, and pesticide loads may also impair the production of zooplankton eaten by delta smelt or eaten by delta smelt's prey (Wilkerson *et al.* 2006; Dugdale *et al.* 2007; Jassby 2008; Ger *et al.* 2009; Werner *et al.* 2010).

Proliferation of submerged aquatic vegetation (1980s to present): For many decades, the Delta's waterways were turbid and the growth of submerged plants was apparently unremarkable. That began to change in the mid-1980s, when the Delta was invaded by non-native plant *Egeria densa*, a fast-growing aquarium plant that has taken hold in many shallow habitats (Brown and Michnuik 2007; Hestir 2010). *Egeria densa* and other non-native species of submerged aquatic vegetation (SAV) grow most rapidly in the summer and late fall when water temperatures are warm (>20°C) and outflow is relatively low (Hestir 2010). The large canopies formed by these plants have physical and biological consequences for the ecosystem (Kimmerer *et al.* 2008). First, dense SAV promotes water transparency. Increased water transparency leads to a loss of habitat for delta smelt (Feyrer *et al.* 2007; Nobriga *et al.* 2008). Second, dense SAV canopies provide habitat for a suite of non-native fishes, including largemouth bass, which now dominate many shallow habitats of the Delta and displace native fishes (Nobriga *et al.* 2005; Brown and Michniuk 2007). Finally, SAV colonization over the last three decades has led to a shift in the dominant freshwater food web pathways and that fuel fish production (Grimaldo *et al.* 2009b). It is noteworthy that SAV-dominated habitats are comparatively productive (Nobriga *et al.* 2005; Grimaldo *et al.* 2009b), but most of the productivity they generate remains in the nearshore environment and therefore does not contribute much to pelagic fish production (Grimaldo *et al.* 2009b).

Reduced turbidity (1999-present): The next major change was a change in estuarine turbidity that culminated in an estuary-wide step-decline in 1999 (Schoellhamer 2011). For decades, the turbidity of the modified estuary had been sustained by very large sediment deposits resulting mainly from gold mining in the latter 19th century. The sediments continued to accumulate into the mid-20th century, keeping the water relatively turbid even as sediment loads from the Sacramento River basin declined due to dam and levee construction (Wright and Schoellhamer 2004). The flushing of the sediment deposits may also have made the estuary deeper overall and thus a less suitable nursery from the 'static' bathymetric perspective (Schroeter 2008). Delta smelt larvae require turbidity to initiate feeding (Baskerville-Bridges *et al.* 2004), and as explained above, older fish are thought to use turbidity as cover from predators. Thus, turbidity is an aspect of PCE # 2 which is a necessary water quality aspect of delta smelt's critical habitat.

Dams and armored levees have contributed to the long-term decline in sediment load to the estuary (Wright and Schoellhamer 2004) and to the clearing of estuary water. This is a long-term effect that stemmed from building and maintaining infrastructure. Opportunities to substantively address this

change are limited due to the extreme Central Valley flood and water supply risks that will result from decommissioning dams or removing levees.

Changing water temperature (present through long-term climate forecasts): Delta smelt is already subjected to thermally stressful temperatures every summer in the Delta. Water temperatures are presently above 20°C for most of the summer in core habitat areas, sometimes even exceeding the nominal lethal limit of 25°C for short periods. Coldwater fishes begin to have behavioral impairments (Marine and Cech 2004) and lose competitive abilities (Taniguchi *et al.* 1998) prior to reaching their thermal tolerance limits. Thus, the estuary can already be considered thermally stressful to delta smelt and can only become more so if temperatures warm in the coming decades.

All available regional climate change projections predict central California will be warmer still in the coming decades (Dettinger 2005). It is expected that warmer estuary temperatures will be yet another significant conservation challenge (Brown *et al.* 2013; Cloern *et al.* 2011). This is true because they will limit abiotic habitat suitability further than indicated by flow-based projection (e.g., Feyrer *et al.* 2011). In addition, warmer water temperatures mean that higher prey densities will be required just to maintain present-day growth rates, which are already lower than they once were (Sweetnam 1999; Bennett 2005). Water temperature is mainly affected by climate variation, both as air temperature and as flood and drought scale flow variation (Kimmer 2004; Wagner *et al.* 2011).

Sensitivities to contaminants (ongoing): Delta smelt's spawning migration coincides with early winter rains (Sommer *et al.* 2011). This 'first-flush' of inflow to the Delta brings sediment-bound pesticides with it (Bergamaschi *et al.* 2001), and peak densities of larvae and juveniles can co-occur with numerous pesticides (Kuivila and Moon 2004). Bennett (2005) reported that about 10 percent of the delta smelt analyzed for histopathological anomalies in 1999-2000 showed evidence of deleterious contaminant exposure, but this was low compared to the 30-60 percent of these fish that appeared to be food-limited.

Delta smelt can also be exposed to other toxic substances. Recent toxicological research has provided dose-response curves for several contaminants (Connon *et al.* 2009; 2011). This research has also shown the gene expression changes and impairment of delta smelt swimming performance occur at contaminant concentrations lower than levels that cause mortality. Climate scale flow variation (e.g., flood versus drought scale variation) affects the amount of methyl mercury (Darryl Slotton presentation) entering the ecosystem and may have some influence on the meaningful dilution of ammonium from urban wastewater inputs (Dick Dugdale presentation).

Invasive species may also affect PCE #2 by changing contaminant dynamics. For instance, *Microcystis* blooms generate toxic compounds that can kill delta smelt prey (Ger *et al.* 2009) and accumulate in the estuarine food web (Lehman *et al.* 2010). A second example is the biomagnification of selenium in the food web by *Corbula* (Stewart *et al.* 2004). This has been considered a potential issue for the clam's predators – namely sturgeon, splittail, and diving ducks (Richman and Lovvorn 2004; Stewart *et al.* 2004). However, it is not known whether this change in selenium dynamics negatively affects delta smelt and other fishes that do not directly prey on the clams.

Alterations of River Flows (PCE # 3)

This PCE refers to the transport flows that help guide young delta smelt from spawning habitats to rearing habitats, and to flows that guide adult delta smelt from rearing habitats to spawning habitats. Delta outflow also has some influence on delta smelt's supporting food web (Jassby *et al.* 2002; Kimmerer 2002a) and it affects abiotic habitat suitability as well (Feyrer *et al.* 2007; 2011). The latter

is expanded upon in the discussion of PCE # 4. The environmental driver with the strongest influence on PCE # 3 is highly dependent on the time-scale being considered. The tide has the largest influence on flow velocities and directions in delta smelt's critical habitat at very short timescales (minutes to days), whereas interannual variation in precipitation and runoff has the largest influence on flows into and through the Delta at very long timescales (years to decades), and sometimes at shorter time scales (days to weeks) during major storm events. Changes to flow regimes can have the largest influence on PCE #3 at timescales of weeks to seasons. This is particularly true during periods of low natural inflow, for instance during the fall and during droughts, and in the south Delta where Old and Middle River flows are often managed using changes in export flow rates.

Entrainment into water export diversions (1951 to present). The amount of water diverted from the estuary has generally increased over time, and most of the increase during the 1950s and 1960s was due to CVP exports and since the latter 1960s, SWP exports. There are two basic potential fishery impacts that result from water diversion from the Delta: ecosystemic impacts and direct entrainment. From the ecosystemic perspective, water diversions are unnatural 'predators' because they 'consume' organisms at every trophic level in the ecosystem from phytoplankton (Jassby *et al.* 2002) to fish (Kimmerer 2008). Unlike natural predators which typically shift their prey use over time in association with changes in prey fish density (Nobriga and Feyrer 2008), fractional entrainment losses of fishes to diversions are functions of water and demand (e.g., Grimaldo *et al.* 2009). Thus, water diversions not only elevate 'predation' mortality in an aquatic system, but they can do so in an atypical, density-independent manner. Diversions and fish collection facilities in the south Delta are very large structures which attract large aggregations of actual predatory fish and prey on smaller species like delta smelt before they reach the fish salvage facilities and within these facilities (Gingras 1997).

Estimated entrainment losses of delta smelt to SWP and CVP diversions can be substantial in some years (Kimmerer 2008). Given the delta smelt's current density-independent population dynamics, even a statistically indiscernible entrainment effect on the population is likely to cause the species to continue to decline (Kimmerer 2011). The entrainment losses of delta smelt are not generally observed until they reach the early juvenile stage (~20-30 mm in length), but combinations of 20-mm Survey distribution data and hydrodynamic modeling provide evidence that their risk of entrainment into the CVP and SWP diversions can be described by any of several indices that integrate Delta inflow and export flow (Kimmerer and Nobriga 2008; Kimmerer 2008; Service 2008; Grimaldo *et al.* 2009).

Delta smelt entrainment losses estimated from survey data and hydrodynamics can also be substantial in some years (Kimmerer 2008), though it is possible that Kimmerer may have overestimated them (Miller 2011). Nonetheless, increasing higher outflow (or lower X2) moves the bulk of the larval population increasingly west, which results in fewer larvae distributed in the south Delta where they are at highest risk of entrainment. At the same time, indices like the export to inflow ratio or Old and Middle river flow are useful metrics for gauging the effect of exports on the south Delta.

The risk of delta smelt entrainment into smaller agricultural irrigation diversions used mainly to irrigate crops within the Delta is also related to flow conditions. These in-Delta irrigation diversions generally have mean flow rates less than 1 cubic meter per second (Nobriga *et al.* 2004). The lower the Delta outflow, the higher the proportion of the young delta smelt population that overlaps the array of irrigation diversions in the Delta (Kimmerer and Nobriga 2008). However, the irrigation diversions are not currently considered to represent a substantial source of mortality because they individually draw small quantities of water relative to channel volumes (Nobriga *et al.* 2004).

In Suisun Marsh, water diversions are largely made to support waterfowl production. Some Suisun Marsh diversions are larger for the size of channels they are in than most of the agricultural irrigation diversions in the Delta. Based on hydrodynamic simulations, proximity to water diversions in the marsh is expected to correlate strongly with entrainment (Culberson *et al.* 2004), and substantial delta smelt losses have been reported when these diversions are not screened (Pickard *et al.* 1982). Entrainment risk for delta smelt in western Suisun Marsh is considered low because the habitat surrounding the diversions is often too saline (Enos *et al.* 2007).
Salinity PCE # 4

The core delta smelt habitat, is the LSZ (Moyle *et al.* 1992; Bennett 2005). The LSZ is where freshwater transitions into brackish water; the LSZ is defined as the area of the estuary where salinity ranges from 0.5-6.0 psu (Kimmerer 2004). This area is always moving due to tidal and river flow variation. The 2 psu isohaline is a specific location within the LSZ where the average daily salinity at the bottom of the water is 2 psu (Jassby *et al.* 1995). By local convention, changes in the location of the LSZ are described in terms of the distance from the Golden Gate Bridge to the 2 psu isohaline (X2); X2 is an indicator of habitat suitability for many of the estuary's organisms and it is associated with variance in abundance of diverse components of the ecosystem (Jassby *et al.* 1995; Kimmerer 2002b; Kimmerer *et al.* 2009). The LSZ expands and moves downstream when river flows into the estuary are high (Kimmerer *et al.* 2009). Similarly, it contracts and moves upstream when river flows are low. During the past 40 years, monthly average X2 has varied from as far downstream of San Pablo Bay (45 km) to as far upstream as Rio Vista on the Sacramento River (95 km).

Larval delta smelt tend to reside somewhat landward (upstream) of X2 (Dege and Brown 2004), but the center of juvenile distribution tends to be very near X2 until the fish start making spawning migrations in the winter (Feyrer *et al.* 2011; Sommer *et al.* 2011). Because of this association between the distribution of salinity in the estuary and the distribution of the delta smelt population, the tidal and river flows that comprise PCE # 3 affect PCE # 4.

The expansion and contraction of the LSZ affects the areal extent of abiotic habitat for delta smelt, both during spring (Kimmerer *et al.* 2009) and fall (Feyrer *et al.* 2007; 2011). In the spring, most delta smelt are larvae or young juveniles and the LSZ is typically maintained over the expansive Suisun Bay region. Thus, abiotic habitat "limitation" is unlikely and no consistent influence of spring X2 variation on later stage abundance estimates has been reported to date (Jassby *et al.* 1995; Bennett 2005; Kimmerer *et al.* 2009). In fact, historical maxima in juvenile abundance according to CDFW's TNS occurred in low outflow years when abiotic habitat area was comparatively low (Kimmerer 2002a; Kimmerer *et al.* 2009).

In contrast, during fall delta smelt are late stage juveniles and for the past decade or more, the LSZ has been persistently constricted by low Delta outflow. Fall habitat conditions affect delta smelt distribution and the concurrent FMWT abundance index (Feyrer *et al.* 2007; 2011). However, the quantitative life cycle models developed to date have not found evidence for a year over year effect of fall LSZ location on delta smelt population dynamics (Mac Nally *et al.* 2010; Thompson *et al.* 2010; Maunder and Deriso 2011).

It is now recognized that some delta smelt occur year-round in the Cache Slough region including the Sacramento Deep Water Shipping Channel and Liberty Island (Kimmerer 2011; Miller 2011; Sommer *et al.* 2011). The latter has been a consistently available habitat only since 1997. This region is often lower in salinity than 0.6 psu, the lower formal limit of the LSZ as defined by Kimmerer (2004). Delta smelt likely use it because it is one of the most turbid habitats remaining in the Delta (Nobriga *et al.* 2005). A recent population genetic study found no evidence that delta smelt inhabiting this region are unique compared to delta smelt using the LSZ-proper (Fisch *et al.*

2011), therefore it is likely that individual delta smelt migrate between the LSZ and the Cache Slough region. This is consistent with the high summer water temperatures observed there, which might compel individual delta smelt to seek out cooler habitats within and outside the Cache Slough region.

Delta Smelt Environmental Baseline

The portions of the Action Area that fall within the range of delta smelt include the Sacramento River east levee, south of Sacramento and the Sacramento Weir. Delta smelt typically migrate up into this area as early as December and move out in the spring and summer. The proposed project contains habitat components that can be used for feeding, spawning, rearing, and movement. Some amount of erosion protection has already occurred within the action area. Additionally, the Corps has a project which will place rock along 31,000 linear feet of the right bank of the Sacramento River immediately across the river and extending upstream from the proposed project footprint. Compensation for the placement of this rock will be through the development of a setback levee that will provide 118 acres of newly created shallow water habitat.

Giant Garter Snake Status of the Species

For the most recent assessment of the species' range-wide status please refer to the *Giant Garter Snake (Thamnophis gigas) 5-year Review: Summary and Evaluation* (Service 2012) for the current status of the species. Ongoing threats to giant garter snake include habitat loss from water transfers, rice fallowing due to drought conditions, habitat disturbance and loss from irrigation and drainage ditch maintenance, climate change, and invasive species. While these threats continue to effect the giant garter snake throughout its range, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the giant garter snake.

Giant Garter Snake Environmental Baseline

The *Draft Recovery Plan for the Giant Garter Snake* (Service 1999b) subdivides the range of the species into four recovery units. Each recovery unit includes populations. The action area for the proposed project is located within the Yolo Basin-Willow Slough unit and the American Basin unit. According to the 2012, 5-year review (Service 2012) the abundance and distribution of giant garter snakes has not changed significantly. Within the Action Area habitat loss and fragmentation is the most significant threat to the giant garter snake. Urbanizing areas within the Action Area include Sacramento and West Sacramento. Habitat loss through water transfers and rice fallowing also negatively affects giant garter snakes. In the Sacramento Valley, rice has served as a substitute for the large amounts of historical wetlands that used to exist in the Central Valley. Loss of this habitat has been shown to reduce or exclude giant garter snakes compared to areas which are actively irrigated in rice (Wylie *et al.* 2002a, b, 2004).

Flood control maintenance and agricultural activities can reduce and prevent the establishment of vegetation and burrows needed by the giant garter snake for cover and shelter on canals, levees, and agricultural ditches. This can also reduce the prey base for giant garter snake, affecting their feeding. Additionally, clearing, scraping and/or re-contouring canals, ditches, and levees, destroys burrows and crevices that are used as over-wintering habitat and during the summer for thermoregulation, shedding, and giving birth. These activities are being conducted by local maintaining agencies throughout the Action Area.

Other factors which effect the giant garter snake population in the Action Area include vehicular mortality particularly where canals or aquatic habitat are bordered by roads such as the crown of the

levees. Non-native predators such as game fish, bull frogs (*Rana catesbiana*), and domestic cats can affect giant garter snake populations (Service 1999b). This can be particularly detrimental to young and juvenile giant garter snakes. All of the Action Area has non-native predators occurring in it.

Snakes have been located within the Yolo Bypass within 2 miles of the Sacramento Bypass. Numerous irrigation and drainage canals exist which provide connectivity from the Sacramento Bypass and areas that are known to support snakes in the Yolo Bypass. A snake observed 0.5 mile to the west of the NEMDC along Elkhorn Boulevard in 1996 (CNDDB 2015). Borrow site 2's northern boundary is Elkhorn Boulevard on the east side of the NEMDC. Giant garter snakes could be using the NEMDC for aquatic habitat and the surrounding grasslands for uplands.

Western Yellow-Billed Cuckoo Status of the Species

For the most recent assessment of the species range-wide status please refer to the October 3, 2014, *Determination of Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (Coccyzus americanus occidentalis)* (79 FR 59991). Ongoing threats to the yellow-billed cuckoo include habitat loss from flood control projects and maintenance, alterations to hydrology, climate change, and invasive species. While these threats continue to affect the yellow-billed cuckoo throughout its range, no project, to date, has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the yellow-billed cuckoo.

Western Yellow-Billed Cuckoo Baseline

Yellow-billed cuckoo detections have occurred most frequently in the upper Sacramento River where levees are setback from the river or do not exist. Additionally, the last 20 years has seen a large amount of riparian restoration occur in the upper Sacramento River. Habitat in the action area tends to be more narrow and linear than in the upper Sacramento River. Levees were constructed close to the bank of the Sacramento River leaving narrow bands of small patch sizes. Construction of the setback levee along the right bank of the Sacramento River as part of the West Sacramento Flood Control Project will provide some wider patches of riparian habitat that will benefit the yellow-billed cuckoo. The American River has a wider floodplain due to levees being setback from the channel. There are some patches large enough to support nesting yellow-billed cuckoos, though cuckoos have not been observed nesting along the American River.

Effects of the Proposed Action

Valley Elderberry Longhorn Beetle

Vegetation removal, including elderberries could cause mortality of any beetle larvae within the elderberry shrub. Transplanting the shrubs between November 1 and February 15, when the shrubs are dormant, will minimize the likelihood of killing larvae within the shrub. Transplanting the shrub could still result in mortality to larvae within the shrub, particularly if the shrub does not survive transplantation. Proper care of the transplants through watering in the initial years can minimize this loss and increase the likelihood that the shrub will survive and provide continued habitat for the valley elderberry longhorn beetle.

Construction that occurs near elderberry shrubs that will be protected in place can kill adult beetles if construction equipment is operating between the months of March and June when valley elderberry longhorn beetles have emerged from the elderberry shrubs and are locating mates for reproduction. Fencing the area which contains riparian habitat, specifically elderberry shrubs, and keeping a minimum of a 20 foot buffer from the dripline of the elderberry shrub will keep

construction equipment from driving too close to the shrubs and minimize the number of beetles that might be struck or run over by equipment.

Transplanting elderberry shrubs out of the construction footprint has the potential to affect valley elderberry longhorn beetle dispersal if there is potential to remove large areas of elderberry shrubs. The Corps has provided maps of where existing valley elderberry longhorn beetle habitat exists and where shrubs will be removed due to the project. Along the Sacramento River, 13 elderberry shrubs distributed within 70 acres of riparian habitat will be transplanted as part of the project, however during surveys the Corps has documented an additional 60 elderberry shrubs that will be protected in place along the Sacramento River. The Corps has also proposed to include elderberry shrub plantings along the bank repair footprint where the elevation is suitable so the shrubs are not inundated too frequently. Along the American River, 250 elderberry shrubs distributed within 65 acres of riparian habitat will be transplanted as part of the project. The American River has many conservation sites and the Corps has proposed to offset the removal of elderberry shrubs through development of additional sites and enlargement of existing sites in the lower American River Parkway. The Corps is proposing to create an additional 69.91 acres of habitat for the valley elderberry longhorn beetle in the lower American River Parkway.

Trimming of elderberry shrubs can result in the loss of some habitat for the valley elderberry longhorn beetle. Unlike transplantation however, the shrub remains within the riparian corridor and can provide habitat for the beetle during dispersal. There is potential for one of the pruned stems to contain the larvae of the valley elderberry longhorn beetle. While elderberry shrubs do resprout readily, there is a temporal loss of habitat for the beetle and as part of the maintenance any resprouted stems will be removed in order to provide maintenance equipment access. To offset these effects the local maintaining agencies have proposed to create a 40-acre conservation area for the valley elderberry longhorn beetle. This area will be selected as described in the preceding paragraph. This will ensure habitat connectivity and help with long-term maintenance and monitoring of these lands.

Delta Smelt

Construction along the Sacramento River will place bank protection along a 50,300 linear foot section of the left bank of the Sacramento River. Delta smelt are a pelagic species that is typically found in the center of the channel. However, as described in the status of the species they do spawn on sandy beaches in shallow water habitat (0 to 3 meters) and in this portion of the Sacramento River are found close to the banks. The rock footprint will change the substrate along the 50,300 linear feet of 33 acres of shallow water habitat. Additionally 13 acres are being converted from riverine bank edge to a rock wedge. Construction related effects to individual delta smelt will be avoided because construction is occurring between August 1 and November 30, a time when delta smelt are located further downstream in the Delta and Suisun Bay. Effects due to increasing sediment downstream of the work area will be minimized through the conservation measures involving monitoring water quality during construction to ensure that effects do not extend into the portion of the Delta that delta smelt occupies during the late summer/fall period. Construction to widen the Sacramento Weir will occur on the landside of the existing Sacramento River right bank levee. Upon completion of the weir extension the levee removed between August 1 and November 30 avoiding effects to delta smelt habitat.

The primary negative effect of the project on potential spawning habitat is the change of substrate from sand to riprap. Rock used for bank protection is large enough to retard erosional forces of the river and therefore has interstitial spaces. Should delta smelt spawn over this riprap substrate, it is very likely that any eggs will fall into these interstitial spaces resulting in the loss of eggs and

potentially causing fertilization to not occur if the eggs fall into the interstitial spaces. The Corps has proposed to offset this loss of spawning potential in these areas through the purchase of 33 acres of credits at a Service-approved delta smelt conservation bank. The placement of rock will permanently narrow the channel by 13 acres through the change of riverine edge to rock wedge. Rock slope protection limits the lateral mobility of a river channel, increases flow velocities (Sedell *et al.* 1990), limit sediment transport, and eliminates bankside refugia areas (Gregory *et al.* 1991). Rock placement can also affect primary productivity through the loss of vegetation. The Corps will protect large trees in place and plant riparian benches at the conclusion of the rock placement to replace the loss of vegetation. Planting benches and vegetation planting will also help to offset the increased velocities that the bank protection sites will experience due to the smoother rock surface. To offset the complete loss of riverine edge habitat the Corps has proposed to purchase 39 acres of credits at a Service-approved delta smelt conservation bank for a total of 72 acres of credits.

The Corps has proposed to evaluate effects to listed species including delta smelt when long-term maintenance activities for the Sacramento River can be described. If maintenance activities will affect delta smelt the Corps will reinitiate consultation with the Service. Therefore, this biological opinion does not address effects to the delta smelt from any long-term levee maintenance activities.

Delta Smelt Critical Habitat

This opinion on the critical habitat for the delta smelt does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR § 402.02. Instead, we have relied upon the statute and the August 6, 2004, Ninth Circuit Court of Appeals decision in *Gifford Pinchot Task Force v. U. S. Fish and Wildlife Service* (No. 03-35279) to complete the following analysis with respect to the proposed critical habitat.

Implementation of the proposed project will affect PCE #1 Physical Habitat as described under the environmental baseline section above. The placement of rock will change the substrate of shallow water habitat for 46 acres. Any loss of shallow water habitat will be compensated through the purchase of credits at a delta smelt conservation bank. It is expected that planting the sites post-construction will replace any loss of primary productivity within the Sacramento River water column.

Giant Garter Snake

Borrow Site 2 – Upland habitat will be disturbed at borrow site 2 (5.5 acres) when heavy equipment is brought in to remove soil for the Arcade Creek levee repair. Removal of soil from the site will result in the crushing of burrows that snakes use for aestivating and thermoregulation. Fencing the borrow site prior to borrow excavation will minimize the likelihood that snakes will be in the borrow site when construction equipment begins to mobilize. Fencing the site will temporarily (one active season) exclude the use of the area for giant garter snake. This could result in snakes having to move further distances to find upland refugia in the summer months and expose them to predation or other sources of mortality such as being run over by a vehicle on the levee road on the opposite side of the NEMDC. Because the aquatic habitat will not be disturbed by the project, there will not be any effects on the snake's ability to forage.

Upon completion of the project, the site will restored and re-graded to create three habitat types. The creation of additional tule marsh along the edge of the canal will benefit giant garter snakes that may be using the NEMDC as it will provide cover, an area for prey production, and refugia from predators. Additionally, the seasonal wetland bench will only provide aquatic habitat in the winter months when the snake is typically in burrows. The wetland bench will provide some upland habitat

for the giant garter snake during the summer when the snake is active in the form of basking habitat and if dried wetland vegetation remains some refugia from predators; however, because the site will be flooded in the winter it will not serve as overwintering habitat for the snake. The remaining 3.5 acres of the borrow site will be restored to native grassland and will function as summer upland refugia and basking and in the winter serve as overwintering habitat for the snake.

Sacramento Bypass – Enlarging the Sacramento Bypass and Weir will result in both permanent and temporary effects to giant garter snake habitat. Construction of the widened bypass will have similar effects to giant garter snake as the work along borrow site 2. Snakes could be crushed by heavy equipment, entombed in refugia when burrows collapse, and exposed to increased predation because they may have to travel further to find habitat that is unavailable to them due to the project. The 25 acres of aquatic habitat and 50 acres of upland habitat that will be temporarily affected because of the relocation of a levee toe drain will be replaced within one year of construction. The Corps has committed to creating a toe drain that closely mimics the existing aquatic and upland habitat along the northern levee of the Sacramento Bypass. The effects of crushing snakes and exposing them to increased predation will be minimized through the use of the conservation measures described in the project description above.

Permanently, 15 acres of aquatic and 30 acres of upland habitat will be lost through the removal of drainage ditches and farm canals in the area that is currently outside of the bypass footprint. The Corps has committed to offsetting the loss of this habitat through the purchase of 135 acres of giant garter snake credits at a Service-approved conservation bank. Conservation banks provide protection, conservation easement, and funding, endowment, in perpetuity for the giant garter snake. These long-term protections and location of the conservation banks all contribute to the long-term recovery of the giant garter snake.

Operation of the expanded Sacramento Weir and Bypass will result in an increase of water surface elevation of approximately 0.5-foot on the levee slopes on either side of the Yolo Bypass. However, when this increase occurs, during a 200-year flood event, the Yolo Bypass levees already contain water up to 21 feet deep. As a result, giant garter snake burrows would likely already be saturated before the additional water associated with the widened Sacramento Bypass is a factor. The additional 0.5-foot resulting from this action would not significantly change the timing or duration of this flooding and would not result in further impacts to giant garter snake habitat.

The Corps has proposed to evaluate effects to listed species including giant garter snake when long-term maintenance activities for the Sacramento Bypass can be described. If maintenance activities will affect giant garter snakes the Corps will reinitiate consultation with the Service. Therefore, this biological opinion does not address effects to the giant garter snake from any long-term levee maintenance activities.

Yellow-Billed Cuckoo

Sacramento River – The Corps is planning on removing 70 acres of riparian habitat along the Sacramento River. The riparian corridor in this section of the Sacramento River is narrow (about 100 feet wide) because the levees were constructed so close to the edge of the channel bank. This is too narrow for the yellow-billed cuckoo to nest, however it is possible for the yellow-billed cuckoo to use this as a stopover when migrating to the Central Valley to breed. Vegetation removal will reduce the width of the riparian corridor from 100 feet to 40 feet on average. The Corps proposal to plant the bank protection sites will create a 25-foot wide planting berm leaving a loss of about 35 feet of riparian corridor. The Corps proposes to offset the loss of the 70 acres of riparian through the creation of 140 acres of riparian habitat along the lower American River.

American River – The construction of launchable rock trench will remove 65 acres of riparian habitat along the lower American River. The lower American River does have habitat patches large enough to support nesting yellow-billed cuckoos. Large patches of habitat will not be removed; rather a strip will be removed adjacent to the levee which could reduce the size of some of the potential nesting areas. To compensate for this the Corps is proposing to plant 130 acres along the lower American River. As described in the conservation measures, the Corps will develop a Riparian Conservation Plan that will determine the best locations to develop additional riparian habitat. The conservation areas will provide both habitat for yellow-billed cuckoo and valley elderberry longhorn. The areas will also ensure that there is a net increase of potential yellow-billed cuckoo nesting habitat along the lower American River Parkway. There will be a temporal loss of habitat because riparian habitat can take up to 20 years to develop.

In addition to the habitat loss for both the Sacramento and American Rivers, construction itself has the potential to adversely affect yellow-billed cuckoos. Construction that occurs when the cuckoo is in the Sacramento Valley has the potential to harass the bird due to noise. To minimize effects to the cuckoo due to construction noise the Corps conservation measure to do protocol level surveys prior to beginning construction will enable the Corps to determine if yellow-billed cuckoos are nesting near the construction footprint. The Corps has committed to avoid construction near an active yellow-billed cuckoo nest. However, cuckoos that could be foraging in the area could be harassed due to construction activities and noise and move to other locations in the lower American River parkway which could expose individual cuckoos to increased predation.

The Corps has proposed to evaluate effects to listed species including yellow-billed cuckoo when long-term maintenance activities for the Sacramento River and American River can be described. If maintenance activities will affect yellow-billed cuckoos the Corps will reinitiate consultation with the Service. Therefore, this biological opinion does not address effects to the yellow-billed cuckoo from any long-term levee maintenance activities.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Valley Elderberry Longhorn Beetle

Non-Federal adverse effects to the valley elderberry longhorn beetle include effects from nearby pesticide spraying drifting into valley elderberry longhorn beetle habitat and levee and channel maintenance. In the areas of the urbanized areas of the American and Sacramento Rivers human started fires is by far the largest effect to valley elderberry longhorn beetles. Over the last several years numerous fires have burned portions of the American River Parkway.

Delta Smelt

Adverse effects to delta smelt may result from point and non-point source chemical contaminant discharges within the action area. These contaminants include but are not limited to ammonia and free ammonium ion, numerous pesticides and herbicides from agricultural activities, and oil and gasoline product discharges. Oil and gasoline product discharges may be introduced into the Sacramento River from shipping and boating activities and from urban activities and runoff. Other future, non-Federal actions within the action area that are likely to occur and may adversely

affect delta smelt include: the dumping of domestic and industrial garbage that decreases water quality; oil and gas development and production that may affect aquatic habitat and may introduce pollutants into the water; agricultural activities, including burning or removal of vegetation on levees that reduce riparian and wetland habitats that contribute to the quality of habitat used by delta smelt; and livestock grazing activities that may degrade or reduce riparian and wetland habitats that contribute to the quantity and quality of habitat used by delta smelt.

San Francisco Bay-Delta Climate Change

The effects of climate change do not act in isolation; they are anticipated to exacerbate existing threats to delta smelt. We considered the potential effects of climate change on the delta smelt based on projections derived from various modeling scenarios. A series of publications (Feyrer *et al.* 2011; Cloern *et al.* 2011; Brown *et al.* 2013) have modeled future impacts of climate change in the Delta and projected how this will affect delta smelt. These models used the B1 and A2 scenarios from the 2007 IPCC report. Each scenario included both a warmer-wetter and warmer-dryer sub scenario. Modeled predictions presented in these publications are based on current baseline conditions (no increased outflow, no breeching of levees) which may or may not change in the future. Temperature increases are likely to lead to a continued rise in sea level, further increasing salinity which will increasingly restrict delta smelt's already limited geographic range (Feyrer *et al.* 2011; Cloern *et al.* 2011; Brown *et al.* 2013). Higher air temperatures will reduce snowpacks, melt snow earlier in the winter or spring, and increase water temperatures. These changes will likely alter freshwater flows, possibly shifting and condensing the timing and location of delta smelt reproduction (Brown *et al.* 2013).

Projections indicate that temperature and precipitation changes will diminish snowpack, changing the availability of natural water supplies (Reclamation 2011). Warming may result in more precipitation falling as rain and less storage as snow. This would result in increased rain on snow events and increase winter runoff with an associated decrease in runoff for the remainder of the year (Reclamation 2011). Sacramento Valley Ecoregion projections include a 27 percent decrease in annual freshwater flows and earlier snowmelts, with increased freshwater flows in January and February but reduced throughout the rest of the year (PRBO Conservation Science 2011). Earlier seasonal warming increases the likelihood of rain-on-snow events, which are associated with mid-winter floods. Smaller snowpacks that melt earlier in the year may result in increased drought frequency and severity (Rieman and Isaak 2010). Thus overall, these changes may lead to increased frequency of flood and drought cycles during the 21st century (Reclamation 2011).

Sea level rise is likely to increase the frequency and range of saltwater intrusion. Salinity within the northern San Francisco Bay is projected to rise by 4.5 by the end of the century (Cloern *et al.* 2011). Elevated salinity levels could push the position of X2 farther up the estuary if outflows were not increased to compensate for it. Fall X2 mean values are projected to increase by a mean of about 7 km to the area of Antioch for a distance of about 90 km from the Golden Gate Bridge by 2100 (Brown *et al.* 2013). This increase in the position of X2 in the fall is expected to result in a decrease in suitable physical habitat (Brown *et al.* 2013) if current levees and channel structures are maintained. A decrease in spring habitat due to the movement of X2 upstream due to sea level rise is also expected to result from climate change.

We expect warmer estuary temperatures to be yet another significant conservation challenge based on climate change models. Mean annual water temperatures within the upper Sacramento River portion of the Bay-Delta estuary are expected to approach or exceed 14 °C during the second half of this century (Cloern *et al.* 2011). Warmer water temperatures could reduce delta smelt growth, increase delta smelt mortality and constrict suitable habitat within the estuary during the summer

months. Due to warming temperatures, delta smelt are projected to spawn an average of 10 to 25 days earlier in the season depending on the location (Brown *et al.* 2013). Also due to expected temperature increases, total number of high mortality days is expected to increase for all IPCC climate change scenarios (Brown *et al.* 2013). The number of stress days is expected to be stable or decrease partly because many stress days will become high mortality days. This could lead to delta smelt being forced to grow under highly stressful conditions during summer and fall with less time to mature because of advanced spawning (Brown *et al.* 2013). Growth rates have been shown to slow as water temperatures increase therefore requiring delta smelt to consume more food to reach growth rates that are normal at lower water temperatures (Rose *et al.* 2013a). Delta smelt are already often smaller than they used to be (Sweetnam 1999; Bennett 2005) and expected temperature increases due to climate change will likely further slow growth rates.

At the same time, warmer water will tend to move the spawning season earlier in the year (Brown *et al.* 2013). That means the fish will have to grow faster still to compensate for that shorter growing season to produce even as many eggs as they do now – and that may already be a serious limitation on their population fecundity (Rose *et al.* 2013b). Higher temperatures may restrict delta smelt distribution into the fall, limiting their presence in Suisun Bay for more than just salinity reasons and force greater inhabitation of cooler high salinity waters (Brown *et al.* 2013). Water temperatures are already presently above 20°C for most of the summer in core habitat areas, sometimes even exceeding 25 °C for short periods.

The delta smelt is currently at the southern limit of the inland distribution of the family Osmeridae along the eastern Pacific coast. That indicates that this region was already about as warm as that fish family can handle. Increased temperatures associated with climate change may result in a habitat in the Bay-Delta that is outside of the species ecological tolerance limits.

Giant Garter Snake

The Service is aware of other projects currently under review by the State, county, and local authorities where biological surveys have documented the occurrence of federally-listed species. These projects include such actions as urban expansion, water transfer projects that may not have a Federal nexus, and continued agricultural development. The cumulative effects of these known actions pose a significant threat to the eventual recovery of the species. Additionally, an undetermined number of future land use conversions and routine agricultural practices are not subject to Federal permitting processes and may alter the habitat or increase incidental take of snakes, and are, therefore, cumulative to the proposed project. For example other cumulative effects include: (1) unpredictable fluctuations in aquatic habitat due to water management and diversions; (2) dredging and clearing of vegetation from irrigation canals; (3) discing or mowing upland habitat; (4) increased vehicular traffic on access roads adjacent to aquatic habitat; (5) use of burrow fumigants on levees and other potential upland refugia; (6) human intrusion into habitat; (7) use of inappropriate plastic erosion control netting (Stuart *et al.* 2001); (8) riprapping or lining of canals and stream banks; (9) fluctuations in acreages of rice production due to market conditions or water availability; (10) ornamental cultivation; (11) routine grounds maintenance of upland habitat; (12) contaminated runoff from agriculture and urbanization; (13) maintenance of non-Federal flood control structures; and (14) predation by feral animals and pets. Specific cumulative effects related to the proposed project include maintenance activities and/or an increased potential for vandalism, which may degrade or destroy habitat or cause unpredictable fluctuations in habitat.

Yellow-Billed Cuckoo

Habitat that is currently occupied by the yellow-billed cuckoo occurs on public and privately owned lands. Activities on non-Federal lands that may affect the yellow-billed cuckoo include the construction and maintenance of recreational hiking and bicycle trails; restoration of native riparian habitat; transportation related projects like construction and maintenance of State, county, and private roads and bridges; flood channel maintenance by the State water resources agencies, and conversion of riparian habitat to agriculture on private lands.

Conclusion

After reviewing the current status of the valley elderberry longhorn beetle, delta smelt, giant garter snake and yellow-billed cuckoo, the environmental baseline for the action area, the effects of the proposed ARFC project, and the cumulative effects on these species, it is the Service's biological opinion that the proposed AFRC project, is not likely to jeopardize the continued existence of these species. The Service reached this conclusion because the project-related effects to the species, when added to the environmental baseline and analyzed in consideration of all potential cumulative effects, will not rise to the level of precluding recovery or reducing the likelihood of survival of the species based on the conservation measures proposed by the Corps including: creating additional riparian habitat for the valley elderberry longhorn beetle and the yellow-billed cuckoo; purchasing credits at conservation banks for giant garter snake and delta smelt; and restoring any temporarily affected habitat to pre-project conditions.

After reviewing the current status of designated critical habitat for delta smelt, the environmental baseline of critical habitat in the action area, the effects of the proposed ARFC project, and the cumulative effects, it is the Service's biological opinion that the proposed ARFC project, as proposed, is not likely to destroy or adversely modify designated critical habitat. The Service reached this conclusion because the project-related effects to the designated critical habitat, when added to the environmental baseline and analyzed in consideration of all potential cumulative effects, will not rise to the level of precluding the function of the delta smelt critical habitat, to serve its intended conservation role for the species based on the Corps proposal to purchase credits at a conservation bank for permanent effects to the substrate of the Sacramento River. The effects to delta smelt critical habitat are small and discrete, relative to the entire area designated, and are not expected to appreciably diminish the value of the critical habitat or prevent it from sustaining its role in the conservation of the delta smelt.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by Service regulations at 50 CFR 17.3 as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Harm is defined by the same regulations as an act which actually kills or injures wildlife. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action

is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are nondiscretionary, and must be undertaken by the Corps and SAFCA so that become binding conditions of any contract issued for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity that is covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions, or (2) fails to require their contractor or SAFCA or to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the contract, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Amount or Extent of Take

Valley Elderberry Longhorn Beetle

The Service anticipates that incidental take of valley elderberry longhorn beetle will be difficult to detect due to its life history and ecology. Specifically, valley elderberry longhorn beetles can be difficult to locate due to the fact that a majority of their life cycle is spent in the elderberry shrub and finding a dead or injured individual is unlikely due to their relatively small size. There is a risk of harm, harassment, injury and mortality as a result of the proposed construction activities; therefore, the Service is authorizing take incidental to the proposed action as harm, harassment, injury, and mortality of all valley elderberry longhorn beetles within 263 shrubs that will be transplanted as a result of construction and 40 acres of elderberry shrubs that will be trimmed for maintenance purposes over the project's 50 year life.

Delta Smelt

The Service expects that incidental take of delta smelt will be difficult to detect or quantify for the following reasons: the small size of adults, their occurrence in turbid aquatic habitat makes them difficult to detect, and the low likelihood of finding dead or impaired specimens. The Service anticipates that the extent of incidental take will be minimized due to the proposed conservation measures and low relative abundance. Due to the difficulty in quantifying the number of delta smelt that will be taken as a result of the proposed action, the number of acres of affected habitat becomes a surrogate for the species that will be taken. The Service anticipates that all individual adult delta smelt in the 46 acres of the action area may be subject to incidental take in the form of harm as described in this biological opinion. Incidental take of delta smelt for maintenance activities is not covered in this biological opinion.

Giant Garter Snake

The Service anticipates that incidental take of the snake will be difficult to detect or quantify for the following reasons: snakes are cryptically colored, secretive, and known to be sensitive to human activities. Snakes may avoid detection by retreating to burrows, soil crevices, vegetation, and other cover. Individual snakes are difficult to detect unless they are observed, undisturbed, at a distance. Most close-range observations represent chance encounters that are difficult to predict. It is not possible to make an accurate estimate of the number of snakes that will be harassed during construction activities, including in staging areas and roads carrying vehicular traffic. In instances when take is difficult to detect, the Service may estimate take in numbers of species per acre of habitat lost or degraded as a result of the action as a surrogate measure for quantifying individuals.

Therefore, the Service anticipates the number of giant garter snakes that may be found in 125.5 acres of aquatic and upland habitat will be harmed or killed as a result of habitat modification due to the proposed project. Incidental take of giant garter snake for maintenance activities is not covered in this biological opinion.

Yellow-Billed Cuckoo

The Service anticipates that incidental take of yellow-billed cuckoo will be difficult to detect due to its life history and ecology. Specifically, yellow-billed cuckoos can be difficult to locate due to their cryptic appearance and behavior and finding a dead or injured individual is unlikely. There is a risk of harm and harassment as a result of proposed construction activities and operations and maintenance of the restoration plantings; therefore, the Service is authorizing take incidental to the proposed action as harm of all yellow-billed cuckoos within 135 acres. Incidental take of yellow-billed cuckoo for maintenance activities is not covered in this biological opinion.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and Prudent Measures

All necessary and appropriate measure to avoid or minimize effects on the species resulting from implementation of this project have been incorporated into the project's proposed conservation measures. Therefore, the Service believes the following reasonable and prudent measure is necessary and appropriate to minimize incidental take of the species.

1. All conservation measures, as described in the biological assessment and restated here in the Project Description section of this biological opinion, shall be fully implemented and adhered to. Further, this reasonable and prudent measure shall be supplemented by the terms and conditions below.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. The Corps shall include full implementation and adherence to the conservation measures as a condition of any permit or contract issued for the project.

2. The Corps will develop a Riparian Planting Plan. The plan will evaluate locations for riparian vegetation planting based on land use in the lower American River Parkway, effects from future projects, such as the reoperation of Folsom Dam, where existing riparian and valley elderberry longhorn beetle habitat exists, creating and maintaining connectivity between large riparian patches, and coordination with Sacramento County Parks. The plan will maximize habitat quality for both the valley elderberry longhorn beetle and the yellow-billed cuckoo.

3. In order to monitor whether the amount or extent of incidental take anticipated from implementation of the project is approached or exceeded, the Corps shall adhere to the following reporting requirements. Should this anticipated amount or extent of incidental take be exceeded, the Corps must immediately reinitiate formal consultation as per 50 CFR 402.16.

   (a) For those components of the action that will result in habitat degradation or modification whereby incidental take in the form of harm is anticipated, the Corps will provide monthly updates to the Service with a precise accounting of the total acreage of habitat impacted. Updates shall also include any information about changes in project implementation that result in habitat disturbance not described in the Project Description and not analyzed in this biological opinion.
   (b) For those components of the action that may result in direct encounters between listed species and project workers and their equipment whereby incidental take in the form of harassment, harm, injury, or death is anticipated, the Corps shall immediately contact the Service's Sacramento Fish and Wildlife Office (SFWO) at (916) 414-6600 to report the encounter. If the encounter occurs after normal working hours, the Corps shall contact the SFWO at the earliest possible opportunity the next working day. When injured or killed individuals of the listed species are found, the Corps shall follow the steps outlined in the Salvage and Disposition of Individuals section below.
   (c) Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as a Service-approved biologist. Dead individuals must be sealed in a resealable plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it. The bag containing the specimen must be frozen in a freezer located in a secure site, until instructions are received from the Service regarding the disposition of the dead specimen. The Service contact persons are the Habitat Conservation Division Chief at the Sacramento Fish and Wildlife Office at (916) 414-6600; the Assistant Field Supervisor of ESA/Regulatory Division at the Bay Delta Fish and Wildlife Office at (916) 930-5603; and the Resident Agent-in-Charge of the Service's Office of Law Enforcement at (916) 569-8444.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following actions:

1. The Service recommends the Corps develop and implement restoration measures in areas designated in the Delta Fishes Recovery Plan (Service 1996) the Giant Garter Snake Recovery Plan (1999) and the Valley Elderberry Longhorn Beetle Recovery Plan (1984).

2. The Corps and SAFCA should develop and implement projects that support DWR's Central Valley Flood System Conservation Strategy. This document provides goals and measurable objectives and potential projects which could be implemented in a manner that while improving the riverine ecosystem also will improve the flood system.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation with the Corps on the American River Common Features GRR Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and:

(a) If the amount or extent of taking specified in the incidental take statement is exceeded;

(b) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;

(c) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or

(d) If a new species is listed or critical habitat designated that may be affected by the identified action.

If you have any questions regarding this biological opinion, please contact Jennifer Hobbs (jennifer_hobbs@fws.gov or (916) 414-6541) or Doug Weinrich, Assistant Field Supervisor at the letterhead address, (916) 414-6600.

Sincerely,

Jennifer M. Norris
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APPENDIX B

EXISTING HABITAT MAPS OF THE STUDY AREA

Source: GEI Consultants, Inc., 2014; MBK Engineers 2014; data collected and compiled by AECOM in 2014

Sacramento River East Levee Habitat Map 1

Source: GEI Consultants, Inc. 2014, MBK Engineers 2014, data collected and compiled by AECOM in 2014

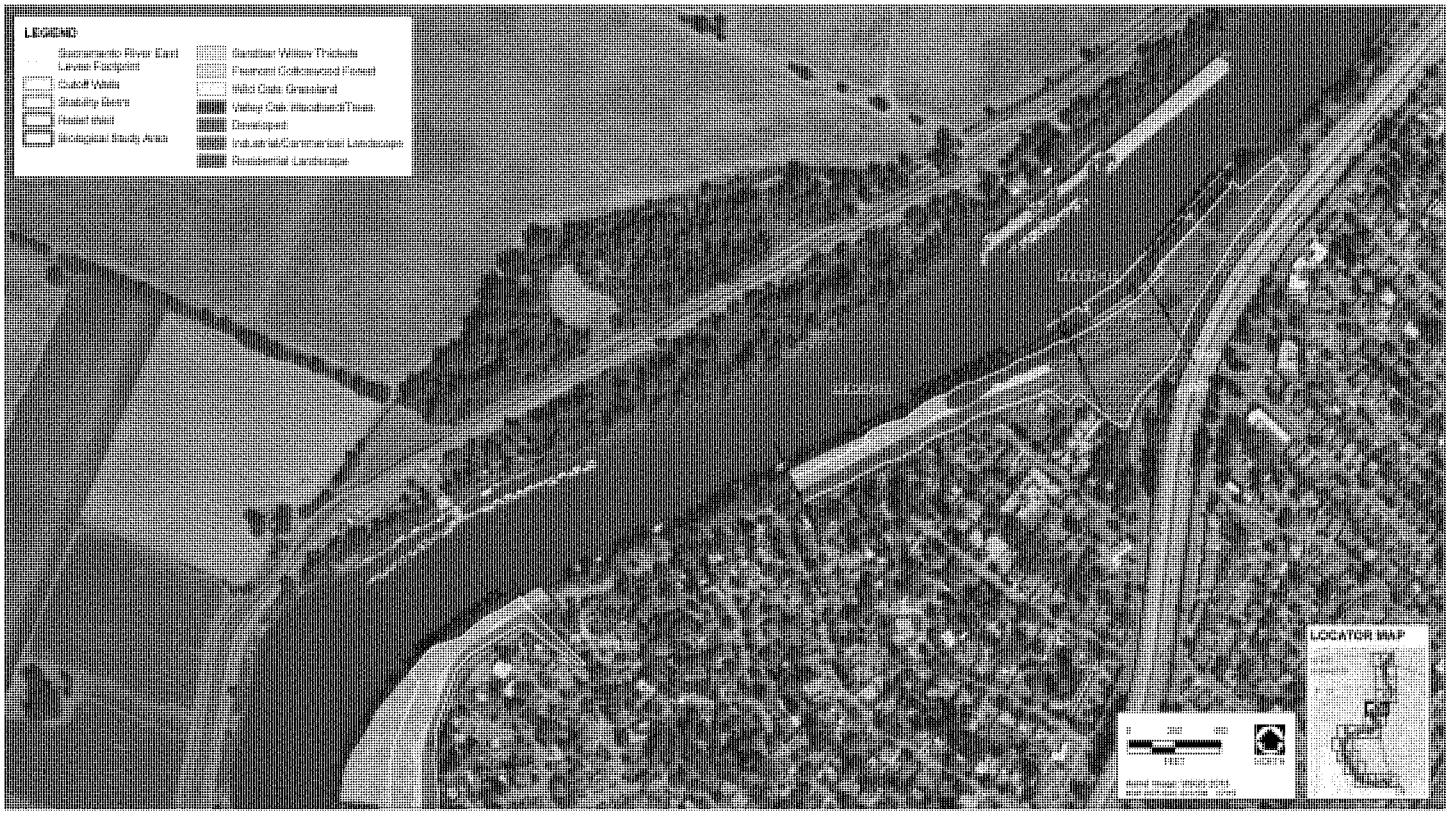
Sacramento River East Levee Habitat Map 2

Source: GEI Consultants, Inc., 2014; MBK Engineers 2014; data collected and compiled by AECOM in 2014

Sacramento River East Levee Habitat Map 3

Source: GEI Consultants, Inc., 2014; MBK Engineers 2014; data collected and compiled by AECOM in 2014

Sacramento River East Levee Habitat Map 4



Source: GEI Consultants, Inc. 2014, MBK Engineers 2014, data collected and compiled by AECOM in 2014

Sacramento River East Levee Habitat Map 5

Source: GEI Consultants, Inc. 2014, MBK Engineers 2014, data collected and compiled by AECOM in 2014

Sacramento River East Levee Habitat Map 6



Source: GEI Consultants, Inc. 2014, MBK Engineers 2014, data collected and compiled by AECOM in 2014

Sacramento River East Levee Habitat Map 7

Source: GEI Consultants, Inc. 2014, MBK Engineers 2014, data collected and compiled by AECOM in 2014

Sacramento River East Levee Habitat Map 8

Source: GEI Consultants, Inc. 2014, MBK Engineers 2014, data collected and compiled by AECOM in 2014

Sacramento River East Levee Habitat Map 9

Source: GEI Consultants, Inc. 2014, MBK Engineers 2014, data collected and compiled by AECOM in 2014

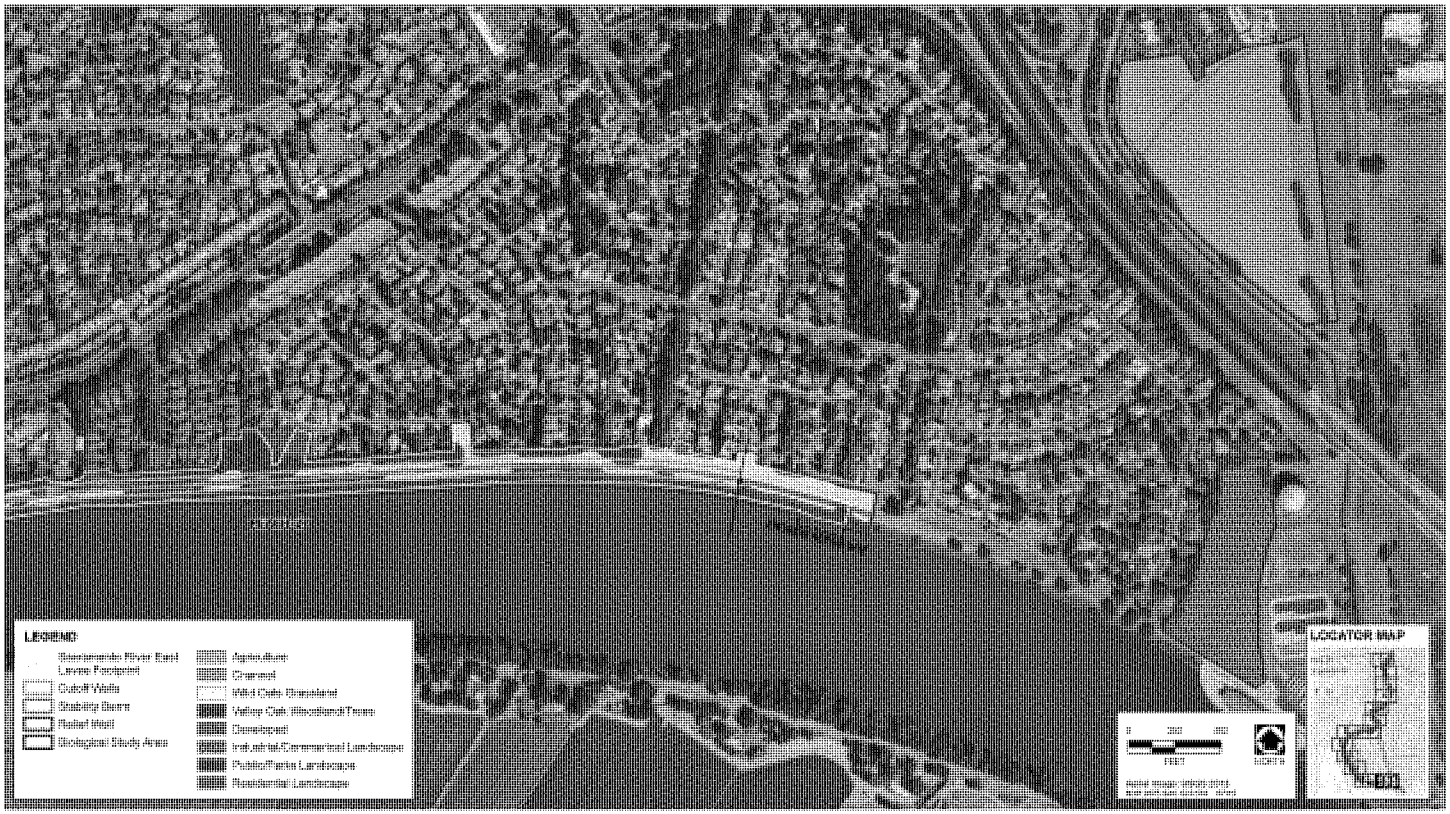
Sacramento River East Levee Habitat Map 10

Sacramento River East Levee Habitat Map 11



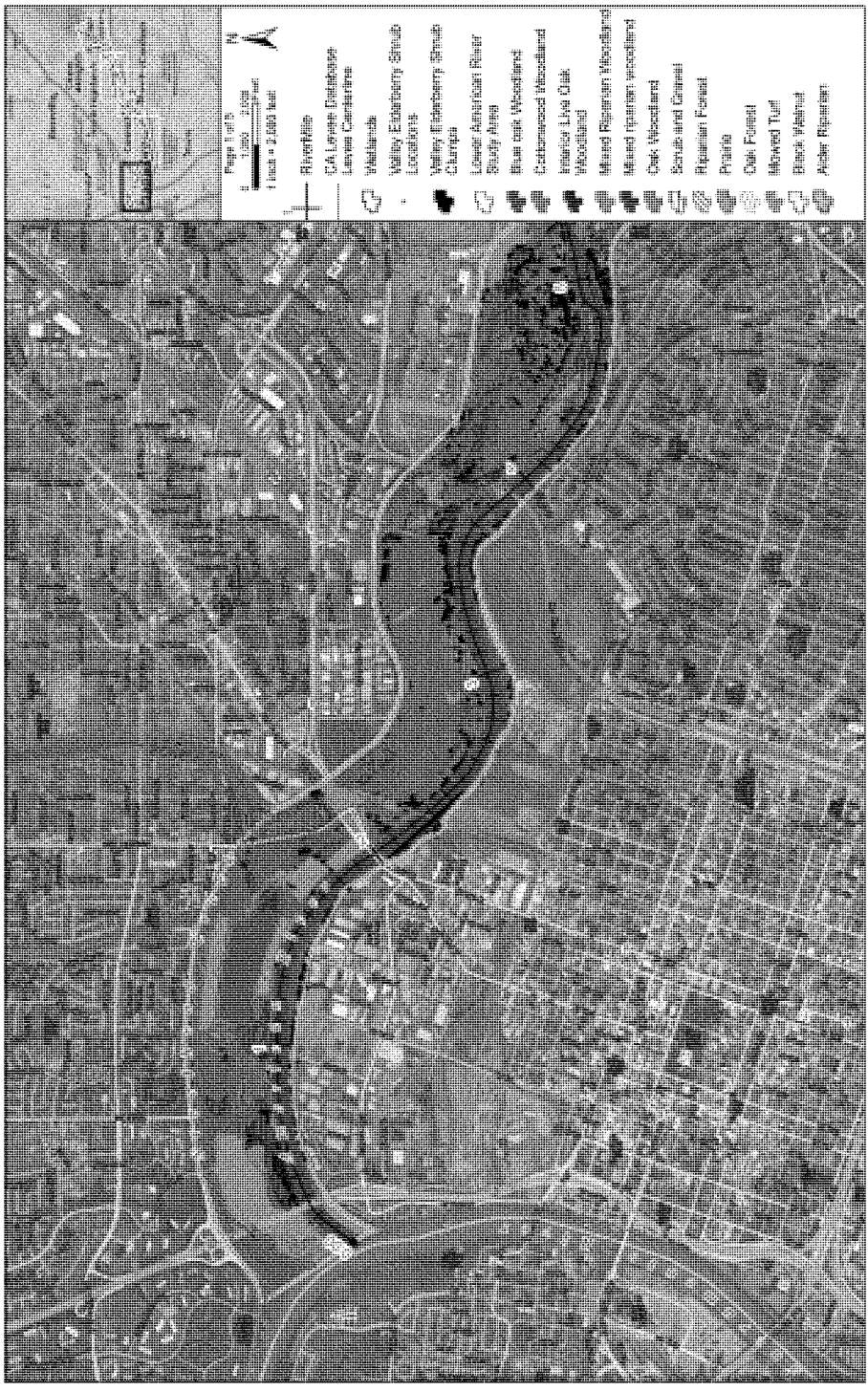
Source: GEI Consultants, Inc. 2014, MBK Engineers 2014, data collectad and compiled by AECOM in 2014

Sacramento River East Levee Habitat Map 12



Source: GEI Consultants, Inc. 2014, MBK Engineers 2014, data collected and compiled by AECOM in 2014

Sacramento River East Levee Habitat Map 13


Riverville
CA Live Oak Savanna
Lower Cienaga Pine
Meadows
Valley Elderberry Shrub
Locations
Valley Elderberry Shrub
Clumps
Lower American River
Study Area
Blue oak Woodland
Cottonwood Woodland
Interior Live Oak
Woodland
Mixed Riparian Woodland
Mixed riparian woodland
Oak Woodland
Scrub and Grassl
Riparian Forest
Prairie
Oak Forest
Mowed Turf
Black Walnut
Alder Riparian

Page 2 of 3
1 inch = 2,000 feet
1 inch = 2,000 feet
N
River Mile
CA Lower Deltaic
Levee Centerline
Wetland
Valley Elderberry Shrub
Locations
Valley Elderberry Shrub
Clumps
Lower American River
Study Area
Blue oak Woodland
Cottonwood Woodland
Interior Live Oak
Woodland
Mixed Riparian Woodland
Mixed riparian woodland
Oak Woodland
Scrub and Gravel
Riparian Forest
Prairie
Oak Forest
Mowed Turf
Shrub Wetland
Active Riparian

APPENDIX C

CULTURAL RESOURCES APPENDIX

American River Common Features GRR

EIS Cultural Resources Appendix

Enclosure 1

Programmatic Agreement

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

WHEREAS, the U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the American River Common Features Project (Project) as authorized in the Water Resources Development Act (WRDA) of 1996, Pub L. No. 104-303, §101(a)(1), 110 STAT. 3658, 3662-3663 (1996), as amended by the WRDA 1999, Pub. L. No. 106-53, Section 366, 113 STAT. 269, 319-320 (1999) and the Energy and Water Development and Related Agencies Appropriations Act of 2008, Pub. L. No. 110-161, Section 130, 121 STAT. 1844, 1947 (2008), and as authorized by Section 7002 of the Water Resources Reform and Development Act (WRRDA) of 2014 (Pub. L. No. 113-121, § 7002, 128 Stat. 1193, 1366); and

WHEREAS, the Project is being developed to provide flood risk management to the City of Sacramento, including areas along the Sacramento and American Rivers, and around and within the Natomas Basin, including the Natomas Cross Canal, the Sacramento Bypass, the Pleasant Grove Creek Canal, the Natomas East Main Drain Canal, Arcade Creek, Dry Creek, Robla Creek, and Magpie Creek located in Sacramento and Yolo Counties, California. The authorized project is a single purpose flood risk management project shown in **Attachment 1** and further described in **Attachment 2**; and

WHEREAS, the Corps proposes to construct levee improvements including, but not limited to: seepage cutoff walls, seepage berms, levee slope flattening, relief wells, adjacent levees, stability berms, drained stability berms, levee raising, floodwalls, bypass widening, riverbank erosion protection, and launchable rock erosion protection; and

WHEREAS the State of California Central Valley Flood Protection Board (CVFPB) is the non-Federal sponsor for the Project and the CVFPB has been invited to be a Concurring Party to this Programmatic Agreement (Agreement); and

WHEREAS, the Corps has determined that the Project activities constitute an Undertaking, as defined in 36 C.F.R. § 800.16(y), and therefore is subject to Section 106 of the National Historic Preservation Act of 1966, 54 U.S.C. § 306108 (NHPA); and

WHEREAS, the Corps has determined that the Project may have an effect on properties that are either listed or eligible for listing in the National Register of Historic Places (NRHP) and has consulted with the California State Historic Preservation Officer (SHPO) pursuant to the NHPA; and

WHEREAS, pursuant to 36 C.F.R. § 800.4(b)(2), the Corps may implement the Project in phases as funding is available and construction authority is provided and, as a result, efforts to identify and evaluate Historic Properties and the determination of effects to those properties may be deferred until more specific project information for each phase is known; and

WHEREAS, this Agreement shall establish the process the Corps shall follow for compliance with 54 U.S.C. § 306108 (formerly 16 U.S.C. § 470f, referred to hereinafter as "Section 106"), taking into consideration the views of the Signatory and Concurring Parties; and

WHEREAS, a total of 69 cultural resources are known to be present within the Area of Potential Effects (APE) and although extensive archaeological inventory has been completed within the APE under other projects, portions of the APE have not been inventoried; and

WHEREAS, the presence of levees, alluvial deposition, and other built environment features have obscured the presence of cultural resources and a full assessment of archaeological sites cannot be made in advance of construction; and

WHEREAS, the levees of the Sacramento and American Rivers are the one known potential Historic Property within the APE that will be affected by the Project; and

WHEREAS, the Corps is aware that there is a high probability for buried cultural resources that may not be identified prior to construction and that also may be eligible for inclusion in the NRHP, and therefore this Agreement documents a framework for managing post-review discoveries per 36 C.F.R. § 800.13; and

WHEREAS, the Corps, with the concurrence of SHPO, has decided to comply with Section 106 of the NHPA for the Undertaking through the execution and implementation of this Programmatic Agreement (Agreement) 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 Project at this time; and

WHEREAS, in accordance with 36 C.F.R. §§ 800.2(c)(2)(ii)(A), 800.3(f)(2), and 800.14(b)(2)(i), the Corps has contacted federal and state recognized Native American Tribes, via letter(s), phone call(s), and meetings, to invite them to consult on the Project and this Agreement, including the Buena Vista Rancheria of the Me-Wuk Indians of California, the Cachil DeHe Band of Wintun Indians of the Colusa Indian Community of the Colusa Rancheria, the Colfax-Todds Valley Consolidated Tribe, the Cortina Wintun Environmental Protection Agency, the El Dorado Miwok Tribe, the Enterprise Rancheria of

Maidu Indians of California, the Ione Band of Miwok Indians of California, the Mechoopda Indian Tribe of Chico Rancheria, the Mooretown Rancheria of Maidu Indians, the Nashville-El Dorado Miwok, the Shingle Springs Band of Miwok Indians, the Strawberry Valley Rancheria, the T'si-Akim Maidu, the United Auburn Indian Community of the Auburn Rancheria, the Wilton Rancheria, the Yocha Dehe Wintun Nation, and interested Native American individuals; the Corps has invited them (and others who may be identified in the future as appropriate Concurring Parties) to participate as Concurring Parties to this Agreement; and the Corps will continue consultation throughout the duration of this agreement; and

WHEREAS, the Corps shall make the terms and conditions of this Agreement part of the conditions of any contracts issued by the Corps for this Project; and

WHEREAS, the definitions set forth in 36 C.F.R. § 800.16 are incorporated herein by reference and apply throughout this Agreement; and

WHEREAS, the definitions for Signatory Parties set forth in 36 C.F.R. § 800.6(c)(1), and the definitions for Concurring Parties set forth in 36 C.F.R. § 800.6(c)(3), are incorporated herein by reference and apply throughout this Agreement; and

WHEREAS, in accordance with 36 C.F.R. § 800.14(b)(3), the Corps notified and invited the Advisory Council on Historic Preservation (ACHP) per 36 C.F.R. § 800.6(a)(1)(C) to participate in consultation to resolve potential adverse effects of the Project, including development of this Agreement, and the ACHP has declined to participate pursuant to 36 C.F.R. § 800.6(a)(1)(iii) in a letter dated August 7, 2012; and

WHEREAS, in accordance with 36 C.F.R. § 800.6(a)(4) and 36 C.F.R. § 800.14(b)(2)(ii), the Corps has notified the public of the Project and provided an opportunity for members of the public to comment on the Project and the Section 106 process as outlined in this Agreement; and

NOW, THEREFORE, the signatories agree that the Undertaking shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on Historic Properties and to satisfy the Corps' Section 106 responsibilities for all individual aspects of the undertaking.

The Corps shall ensure that the following measures are carried out:

STIPULATIONS

I. TIME FRAMES AND REVIEW PROCEDURES

For all documents and deliverables produced in accordance with the stipulations of this Agreement, the Corps shall provide a draft document to the SHPO, Concurring Parties, and Native American interested parties and Tribes for review. Any written comments provided by the SHPO, Concurring Parties, and Native American interested parties and Tribes, within thirty (30) calendar days from the date of receipt, shall be considered in the revision of the document or deliverable. The Corps shall document and report the written comments received for the document or deliverable and how comments were addressed. The Corps shall provide a revised final document or deliverable to the SHPO for concurrence. The SHPO shall have thirty (30) calendar days to respond. Failure of the SHPO, Concurring Parties, and Native American interested parties and Tribes to respond within thirty (30) calendar days of any submittal shall not preclude Corps from moving to the next step in this Agreement.

Should the SHPO object to the final document or deliverable submitted for concurrence, the Corps and SHPO shall consult for a period not to exceed fifteen (15) calendar days following the receipt of the SHPO's written objection in an effort to come to agreement on the issues to which the SHPO has objected. Should the SHPO and the Corps be unable to agree on the issues to which the SHPO has objected, the SHPO and the Corps shall proceed in accordance with **Stipulation XV (Dispute Resolution)**, below. The timeframe to consult to resolve a disagreement or objection may be extended by mutual consent of the Corps and the SHPO.

II. AREA OF POTENTIAL EFFECTS

The APE for Project activities shall include the construction footprint of the activity and a reasonable buffer determined through consultation between SHPO and the Corps, and shall take into account the likelihood of direct and indirect effects to Historic Properties resulting from the Project. **Attachment 1** includes an overall APE map for the Project. Because the Project will occur in phases, it may be necessary to further define the APE for each phase as phases are authorized and funded for design and construction. Prior to activities under **Stipulation IV (Identification and Evaluation)**, the Corps shall submit to the SHPO, Concurring Parties, and Native American interested parties and Tribes a map of the APE for the current phase and a description of the Project activities occurring for that phase, in accordance with **Stipulation I (Timeframes and Review Procedures)**. Revisions to the APE will not necessitate modifications to this Agreement.

A. For purposes of this Agreement, the APE for each phase shall be defined to meet, at a minimum, the following criteria:

The APE for any segment of the levees that are being improved as part of the phase of the Project shall include the levee segment and a corridor extending not less than 150 meters from the landside toe of the levee segment.

B. The APE also shall include:

(1) The extent of all Project construction and excavation activity required to construct flood control facilities and to modify irrigation and drainage infrastructure; and

(2) The additional right-of-way/easements obtained by the Corps as part of the Project's features; and

(3) All areas used for excavation of borrow material and habitat creation; and

(4) All construction staging areas, access routes, spoil areas, and stockpiling areas.

C. After the APE has been defined and consulted on in accordance with **Stipulation II (Area of Potential Effects)** above, construction or other Project activities may require revisions to the APE. If the APE is revised, the Corps shall consult on that revision in accordance with **Stipulation I (Timeframes and Review Procedures)**, and the Corps shall determine the potential for Project activities in a revised APE to affect potential Historic Properties, in accordance with **Stipulation IV (Identification and Evaluation)**.

III. HISTORIC PROPERTIES MANAGEMENT PLAN

The Corps, in consultation with the SHPO, Concurring Parties, and Native American interested parties and Tribes, shall develop a Historic Property Management Plan (HPMP), which provides the framework by which remaining identification, evaluation of eligibility, findings of effect, and resolution of adverse effect efforts to Historic Properties will occur. The HPMP shall include consideration of property types, treatment of property types, expected methodology for identification and evaluation of potential historic properties, potential templates for work plans, provisions for avoidance or protection of historic properties, and consideration for identification and treatment of human remains. The HPMP shall be appended to this Agreement (**Attachment 3)** and will form the basis for any Historic Property Treatment Plans (HPTPs) that may be required for one or more phases of the Project. The HPMP shall be developed after execution of the Agreement, but before construction commences. For the overall Project and individual phases, the HPMP shall be the means for the Corps to comply with 36 C.F.R. § 800.6 and provide standardized methods for dealing with unanticipated discoveries in accordance with 36 C.F.R. § 800.13(a).

The HPMP may be amended and appended to this Agreement without amending the Agreement.

A. Review: The Corps shall submit the Draft HPMP to the SHPO, Concurring Parties, and Native American interested parties and Tribes for review and comment pursuant to **Stipulation I (Timeframes and Review Procedures)**.

B. Historic Property Treatment Plans: The Corps shall consult the SHPO, pursuant to 36 C.F.R. § 800.5, when the Corps has determined that a Project activity will result in adverse effects to a Historic Property. An HPTP specific to the phase of the Project or the Historic Property will be drafted to describe how the Corps intends to resolve adverse effects and that HPTP may be appended to the HPMP. HPTPs shall be consistent with the HPMP and may incorporate by reference historic contexts, methods, procedures, and research designs, as appropriate. When incorporating portions of the HPMP by reference, the HPTP shall at a minimum include the date of the HPMP and where the HPMP is available to be viewed.

(1) An HPTP may address individual or multiple Historic Properties or Historic Property types. An HPTP shall stipulate those actions the Corps shall take to resolve the adverse effects of the Project on Historic Properties within the project phase or specific action specified by the HPTP. For properties eligible under criteria specified in 36 C.F.R. § 60.4 (A) through (D), mitigation other than data recovery may be considered in the treatment plan (e.g., HABS/HAER, oral history, historic markers, exhibits, interpretive brochures or publications, or other means as deemed appropriate by the signatories). In addition to the SHPO, Concurring Parties, and Native American interested parties and Tribes the Corps may invite the interested public, in accordance with **Stipulation XIII (Public Consultation and Public Notice)**, to comment on the means of mitigation, as appropriate. HPTPs shall include specifications (including content and number of copies) for publication of brochures, pamphlets or synthesis reports for distribution to the general public. The Corps shall ensure that all provisions of an HPTP are carried out as stipulated in the HPTP.

(2) Historic Context, Recordation, and Treatment of Levees: The Sacramento and American River levees are a known potential Historic Property within the APE that may be affected by the Project. Sections of the levees have been recorded and evaluated for their individual eligibility for listing in the NRHP but no overall historic context or evaluation of the levee system has been developed. Because the specific project design that may alter the levees will not be developed until after the Project has been approved for design, a determination of effect and, if necessary, an HPTP, cannot be developed until after approval and execution of this Agreement. In order to document the levees for evaluation, the Corps will

develop a historic context and HPTP for recordation of the Sacramento and American River levees as historic structures within the APE in order to evaluate the effects of the Project on the levees. If a historic context and/or HPTP for the levees within the APE has already been developed, the Corps may incorporate it as deemed appropriate by the Corps. The HPTP shall consider the levees in the context of the entire Sacramento and American River levee systems. Additionally, the HPTP shall require the development of clear and specific criteria for determining: (1) recordation guidelines for the levees within the APE, (2) contributing and non-contributing elements of the levee system, (3) thresholds of adverse effect, and (4) treatment of adverse effects. The HPTP shall be developed after execution of the Agreement and before construction commences. The Corps shall submit the HPTP for review, in accordance with **Stipulation I (Timeframes and Review Procedures)**.

(3) HPTPs will be submitted and reviewed in accordance with **Stipulation I (Timeframes and Review Procedures)**, except for those HPTPs developed for Historic Properties discovered during construction activities, which shall follow the review timeframes identified in **Stipulation IX (Discovery of Unknown Historic Properties)**. Circulation of an HPTP shall not include a recirculation of the HPMP.

D. Reporting: Reports and other data pertaining to the inventory of Historic Properties and the treatment of effects to Historic Properties will be distributed to Concurring Parties to this Agreement, Native American Tribes, and other members of the public, consistent with **Stipulation XIV (Confidentiality)** of this Agreement, unless parties have indicated through consultation that they do not want to receive a report or data.

E. Amendments/Addendums/Revisions: If an Historic Property type that is not coveredby an existing HPTP is discovered within the APE subsequent to an initial inventory effort for a phase, or if there are previously unexpected effects to an Historic Property, and the Corps and SHPO agree that the Project may adversely affect the Historic Property, the Corps shall submit an addendum to the HPTP or a new HPTP to the SHPO and Concurring Parties for review and comment, and shall follow the provisions of **Stipulation IX (Discovery of Unknown Historic Properties)**. The HPTP may cover multiple discoveries for the same property type.

F. Data Recovery: When data recovery is proposed, the Corps, in consultation with the SHPO, shall ensure that HPTPs are developed consistent with the *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* and the ACHP's "Recommended Approach for Consultation on Recovery of Significant Information from Archaeological Sites" (ACHP, May 18, 1999).

G. Final Phase Report Documenting Implementation of the Historic Properties Treatment Plan(s): Within one year after the completion of all work for each phase of the Project, the Corps shall submit to the SHPO, Signatory Parties, Concurring Parties, and Native American interested parties and Tribes, a Final Phase Report documenting the results of all work prepared for that phase under the HPTPs, and the information learned from each of the Historic Properties. The submittal of the Final Phase Report shall be in accordance with **Stipulation I (Timeframes and Review Procedures)**.

IV. IDENTIFICATION AND EVALUATION

Should the HPMP not be finalized at the time that a phase of the Project may be proceeding to design and construction, the Corps shall consult with the Signatory Parties before issuing a notice to proceed on any phase of the Project. Should the Signatory Parties agree that the work may proceed, the Corps shall comply with **Stipulation IV A., B., and C. (Identification and Evaluation)** and, as necessary, **Stipulation VI (Determination of Effects)**. The Corps shall complete any identification and evaluation, and as necessary, any evaluation of effects to Historic Properties prior to proceeding with construction. If the Signatory Parties do not agree to proceed with the phase of the Project the Corps shall follow **Stipulation XV (Dispute Resolution)**.

A. Identification of Potential Historic Properties: An inventory of Historic Properties within the APE, consistent with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716–44740) will be initiated for the Project, or for individual phases of the Project, as construction details become available.

Survey recordation shall include features, isolates, and re-recordation of previously recorded sites, as necessary. The survey shall ensure that potential Historic Properties such as historical structures and buildings, historical engineering features, landscapes, viewsheds, and traditional cultural properties (TCPs) with significance to Native American communities, are recorded in addition to archeological sites. Recordation of historic structures, buildings, objects, and sites shall be prepared using the California Department of Parks and Recreation (DPR) 523 Site Record forms.

B. Property Types Exempt from Evaluation: Attachment 4 to this Agreement lists the property types that the Signatories agree shall be exempt from evaluation as determined by the Corps in consultation with the SHPO. The Corps shall evaluate all other identified properties in accordance with **Stipulation IV.C (Evaluation of Potential Historic Properties)**.

C. Evaluation of Potential Historic Properties: After recordation on DPR 523 Site Record forms, potential Historic Properties shall be evaluated by a qualified professional for their eligibility for listing in the NRHP consistent with

the *Secretary of Interior's Standards for Evaluation*, 36 C.F.R. § 60.4. In accordance with **Stipulation I (Timeframes and Review Procedures),** the Corps shall submit a completed inventory and evaluation for each phase of Project work.

V. GEOTECHNICAL INVESTIGATIONS

For the purposes of gathering engineering data and for project planning, it may be necessary for the Corps to conduct limited geotechnical investigations at areas within the APE.

A. The Corps may conduct geotechnical investigations (e.g., borings, potholing, or trenches) for planning and exploratory efforts. The Corps shall follow Stipulation V.A(1) and (2), or may follow Stipulation V.A(3) if unable to follow Stipulation V.A(1) and (2):

(1) A records and literature search and consultation with Native Americans has been conducted and it has been determined there are no known existing potential Historic Properties located within 50 feet of the areas identified for geotechnical investigations, and an archeological field survey of the areas identified for geotechnical investigations has been conducted and it has been determined there are no known potential Historic Properties present;

(2) A potential Historic Property is identified during the records and literature search or field survey and consultation process as being within an area where geotechnical investigation will occur, and the geotechnical investigation is relocated at least 50 feet outside the site boundaries; or

(3) Provisions for an archeological monitor meeting the qualifications described in **Stipulation VII.C. (Archeological Monitor Standards)** are included in the contract specifications for the geotechnical investigations. As appropriate, or when geotechnical activities may occur in sensitive areas, an archeological monitor will be present for all ground disturbing activities.

B. If potential Historic Properties are discovered during geotechnical investigations, **Stipulation IX (Discovery of Unknown Historic Properties)** shall be followed;

C. A Memorandum for Record shall be written documenting the results of the records and literature search, the archeological field survey, any decisions to relocate geotechnical investigation areas, the determination for inclusion of an archeological monitor for ground disturbing activities, and a record of communication with Native American interested parties and Tribes, as appropriate.

VI. DETERMINATION OF EFFECTS

Avoidance of adverse effects to Historic Properties is the preferred treatment approach. The Corps will consider redesign of Project elements in order to avoid Historic Properties and Project effects that may be adverse. However, it may not be possible to redesign the Project in order to avoid adverse effects to Historic Properties.

The Corps will apply the criteria of adverse effect, pursuant to 36 C.F.R. § 800.5(a)(1), to all Historic Properties within the APE that will be affected by the Project. The Corps shall submit determinations of effects in accordance with **Stipulation I (Timeframes and Review Procedures)**.

If effects to Historic Properties are determined to be adverse, **Stipulation III (Historic Properties Management Plan)**, above, will be followed.

VII. QUALIFICATIONS

A. Professional Qualifications: All technical work required for historic preservation activities implemented pursuant to this Agreement shall be carried out by or under the direct supervision of a person or persons meeting, at a minimum, the *Secretary of Interior's Professional Qualifications Standards* for archeology or history, as appropriate (48 FR 44739). "Technical work" here means all efforts to inventory, evaluate, and perform subsequent treatment such as data recovery excavation or recordation of potential Historic Properties that is required under this Agreement. This stipulation shall not be construed to limit peer review, guidance, or editing of documents by SHPO and associated Project consultants.

B. Historic Preservation Standards: Historic preservation activities carried out pursuant to this Agreement shall meet the *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44740), as well as standards and guidelines for historic preservation activities established by the SHPO. The Corps shall ensure that all reports prepared pursuant to this Agreement will be provided to the Signatories, Concurring Parties, and Native American interested parties and Tribes and are distributed in accordance with **Stipulation XIV (Confidentiality),** and meet published standards of the California Office of Historic Preservation, specifically, *Preservation Planning Bulletin* Number 4(a), "Archaeological Resources Management Reports (ARMR): Recommended Contents and Format" (December 1989).

C. Archeological Monitor Standards: Archeological monitoring activities required for exploratory, construction, or construction related ground disturbing activities implemented pursuant to this Agreement shall be carried

out by a person meeting, at a minimum, the *Secretary of Interior's Professional Qualifications Standards* for prehistoric or historic archaeology, as appropriate (48 FR 44739). "Archeological monitoring" here includes monitoring ground disturbing activities that have been determined by the Corps to be occurring in areas potentially sensitive for Historic Properties or buried resources.

VIII. NOTICES TO PROCEED WITH CONSTRUCTION

Notices to Proceed may be issued by the Corps for individual construction segments, defined by the Corps in its construction specifications, after a Historic Properties inventory has been completed [per **Stipulation III (Historic Properties Management Plan)** or **Stipulation IV (Identification and Evaluation)**], and prior to treatment of adverse effects on Historic Properties within the APE provided that:

A. A plan to respond to inadvertent archeological discoveries is prepared by the Corps, and approved by SHPO, prior to the commencement of Project activities anywhere in the APE for that phase of the Project; and

B. Project development activities do not encroach within 30 meters (100 feet) of the known boundaries of any Historic Property as determined from archeological site record forms, other documentation, or as otherwise defined in consultation with the SHPO and other parties, as appropriate; and

C. An archeological monitor meeting the professional qualifications as described in **Stipulation VII (Qualifications)**, is present during any Project activities that are anticipated to extend either vertically or horizontally into any areas designated to be archeologically sensitive by the Corps, in consultation with SHPO, except in phases of construction for slurry walls where visual inspection of the construction area cannot be safely or feasibly accomplished.

IX. DISCOVERY OF UNKNOWN HISTORIC PROPERTIES

The Corps is responsible for complying with 36 C.F.R. § 800.13(a) in the event of inadvertent discoveries of Historic Properties during implementation of the Project. The HPMP will provide procedures for complying with post review and inadvertent discoveries of Historic Properties. If the Corps authorizes work before the HPMP is finalized and there is a discovery of an unknown Historic Property, the Corps shall follow 36 C.F.R. § 800.13(b). Additionally, the following procedures shall be followed:

A. Workforce Training: During implementation of Project activities, the Corps, or archeologists meeting the professional qualifications as described in **Stipulation VII (Qualifications)**, will provide training to all construction

personnel, before they begin work, regarding proper procedures and conduct in the event that archeological materials are encountered during construction.

B. Human Remains: Treatment of human remains is governed by **Stipulation XII (Tribal Consultation and Treatment of Human Remains)**.

X. CURATION

To the extent that curation is determined to be appropriate mitigation to resolve adverse effects to Historic Properties, curation shall be conducted in accordance with 36 C.F.R. § 79, except those materials identified as Native American human remains and items associated with Native American burials. Archeological items and materials from State or privately owned lands shall be maintained in accordance with 36 C.F.R. § 79 until any specified analyses are complete. Although the Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. § 3001 et seq.) does not apply to this Project, as there is no federally owned or administered property within the APE and the Corps will not be curating cultural materials subject to NAGPRA, this Agreement incorporates by reference the definitions for "human remains" and "funerary objects" set forth in 43 C.F.R § 10.2(d) and those definitions shall apply to actions under this Agreement. Further treatment of human remains is addressed in **Stipulation XII (Tribal Consultation and Treatment of Human Remains)**.

XI. TRIBAL INVOLVEMENT

A. In consultation with Native American interested parties and Tribes, the Corps will make a reasonable and good-faith effort to identify Historic Properties of traditional religious and cultural importance. The Corps shall ensure that consultation with Native American Tribes is initiated early with respect to the Project and continues throughout the Section 106 process.

B. In accordance with the guidance provided in National Register Bulletin 38 and Preservation Brief 36, the Corps will seek comments from all potentially interested Native American interested parties and Tribes in making determinations of NRHP eligibility for any Traditional Cultural Properties (TCPs) and Cultural Landscapes (as defined in Bulletin 38 and Preservation Brief 36). Review of documentation shall be consistent with **Stipulation I (Timeframes and Review Procedures)**.

C. Pursuant to 36 C.F.R. § 800.6(c)(2)-(3), the Corps shall consider requests by Native American Tribes to become Concurring Parties to this Agreement. In accordance with **Stipulation XIV (Confidentiality)**, Concurring Parties to this Agreement will receive documents produced under this Agreement, as appropriate.

D. Native American Tribes may choose not to sign this Agreement as a Concurring Party. Native American Tribes and individuals not acting as Concurring Parties to the Agreement will be contacted when the Corps identifies potential interest in a specific phase or action of the project. The Corps will make a good faith effort to identify any Native American organizations and individuals with interest in the proposed treatment of Historic Properties. The identification effort may include contacting the Native American Heritage Commission (NAHC), using online databases, and using personal and professional knowledge. The Corps will then contact each identified organization and individual by mail, inviting them to consult about the specific treatment of Historic Properties. If interest from the contacted parties is received by the Corps, the Corps will proceed to consult in accordance with **Stipulation XI.A. (Tribal Involvement)**. Further consultation may also be carried out through either letters of notification, public meetings, environmental assessments/environmental impact statements, site visits, and/or other method requested by a Native American interested party and Tribe. Failure of any contacted group to comment within thirty (30) calendar days shall not preclude the Corps from proceeding with the Project.

E. The Corps shall make a reasonable and good-faith effort to ensure that Native American Tribes, acting as either Concurring Parties or those expressing interest in the project, will be invited to participate in the development and implementation of the terms of this Agreement, including, but not limited to, the identification of the APE, identification of potential Historic Properties, determinations of eligibility, findings of effect, and the resolution of adverse effect for those Historic Properties. Review periods shall be consistent with **Stipulation I (Timeframes and Review Procedures)** except in situations involving unanticipated discoveries and treatment, which shall follow the review schedules of **Stipulation IX (Discovery of Unknown Historic Properties)**. The Corps shall ensure that all interested Native American reviewers shall receive copies of all final survey and evaluation reports.

XII. TRIBAL CONSULTATION AND TREATMENT OF HUMAN REMAINS

There is no federally owned property within the designated APE, therefore NAGPRA would not apply. The CVFPB and landowner shall ensure that Native American human remains and grave goods encountered during the Undertaking that are located on state or private land are treated in accordance with the requirements in California State Health and Safety Code, Section 7050.5 and Public Resources Code 5097.98. If Native American human remains are encountered within the context of a National Register eligible archaeological site, a clear means of identifying those remains and grave goods will be described in the HPMP. Any procedures described in the HPTP regarding the handling or treatment of human remains will be coordinated with the landowner to ensure

that they are consistent with Public Resources Code 5097.98. In the event that any Native American human remains or associated funerary items are identified, the Most Likely Descendant (MLD), as identified by the Native American Heritage Commission, shall be invited to advise the CVFPB and landowner in the treatment of any Native American human remains and items associated with Native American burials.

XIII. PUBLIC CONSULTATION AND PUBLIC NOTICE

A. Pursuant to 36 C.F.R. § 800.6(c)(2)-(3), the Corps will consider requests by interested parties to become Concurring Parties to this Agreement. Within thirty (30) calendar days of the effective date of this Agreement, the Corps shall consult with the SHPO to compile a list of members of the interested public who shall be provided notice of this Agreement.

B. The interested public will be invited to provide input on the identification, evaluation, and proposed treatment of Historic Properties. This may be carried out through either letters of notification, public meetings, environmental assessment/environmental impact statements, and/or site visits. The Corps shall ensure that any comments received from members of the public are taken under consideration and incorporated where appropriate. Review periods shall be consistent with **Stipulation I (Timeframes and Review Procedures)**. In seeking input from the interested public, locations of Historic Properties will be handled in accordance with **Stipulation XIV (Confidentiality)**. In cases where the release of location information may cause harm to the Historic Property, this information will be withheld from the public in accordance with Section 304 of the NHPA (54 U.S.C. § 307103).

XIV. CONFIDENTIALITY

Confidentiality regarding the nature and location of the archaeological sites and any other cultural resources discussed in this Agreement shall be limited to appropriate Corps personnel, Corps contractors, Native American tribes, the SHPO, and those parties involved in planning, reviewing and implementing this Agreement in accordance with Section 304 of the NHPA (54 U.S.C. § 307103).

XV. DISPUTE RESOLUTION

A. Should any Signatory Party to this Agreement object in writing to any action proposed or carried out pursuant to this Agreement, the Corps will immediately notify the SHPO and the Concurring Parties of the objection and proceed to consult with the objecting party for a period of time, not to exceed thirty (30) calendar days, to resolve the objection. If the objection is resolved through consultation, the Corps may authorize the disputed action to proceed in accordance with the terms of such resolution. If the Corps determines that the objection cannot be resolved, the Corps shall forward all documentation

relevant to the dispute to the ACHP. Within forty-five (45) calendar days after receipt of all pertinent documentation, the ACHP shall either:

(1) Advise the Corps that the ACHP concurs in the Corps' proposed response to the objection, whereupon the Corps will respond to the objection accordingly; or

(2) Provide the Corps with recommendations, which the Corps shall consider in reaching a final decision regarding the objection; or

(3) Notify the Corps that the ACHP will comment in accordance with the requirements of Section 106 of the NHPA, and proceed to comment. Any ACHP comment provided in response shall be considered by the Corps, pursuant to the requirements of Section 106 of the NHPA.

B. Should the ACHP not exercise one of the options under **Stipulation XV.A. (Dispute Resolution)** within forty-five (45) calendar days after receipt of all submitted pertinent documentation, the Corps' responsibilities under Section 106 of the NHPA are fulfilled upon implementation of the proposed response to the objection.

C. The Corps shall consider any ACHP recommendation or comment and any comments from the SHPO to this Agreement provided in accordance with this stipulation with reference only to the subject of the objection; the Corps' responsibility to carry out all actions under this Agreement that are not the subjects of the objection shall remain unchanged.

D. The Corps shall provide the SHPO with a written copy of its final decision regarding any objection addressed pursuant to **Stipulation XV.A. (Dispute Resolution)**.

E. At any time during implementation of the measures stipulated in this Agreement should an objection pertaining to the Agreement be raised by a Concurring Party, Native American Tribe, or a member of the public, the Corps shall notify the Signatory and Concurring Parties and take the objection under consideration, consulting with the objecting party and, should the objecting party request, any of the Signatory and Concurring Parties to this Agreement, for no longer than fifteen (15) calendar days. The Corps shall consider the objection, and in reaching its decision, will consider all comments provided by the other parties. Within fifteen (15) calendar days following closure of the comment period, the Corps will render a decision regarding the objection and respond to the objecting party. The Corps will promptly notify the other parties of its decision in writing, including a copy of the response to the objecting party. The Corps' decision regarding resolution of the objection will be final. Following issuance of its final decision, the Corps may authorize the action that was the subject of the dispute to proceed

in accordance with the terms of that decision. The Corps' responsibility to carry out all other actions under this Agreement shall remain unchanged.

XVI. NOTICES

A. All notices, demands, requests, consents, approvals or communications from all parties to this Agreement to other parties to this Agreement shall be personally delivered, sent by United States Mail, or emailed, and all parties shall be considered in receipt of the materials five (5) calendar days after deposit in the United States mail, certified and postage prepaid, return receipt requested.

B. Signatory and Concurring Parties agree to accept facsimiles or copies of signed documents and agree to rely upon such facsimiles or copies as if they bore original signatures.

XVII. AMENDMENTS, NONCOMPLIANCE, AND TERMINATION

A. Amendment: Any Signatory Party to this Agreement may propose that the Agreement be amended, whereupon the Corps shall consult with the SHPO to consider such amendment. The Agreement may be amended only upon written concurrence of all Signatories.

All attachments to this Agreement, and other instruments prepared pursuant to this agreement including, but not limited to, the Project's description, initial cultural resource inventory report and maps of the APE, the HPMP, HPTPs, and monitoring and discovery plans, may be individually revised or updated through consultation consistent with **Stipulation I (Timeframes and Review Procedures)** and agreement in writing of the Signatories without requiring amendment of this Agreement, unless the Signatories through such consultation decide otherwise. In accordance with **Stipulation XI (Tribal Involvement)** and **Stipulation XIII (Public Consultation and Public Notice)**, the Concurring Parties, interested Native American Tribes, and interested members of the public, will receive amendments to the Project's description, initial cultural resource inventory report and maps of the APE, the HPMP, HPTPs, and monitoring and discovery plans, as appropriate, and copies of any amendment(s) to the Agreement.

B. Termination: Only the Signatories may terminate this Agreement. If this Agreement is not amended as provided for in **Stipulation XVII.A. (Amendment)**, or if any Signatory proposes termination of this Agreement for other reasons, the Signatory proposing termination shall notify the other Signatory in writing, explain the reasons for proposing termination, and consult with the other Signatory to seek alternatives to termination, within thirty (30) calendar days of the notification.

Should such consultation result in an agreement on an alternative to termination, the Signatories shall proceed in accordance with that agreement.

Should such consultation fail, the Signatory proposing termination may terminate this Agreement by promptly notifying the other Signatory and Concurring Parties in writing.

Beginning with the date of termination, the Corps shall ensure that until and unless a new agreement is executed for the actions covered by this Agreement, such undertakings shall be reviewed individually in accordance with 36 C.F.R. § 800.4-800.6.

C. **Duration:** This Agreement shall remain in effect for a period of ten (10) years after the date it takes effect and shall automatically expire and have no further force or effect at the end of this ten-year period unless it is terminated prior to that time. No later than ninety (90) calendar days prior to the expiration date of the Agreement, the Corps shall initiate consultation to determine if the Agreement should be allowed to expire automatically or whether it should be extended, with or without amendments, as the Signatories may determine. Unless the Signatories unanimously agree through such consultation on an alternative to automatic expiration of this Agreement, this Agreement shall automatically expire and have no further force or effect in accordance with the timetable stipulated herein.

XVIII. ANNUAL REPORTING

At the end of every calendar year following the execution of this Agreement, the Corps shall provide all parties to this Agreement a summary report detailing work carried out pursuant to its terms, if any. Such report shall describe progress made implementing the terms of the Agreement as well as include any scheduling changes proposed, any problems encountered, and any disputes and objections received in the Corps' efforts to carry out the terms of this Agreement. Any Signatory party may request to meet with the other Signatories to discuss implementation of this Agreement.

XIX. EFFECTIVE DATE

This Agreement shall take effect on the date that it has been fully executed by the Corps and the SHPO.

EXECUTION of this Agreement by the Corps and the SHPO, its transmittal to the ACHP, and subsequent implementation of its terms evidence that the Corps has afforded the ACHP an opportunity to comment on the undertaking and its effects on Historic Properties, that the Corps has taken into account the effects of the undertaking on Historic Properties, and that the Corps has satisfied its

responsibilities under Section 106 of the NHPA and applicable implementing regulations for all aspects of the undertaking.

SIGNATORIES TO THIS AGREEMENT:

U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT

BY: _____ DATE : 9 Sep 15

Michael J. Farrell, Colonel, U.S. Army Corps of Engineers, District Commander

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

BY: _____ DATE: 10 Sept 2015

Julianne Polanco, State Historic Preservation Officer

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

STATE OF CALIFORNIA CENTRAL VALLEY FLOOD PROTECTION BOARD

BY:_____DATE:_____
Leslie Gallagher, Executive Officer

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

BUENA VISTA RANCHERIA OF THE ME-WUK INDIANS OF CALIFORNIA

BY:_____DATE: _____
Rhonda L. Morningstar Pope, Chairwoman

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

CACHIL DEHE BAND OF WINTUN INDIANS OF THE COLUSA INDIAN COMMUNITY OF THE COLUSA RANCHERIA

BY:_____DATE: _____
Ambar Mohammed

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

COLFAX-TODDS VALLEY CONSOLIDATED TRIBE

BY:_____DATE: _____

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

CORTINA WINTUN ENVIRONMENTAL PROTECTION AGENCY

BY:_____DATE: _____
Charlie Wright, Chairperson

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

EL DORADO MIWOK TRIBE

BY:_____DATE: _____

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

BY:_____DATE: _____
Rose Enos

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

ENTERPRISE RANCHERIA OF MAIDU INDIANS OF CALIFORNIA

BY:_____DATE:_____
Glenda Nelson, Chairperson

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

FAIR OAKS HISTORICAL SOCIETY

BY:_____DATE: _____

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

BY:_____DATE: _____
Kesner Flores

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

GOLDEN GATE STATE MUSEUM

BY:_____DATE: _____

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

IONE BAND OF MIWOK INDIANS OF CALIFORNIA

BY:_____DATE: _____
Crystal Martinez, Chairperson

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

MECHOOPDA INDIAN TRIBE OF CHICO RANCHERIA

BY:_____DATE: _____
Dennis Ramirez, Chairperson

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

MOORETOWN RANCHERIA OF MAIDU INDIANS

BY:_____DATE:_____
Guy Taylor, Representative

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

NASHVILLE-EL DORADO MIWOK

BY:_____DATE: _____
Cosme Valdez, Interim Chief Executive Officer

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

SACRAMENTO COUNTY HISTORICAL SOCIETY

BY:_____DATE: _____

PROGRAMMATIC AGREEMENT
AMONG
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THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

SHINGLE SPRINGS BAND OF MIWOK INDIANS

BY:_____DATE: _____
Nicholas Fonseca, Chairperson

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

SOCIETY FOR CALIFORNIA ARCHAEOLOGY

BY:_____DATE: _____

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

STRAWBERRY VALLEY RANCHERIA

BY:_____DATE: _____
Cathy Bishop, Chairperson

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

SUTTER COUNTY HISTORICAL SOCIETY

BY:_____DATE: _____

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

T'SI-AKIM MAIDU

BY:_____DATE: _____
Don Ryberg, Chairman

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

UNITED AUBURN INDIAN COMMUNITY OF THE AUBURN RANCHERIA

BY:_____DATE: _____
Gene Whitehouse, Chairman

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

WEST SACRAMENTO HISTORICAL SOCIETY

BY:_____DATE: _____

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA

CONCURRING PARTIES:

WILTON RANCHERIA

BY:_____DATE: _____
Raymond Hitchcock, Chairperson

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

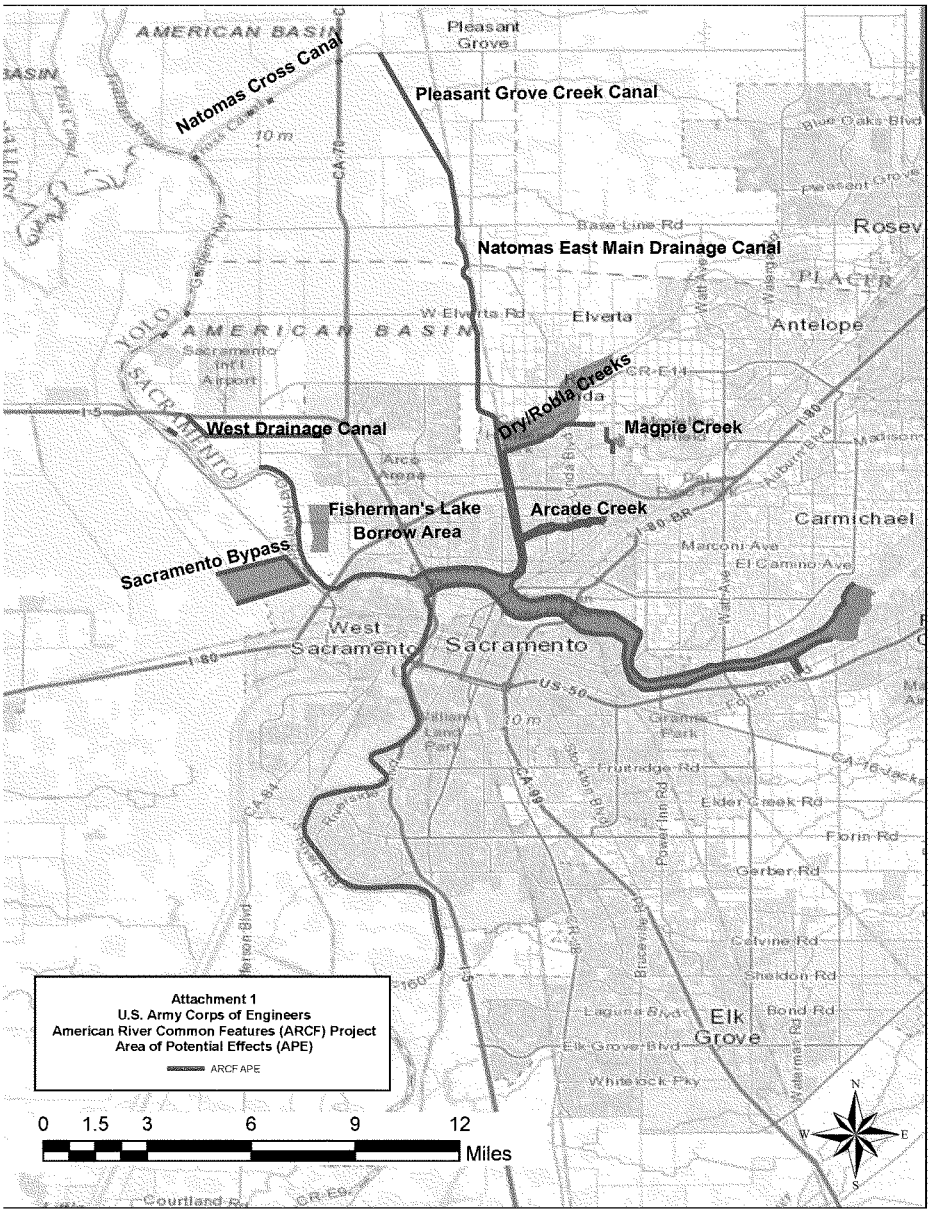
YOLO COUNTY HISTORICAL SOCIETY

BY:_____DATE: _____

**PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
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REGARDING THE AMERICAN RIVER COMMON FEATURES PROJECT,
SACRAMENTO, SACRAMENTO AND YOLO COUNTIES, CALIFORNIA**

CONCURRING PARTIES:

BY:_____DATE: _____
Randy Yonemura


Natomas Cross Canal
Pleasant Grove Creek Canal
Natomas East Main Drainage Canal
West Drainage Canal
Dry/Robla Creeks
Magpie Creek
Fisherman's Lake
Borrow Area
Arcade Creek
Sacramento Bypass
AMERICAN BASIN
YOLO
SACRAMENTO
PLACER
Pleasant Grove
Elverta
Antelope
Rosev
Carmichael
West Sacramento
Sacramento
Elk Grove
Attachment 1
U.S. Army Corps of Engineers
American River Common Features (ARCF) Project
Area of Potential Effects (APE)
ARCF APE
0 1.5 3 6 9 12
Miles

Attachment 2

American River Common Features Project
Project Description
November 2014

The American River Common Features (ARCF) Project is being developed to provide flood risk reduction to the city of Sacramento, including the Natomas Basin, areas along the North and South banks of the American River, and areas along the East bank of the Sacramento River below the American River. The non-Federal sponsor for the ARCF Project is the State of California Central Valley Flood Protection Board (CVFPB). The Sacramento Area Flood Control Agency (SAFCA) has a Local Cooperation Agreement with the CVFPB. Authorized Local Cooperation Agreements include requirements to: 1) Provide lands, easements, and rights-of-way; 2) Modify or relocate utilities, roads, bridges (except railroad bridges), and other facilities where necessary for the construction of the project; 3) Cost share the project per applicable laws; and 4) Bear all costs of operation, maintenance, repair, rehabilitation and replacement of flood control facilities.

Location

The Sacramento River Watershed covers approximately 26,000 square miles in central and northern California. Shasta Dam impounds the upper Sacramento River Watershed. 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 approximately 110,000 acres in their confluence. The flood plain includes most of the developed portions of the city of Sacramento and encompasses the boundaries of the study area. Figure 1 shows the ARCF study area.

Area of Potential Effects (APE)

While the overall ARCF Project study area covers a broad geographic area, the ARCF Project area of potential effects (APE) includes those areas where the project will have potential direct or indirect effects to the character or use of historic properties. 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; 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. The APE is shown in Figure 2.

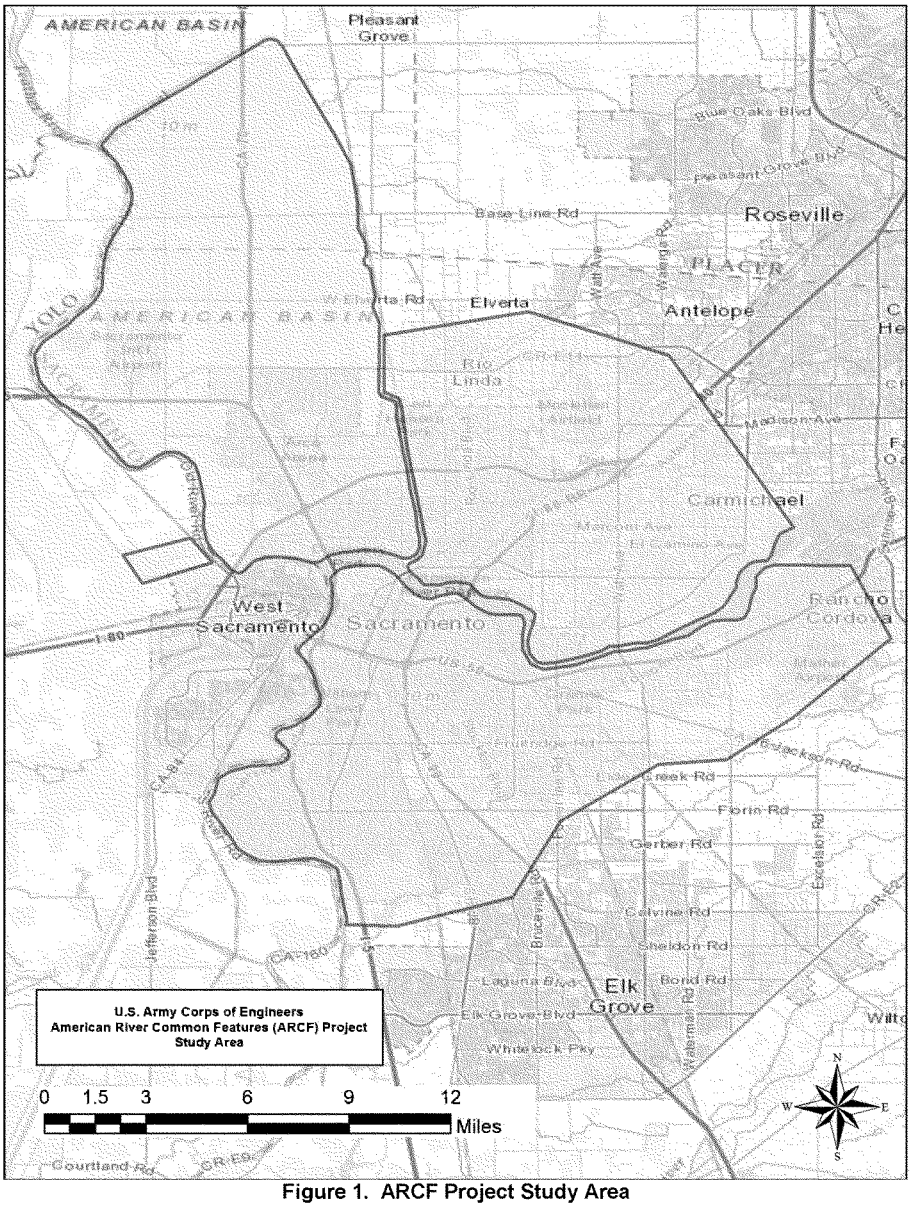


Figure 1. ARCF Project Study Area

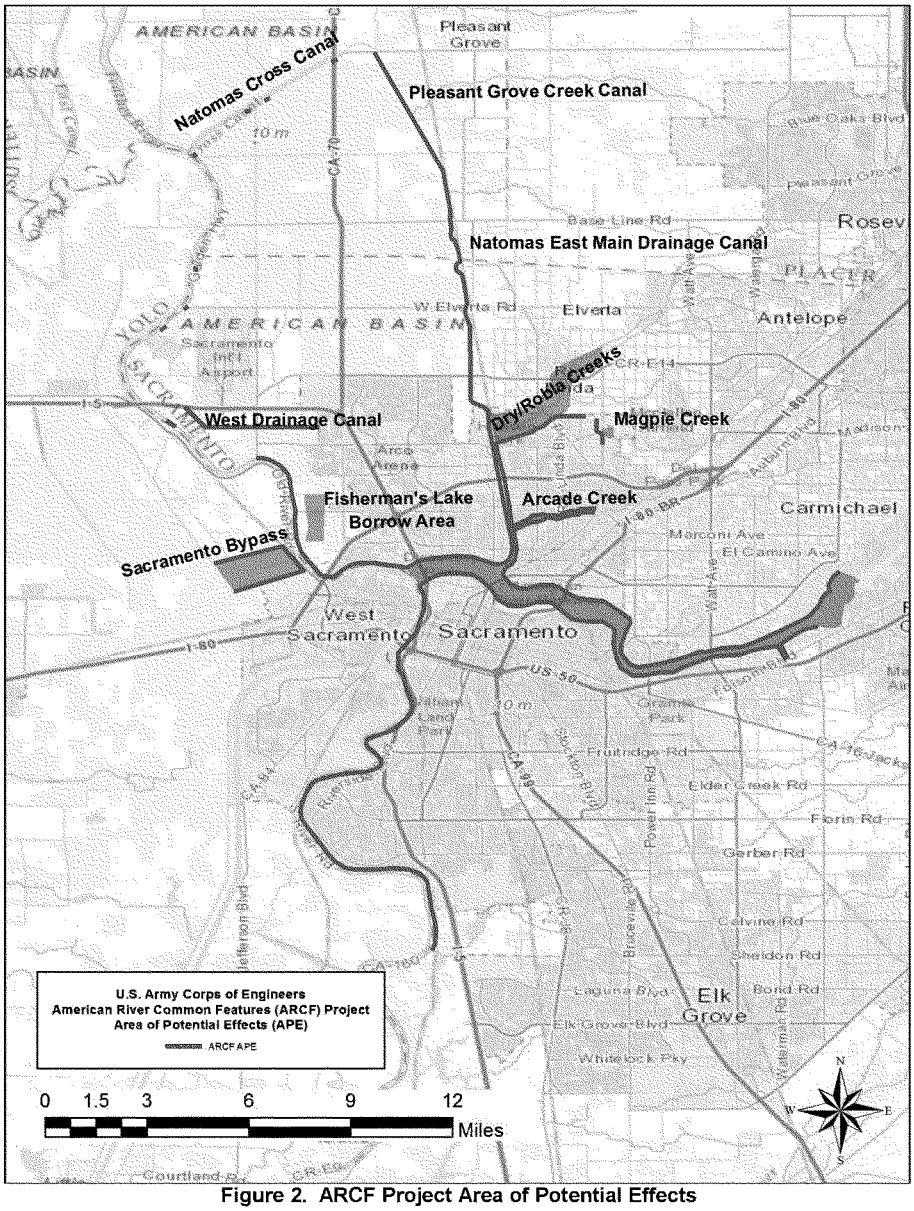


Figure 2. ARCF Project Area of Potential Effects

Project Authorization

The ARCF Project was authorized in the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. Significant changes to the project were approved via the Second Addendum to the Supplemental Information Report of March 2002. Additionally, the Energy and Water Development Appropriations Act of 2004 increased the authorized total cost of the project to $205,000,000. The current estimated cost of the authorized project is $277,563,000.

In the ARCF Project, authorized features are generally located in the Lower American River, Natomas Basin and Sacramento River. All Lower American River features authorized in WRDA 1996 and 1999 have been constructed or are scheduled for construction within the next three years. Construction of authorized Natomas features were deferred as a result of deep underseepage concerns raised after the 1997 flood event in the Sacramento Valley. In 1997, considerable deep underseepage occurred on the Sacramento River in areas that had previously undergone remediation after the 1986 flood event. The previous remediation consisted of shallow seepage cutoff walls and did not account for the deep underseepage problems revealed during the 1997 flood event. Significant seepage on the American River was also observed.

Because of the considerable cost increase of seepage remediation on the American River, all funds appropriated by Congress throughout the late 1990s and the early part of the 2000s were used for construction activities on the Lower American River instead of for design efforts in the Natomas Basin. Additionally, it was recognized that all work in the Natomas Basin would require significantly more features than was anticipated at the time of authorization. Additional levee improvements were also needed on the Sacramento River and the American River below Folsom Dam in order to truly capture the benefits of the Folsom Dam projects and the Common Features project already authorized and constructed. Therefore, the Corps decided that reevaluation studies would be required for the Natomas Basin and city of Sacramento portions of the ARCF Project. This reevaluation is now called the Common Features General Reevaluation Report (CFGRR).

Proposed Measures

In general, levees fail because of one of four reasons: seepage, slope stability, overtopping, and erosion. The CFGRR is looking at reducing the likelihood of having a levee failure in the city of Sacramento as a result of any of these reasons. Methods that were looked at to achieve this goal include, but are not limited to: seepage cutoff wall, seepage berm, levee slope flattening, relief wells, adjacent levee, stability berm, drained stability berm, levee raising, floodwall, bypass widening, riverbank erosion protection, and launchable rock erosion protection. These preliminary methods have been screened and refined to the following final array of measures. The ARCF Project is a single purpose flood risk management project with the measures shown in Table 1 below proposed for implementation. In addition to the measures listed in Table 1, the following measures would be implemented throughout the APE:

- Establish the Corps' standard levee footprint on all levees within the APE that are out of compliance, including a 10-foot-wide landside maintenance access easement.
- Bring utility encroachments, including pump stations, into compliance with Corps policy.
- Remove private encroachments.
- Relocate, as needed, irrigation canals within the Natomas Basin, to include the relocation of the West Drainage Canal south of the Airport Operations Area.
- Remediate the Highway 99/Natomas Cross Canal Bridge.

- Excavation of borrow materials at designated borrow sites, to include the South Fisherman's Lake Borrow Area and the West Lakeside School site in the Natomas Basin.

Table 1. Proposed Measures for the American River Common Features Project.

Waterway/Location	Extent of Action	Proposed Measure
American River	North and south levees from the confluence with the Sacramento River upstream for approximately 12 miles.	• Construct bank protection or launchable rock trenches
American River	North levee from the confluence with the Sacramento River upstream to approximately NEMDC.	• Flatten the levee slope • Install cutoff walls
Sacramento River	East levee from Power Line Road to the American River.	• Construct an adjacent levee with a flattened landside slope • Install cutoff walls • Construct seepage berms • Install relief wells • Construct levee raise • Establish compliance with Corps vegetation requirements for upper 2/3 slopes of the levee.
Sacramento River	East levee from the American River to Morrison Creek.	• Install cutoff walls • Construct bank protection • Construct levee raise • Establish compliance with Corps vegetation requirements for upper 2/3 slopes of the levee.
NEMDC	East levee from Dry/Robla Creek to the American River	• Install cutoff walls • Construct floodwalls • Establish compliance with Corps vegetation requirements.
NEMDC	West levee from Dry/Robla Creek to the American River	• Construct bank protection • Construct levee raise and flatten levee slope • Establish compliance with Corps vegetation requirements.
NEMDC	West levee from Sankey Road to Dry/Robla Creek	• Construct levee raise and flatten levee slope • Install cutoff walls • Establish compliance with Corps vegetation requirements.
Pleasant Grove Creek Canal	West levee	• Construct bank protection • Construct levee raise with a widened levee • Install cutoff walls • Upgrade or remove culverts

Waterway/Location	Extent of Action	Proposed Measure
		• Establish compliance with Corps vegetation requirements.
Arcade Creek	North and south levees from NEMDC to Marysville Boulevard	• Install cutoff walls • Raise floodwalls • Establish compliance with Corps vegetation requirements.
Dry/Robla Creek		• Raise floodwalls • Establish compliance with Corps vegetation requirements.
Magpie Creek Diversion Canal	Upstream of Raley Boulevard	• Construct floodwalls • Establish compliance with Corps vegetation requirements.
Magpie Creek area	South of Raley Boulevard	• Construct new levee
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
Sacramento Weir and Bypass	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

Construction Activities

While the Corps began its reevaluation studies, SAFCA began final design and construction on certain areas in Natomas. A local sponsor or entity may request permission under Section 408 to alter a Federal project and a Section 404 permit to comply with the Clean Water Act. Generally a local sponsor or entity will request Section 408 permission and will move forward with the funding, planning, and constructing of the Federal project with the intention of seeking later credit under Section 104 for their share of an authorized Federal project. In 2008, the SAFCA requested consideration for a Section 104 credit, permission under Section 408, and requested a Section 404 permit for the Natomas Levee Improvement Project (NLIP). The Natomas Basin portions of the ARCF Project have been divided into a number of construction phases (Figure 3).

Shortly after receiving Section 408 permission and Section 404 approval, SAFCA, in cooperation with the California Department of Water Resources (DWR) and the CVFPB, implemented urgently needed improvements to the Federal project levee system around the Natomas Basin. SAFCA has completed construction for all of Phases 1, 2A, and 3 and is finishing construction of Phase 4a. When complete, SAFCA will have completed levee improvement construction on 18 miles of the 42 miles surrounding the Natomas Basin. The Corps will be constructing the remaining 24 miles of levee improvement once authorization and appropriations are received.

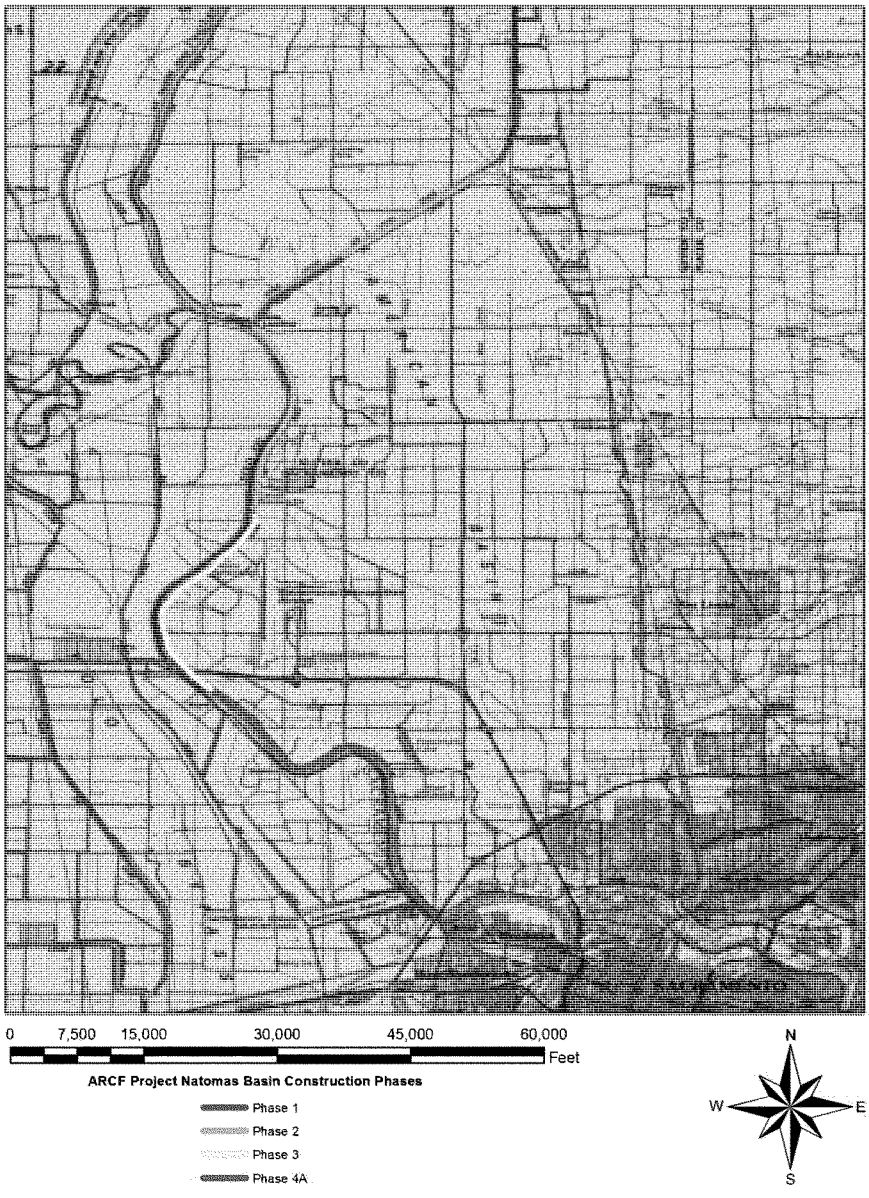


Figure 3. ARCF Project NLIP Construction Phases

Cultural Resources/NEPA Compliance

For NLIP Phases 1, 2, 3, and 4a, SAFCA, DWR and CVFPB were the lead decision makers on the planning, design, environmental and cultural resources compliance, and construction for NLIP. 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 the National Environmental Policy Act of 1969 (NEPA) and the National Historic Preservation Act of 1966, as amended (NHPA).

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertaking on historic properties and afford the Advisory Council on Historic Preservation 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 Environmental Impact Statement/Environmental Impact Report (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. The records and literature search identified 175 cultural resources and 285 surveys and inventories conducted within the ARCF study area.

Because of the 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 programmatic agreement (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 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/Impact Statement 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. And Phase 4a was covered in a EIS/EIR completed November 2009.

Because construction of Phases 1, 2, 3, and 4a does not address all of the flood risk concerns in the Natomas Basin, it does not provide complete flood protection 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. Therefore, as part of our reevaluation efforts (CFGRR), the Corps is implementing completion of the remaining phases in the Natomas Basin, as well as the other portions of the ARCF Project as the Federal lead on the project. The remaining Natomas construction was covered under NEPA/CEQA in

the NLIP Phase 4b EIS/EIR in October 2010. The Corps will also be preparing a NEPA/CEQA document for the CFGRR for those activities not covered in the previous NEPA/CEQA documents.

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, determinations 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, a new PA will need to be developed and executed for the remaining construction activities the Corps will undertake in the Natomas Basin as well as the other authorized project features for the rest of the ARCF Project.

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 Project.

Attachment 3

Historic Properties Management Plan

Historic Properties Management Plan (HPMP) shall include:

I. Introduction and Description of the Undertaking
   a. Overview and Executive Summary
   b. Purpose and Application of the HPMP
   c. Regulatory context
   d. Description of the Undertaking

II. General Standards and Procedures
   a. Professional Qualifications
   b. Documentation Standards
   c. Dissemination and Confidentiality of Information
   d. Permits and Rights of Entry
   e. Curation

III. Background Information
   a. Records and Literature Search
   b. Archaeological Sensitivity Assessment Procedure
   c. Correspondence with Knowledgeable Individuals and Groups
   d. American Indian Outreach

IV. Historic Context
   a. Prehistoric Resource Types
   b. Historic Resource Types
   c. Environmental Context
      i. Regional Surface Geology
      ii. Regional Geomorphology
      iii. Climate
      iv. Flora and Fauna
   d. Cultural Context
      i. Prehistoric Archaeology
      ii. Ethnographic Context
      iii. Historic Context

V. Identification of Historic Properties
   a. General Methods
   b. Evaluation
   c. Documentation

VI. American Indian Consultation Procedures
   a. American Indians and Organizations as Concurring Parties
   b. American Indians and Organizations as Non-Concurring Parties

VII. Assessment of Effects
   a. Criteria of Adverse Effect
   b. Finding of Effect

c. Consultation and Documentation of Effect Findings

VIII. Resolution of Adverse Effects
a. Consultation and Documentation
b. Avoidance
c. Treatment Options
d. Development of Historic Properties Treatment Plans
e. Inadvertent Discoveries

Attachment 4

Property Types Exempt from Evaluation

This attachment defines categories of properties that do not warrant evaluation pursuant to Stipulation IV.B of this Agreement. Only individuals meeting the Secretary of the Interior's Professional Qualification Standards pursuant to Stipulation VII.A of this agreement are authorized to determine whether properties meet the requirements of this attachment and are therefore exempt from evaluation and consultation with SHPO. Exempted properties may be documented, if documentation is warranted, at a level commensurate with the nature of the property (e.g., DPR 523 Primary Form, Location Map, memo). The Corps Cultural Resources staff shall make any final determinations on level of documentation required under this agreement.

Exempt Property Type 1: Archaeological Property Types and Features

1. Isolated prehistoric finds consisting of fewer than three items per 100 m^2
2. Isolated historic finds consisting of fewer than three artifacts per 100 m^2 (several fragments from a single glass bottle, and similar vessels are to be counted as one artifact)
3. Refuse scatters less than 50 years old (scatters containing no material that can be dated with certainty as older than 50 years old)
4. Features less than 50 years old (those known to be less than 50 years old through map research, inscribed dates, etc.)
5. Isolated refuse dumps and scatters over 50 years old that lack specific associations
6. Isolated mining prospect pits
7. Placer mining features with no associated structural remains or archaeological deposits
8. Foundations and mapped locations of buildings or structures more than 50 years old with few or no associated artifacts or ecofacts, and with no potential for subsurface archaeological deposits

Exempt Property Type 2: Minor, Ubiquitous, or Fragmentary Infrastructure Elements

The following list does not apply to properties 50 years old or older that could be potentially important, nor does it apply to properties that may contribute to the significance of larger historic properties such as districts or cultural landscapes.

Water Conveyance and Control Features

- Natural bodies of water providing a water source, conveyance, or drainage
- Modified natural waterways

- Concrete-lined canals less than 50 years old and fragments of abandoned canals
- Roadside drainage ditches and secondary agricultural ditches
- Small drainage tunnels
- Flood storage basins
- Reservoirs and artificial ponds
- Levees and weirs
- Gates, valves, pumps, and other flow control devices
- Pipelines and associated control devices
- Water supply and waste disposal systems
- Rip-rap

Recent Transportation or Pedestrian Facilities

- Railroad grades converted to other uses, such as roads, levees, or bike paths
- Bus shelters and benches
- Vista points and rest stops
- Bike paths, off-road vehicle trails, equestrian trails, and hiking trails
- Parking lots and driveways

Highway and Roadside Features

- Isolated segments of bypassed or abandoned roads
- Retaining walls
- Highway fencing, soundwalls, guard rails, and barriers
- Drains and culverts, excluding culverts assigned a Caltrans bridge number
- Cattle crossing guards
- Roadside landscaping and associated irrigation systems
- Signs and reflectors
- Telecommunications services, including towers, poles, dishes, antennas, boxes, lines, cables, transformers, and transmission facilities
- Utility services, including towers, poles, boxes, pipes, lines, cables, and transformers
- Oil and gas pipelines and associated control devices

Adjacent Features

- Fences, walls, gates, and gateposts

- Isolated rock walls and stone fences
- Telephone booths, call boxes, mailboxes, and newspaper receptacles
- Fire hydrants and alarms
- Markers, monuments, signs, and billboards
- Fragments of bypassed or demolished bridges
- Temporary roadside structures, such as seasonal vendors' stands
- Pastures, fields, crops, and orchards
- Corrals, animal pens, and dog runs
- Open space, including parks and recreational facilities
- Building and structure ruins and foundations less than 50 years old

Movable or Minor Objects

- Movable vehicles
- Stationary vehicles less than 50 years old or moved within the last 50 years
- Agricultural, industrial and commercial equipment and machinery
- Sculpture, statuary, and decorative elements less than 50 years old or moved within the last 50 years

American River Common Features GRR

EIS Cultural Resources Appendix

Enclosure 2

Section 106 Consultation Record

American River Common Features Project SHPO, ACHP, Sponsor Consultation Record*

*May not include all communication for project.

12/31/15

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
2/1/2012	Outgoing Letter	ACHP	Reid Nelson	Inform ACHP of proposed project, process to be followed, ask for participation in PA.
2/1/2012	Outgoing Letter	SHPO	Milford Donaldson	Request comments on APE, proposed efforts to identify historic properties, plan to develop PA.
4/11/2012	Outgoing Email	State of CA	Erin Brehmer, Mary Hadden	Transmittal of draft PA for sponsor review, request comments.
4/13/2012	Incoming Email	State of CA	Erin Brehmer	Acknowledgement of receipt of PA and will sent to CVFPP and DWR cultural staff.
5/22/2012	Outgoing Email	State of CA	Erin Brehmer	Request timeframe for CVFPP and DWR review of PA.
6/13/2012	Incoming Email	State of CA	Erin Brehmer	Transmittal that DWR had no comments on PA and CVFPP transmittal of comments.
6/20/2012	Outgoing Phone Call	CVFPP	James Herota	Discussed CVFPP comments on PA, explained that CEQA specific language would not be included.
6/20/2012	Outgoing Email	State of CA	Erin Brehmer	Responses to CVFPP PA comments.
6/21/2012	Incoming Email	CVFPP	James Herota	Receipt of additional Native American contacts from CVFPP.
7/16/2012	Outgoing Letter	SHPO	Milford Donaldson, Susan Stratton, Dwight Dutsche	Letter transmitting PA for review and comment, determination of the APE, potential adverse effects, resolution of adverse effects through a PA, suggest meeting.
7/16/2012	Outgoing Letter	ACHP	Reid Nelson	Letter transmitting PA for review and comment, request notification if ACHP plans to participate in the PA.
7/16/2012	Outgoing Email	SHPO	Susan Stratton, Dwight Dutsche	Email transmittal of 7/16/12 formal letter.
7/16/2012	Outgoing Email	ACHP	Tom McCulloch	Email transmittal of 7/16/12 formal letter.
7/27/2012	Incoming Email	ACHP	Tom McCulloch	Acknowledgement of receipt of 7/16/12 letter, ask if ACHP participation is needed, ask if comments on PA needed.
7/27/2012	Outgoing Email	ACHP	Tom McCulloch	Request any comments from the ACHP on PA, ACHP participation in PA probably not needed unless ACHP thinks so after reading submitted information.
8/7/2012	Incoming Letter	ACHP	Raymond Wallace	ACHP decline to participate in PA, request final signed and executed PA once completed.
8/7/2012	Outgoing Email	ACHP	Tom McCulloch	Request for any comments on PA, acknowledge letter from ACHP declining to participate.
8/14/2012	Outgoing Email	SHPO	Susan Stratton, Dwight Dutsche	Follow up to 7/16/12 formal letter and email requesting comments on PA, proposing a meeting, transmittal of ACHP declining to participate.
9/17/2012	Outgoing Email	SHPO	Susan Stratton, Dwight Dutsche	Follow up to 7/16/12 formal letter, follow up emails on 7/16/12 and 8/14/12 requesting comments on PA and date for when comments would be available.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
10/10/2012	Outgoing Email	SHPO	Susan Stratton, Dwight Dutsche	Email request for consultation meeting with SHPO to include PDT (Dan Tibbitts and Sara Schultz) to discuss project and PA.
10/23/2012	Consultation Meeting	SHPO	Susan Stratton, Dwight Dutsche, Dan Tibbitts, Melissa Montag	Consultation meeting to discuss project and PA, SHPO provided comments on the PA.
10/25/2012	Outgoing Email	SHPO	Susan Stratton, Dwight Dutsche	Email addressing comments from 10/23/12 meeting, transmittal of revised PA, request concurrence on PA acceptability, propose meeting in November.
10/29/2012	Outgoing Email	SHPO	Susan Stratton, Dwight Dutsche, Brendan Greenaway, Dan Tibbitts, Melissa Montag	Email request for follow up consultation meeting to 10/23/12 meeting and 10/25/12 email and changes/revisions to PA.
11/5/2012	Consultation Meeting	SHPO	Susan Stratton, Dwight Dutsche, Brendan Greenaway, Dan Tibbitts, Sara Schultz, Melissa Montag	Consultation meeting to discuss project and PA, SHPO requested a Historic Properties Management Plan be included in PA.
11/7/2012	Outgoing Email	SHPO	Susan Stratton, Dwight Dutsche, Brendan Greenaway, Dan Tibbitts, Sara Schultz	Transmittal of current draft of PA after incorporating comments from 11/5/12 meeting, communication of project schedule and long term phasing, requested comments on draft PA by 12/31/12.
1/14/2013	Outgoing Email	SHPO	Brendan Greenaway	Email transmittal of draft PA sent 11/7/12, request comments from SHPO.
1/14/2013	Incoming Email	SHPO	Brendan Greenaway	Acknowledgement of 1/14/13 transmittal, no comments from SHPO yet. Will review, suggested sending draft PA to concurring parties.
1/14/2013	Outgoing Email	SHPO	Brendan Greenaway	Acknowledgement of 1/14/13 email from SHPO.
1/30/2013	Outgoing Email	SHPO	Susan Stratton, Brendan Greenaway	Transmittal of draft HPMP for SHPO review and comment.
2/11/2013	Outgoing Email	DWR	Jacqueline Wait	Transmittal of draft PA to sponsor, provided project information, CVFPP comments from 2012, requested comments on draft PA.
2/11/2013	Outgoing Email	SAFCA	Peter Buck	Email to inquire who at SAFCA would review PA.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
2/12/2013	Incoming Email	SAFCA	Peter Buck	Acknowledgement of 2/11/12, request PA be sent to Mr. Buck.
2/12/2013	Outgoing Email	SAFCA	Peter Buck	Transmittal of draft PA for SAFCA review.
3/14/2013	Incoming Email	SHPO	Brendan Greenaway	Acknowledgement of draft HPMP sent 1/30/13, agreed document was acceptable.
3/19/2013	Incoming Email	SAFCA	Peter Buck	Email informing Corps that draft PA is still being reviewed by SAFCA counsel.
4/10/2013	Outgoing Email	DWR	Jacqueline Wait	Follow up email to 2/11/13 email transmitting electronic documents again and requesting comments on draft PA by 5/20/13.
4/11/2013	Incoming Email	SAFCA	Peter Buck	Transmittal of SAFCA comments on draft PA.
6/13/2013	Incoming Email	SHPO	Brendan Greenaway	Queried status of PA.
6/13/2013	Outgoing Email	SHPO	Brendan Greenaway	Informed SHPO that the PA is undergoing additional review by Native Americans, ACHP has declined to participate and Corps would appreciate any comments SHPO may have on draft PA. Told SHPO of general project schedule.
6/13/2013	Incoming Email	SHPO	Brendan Greenaway	Acknowledgment of 6/13/13 email.
9/19/2013	Outgoing Email	DWR	Erin Brehmer, Jacqueline Wait	Transmittal of EIS Cultural Resources section for State/Sponsor CEQA review.
9/19/2013	Outgoing Email	DWR	Jacqueline Wait	Transmittal of Archaeological Sensitivity Analysis for State/Sponsor review.
6/12/2014	Outgoing Email	DWR	Brehmer, David Martasian, Wait	Transmittal of updated EIS/EIR Cultural Resources appendix and current version of final draft of the PA.
6/13/2014	Outgoing Email	SHPO	Brendan Greenaway	Transmittal of final draft of PA for SHPO review, summarized consultation efforts with DWR, ACHP, and tribes so far.
6/13/2014	Incoming Email	SHPO	Brendan Greenaway	Acknowledgement of 6/13/14 email transmittal. Stated SHPO will review once current draft of PA has been circulated to tribes. Asked for the review period for tribes on the current draft.
6/13/2014	Outgoing Email	SHPO	Brendan Greenaway	Response to SHPO email above, stating current review of draft PA for tribes is 30 days and that the tribes received the draft PA for a 45 day review period in 2013.
6/13/2014	Incoming Email	SHPO	Brendan Greenaway	Restated SHPO will review following the current 30 day review period. Asked to provide any response to the 30 day review period once it has passed.
6/13/2014	Outgoing Letter	SHPO	Brendan Greenaway	Outgoing letter (hand delivered) to SHPO. Requests that the SHPO concur on the Corps' determination of the APE, plans to identify cultural resources through sensitivity assessment, and provide comments on the final draft of the PA.
6/13/2014	Outgoing Letters	DWR, ACHP	Jacqueline Wait, Reid Nelson	Copy furnished (with enclosures) 6/13/14 letter to SHPO for DWR and ACHP files.
6/16/2014	Outgoing Email	SHPO	Brendan Greenaway	Response to 6/13/14 email, mentioned the Corps would like to execute the PA this fall, offered to arrange for site visit or hold a meeting to provide additional information that could help with SHPO's review.
6/17/2014	Incoming Email	SHPO	Brendan Greenaway	Response to 6/16/14 email that a field trip might be a good idea, asked for what and where the field trip could cover.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
6/17/2014	Outgoing Email	SHPO	Brendan Greenaway	Response to 6/17/14 email that the field trip could cover four locations where the Corps is proposing work to show the scope of the effort, provide information on the construction, as well as future efforts to identify cultural resources in accordance with the PA. Requested three available dates to schedule a site visit.
6/17/2014	Incoming Email	SHPO	Brendan Greenaway	Will check schedules for attendance for site visit to include Jessica Tudor and Susan Stratton.
6/26/2014	Outgoing Email	SHPO	Brendan Greenaway	Follow up to email from 6/17/14 to suggest 7/31/14 for a field visit, possibly to include stops for West Sac Project as well.
7/2/2014	Incoming Email	SHPO	Jessica Tudor	Ms. Tudor requested list of comments from Mr. Dutsche on the draft PA, and what comments may have been addressed, or not.
7/3/2014	Outgoing Email	SHPO	Jessica Tudor	Response to 7/2/14 email, provided Ms. Tudor with email from Ms. Montag to SHPO on 10/25/12 that addressed comments from SHPO and provided a new draft of the PA. Provided information that no written comments have been received, though the SHPO did suggest the development of a HPMP as an attachment to the PA, to be developed later. Also suggested the field visit, possibly for 7/31/14.
7/3/2014	Incoming Email	SHPO	Jessica Tudor	Requested information on proposed field trip on 7/31/14, as well as the timeline for the review of the draft PA, APE, and historic properties identification efforts.
7/3/2014	Outgoing Email	SHPO	Jessica Tudor	Response to 7/3/14 email, provided logistical information on proposed field trip, that the review of the draft PA can take place in a few weeks but preferably prior to field trip on 7/31/14, and the Corps' plan to release the draft PA with the draft EIS/EIR in mid-August, preferably with comments from SHPO incorporated and comments from tribes considered (if they have been received).
7/3/2014	Incoming Email	SHPO	Jessica Tudor	Ms. Tudor said she is available for field visit on 7/31/14, will check with Ms. Stratton and Mr. Greenaway on their availability.
7/3/2014	Outgoing Email	SHPO	Jessica Tudor	Forwarded 7/31/14 field visit meeting request to Ms. Tudor.
7/3/2014	Incoming Email	SHPO	Jessica Tudor	Accepted 7/31/14 field visit meeting request.
7/22/2014	Outgoing Email	DWR	Erin Brehmer, David Martasian, Jacqueline Wait	Sent email to let DWR that UAIC has requested to meet with the Corps regarding the project and PA. Asked that DWR check and confirm availability on August 4th or 5th. Asked for a response ASAP.
7/22/2014	Incoming Email	DWR	David Martasian	Acknowledged 7/22/14 email, said would check and respond ASAP.
7/22/2014	Outgoing Email	DWR	David Martasian	Acknowledged 7/22/14 email from Mr. Martasian.
7/25/2014	Incoming Email	DWR	Erin Brehmer	Response to 7/22/14 email, Ms. Wait has recommended that Anecita Agustinez attend the meeting for DWR and is available on August 5th.
7/28/2014	Incoming Phone Call	DWR	Erin Brehmer	Ms. Brehmer called to follow up to 7/25/14 email, left voice message.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
7/29/2014	Outgoing Phone Call	DWR	Erin Brehmer	Ms. Montag called Ms. Brehmer to discuss the potential meeting on August 5th, asked if Ms. Wait was planning to attend since much of the discussion may center on the project PA and Section 106 requirements. Ms. Brehmer said it was recommended that Ms. Agustinez attend for DWR.
7/29/2014	Outgoing Meeting Request	DWR	Erin Brehmer, David Martasian, Jacqueline Wait, Anecita Agustinez	Sent placeholder meeting request for 8/5/14 meeting with DWR and UAIC.
7/29/2014	Outgoing Email	SHPO	Jessica Tudor	Email to Ms. Tudor that field visit on 7/31/14 has to be cancelled due to logistical reasons. Asked for availability the week of August 11th or 18th.
7/29/2014	Incoming Email	SHPO	Jessica Tudor	Response to 7/29/14 email that those dates are generally open for Ms. Tudor.
7/31/2014	Outgoing Email	SHPO	Jessica Tudor	Asked Ms. Tudor if 8/13/14 or 8/14/14 would work better for the field visit.
7/31/2014	Incoming Email	SHPO	Jessica Tudor	Ms. Tudor responded that either date would work.
7/31/2014	Outgoing Meeting Request	SHPO	Jessica Tudor, Susan Stratton, Brendon Greenaway	Sent meeting request for field visit on 8/13/14.
7/31/2014	Incoming Email	SHPO	Jessica Tudor	Accepted 8/13/14 field visit request.
7/31/2014	Incoming Email	SHPO	Susan Stratton	Declined 8/13/14 field visit request.
7/31/2014	Incoming Email	SHPO	Jessica Tudor	Requested Word version of final draft of PA.
8/1/2014	Outgoing Email	SHPO	Jessica Tudor	In response to 7/31/14 email, sent Word version of final draft of PA.
8/1/2014	Outgoing Email	DWR	Erin Brehmer, David Martasian, Jacqueline Wait, Anecita Agustinez	Revised placeholder meeting sent on 7/29/14 to meeting times for meeting with UAIC on 8/5/14.
8/1/2014	Incoming Email	DWR	David Martasian	Accepted 8/5/14 meeting request.
8/4/2014	Incoming Email	DWR	Erin Brehmer	Accepted 8/5/14 meeting request.
8/4/2014	Incoming Email	DWR	Jacqueline Wait	Accepted 8/5/14 meeting request.
8/4/2014	Incoming Email	DWR	Anecita Agustinez	Declined 8/5/14 meeting request.
8/5/2014	Consultation Meeting	Corps, DWR, Tribes	David Martasian, Erin Brehmer, Jacqueline Wait	Consultation meeting held with UAIC and SSBMI.
8/8/2014	Incoming Email	SHPO	Jessica Tudor, Susan Stratton	Comments provided on draft PA sent 8/1/14.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
9/2/2014	Outgoing Email	DWR	David Martasian, Erin Brehmer, Jacqueline Wait, Anecita Agustinez	Sent link to Doodle poll to schedule next meeting with UAIC and SSBMI for late October/early November. Requested response to poll by 9/17/14. Welcomed receiving any comments on the draft programmatic agreement.
9/4/2014	Incoming Email	DWR	David Martasian	Responded to Doodle poll.
11/17/2014	Outgoing Email	SHPO	Jessica Tudor	Sent track changes version of draft PA responding to comments sent 8/8/14, included additional language and current version of PA that will be included with draft EIS/EIR to be released to the public in mid-December. Suggested a face-to-face meeting to resolve any lingering issues before moving to a final draft of PA.
12/10/2014	Outgoing Email	DWR	David Martasian, Erin Brehmer, Jacqueline Wait	Sent current versions of cultural resources sections from the EIS/EIR to ask if DWR has any comments or changes needed in order to comply with CEQA because the EIS/EIR will be going to the CVFPB in January for approval for public release. Stated that comments would be needed in early January to make any changes.
7/1/2015	Outgoing Email	SHPO	Jessica Tudor	Sent an updated version of the PA with comments addressed (similar to 11/17/14 version) as well as merged changes as a result of consultation with tribes. Suggested a meeting to discuss and that the Corps would like to execute the PA around September.
8/6/2015	Outgoing Email	SHPO	Jessica Tudor, Anmarie Medin	Transmittal of updated clean draft of the PA with comments addressed. Suggested meeting to go over changes and edits, if needed, as the Corps is working to execute the PA in September.
9/10/2015	Meeting	SHPO	Anmarie Medin, Julianne Polanco	Signing and execution of final PA for ARCF Project.
10/30/2015	Outgoing Email	ACHP	Brian Lusher	Transmittal of signed and executed PA to the ACHP.
10/30/2015	Outgoing Email	SHPO	Jessica Tudor, Anmarie Medin	Transmittal of list of potential concurring parties to transmit notice of PA, requested a response from SHPO within two weeks.
11/2/2015	Incoming Letter	ACHP	Brian Lusher	Acceptance and acknowledgement of the PA by the ACHP.
11/9/2015	Incoming Email	SHPO	Jessica Tudor	In response to 10/30/15 email, Ms. Tudor suggested adding the Society for California Archaeology and potential historical societies/museums to the mailing list of possible concurring parties.
11/17/2015	Outgoing Email	SHPO	Jessica Tudor, Anmarie Medin	In response to 11/9/15 email, Ms. Montag stated the Society of California Archaeology and several historical societies have been added as potential concurring parties to the PA and if SHPO thinks of any additional parties to let the Corps know.
11/30/2015	Incoming Email	SHPO	Jessica Tudor	Acknowledgement of 11/17/15 email.

American River Common Features Project Native American Consultation Record*

*May not include all communication for project.

12/31/15

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5/4/2011	Outgoing Letters	Mechoopda Indian Tribe of Chico Rancheria (MITCR), Shingle Springs Bank of Miwok Indians (SSBMI), Strawberry Valley Rancheria (SVR), Tsi-Akim Maidu (TAM), United Auburn Indian Community (UAIC), Wilton Rancheria (WR), Nashville-El Dorado Miwok (NEDM), Ione Band of Miwok Indians (IBMI), El Dorado Miwok Tribe (EDMT), Enterprise Rancheria of Maidu Indians (ERMI), Buena Vista Rancheria (BVR)	Various	Letter to Native American tribes with potential interest in the American River Common Features (ARCF) Project area of potential effects (APE) informing them of upcoming geotech borings and upcoming Programmatic Agreement (PA).
5/9/2011	Incoming Letter	MITCR	Mike DeSpain	Response letter from 5/4/11 letter expressing tribe's concerns about possible cultural resources sites, unaware of sites within the project area. Requested that is cultural resources are found that a funded tribal monitor be put in place.
6/2/2011	Incoming Letter	UAIC	Marcos Guerrero	Response letter from 5/4/11 letter expressing tribe's concerns about possible cultural resources sites impacted by development. Requested copies of archeological reports produced for the project, future environmental documents, and opportunity for UAIC consultants to accompany Corps during field surveys. Request to set up a field visit and concurring party status on
6/24/2011	Incoming Email	UAIC	Marcos Guerrero	Request initiation of Native American consultation for Natomas Levee Improvements Project (NLIP) and American River Common Features (ARCF) Project. Request environmental and cultural reports.
9/13/2011	Incoming Phone Call	SSBMI	Angela Rivera	Phone call requesting additional information on geotechnical investigations mentioned in 5/4/11 letter.

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9/13/2011	Outgoing Email	SSBMI	Angela Rivera	Follow up to 9/13/11 phone call, email transmittal of information on geotechnical investigations, committed to sending PA for comments when draft is ready.
9/19/2013	Incoming Email	SSBMI	Angela Rivera	Acknowledgement of 9/13/11 email transmittal, expressed interest in PA.
1/31/2012	Incoming Email	UAIC	Marcos Guerrero	Request construction schedule for NLIP Phase 4 and ARCF Project.
2/1/2012	Outgoing Email	UAIC	Marcos Guerrero	Clarification that NLIP Phase 4 will be pulled into ARCF Project and that construction schedule will be after environmental process, executing a PA, signed Chief's report, and Congressional authorization.
2/2/2012	Incoming Email	UAIC	Marcos Guerrero	Acknowledge receipt of information from 2/2/12 email, request to meet regarding ARCF and the PA.
4/3/2012	Incoming Letter	SSBMI	Daniel Fonseca	Request to meet regarding the project, to be added as a consulting party to identify TCPs in APE, and requested environmental and cultural reports.
4/25/2012	Outgoing Letter	SSBMI	Daniel Fonseca	Acknowledgement of 4/3/12 letter and plan to contact for a meeting and consult with the SSBMI on the ARCF Project.
4/25/2012	Outgoing Letter	UAIC	Gregory Baker, Marcos Guerrero	Acknowledgement of 5/9/11 request that UAIC be included survey efforts, as a concurring party to agreement documents, copies of reports, and to schedule a meeting.
4/25/2012	Outgoing Email	UAIC	Gregory Baker, Marcos Guerrero	Email transmittal of 4/25/12 letter and to schedule a tribal consultation meeting.
4/25/2012	Outgoing Email	SSBMI	Daniel Fonseca, Crystal Dilworth	Email transmittal of 4/25/12 letter and to schedule a tribal consultation meeting, suggested dates.
4/26/2012	Incoming Email	UAIC	Marcos Guerrero	Acknowledgment of 4/25/12 email and dates for meeting.
4/27/2012	Outgoing Email	UAIC	Marcos Guerrero	Follow up to 4/26/13 email, suggested dates for meeting.
4/30/2012	Outgoing Email	UAIC	Marcos Guerrero, Greg Baker	Sent meeting request for UAIC consultation meeting on 6/12/12.
4/30/2012	Outgoing Email	SSBMI	Daniel Fonseca, Crystal Dilworth	Sent meeting request for SSBMI consultation meeting on 6/14/12.
5/11/2012	Outgoing Letter	UAIC, SSBMI, EDMT, ERMI, NEDM, IBMI, TAM, SVR, WR, Mechoopda, BVR		Letter informing of planned geotechnical investigations, request for information, , request tribes to inform Corps if they are interested in additional Section 106 compliance efforts.

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6/12/2012	Consultation Meeting	UAIC	Marcos Guerrero, Melodi McAdams, Danny Rey, Melissa Montag, Dan Tibbitts, Sara Schultz, Jane Rinck	Consultation meeting with the UAIC to discuss project, upcoming schedule, description of work, plan for PA. Tribe requested the PA to review when it is ready.
6/14/2012	Consultation Meeting	SSBMI	Daniel Fonseca, Andrew Godsey, Melissa Montag, Jane Rinck, Dan Tibbitts	Consultation meeting with the SSBMI to discuss project, upcoming schedule, description of work, plan for PA. Tribe requested the PA to review when it is ready. Tribe was open to creative mitigation measures for sites Corps is unable to avoid during construction or unknown affected sites.
6/21/2012	Incoming Letter	BVR	Roselynn Lwenya	Response letter to 5/11/12 letter indicating interest in consultation on the project, Request additional information of proposed geotechnical investigations, schedule, site visit, copies of records and literature search, involvement in developing scopes, sampling strategy, research designs, field investigations, laboratory analysis, report writing, and consideration for a tribal monitor during
7/12/2012	Outgoing Letter	BVR	Roselynn Lwenya	Response letter to 6/21/12 letter informing tribe that geotechnical investigations mentioned in 5/11/12 letter would not be occurring, informing tribe of upcoming PA, and proposing a meeting to discuss Section 106 consultation efforts.
8/15/2012	Outgoing Phone Call	BVR	Roselynn Lwenya	Called to follow up from 6/21/12 and 7/12/12 letters. Spoke to Ms. Lwenya to discuss a meeting to address concerns in 6/21/12 letter. Ms. Lwenya stated she would respond with dates for a meeting.
8/15/2012	Outgoing Email	BVR	Roselynn Lwenya	Follow up to 8/15/12 phone call reiterating that geotech investigations mentioned in 5/11/12 letter would not be occurring, but requested the tribe's involvement in development of the PA for the project.
8/22/2012	Incoming Email	BVR	Roselynn Lwenya	Acknowledgement of 8/15/12 email, will follow up with available meeting dates.
8/22/2012	Outgoing Email	BVR	Roselynn Lwenya	Acknowledgement of 8/22/12 email.
11/1/2012	Outgoing Email	BVR	Roselynn Lwenya	Follow up email to 8/15/12 requesting available dates for the BVR to meet to discuss project.
1/8/2013	Incoming Email	BVR	Roselynn Lwenya	Request to set up tribal meeting with proposed dates.
1/9/2013	Outgoing Email	BVR	Roselynn Lwenya	Response to 1/8/13 email with suggested alternate dates.
1/22/2013	Outgoing Email	BVR	Roselynn Lwenya	Follow up to 1/9/13 email to request setting up a tribal meeting, provided dates.
1/22/2013	Incoming Email	BVR	Roselynn Lwenya	Acknowledgement of 1/22/13 email, will reply with proposed dates in the future.
1/24/2012	Incoming Email	BVR	Roselynn Lwenya	Email proposing tribal meeting on 2/22/13.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
1/25/2012	Outgoing Email	BVR	Roselynn Lwenya	Follow up to 1/24/13 email communicating Corps not available to meet on 2/22/13, suggested alternate dates before and after.
2/15/2013	Outgoing Email	BVR	Roselynn Lwenya	Follow up email to 1/25/13 email to request setting up a tribal meeting, suggested meeting dates in March.
4/5/2013	Outgoing Letter	MITCR, SSBMI, SVR, TAM, UAIC, WR, NEDM, IBMI, EDMT, ERMI, BVR, Cachil DeHe Band of Wintun Indians (Cachil DeHe), Mooretown Rancheria of Maidu Indians (MRMI)		Letter providing project information, determination of possible affects, transmittal of PA for tribal review and comment, request for involvement and review within 45 days.
4/19/2013	Incoming Voicemail	IBMI	Andrew Raimey	Received call from Andrew Raimey to coordinate Ione Band participation in PA with Randy Yonemura.
4/22/2013	Outgoing Phone Call	IBMI	Randy Yonemura	As requested in 4/19/13 voicemail, contacted Randy to discuss Ione Band concerns, participation in PA. Conversation and follow up communication efforts were documented in a telephone conversation log.
4/22/2013	Outgoing Email	IBMI	Randy Yonemura	Follow up email to 4/22/13 phone call to discuss Ione Band concerns, suggested several dates for possible meetings.
4/23/2013	Outgoing Email	BVR	Roselynn Lwenya	Follow up email to 2/15/13 email to request setting up a tribal meeting, emailed electronic versions of PA and supporting documents.
4/29/2013	Outgoing Email	IBMI	Randy Yonemura	As requested in 4/19/13 voicemail, contacted Randy to discuss Ione Band concerns, participation in PA. Follow up from 4/22/13 email.
5/6/2013	Incoming Email	UAIC	Marcos Guerrero	Requested updated signature page for the UAIC to sign the PA.
5/9/2013	Outgoing Email	UAIC	Marcos Guerrero	Response to 5/6/13 email letting Mr. Guerrero that the PA will not be ready for signature until fall/winter. Committed to continuing to keep the UAIC informed as the PA and EIS move forward.
5/13/2013	Outgoing Phone Call	IBMI	Randy Yonemura	As requested in 4/19/13 voicemail, contacted Randy to discuss Ione Band concerns, participation in PA. Follow up from 4/22/13 and 4/29/13 emails. Left
5/15/2013	Outgoing Phone Call	BVR	Roselynn Lwenya	Called to follow up from 4/5/13 letter, was directed to speak to Roselynn and call back the next day.
5/15/2013	Outgoing Phone Call	EDMT		Called to follow up from 4/5/13 letter, no answer.
5/15/2013	Outgoing Phone Call	ERMI	Cindi Smith	Called to follow up from 4/5/13 letter, was directed to speak to Cindi Smith. Cindi Smith was out.
5/15/2013	Outgoing Phone Call	IBMI	Yvonne Miller	Called to follow up from 4/5/13 letter, was told to reach Ms. Miller by email.
5/15/2013	Outgoing Phone Call	NEDM	Cosme Valdez	Called to follow up from 4/5/13 letter, no answer.
5/15/2013	Outgoing Phone Call	SSBMI	Daniel Fonseca	Called to follow up from 4/5/13 letter, no answer.

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5/15/2013	Outgoing Phone Call	SSBMI	Angela Rivera	Called to follow up from 4/5/13 letter, spoke with Ms. Rivera who said she would call back.
5/15/2013	Outgoing Phone Call	SVR	Cathy Bishop	Called to follow up from 4/5/13 letter, no option to leave a voicemail message.
5/15/2013	Outgoing Phone Call	WR	Mary Daniels-Tarango	Called to follow up from 4/5/13 letter, no answer.
5/15/2013	Outgoing Phone Call	MRMI	Guy Taylor	Called to follow up from 4/5/13 letter, no answer.
5/16/2013	Outgoing Email	IBMI	Yvonne Miller	Emailed Ms. Miller to follow up from 4/5/13 letter and 5/16/13 phone call, no answer.
5/16/2013	Outgoing Phone Call	EDMT		Called to follow up from 4/5/13 letter, left message.
5/16/2013	Outgoing Phone Call	NEDM	Cosme Valdez	Called back from 5/15/13 call, spoke with Mr. Valdez. He stated no comments on the PA, does not want to meet with the Corps.
5/16/2013	Outgoing Phone Call	ERMI	Cindi Smith	Call back from 5/15/13 call, left message with Ms. Smith's voicemail.
5/16/2013	Outgoing Phone Call	SSBMI	Daniel Fonseca	Call back from 5/15/13 call, left message with Mr. Fonseca's voicemail.
5/16/2013	Outgoing Phone Call	BVR	Roselynn Lwenya	Call back from 5/15/13 call, Roselynn said she received materials from 4/5/13 letter, will speak with the tribal committee and get back to the Corps.
5/16/2013	Outgoing Phone Call	SVR	Cathy Bishop	Call back from 5/15/13 call, no option to leave a voicemail message.
5/16/2013	Outgoing Phone Call	WR	Mary Daniels-Tarango	Call back from 5/15/13 call, left message with Ms. Daniels-Tarango's voicemail.
5/16/2013	Outgoing Phone Call	MITCR	Dennis Ramirez, Mike DeSpain	Called to follow up from 4/5/13 letter, called in AM, Mr. Ramirez and Mr. DeSpain were not available. Called in PM, no answer, left messages.
5/16/2013	Outgoing Phone Call	MRMI	Guy Taylor	Call back from 5/15/13 call, left message with Mr. Taylor's voicemail.
5/16/2013	Outgoing Phone Call	Cachil DeHe	Ambar Mohammed	Called to follow up from 4/5/13 letter, left message.
5/17/2013	Incoming Voicemail	MITCR	Mike DeSpain	Requested further information on project and asked if Cachil DeHe and UAIC had been contacted.
5/17/2013	Incoming Voicemail	IBMI	Randy Yonemura	Voicemail requesting to set up meeting between Corps and Ione Band.
5/17/2013	Incoming Voicemail	SSBMI	Andrew Godsey	Received voicemail from Mr. Godsey indicating the SSBMI would like the chance to comment on the PA.
5/20/2013	Outgoing Email	MITCR	Mike DeSpain	Provided information on project, consultation with Cachil DeHe, UAIC, offered to meet with Mechoopda and/or provide more information.
5/20/2013	Incoming Email	MITCR	Mike DeSpain	Recommended UAIC as the contact for the Section 106 for the project.
5/20/2013	Outgoing Email	IBMI	Randy Yonemura	Follow up email to 5/17/13 email requesting available dates for a tribal meeting.
5/20/2013	Outgoing Phone Call	TAM	Eileen Moon	Called to follow up from 4/5/13 letter, no answer.
5/20/2013	Outgoing Email	BVR	Roselynn Lwenya	Email request for tribal consultation meeting with BVR on 5/29/13.
5/23/2013	Outgoing Email	SSBMI	Andrew Godsey, Daniel Fonseca, Angela Rivera	Follow up to voice mail message from 5/17/13 providing electronic version of the PA for review and comment, requested comments from SSBMI.
5/23/2013	Incoming Email	SSBMI	Andrew Godsey	Acknowledgement of receipt of 5/23/13 email from Corps.

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5/29/2013	Consultation Meeting	BVR	Roselynn Lwenya, Rhonda Pope, Jeanette Simmons, Christy, Richard, Jane Rinck, Dan Tibbitts, Melissa Montag	Tribal consultation meeting to discuss project, Section 106 compliance, project schedule, draft PA, tribal involvement.
5/29/2013	Outgoing Phone Call	IBMI	Randy Yonemura	As requested in 4/19/13 voicemail, contacted Randy to discuss Ione Band concerns, participation in PA. Follow up from 4/22/13 and 4/29/13 emails and 5/13/13 voicemail. Left voicemail.
6/3/2013	Outgoing Email	BVR	Roselynn Lwenya	Email follow up to 5/29/13 tribal consultation meeting requesting comments from tribe by 6/28/13, providing additional project information.
6/5/2013	Outgoing Email	SSBMI	Andrew Godsey, Daniel Fonseca, Angela Rivera	Follow up to 5/23/13 providing electronic version of the PA for review and comment, requested comments by 6/28/13.
6/6/2013	Outgoing Letters	ERMI, WR, SVR, Kesner Flores, Cortina Band of Wintun Indians (CBWI), Marshall McKay, Yocha DeHe Wintun Nation, Rose Enos, Randy Yonemura, April Moore, Colfax-Todds Valley Consolidated Tribe (CTVCT), IBMI, SSBMI, TAM	Various	After receipt of additional Native American contacts from the NAHC, a second mailing of the 4/5/13 letter. Letter providing project information, determination of possible affects, transmittal of PA for tribal review and comment, request for involvement and review within 45 days.
6/13/2013	Incoming Letter	BVR	Rhonda Pope	Letter received 6/20/13 communicating the BVR comments on the draft PA, concerns about aspects of the PA and past tribal consultation efforts.
6/14/2013	Incoming Email	BVR	Roselynn Lwenya	Transmittal of attendee list requested in 6/3/13 email, noted postal mailing of comments from BVR on the PA.
6/18/2013	Outgoing Email	BVR	Roselynn Lwenya, Rhonda Pope	Acknowledge receipt of 6/14/13 email, responded to request for records and literature searches by noting confidentiality agreements with CHRIS.
6/19/2013	Incoming Phone Call	TAM	Grayson Coney	Mr. Coney called to express the interest of the T'Si-akim Maidu in the ARCF PA. He asked to be included in future EIS correspondence and said the tribe would be interesting in signing the PA as a concurring party. He also expressed that the tribe feels it would be the MLD for the project and that tribal monitors may be required. Conversation was documented in a telephone

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7/9/2013	Incoming Letter	Yocha Dehe Wintun Nation	Marshall McKay	Letter received 7/12/13 in response to 6/6/13 letter to tribes asking for comments on draft PA. The tribe reviewed the project and concluded it is not within the aboriginal territories of the tribe and declined comment on the project or the PA.
7/15/2013	Outgoing Email	BVR	Roselynn Lwenya, Rhonda Pope	Outgoing email in response to receipt of 6/13/13 letter from the tribe. Acknowledged receipt, plan to address comments from tribe, and request dates to meet to consult on project again at a later date.
9/13/2013	Outgoing Email	BVR	Roselynn Lwenya, Rhonda Pope	Requested dates to meet with Buena Vista in late October/early November regarding ARCF Project, PA, continuing consultation with the tribe.
9/18/2013	Incoming Email	UAIC	Marcos Guerrero	Contacted the Corps in regard to the Common Features Remaining Sites construction project and asked about status of the ARCF GRR PA.
9/18/2013	Outgoing Email	UAIC	Marcos Guerrero	Reply to 9/18/13 email, provided information that the PA is still in draft form, EIS is expected to be out for public review in the fall (UAIC and Shingle Springs will receive the EIS and draft PA for additional review) and PA is not expected to be signed until 2014, with construction to come in following years.
10/9/2013	Outgoing Phone Call		Rose Enos	Called regarding 6/6/13 letter and was told Ms. Enos was not available and to call back later.
10/9/2013	Outgoing Phone Call		April Wallace Moore	Called regarding 6/6/13 letter and spoke to Ms. Moore. She requested that a monitor be present during construction and to be kept up to date on the project.
10/9/2013	Outgoing Phone Call	CTVCT	Judith Marks	Called and left message regarding 6/6/13 letter.
10/9/2013	Outgoing Phone Call	CTVCT	Pamela Cubbler	Called regarding 6/6/13 letter, Ms. Cubbler indicated she would like to meet, suggested possible dates in late October.
10/9/2013	Outgoing Phone Call	IBMI	Anthony Burris	Called regarding 6/6/13 letter, message on phone said "the number is not assigned yet," unable to leave message.
10/9/2013	Outgoing Phone Call	SSBMI	Sam Daniels	Called regarding 6/6/13 letter, left message.
10/9/2013	Outgoing Phone Call	WR	Andrew Franklin	Called regarding 6/6/13 letter, was told to email Andrew Franklin.
10/9/2013	Outgoing Email	WR	Andrew Franklin	Emailed regarding 6/6/13 letter and as directed from 10/9/13 phone call to Mr. Franklin.
10/9/2013	Outgoing Email	WR	Steven Hutchason	Emailed regarding 6/6/13 letter.
10/9/2013	Outgoing Phone Call	ERMI	Art Angle	Called regarding 6/6/13 letter, was told to email Ren Reynolds.

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10/9/2013	Outgoing Email	ERMI	Ren Reynolds	Emailed regarding 6/6/13 and as directed from 10/9/13 phone call to Mr. Angle.
10/9/2013	Outgoing Email	SVR	Cathy Bishop	Emailed regarding 6/6/13 letter.
10/9/2013	Outgoing Email		Kesner Flores	Emailed regarding 6/6/13 letter.
10/9/2013	Outgoing Email	CBWI		Emailed regarding 6/6/13 letter.
10/10/2013	Outgoing Email		Randy Yonemura	Sent email regarding 6/6/13 letter and regarding project and comments on the PA.
10/10/2013	Outgoing Phone Call		Rose Enos	Called regarding 6/6/13 letter and following up from 10/9/13 call and was told Ms. Enos was not available and to call back later.
10/16/2013	Outgoing Email	BVR	Roselynn Lwenya, Rhonda Pope	Follow up to 9/13/13 email requesting dates to meet with Buena Vista in late October/early November regarding ARCF Project, PA, continuing consultation with the tribe.
10/18/2013	Outgoing Phone Call	CTVCT	Pamela Cubbler	Follow up to 10/9/13 phone call to schedule a meeting with the CTVCT and Ms. Cubbler. Left message.
10/18/2013	Outgoing Email	IBMI	Randy Yonemura, Yvonne Miller, IMBI Cultural Heritage	Follow up to previous attempts (last 5/20/13) to set up a meeting with the IBMI. Follow up to emails 5/20/13, 4/29/13, 4/22/13.
10/18/2013	Outgoing Phone Call		Rose Enos	Called following up from 6/6/13 letter and 10/9/13 and 10/10/13 phone calls. Ms. Enos stated she is concerned about burials and construction and asked to be kept on our mailing list and to be informed as the project moves forward. She did not want to meet with the Corps at this time.
10/18/2013	Outgoing Phone Call	BVR	Roselynn Lwenya	Follow up to 10/16/13 email requesting dates to meet with Buena Vista regarding the project, PA, continuing consultation with the tribe.
10/18/2013	Outgoing Phone Call	CTVCT	Judith Marks	Follow up to 6/6/13 letter and 10/9/13 phone call message.
10/18/2013	Outgoing Phone Call	IMBI	Anthony Burris	Follow up to 6/6/13 letter and 10/9/13 phone call, unable to leave message because message said "the number is not assigned yet."
10/18/2013	Outgoing Phone Call	SSBMI	Sam Daniels	Follow up to 6/6/13 letter and 10/9/13 phone call message, left message asking for SSBMI to contact the Corps if they have comments, concerns, or would like to meet.
10/18/2013	Outgoing Phone Call	WR	Steven Hutchason	Follow up to 10/9/13 email, Mr. Hutchason expressed interest in commenting on the PA, asked for a Word version to provide track changes. Ms. Montag committed to sending a Word version of the PA after current OC review and asked the WR to contact the Corps with any additional comments, concerns, or requests to meet.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
10/18/2013	Outgoing Phone Call	SVR	Cathy Bishop	Follow up to 6/6/13 letter and 10/9/13 email to try and leave a phone call message. Voice message on phone would not allow leaving a message.
10/18/2013	Outgoing Phone Call		Kesner Flores	Follow up to 6/6/13 letter and 10/9/13 email, Mr. Flores expressed an interest in reviewing the project area to determine if it is within his interest area. Ms. Montag committed to sending a Word version of the PA for review after current OC review is completed and a new draft is ready.
10/18/2013	Outgoing Phone Call	CBWI	Charlie Wright	Follow up to 6/6/13 letter and 10/9/13 email, left voice message with Chairman Charlie Wright.
11/15/2013	Incoming Phone Call	IBMI	Randy Yonemura	Phone call requesting that the Corps meet with the Bureau of Indian Affairs (Gerald Jones) regarding the Common Features Project and general requirements the Corps may have on water projects.
11/15/2013	Outgoing Phone Call	Bureau of Indian Affairs (BIA)	Gerald Jones	Spoke with Gerald Jones to get clarification on the proposed Corps/BIA/Ione Band meeting. Requested proposed agenda for proper coordination with Corps management.
11/19/2013	Outgoing Email	IBMI, BIA	Yonemura, Jones	Follow up to phone conversations on 11/15/13, requested agenda or discussion topics, proposed dates for a meeting. Provided contact information for Jane Rinck and Mark Gilfillan to coordinate if needed.
5/7/2014	Incoming Email	UAIC	Marcos Guerrero	Asked if the Corps has an electronic version of the Common Features PA.
5/13/2014	Outgoing Email	UAIC	Marcos Guerrero	Response to 5/7/14 email that a current draft of the Common Features PA is still being worked on, taking into account comments received so far and that Ms. Montag will be in touch when that draft is available for review.
6/5/2014	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	As requested in emails dated 9/18/13 and 5/7/14, provided the draft PA and attachments in electronic form for review and comment. Mentioned an official letter will be transmitted soon with a review period in that letter. Asked to provide any questions or concerns, or interest in scheduling a meeting.
6/5/2014	Outgoing Email	WR	Steven Hutchason	As requested phone call on 10/18/13, provided the draft PA and attachments in electronic form for review and comment. Mentioned an official letter will be transmitted soon with a review period in that letter. Asked to provide any questions or concerns, or interest in scheduling a meeting.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
6/5/2014	Outgoing Email	BVR	Roselynn Lwenya, Rhonda Pope	Follow up to most recent email on 10/18/13, provided the draft PA and attachments in electronic form for review and comment. Mentioned an official letter will be transmitted soon with a review period in that letter. Asked to provide any questions or concerns, or interest in scheduling a meeting. Asked for three available dates in June and July to schedule a meeting.
6/5/2014	Outgoing Email		Kesner Flores	As requested phone call on 10/18/13, provided the draft PA and attachments in electronic form for review and comment. Mentioned an official letter will be transmitted soon with a review period in that letter. Asked to provide any questions or concerns, or interest in scheduling a meeting.
6/5/2014	Outgoing Email	WR	Steven Hutchason	Follow up to 6/5/14 email, earlier email did not attach PA attachments. Resent with PA attachments.
6/5/2014	Outgoing Email	BVR	Roselynn Lwenya, Rhonda Pope	Follow up to 6/5/14 email, earlier email did not attach PA attachments. Resent with PA attachments.
6/5/2014	Outgoing Email		Kesner Flores	Follow up to 6/5/14 email, earlier email did not attach PA attachments. Resent with PA attachments.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
6/12/2014	Outgoing Letters	SVR, IMBI, UAIC, TAM, CTVCT, SSBMI, WR, MITCR, EDMT, ERMI, BVR, Cachil DeHe, MRMI, NEDM, CBWI	Cathy Bishop, Anthony Burris, Jason Camp, Grayson Coney, Pamela Cubbler, Sam Daniels, Mary Daniels-Tarango, Michael DeSpain, Rose Enos, Kesner Flores, Daniel Fonseca, Nicholas Fonseca, Andrew Franklin, Reno Franklin, Marcos Guerrero, Steven Hutchason, Roselynn Lwenya, Judith Marks, Yvonne Miller, Ambar Mohammed, Eileen Moon, April Wallace Moore, Glenda Nelson, Rhonda Morningstar Pope, Dennis Ramirez, Guy Taylor, Cosme Valdez, Gene Whitehouse, Charlie Wright, Randy Yonemura	Letters providing final draft of PA, summarized previous actions to consult in April/June 2013, provided sensitivity assessment for review/comment, detailed previous Section 106 consultation efforts with SHPO, ACHP, CVFPP DWR, and tribes, communication with the public via letter, requested involvement in the PA as a potential concurring party, requested comments for consideration for the final PA, interest in scheduling a meeting, and to inform the Corps if there is interest in signing the PA as a Concurring Party and any edits to signature block.
6/20/2014	Incoming Email	UAIC	Marcos Guerrero	In response to 6/5/14 email, Mr. Guerrero asked if an MOA or addendum for sites within the APE with a high potential for adverse effects could be included with the PA, as well as if a map with sensitivity areas UAIC would like to have monitored could be included.

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6/23/2014	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	Response to 6/20/14 email to iterate that the PA is the Corps' planned process to comply with Section 106, identify historic properties, and determine adverse effects once the project is authorized and that an MOA or addendum would be premature since historic properties have not yet been identified. Further iterated that the Corps welcomes UAIC's assistance identifying sensitive areas and would appreciate any information the tribe is willing to share.
6/26/2014	Outgoing Letters	BVR	Rhonda Pope, Roselynn Lwenya	Received 6/12/14 letters back as undeliverable. Re-dated letters to 6/26/14 and sent by mail again.
6/30/2014	Outgoing Email		Kesner Flores	Received hard copy of 6/12/14 letter back as unclaimed. Sent email to ask Mr. Flores for an address to re-send the hard copies to. Provided electronic copies of the documents (Letter to Mr. Flores, letter to SHPO, Word version of draft PA) sent in 6/12/14 postal mailing.
7/1/2014	Incoming Email	UAIC	Marcos Guerrero	Requested to meet regarding the project to share UAIC maps and to start to identify the need to ground truth locations. Requested to meet the week of July 21st.
7/1/2014	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	Replied to 7/1/14 email from Mr. Guerrero that Ms. Montag is not available the week of the 21st, but would be available the week of the 14th, or the 28th or 29th. Or could scheduled for August. Also requested that UAIC let Ms. Montag know if they would like other Corps personnel to attend meeting.
7/14/2014	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	Follow up to email sent on 7/1/14 to inquire if Mr. Guerrero would still like to schedule a meeting. Provided July 16-18, 28, 29, August 4-6 as available, or could schedule for later in August.
7/15/2014	Incoming Email	UAIC	Marcos Guerrero, Jason Camp	Response to 7/14/14 email, suggested 7/29/14 to meet.
7/15/2014	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	Confirmed 7/29/14 would likely work, asked who from the Corps UAIC would like to have present at the meeting so Ms. Montag can coordinate.
7/15/2014	Incoming Email	UAIC	Marcos Guerrero, Jason Camp	Mr. Guerrero suggested the Corps PM and those in charge at SAFCA attend the 7/29/14 meeting.
7/15/2014	Returned Mailing	TAM	Grayson Coney	Received 6/12/14 letters back as unclaimed.
7/15/2014	Outgoing Phone Call	TAM	Grayson Coney	Called Mr. Coney to confirm mailing address, he confirmed the correct mailing and was out of town.
7/15/2014	Outgoing Letter	TAM	Grayson Coney	Resent 6/12/14 letter and draft PA.

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7/15/2014	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	Reply to 7/15/14 email that Corps PM is not available on 7/29/14, suggested 8/1 or 8/4-8/6. Also explained that DWR is the non-Federal sponsor the ARCF Project and offered to coordinate their attendance at meeting, depending on UAIC's preference.
7/16/2014	Returned Mailing		Randy Yonemura	Received 6/12/14 letters back as unclaimed.
7/16/2014	Outgoing Phone Call		Randy Yonemura	Called and left message that 6/12/14 letter was returned and requested a current address to send the letter and final draft PA to.
7/16/2014	Outgoing Email		Randy Yonemura	Sent 6/12/14 letter, enclosures, and copy of 6/12/14 SHPO letter by email to email addresses on file. Asked if Mr. Yonemura has any questions or would like to discuss to contact Ms. Montag.
7/18/2014	Incoming Email		Randy Yonemura	Mr. Yonemura asked that the document be re-sent to him on 7/24/14. Prefers a hard copy be sent.
7/18/2014	Incoming Phone Call		Randy Yonemura	Mr. Yonemura asked that the document be re-sent to him on 7/24/14. Ms. Montag confirmed it will be sent by mail on 7/24/14. Mr. Yonemura said he would review the documentation and get back in touch with Ms. Montag.
7/22/2014	Incoming Email	UAIC	Marcos Guerrero	Reply to 7/15/14 email, suggested 8/4/14 or 8/5/14 for a meeting with the Corps and UAIC, agreed that DWR should be invited to attend.
7/22/2014	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Andrew Godsey	Reply to 7/22/14 email, Ms. Montag said she would coordinate with DWR for availability for a 8/4/14 or 8/5/14 meeting. Noted that Mr. Guerrero included Mr. Godsey on his 7/22/14 and asked if UAIC is requesting a joint meeting with SSBMI invited to attend.
7/24/2014	Outgoing Letter		Randy Yonemura	Re-sent via USPS 6/12/14 mailing as Mr. Yonemura requested during phone call on 7/18/14 be sent on 7/24/14.
7/24/2014	Outgoing Email		Randy Yonemura	Followed up with email to Mr. Yonemura letting him know the 6/12/14 letter was re-sent in today's mail, as he requested.
7/28/2014	Incoming Email	UAIC	Marcos Guerrero	Email from Mr. Guerrero asking if there was still a meeting scheduled for 7/29/14 (which had been previously discussed to be moved to either 8/4/14 or 8/5/14).
7/29/2014	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Andrew Godsey	Response to 7/28/14 email that Ms. Montag thought the 8/4/14 or 8/5/14 were the meeting dates being discussed. Suggested 8/5/14 and asked Mr. Guerrero to respond with an available time.
7/31/2014	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Andrew Godsey	Follow up to 7/29/14 email to ask if 8/5/14 will work for a meeting, and the time UAIC would like to meet.
8/1/2014	Incoming Email	UAIC	Marcos Guerrero	Response to 7/31/14 email suggesting 10AM for meeting on 8/5/14.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
8/1/2014	Outgoing Meeting Request	UAIC, SSBMI	Marcos Guerrero, Jason Camp, Andrew Godsey	Sent meeting request for 8/5/14 for 10AM-12PM at UAIC offices in Auburn. Suggested the Corps would bring information on the project, the PA, and that DWR is planning to attend. Requested that UAIC indicate if there is specific information they are interested in or agenda items they want to discuss that they let Ms. Montag known.
8/1/2014	Incoming Email	UAIC	Marcos Guerrero	Accepted 8/5/14 meeting request.
8/4/2014	Incoming Email	UAIC	Melodi McAdams	Requested GIS shape files for APE to prepare for meeting on 8/5/14.
8/4/2014	Outgoing Email	UAIC	Melodi McAdams, Marcos Guerrero, Jason Camp	Sent GIS shape files of APE as requested, emphasized that the APE is very approximate and will be refined during planning and design for construction and potentially as a result of future environmental and cultural resources investigations.
8/4/2014	Incoming Email	UAIC	Melodi McAdams	Acknowledgement of receipt of 8/4/14 email with GIS shape files.
8/5/2014	Incoming Email	UAIC	Marcos Guerrero	Requested that Ms. Montag bring archeological site maps and a brief overview of cultural resources in the APE. Indicated UAIC's interest in discussing site eligibility, burial plans, and potential adverse effects.
8/5/2014	Consultation Meeting	UAIC, SSBMI, USACE, DWR	Peter Wakeland, Jason Camp, Melodi McAdams, Marcos Guerrero, Josh Stewart, Donald Rey, Andrew Godsey, Kara Perry, Dan Tibbitts, Melissa Montag, David Martasian, Erin Brehmer, Jacqueline Wait	Meeting with UAIC and SSBMI to discuss concerns of the tribes regarding the ARCF Project including treatment of burials, efforts to identify cultural resources of significance to the tribes, tribal monitors, the draft programmatic agreement. All parties agreed regular scheduled meetings would help ease the process along, comments on the programmatic agreement were requested from the tribes by late September for consideration in the version included in the draft EIS/EIR.
8/5/2014	Outgoing Email	SSBMI	Andrew Godsey, Kara Perry	As requested during consultation meeting with UAIC and SSBMI on 8/5/14, transmitted electronic version of the PA and attachments. The previous draft version of the PA was also transmitted via email on 5/23/13 and 6/5/13.
8/5/2014	Outgoing Email	UAIC	Melodi McAdams, Marcos Guerrero, Jason Camp	Requested meeting attendee list from 8/5/14 meeting with UAIC, SSBMI, Corps and DWR.
8/6/2014	Outgoing Email	SSBMI	Andrew Godsey, Kara Perry	Re-send of 8/5/14 email with draft PA attachments. Email sent on 8/5/14 did not attach the PA attachments correctly.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
8/7/2014	Incoming Email	UAIC	Melodi McAdams	Reply to 8/5/14 email request, sent meeting attendees list from 8/5/14 meeting.
8/19/2014	Incoming Letter	UAIC	Marcos Guerrero	(Letter received 10/16/14) Follow up letter from 8/5/14 consultation meeting requesting the Corps and DWR provide UAIC with: pre-burial plan, confidentiality and data sharing agreement, tribal signatory status on PA, tribal preference on scientific analysis, contractor selection, compensation for tribal monitors and information from tribes.
9/2/2014	Outgoing Email	UAIC, SSBMI	Marcos Guerrero, Jason Camp, Andrew Godsey	Sent link to Doodle poll to schedule next meeting with UAIC and SSBMI for late October/early November. Requested response to poll by 9/17/14. Welcomed receiving any comments on the draft programmatic agreement.
9/3/2014	Incoming Email	UAIC	Marcos Guerrero	Responded with available dates for next meeting, asked when comments on PA are due.
9/3/2014	Outgoing Email	UAIC, SSBMI, DWR	Jason Camp, Marcos Guerrero, Andrew Godsey, Dan Tibbitts, David Martasian, Erin Brehmer, Jacqueline Wait, Anecita Agustinez	Replied to 9/3/14 email from Mr. Guerrero that the last comment review period for the draft of the PA closed July 12, 2014, but that review of the draft is still open. The draft EIS/EIR will include comments received up to August 2014.
9/3/2014	Incoming Email	SSBMI	SSBMI	Responded to Doodle poll with available dates.
9/4/2014	Outgoing Email	UAIC, SSBMI, DWR	Jason Camp, Marcos Guerrero, Andrew Godsey, Dan Tibbitts, David Martasian, Erin Brehmer, Jacqueline Wait, Anecita Agustinez	Asked potential meeting attendees to double check their available dates since to date with six respondents there is not a date that lines up for a meeting from October 31-November 19.
9/24/2014	Outgoing Meeting Request	UAIC, SSBMI, DWR	Jason Camp, Marcos Guerrero, Andrew Godsey, Dan Tibbitts, David Martasian, Erin Brehmer, Jacqueline Wait, Anecita Agustinez	Sent meeting request for 11/3/14 10:00-12:00 meeting at Corps offices.
9/24/2014	Incoming Email	DWR	David Martasian	Declined 11/3/14 meeting request.
9/24/2014	Incoming Email	DWR	Anecita Agustinez	Accepted 11/3/14 meeting request.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
9/24/2014	Incoming Email	UAIC	Marcos Guerrero	Accepted 11/3/14 meeting request.
9/24/2014	Incoming Email	DWR	Erin Brehmer	Accepted 11/3/14 meeting request.
10/1/2014	Incoming Email	DWR	Jacqueline Wait	Declined 11/3/14 meeting request.
10/28/2014	Outgoing Email	UAIC, SSBMI, DWR	Jason Camp, Marcos Guerrero, Andrew Godsey, Dan Tibbitts, David Martasian, Erin Brehmer, Jacqueline Wait, Anecita Agustinez	Sent DRAFT meeting agenda for 11/3/14, requested any additional topics for discussion ASAP.
10/31/2014	Incoming Email	SSBMI	Kara Perry	Accepted 11/3/14 meeting request.
10/31/2014	Incoming Email	SSBMI	Cynthia Franco	Accepted 11/3/14 meeting request.
11/3/2014	Consultation Meeting	UAIC, SSBMI, DWR	Marcos Guerrero, Kara Perry, Cynthia Franco, Erin Brehmer, Anecita Agustinez	Consultation meeting to discuss ongoing ARCF project schedule and activities, outstanding topics: pre-burial plan, confidentiality and data sharing agreement, tribal signatory status on PA, tribal preference on scientific analysis, contractor selection, compensation for tribal monitors and information from tribes. Proposed a field visit of Natomas area in January.
11/6/2014	Incoming Email	UAIC	Marcos Guerrero	Asked to be sent the RFP for ARCF cultural services, asked if the tribe would be able to submit a bid and asked to be integrated into this process.
11/7/2014	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Josh Garcia	In response to 11/6/14 email, Ms. Montag stated cultural resources work under the ARCF PA is not moving forward for several months or longer, will likely be awarded under the Planning IDIQ. Provided information that a new Planning IDIQ is likely to be advertised in the next 30-60 days, that the Corps is looking for a firm to address multiple disciplines (planning, environmental, economics, cultural), to check https://www.fbo.gov/ for listings of federal contracts, and further information cannot be provided because it could be perceived as providing a potential contractor an unfair advantage. For further information, suggested contacting Josh Garcia as the Planning IDIQ COR.

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11/7/2014	Outgoing Meeting Request	UAIC, SSBMI, DWR	Jason Camp, Marcos Guerrero, Andrew Godsey, Kara Perry, Cynthia Franco, Dan Tibbitts, Sara Schultz, David Martasian, Erin Brehmer, Jacqueline Wait, Anecita Agustinez, Mark Gilfillan	Sent meeting request for 1/6/15 field visit to Natomas Basin.
11/7/2014	Outgoing Meeting Request	UAIC, SSBMI, DWR	Jason Camp, Marcos Guerrero, Andrew Godsey, Kara Perry, Cynthia Franco, Dan Tibbitts, Sara Schultz, David Martasian, Erin Brehmer, Jacqueline Wait, Anecita Agustinez, Mark Gilfillan	Sent backup meeting request for 1/13/15 field visit to Natomas Basin.
11/7/2014	Incoming Email	SSBMI	Kara Perry	Accepted 1/6/15 and 1/13/15 meeting requests.
11/7/2014	Incoming Email	DWR	Jacqueline Wait	Accepted 1/6/15 and 1/13/15 meeting requests.
11/7/2014	Incoming Email	USACE	Sara Schultz	Accepted 1/6/15 and 1/13/15 meeting requests.
11/7/2014	Incoming Email	USACE	Dan Tibbitts	Accepted 1/6/15 and 1/13/15 meeting requests.
11/7/2014	Incoming Email	UAIC	Marcos Guerrero	Accepted 1/6/15 and 1/13/15 meeting requests.
11/7/2014	Incoming Email	USACE	Mark Gilfillan	Accepted 1/6/15 meeting, declined 1/13/15 meeting.
11/10/2014	Incoming Email	SSBMI	Cynthia Franco	Accepted 1/6/15 meeting request.
11/12/2014	Incoming Email	DWR	Erin Brehmer	Accepted 1/6/15 and 1/13/15 meeting requests.
11/12/2014	Incoming Email	DWR	Anecita Agustinez	Accepted 1/6/15 and 1/13/15 meeting requests.
12/1/2014	Incoming Email	SSBMI	Daniel Fonseca	Accepted 1/6/15 meeting request.
12/17/2014	Incoming Email	UAIC	Marcos Guerrero	In response to 6/5/14 email transmittal of electronic version of draft PA, UAIC submitted track changes of comments on the document.
12/18/2014	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Melodi McAdams, Donald Rey	In response to 12/17/14 email, thanked Mr. Guerrero for providing UAIC comments on the draft PA.

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12/29/2014	Outgoing Email		Jason Camp, Marcos Guerrero, Andrew Godsey, Kara Perry, Cynthia Franco, Dan Tibbitts, Sara Schultz, David Martasian, Erin Brehmer, Jacqueline Wait, Anecita Agustinez, Mark Gilfillan	Sent updated meeting request for 1/6/15 field visit. Included meeting location, information on weather, tentative agenda.
12/29/2014	Incoming Email	UAIC	Marcos Guerrero	Accepted 1/6/15 meeting request.
1/5/2015	Incoming Email	UAIC	Jason Camp	Accepted 1/6/15 meeting request.
1/6/2015	Field Visit	UAIC, SSBMI, DWR, RD1000	Melissa Montag, Dan Tibbitts, Jason Camp, Marcos Guerrero, Donald Rey, Melodi McAdams, Kara Perry, Cynthia Franco, David Martasian, Erin Brehmer, Jacqueline Wait, Anecita Agustinez, Paul Devereux	Field visit of Natomas Basin, beginning south on Garden Highway with stops at San Juan Road, at pump station, Natomas Cross Canal, Pleasant Grove Creek Canal, Natomas East Main Drain Canal. Corps staff provided information on past NLIP work completed, types of alternatives being considered for Natomas, plans for compliance with Section 106.
1/6/2015	Outgoing Email	UAIC, SSBMI, DWR, RD1000	Melissa Montag, Dan Tibbitts, Jason Camp, Marcos Guerrero, Donald Rey, Melodi McAdams, Kara Perry, Cynthia Franco, David Martasian, Erin Brehmer, Jacqueline Wait, Anecita Agustinez, Paul Devereux	Ms. Montag transmitted the meeting attendance sheet for the 1/6/15 meeting and stated she would look to April to schedule the next quarterly meeting. Provided the general information that the draft EIS/EIR for the ARCF GRR will be released for public review soon and UAIC and SSBMI are on the mailing list to receive copies. Ms. Montag asked that if there is anything to discuss before the next meeting to please get in contact with her.

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1/8/2015	Consultation Meeting	SSBMI	Kara Perry, Cynthia Franco	Met with SSBMI representatives to specifically address Natomas Reach H borings, but also touched on overall ARCF GRR topics. Ms. Perry requested an electronic copy of the draft PA (previously emailed to Andrew Godsey 5/23/13 and Mr. Godsey and Ms. Perry on 8/61/14).
1/8/2015	Outgoing Email	SSBMI	Kara Perry, Cynthia Franco, Mark Gilfillan	Email transmittal of ARCF draft PA and PA attachments as requested in 1/8/15 consultation meeting. Explained that the PA covers Natomas activities, as well as future work in other basins, welcomed comments from the tribe.
1/8/2015	Outgoing Email	SSBMI	Kara Perry, Cynthia Franco, Mark Gilfillan	Resent 1/8/15 email with PA attachments only.
1/8/2015	Incoming Phone Call	BVR	Roselynn Lwenya	Ms. Lwenya returned a phone call regarding work for the ARCF Reach H project. Included in the conversation, Ms. Montag expressed that if BVR would like to meet to discuss the ARCF projects or any other Corps projects to notify the Corps. Ms. Lwenya stated she would provide this information to the BVR board and would respond to Ms. Montag if the tribe would like to meet.
3/17/2015	Outgoing Email	BVR, IBMI, SSBMI, UAIC, WR, MITCR, CWEPA, TAM, ERMI, NEDM,	Anthony Burris, Jason Camp, Grayson Coney, Michael DeSpain, Kesner Flores, Daniel Fonseca, Nicholas Fonseca, Reno Franklin, Marcos Guerrero, Steven Hutchason, Roselynn Lwenya, Yvonne Miller, Rhonda Morningstar Pope, Dennis Ramirez, Cosme Valdez, Randy Yonemura	Transmitted link to webpage where draft EIS/EIR and GRR are available for review from March 20 to May 4. Provided information on public workshop meetings. Sent by email to those addresses available, stated a letter and CD would also be sent by mail.
3/17/2015	Incoming Email		Kesner Flores	3/17/15 email to Mr. Flores returned as undeliverable.
3/17/2015	Incoming Email	ERMI	ERMI	3/17/15 email to main info address for ERMI returned as undeliverable.
3/17/2015	Incoming Email	NEDM	Cosme Valdez	3/17/15 email to Mr. Valdez returned as undeliverable.
3/17/2015	Incoming Email	TAM	TAM	3/17/15 email to main info address for TAM returned as undeliverable.
3/17/2015	Incoming Email	UAIC	Marcos Guerrero	In response to 3/17/15 email, requested the confidential cultural resources appendix and any survey, inventory, or evaluation reports.

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3/19/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	In reply to 3/17/15, stated there is not confidential information in the cultural resources appendix relating to cultural resources and that the Corps has not yet conducted any survey, inventory or evaluation for the Common Features Project. Transmitted the archaeological sensitivity assessment.
3/19/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Melodi McAdams	Transmitted GIS shape files as was requested in February 2015 UAIC Outreach Day. These GIS shape files were previously sent 8/4/15.
3/19/2015	Incoming Email	UAIC	Melodi McAdams	In reply to 3/19/15, acknowledged receipt of GIS shape files.
3/23/2015	Incoming Email	UAIC	Marcos Guerrero	Asked for the MMRP for the Common Features and Marysville Ring Levee Projects.
3/24/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	In reply to 3/23/15 email, asked for definition of MMRP.
3/24/2015	Incoming Email	UAIC	Marcos Guerrero	MMRP is Mitigation and Monitoring Report Plan, as part of EIR.
3/24/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	Provided contact information for DWR staff POCs for Common Features and Marysville Ring Levee Projects.
4/13/2015	Outgoing Email and Poll	UAIC, SSBMI, DWR	Marcos Guerrero, Jason Camp, Andrew Godsey, Daniel Fonseca, Kara Perry, Cynthia Franco	Email request to set up next quarterly meeting with UAIC and SSBMI in May. Proposed five different days/times to possibly meet, asked for any agenda topics to be forwarded.
4/13/2015	Incoming Poll Response	SSBMI		Responded with availability in poll.
4/14/2015	Incoming Poll Response	UAIC	Marcos Guerrero	Responded with availability in poll.
4/16/2015	Incoming Email	UAIC	Marcos Guerrero	Email with comments from UAIC on the DEIS/DEIR.
4/17/2015	Outgoing Meeting Request	UAIC, SSBMI, DWR	Marcos Guerrero, Jason Camp, Andrew Godsey, Daniel Fonseca, Kara Perry, Cynthia Franco	Sent meeting request for meeting on 5/19/15 from 10AM-12PM for next quarterly meeting with UAIC and SSBMI. Agenda to come.
4/17/2015	Incoming Email	SSMBI	Cynthia Franco, Kara Perry	Accepted meeting request for 5/19/15 meeting.
4/17/2015	Incoming Email	UAIC	Marcos Guerrero	Accepted meeting request for 5/19/15 meeting.
4/17/2015	Incoming Email	UAIC	Marcos Guerrero	Received comments on DEIS/DEIR from UAIC.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
4/20/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	Acknowledged receipt of comments from 4/17/15.
4/20/2015	Incoming Email	UAIC	Marcos Guerrero	Asked when the comment period for DEIS/DEIR ends.
4/20/2015	Outgoing Email	UAIC	Marcos Guerrero	Responded to 4/20/15 email that comment period for DEIS/DEIR ends 5/4/15.
4/20/2015	Incoming Email	UAIC	Jason Camp	Accepted meeting request for 5/19/15 meeting.
4/21/2015	Incoming Email	UAIC	Marcos Guerrero	Asked if UAIC can be an invited signatory to the PA.
4/21/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	Replied to 4/21/15 email that Ms. Montag would have to get back to Mr. Guerrero regarding this question.
4/29/2015	Outgoing Email	UAIC	Marcos Guerrero	Provided information that comment review period on the DEIS/DEIR has been extended two weeks until 5/18/15.
5/15/2015	Outgoing Email	UAIC, SSBMI, DWR	Marcos Guerrero, Jason Camp, Andrew Godsey, Daniel Fonseca, Kara Perry, Cynthia Franco	Sent draft meeting agenda for 5/15/15, requested any additional topics for discussion.
5/18/2015	Incoming Letter	UAIC	Gene Whitehouse	Letter to Colonel Farrell requesting Government to Government consultation, notification to the Corps about sites of importance to the tribe in the project area, requesting signatory party status on the PA.
5/19/2015	Consultation Meeting	UAIC, SSBMI, DWR	Marcos Guerrero, Jason Camp, Melodi McAdams, Kara Perry, Cynthia Franco	Scheduled consultation meeting. Topics included an update on the EIS/EIR, draft PA. Requested to know if the tribes have any information on sites or areas of interest within the project area. Tribes expressed concerns about sharing information on sites with the Corps, and with indicating any information on sites of importance. Asked about the project phasing and construction. Corps staff reiterated that phases in Natomas Basin are at early stages of design and suggested those designs could be shared with the tribes so they could determine what concerns the tribes may have. Shape files for current design phases will be sent to tribes and a follow up meeting in July or August to discuss those phases. Mr. Guerrero and Mr. Camp asked if UAIC will be invited as a signatory, Ms. Montag stated that decision is still being considered by the Corps.
5/27/2015	Incoming Email	UAIC	Marcos Guerrero	Email requesting maps of areas currently being consulted on and designed for the project in the Natomas area. Stated UAIC would like to schedule a follow up meeting and field visit to show areas they are most concerned with and to discuss TCPs and historic properties.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
5/27/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	In reply to 5/27/15 email, stated that GIS shape files have been requested internally but not received and will be forwarded on as soon as they are available. Stated the Corps is very interested in hearing the concerns from UAIC and continuing to discuss TCPs and historic properties.
6/16/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Melodi McAdams	Provided PDF of project areas for Natomas Reach I, shape files for project areas, and information/description on those areas. Requested potential dates to meet in July, who the tribe would like present at the meeting.
6/16/2015	Outgoing Email	SSBMI	Kara Perry, Cynthia Franco, Daniel Fonseca	Provided PDF of project areas for Natomas Reach I, shape files for project areas, and information/description on those areas. Requested potential dates to meet in July, who the tribe would like present at the meeting.
6/26/2015	Incoming Email	UAIC	Marcos Guerrero	In reply to 6/16/15 email, Mr. Guerrero suggested 7/6/15 as a possible meeting date and expressed concerns about the proposed APE. Stated no other tribes needed to be in attendance at meeting on 7/6/15.
6/26/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Melodi McAdams	In reply to 6/26/15 email, Ms. Montag stated she would coordinate the 7/6/15 date and would get back to UAIC.
6/30/2015	Outgoing Meeting Request	UAIC	Marcos Guerrero, Jason Camp, Melodi McAdams	Sent meeting request for site visit for Natomas Reach I for 7/6/15.
7/1/2015	Incoming Email	UAIC	Marcos Guerrero	Accepted 7/6/15 meeting request.
7/1/2015	Incoming Email	UAIC	Jason Camp	Accepted 7/6/15 meeting request.
7/7/2015	Outgoing Letter	UAIC	Gene Whitehouse	Letter requesting additional details and specific information regarding comments from UAIC in 4/16/15 email.
8/6/2015	Consultation Meeting	UAIC/Corps	Bill Welsh, Mike Kynett (Corps), Mark Boedker (Corps), Robin Rosenau (Corps), Marcos Guerrero, Melodi McAdams (UAIC), Donald Skip Rey (UAIC)	Staff-to-staff level consultation meeting regarding Natomas Reach I project and ARCF DEIS/DEIR, sites of concern to the tribe, construction activities of concern to the tribe. Additional topics included involvement of the tribe in surveying and monitoring, reporting, preferences on data recovery and curation, professional qualifications.
8/10/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Melodi McAdams	Sent comment responses to DEIS/DEIR and requested clarification/correction on notes taken during 8/6/15 consultation meeting with UAIC. Requested responses by 8/14/15.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
8/17/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Melodi McAdams	Transmitted meeting minutes from 8/6/15 meeting, attached email and document from 8/10/15 and requested any comments no later than 8/19/15.
8/24/2015	Outgoing Letter	UAIC	Gene Whitehouse	In response to 5/18/15 letter from UAIC, committed to continuing Government to Government consultation through Corps' Tribal Liaison, invited UAIC be be a concurring party on the PA.
11/30/2015	Incoming Email	UAIC	Marcos Guerrero	Mr. Guerrero asked if the Corps would still accept comments from UAIC on the draft EIS/EIR, despite comments being due 5/18/15.
12/7/2015	Outgoing Letters	Cortina Wintun, SVR, WR, CVTCT, Cachil Dehe, Mooretown Rancheria, Mechoopda, UAIC, TAM, SSBMI, NEDM, IBMI, ERMI, EDM, BVR, interested Native Americans	Various chairpersons, as well as Kesner Flores, Randy Yonemura, Rose Enos.	Letter transmitting the signed and executed PA and requesting parties to sign as concurring parties if they choose to.
12/31/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Courtney Coyle, Melodi McAdams, Jane Rinck, Mark Gilfillan	In response to 11/30/15 email, Ms. Montag stated that although the comment review period on the draft EIS/EIR is closed and the final document is being prepared, the Corps welcomes any comments from the tribe at any time, and anticipates extensive interactions with tribes for cuture environmental compliance efforts and while executing the stipulations of the PA.

670

American River Common Features Project Public Involvement Consultation Record*

*May not include all communication for project.

12/31/15

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
4/5/2013	Outgoing Letter	Various Historic Societies/Groups of Interest	To all interested parties	Letter providing project description and map, requesting any information on significant cultural resources.
4/8/2013	Incoming Email	Center for Sacramento History	Pat Johnson	Acknowledgement of 4/5/13 letter.
4/22/2013	Returned Letter	California Historical Building Safety Board		4/5/13 letter returned marked as "Not Deliverable as Addressed, Unable to Forward."
4/22/2013	Returned Letter	California Institute for Rural Studies		4/5/13 letter returned marked as "Attempted Not Known."
4/22/2013	Returned Letter	Discovery Museum of Sacramento		4/5/13 letter returned marked as "Not Deliverable as Addressed, Unable to Forward."
4/22/2013	Returned Letter	West Sacramento Museum and Visitor Center		4/5/13 letter returned marked as "Not Deliverable as Addressed, Unable to Forward."
11/19/2013	Returned Letter	Association for Northern California Records and Research		4/5/13 letter returned marked as "Return to Sender."
12/7/2015	Outgoing Letter	Society for California Archaeology, Yolo County Historical Society, West Sacramento Historical Society, Sutter County Historical Society, Golden Gate State Museum, Fair Oaks Historical Society, Sacramento County Historical Society, Central Valley Flood Protection Board		Letter transmitting the signed and executed PA and requesting parties to sign as concurring parties if they choose to.

American River Common Features GRR

EIS Cultural Resources Appendix

Enclosure 3

Consultation with the SHPO

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

FEB 0 1 2012

Mr. Milford Wayne Donaldson
State Historic Preservation Officer
Office of Historic Preservation
P.O. Box 942896
Sacramento, California 94296-0001

Dear Mr. Donaldson:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project near Sacramento, California. The ARCF Project is being developed to reduce flood risk to the City of Sacramento, including the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River. The ARCF Project is a part of the Common Features General Reevaluation Report. The non-Federal sponsor for the ARCF Project is the State of California Central Valley Flood Protection Board.

Pursuant to 36 CFR Part 800.3 we are initiating the Section 106 process for the ARCF Project and we are asking for your concurrence with our determination of the area of potential effects (APE) for the ARCF Project in accordance with 36 CFR Part 800.4(a)(1). We are also asking for your comments on our proposed efforts to identify historic properties pursuant to 36 CFR Part 800.4. We are also proposing to develop a programmatic agreement (PA) for the ARCF Project in accordance with 36 CFR Part 800.14(b).

The Corps has undertaken or has been the regulatory agency for multiple efforts to reduce flood risk in the region and the Sacramento and American River watersheds. Many of these efforts have resulted from authority given in the Water Resources Development Acts of 1996 and 1999. Because of the complex nature of these different studies and efforts, we have prepared a short summary document describing the authorizations for the projects in the region, what has been constructed, what agency or partner completed the construction, previous compliance with the National Historic Preservation Act of 1966, as amended, and the National Environmental Policy Act of 1969, and the planned future activities within the watersheds (Enclosure 1).

The APE for the ARCF Project includes approximately 12 miles of the north and south banks of the American River immediately upstream from the confluence with the Sacramento River; approximately 18 miles of the east bank of the Sacramento River immediately downstream of the Natomas Cross Canal (NCC) down to the confluence with the American River; approximately 5 miles of the south bank of the NCC immediately upstream of the confluence with the Sacramento River; approximately 4 miles of the Pleasant Grove Creek Canal; approximately 8 miles of the Natomas East Main Drainage Canal; approximately 15 miles of the east bank of the Sacramento River downstream of the American River down to Morrison

Creek; approximately 1.5 miles of the north and south banks of Dry/Robla Creeks; and approximately 2 miles of the north and south banks of Arcade Creek. The APE is shown in Enclosure 2.

We have completed a records and literature search of the APE at the North Central Information Center at California State University, Sacramento and at the Northeast Information Center at California State University, Chico in 2008. The records and literature search identified 136 cultural resources and 285 surveys and inventories conducted within and nearby the ARCF Project APE. Portions of the APE have been previously surveyed but the majority of the APE has not been intensively surveyed for cultural resources in the last ten years.

Because the APE for the ARCF Project covers a large geographic area and is largely located along rivers, which have been shown to be sensitive for buried resources, we are developing two predictive models to extrapolate archaeological sensitivity over un-surveyed portions of the APE. The first model will be a general model of site locations that will anticipate the likelihood that any one or more spots in the study area will be in an archaeological site. The second model will highlight portions of the study area where we would be more or less likely to find buried archaeological materials. Once the predictive models have been completed we plan to demonstrate their accuracy through field testing. Ultimately we plan to use the predictive models to assist with planning and evaluating alternatives to avoid adverse effects to cultural resources whenever and wherever possible.

A number of possible measures may be considered in order to reduce the flood risk to the City of Sacramento. The measures under consideration are described in Enclosure 1. Because the ARCF Project will be a complex undertaking that may be constructed in multiple phases and may result in adverse effects to historic properties, we are proposing to develop a PA to govern the implementation of our compliance efforts. We are working on a draft PA and plan to coordinate the execution of the PA with you and other potential signatory and concurring parties.

We obtained a list of potentially interested Native Americans from the Native American Heritage Commission and contacted them in letters dated May 4, 2011 to inquire if they have knowledge of locations of archeological sites, or areas of traditional cultural value or concern in or near the ARCF Project APE. Both the United Auburn Indian Community of the Auburn Rancheria and the Mechoopda Indian Tribe of Chico Rancheria have contacted us and expressed interest in the ARCF Project. We plan to continue to communicate with those tribes, as well as others that may have an interest in the ARCF Project as we comply with Section 106 and develop a PA.

Pursuant to 36 CFR Part 800.4(a)(1), we request your comments on our preliminary determination of the APE for the ARCF Project. We also request any comments your office may have of our proposed efforts to identify historic properties under 36 CFR Part 800.4 and our plan

to develop a PA in accordance with 36 CFR Part 800.14(b). We would like to schedule a meeting to meet with you and your staff to discuss the ARCF Project and answer any questions your may have about the project or our proposed Section 106 compliance efforts.

Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information about the Section 106 compliance and consultation, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil. Please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372 with any specific project questions.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Milford Wayne Donaldson
State Historic Preservation Officer
Office of Historic Preservation
P.O. Box 942896
Sacramento, California 94296-0001

JUL 16 2012

Dear Mr. Donaldson:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to transmit a draft programmatic agreement (PA) for the proposed American River Common Features (ARCF) Project near Sacramento, California. The ARCF Project is being developed to reduce flood risk to the City of Sacramento, including the Natomas Basin, areas along the north and south banks of the American River, and the east bank of the Sacramento River. The ARCF Project is a part of the Common Features General Reevaluation Report. The non-Federal sponsor for the ARCF Project is the State of California Central Valley Flood Protection Board.

We previously contacted you in a letter dated February 1, 2012, asking for your concurrence with our determination of the area of potential effects (APE), for your comments on our proposed efforts to identify historic properties, and to inform you of our proposed plan to develop a PA for the ARCF Project (Enclosure 1). The ARCF Project will be a complex undertaking that may be constructed in multiple phases, the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and it may result in adverse effects to historic properties. As a result, pursuant to 36 CFR § 800.14(b), we have drafted a PA to establish a framework for the resolution of potential adverse effects that may result from implementation of the ARCF Project. The draft PA is enclosed for your review and comment (Enclosure 2).

Included as attachments to the PA are a map of the APE (Enclosure 2, Attachment 1) and a project description for the ARCF Project (Enclosure 2, Attachment 2). We have also contacted the Advisory Council on Historic Preservation to ask for their comments on the proposed ARCF Project. They have also received the draft PA for their review and comment.

On several prior occasions we have been in contact with potentially interested Native Americans, asking for their participation in the Section 106 compliance efforts for the ARCF Project. We have met with the United Auburn Indian Community of the Auburn Rancheria and Shingle Springs Band of Miwok Indians on the ARCF Project. As we develop the PA and comply with Section 106, we will continue to involve these tribes, as well as other tribes identified by the Native American Heritage Commission as having an interest in the APE.

Pursuant to 36 CFR § 800.14(b)(2)(i), we request your involvement in the development of the PA for the ARCF Project. We ask that you review the enclosed PA and provide us with comments within 45 days. Additionally, we would like to schedule a time to meet with you and your staff to discuss the ARCF Project and answer any questions you may have about the project or our proposed Section 106 compliance efforts.

Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information about the Section 106 compliance and consultation, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil. Please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372 with any specific project questions.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Dr. Carol Roland-Nawi
State Historic Preservation Officer
Department of Parks and Recreation
Office of Historic Preservation
1725 23rd Street, Suite 100
Sacramento, CA 94296-0001

Dear Dr. Roland-Nawi:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), we are writing to continue consultation on the American River Common Features (ARCF) Project near Sacramento, California. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We have previously contacted your office in letter dated February 1, 2012, which documented our determination of the area of potential effects (APE), and requested comments on our efforts to identify historic properties and our plan to develop a programmatic agreement (PA). In a letter July 16, 2012, we transmitted the draft PA for review and requested comments, provided an update of consultation with the Advisory Council on Historic Preservation (ACHP) and potentially interested Native American tribes, and requested to meet on the ARCF Project. Staff from my office met with Ms. Susan Stratton, Mr. Dwight Dutsche, and Mr. Brendan Greenaway of your office in meetings on October 29, 2012 and November 5, 2012 to discuss the ARCF Project and the planned efforts to comply with Section 106 of the NHPA. Previous consultation with your office on the ARCF Project is included in Enclosure 1.

Pursuant to 36 CFR Part 800.3 we are requesting your concurrence with our determination of the area of potential effects (APE) for the ARCF Project in accordance with 36 CFR Part 800.4(a)(1). We are also providing information on our efforts to identify historic properties pursuant to 36 CFR Part 800.4 and we

are providing the most recent final draft of the PA for the ARCF Project for your final review and comment before we plan to execute the PA. The final draft of the PA is included in Enclosure 2.

The Corps has undertaken or has been the regulatory agency for multiple efforts to reduce flood risk in the region and the Sacramento and American River watersheds. Many of these efforts have resulted from authority given in the Water Resources Development Acts of 1996 and 1999. Because of the complex nature of these different studies and efforts, we have prepared a short summary document describing the authorizations for the projects in the region, what has been constructed, what agency or partner completed the construction, previous compliance with the National Historic Preservation Act of 1966, as amended, and the National Environmental Policy Act of 1969, and the planned future activities within the watersheds (Enclosure 2, Attachment 4).

We have determined that the APE for the ARCF Project 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; approximately 4 miles of the Pleasant Grove Creek Canal; approximately 8 miles of the Natomas East Main Drainage Canal; 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. Most of the activities planned for the ARCF Project will be confined to the levees or the immediately adjacent river banks near the levees, however, the APE for the ARCF Project 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. The APE is shown in Enclosure 2, Attachment 3.

We have completed a records and literature search of the APE at the North Central Information Center at California State University, Sacramento and at the Northeast Information Center at California State University, Chico in 2006 and 2007, and updated in 2010 and 2013. The records and literature search identified 61 known cultural resources within and nearby the ARCF Project APE. Portions of the APE have been previously surveyed but the majority of the APE has not been intensively surveyed for cultural resources in the last ten years.

Because the APE for the ARCF Project covers a large geographic area and is mostly located along rivers, which have been shown to be sensitive for buried resources, we have developed two predictive models to extrapolate archaeological sensitivity over un-surveyed portions of the APE. The first model is a general model of site locations that anticipates the likelihood that any one or more spots in the study area will be in an archaeological site. The second model highlights portions of the APE where we would be more or less likely to find buried archaeological materials. Ultimately we plan to use the predictive models to assist with planning and evaluating alternatives to avoid adverse effects to cultural resources whenever and wherever possible. The models and detailed information on the archaeological sensitivity assessment are included in Enclosure 3. We request any comments you may have on the archaeological sensitivity assessment.

A number of possible measures may be considered in order to reduce the flood risk to the City of Sacramento. The measures under consideration are described in Attachment 4 of Enclosure 2. Because the ARCF Project will be a complex undertaking that may be constructed in multiple phases and may result in adverse effects to historic properties, we have developed a PA to govern the implementation of our compliance efforts. The PA has been provided to your office, the ACHP, CVFPP, Department of Water Resources (DWR), SAFCA, and potentially interested American Indian Tribes and interested American Indian individuals for review and comment. In a letter dated August 7, 2012, the ACHP declined to participate in consultation for the ARCF Project (Enclosure 2, Attachment 2). Comments were received from the CVFPP, DWR, SAFCA, and American Indian Tribes and have been considered in this current final draft of the PA.

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 APE. One response, from the Center for Sacramento History, was received, noting they would keep our letter on file. In accordance with 36 CFR § 800.14(b)(2)(ii), we will also provide the final draft PA with the forthcoming Environmental Impact Statement/Environmental Impact Report which will be released for public review this summer.

We obtained a list of potentially interested American Indian tribes and interested American Indian individuals from the Native American Heritage Commission and contacted them in 2011, 2012, and 2013 to inquire if they have knowledge of locations of archeological sites, or areas of traditional cultural value or concern in or near the ARCF Project APE. The United Auburn Indian Community of the Auburn

Rancheria (UAIC), the Shingle Springs Band of Miwok Indians (SSBMI), the Mechoopda Indian Tribe of Chico Rancheria, the Ione Band of Miwok Indians, and the Buena Vista Rancheria (BVR) have contacted us and expressed interest in the ARCF Project. We have met with the UAIC, the SSBMI, and the BVR and we plan to continue to communicate with those tribes, as well as others that may have an interest in the ARCF Project as we execute the PA in compliance with Section 106 of the NHPA. A consultation log of communications with American Indian tribes and American Indian individuals for the ARCF Project is included as Enclosure 4.

Pursuant to 36 CFR Part 800.4(a)(1), we request your comments on our determination of the APE for the ARCF Project. We also request any comments your office may have of our efforts to identify historic properties under 36 CFR Part 800.4 and any comments you may have on the final draft of the PA for the ARCF Project which was developed in accordance with 36 CFR Part 800.14(b).

Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information about the Section 106 compliance and consultation, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil. Please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372 with any specific project questions.

Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosures

cc: (w/o enclosures)
Cathy Bishop, Chairperson, Strawberry Valley Rancheria, 1540 Strader Avenue, Sacramento, California 95815
Anthony Burris, Ione Band of Miwok Indians, P.O. Box 699, Plymouth, California 95669
Jason Camp, Tribal Historic Preservation Officer, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603
Grayson Coney, Tsi-Akim Maidu, P.O. Box 1316, Colfax, California 95713

Pamela Cubbler, Colfax-Todds Valley Consolidated Tribe, P.O. Box 734, Foresthill, California 95631
Sam Daniels, Shingle Springs Band of Miwok Indians, P.O. Box 1340, Shingle Springs, California 95682
Mary Daniels-Tarango, Chairperson, Wilton Rancheria, 7916 Farnell Way, Sacramento, California 95823
Michael D. DeSpain, Director of OEPP, Mechoopda Indian Tribe of Chico Rancheria, 125 Mission Ranch Boulevard, Chico, California 95926
El Dorado Miwok Tribe, P.O. Box 711, El Dorado, California 95623
Rose Enos, 15310 Bancroft Road, Auburn, California 95603
Kesner Flores, P.O. Box 1047, Wheatland, California 95692
Daniel Fonseca, Tribal Historic Preservation Officer, Shingle Springs Band of Miwok Indians, P.O. Box 1340, Shingle Springs, California 95682
Nicholas Fonseca, Chairperson, Shingle Springs Band of Miwok Indians, P.O. Box 1340, Shingle Springs, California 95682
Andrew Franklin, Wilton Rancheria, 9300 W. Stockton Blvd, Suite 200, Elk Grove, California 95758
Reno Franklin, Tribal Historic Preservation Officer, Enterprise Rancheria of Maidu Indians, 2133 Monte Vista Avenue, Oroville, California 95966
Marcos Guerrero, Cultural Resources Manager, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603
Steven Hutchason, Executive Director of Environmental Resources, Wilton Rancheria, 9300 W. Stockton Blvd, Suite 200, Elk Grove, California 95758
Roselynn Lwenya, Tribal Historic Preservation Officer, Buena Vista Rancheria, P.O. Box 162283, Sacramento, California 95816
Judith Marks, Colfax-Todds Valley Consolidated Tribe, 1068 Silverton Circle, Lincoln, California 95648
Yvonne Miller, Chairperson, Ione Band of Miwok Indians, P.O. Box 699, Plymouth, California 95669
Ambar Mohammed, Cachil DeHe Band of Wintun Indians of the Colusa Indian Community of the Colusa Rancheria, 3730 State Highway 45 #B, Colusa, California 95932
Eileen Moon, Vice Chairperson, 760 South Auburn Street, Suite 2-C, Grass Valley, California 95945
April Wallace Moore, 19630 Placer Hills Road, Colfax, California 95713
Rhonda Morningstar Pope, Chairperson, Buena Vista Rancheria, P.O. Box 162283, Sacramento, California 95816
Glenda Nelson, Chairperson, Enterprise Rancheria of Maidu Indians, 2133 Monte Vista Avenue, Oroville, California 95966

Dennis Ramirez, Chairperson, Mechoopda Indian Tribe of Chico Rancheria, 125 Mission Ranch Boulevard, Chico, California 95926
Guy Taylor, Representative, Mooretown Rancheria of Maidu Indians, 31 Alverde Drive, Oroville, California, 95966
Cosme Valdez, Interim Chief Executive Officer, Nashville-El Dorado Miwok, P.O. Box 580986, Elk Grove, California 95758
Gene Whitehouse, Chairperson, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603
Charlie Wright, Chairperson, Cortina Wintun Environmental Protection Agency, P.O. Box 1630, Williams, California 95987
Randy Yonemura, 4305 39th Avenue, Sacramento, California 95824

cc: (w/enclosures)
Reid Nelson, Advisory Council on Historic Preservation, 401 F Street NW, Suite 308, Washington, DC 20001-2637
Jacqueline Wait, Department of Water Resources, Division of Environmental Services, Environmental Compliance & Evaluation Branch, Cultural, Recreation, and Environmental Planning Section, 3500 Industrial Boulevard, West Sacramento, California 95691

American River Common Features GRR

EIS Cultural Resources Appendix

Enclosure 4

Consultation with the ACHP

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Reid Nelson
Advisory Council on Historic Preservation
Office of Federal Agency Programs
Old Post Office Building
1100 Pennsylvania Avenue, NW, Suite 803
Washington, DC 20004

FEB 01 2012

Dear Mr. Nelson:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), we are writing to inform you of the proposed American River Common Features (ARCF) Project near Sacramento, California, and to request your participation in the ARCF Project. The ARCF Project is being developed by the U.S. Army Corps of Engineers (Corps) to reduce flood risk to the city of Sacramento. The reaches of the ARCF project include the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River. The ARCF Project will be described in the Common Features General Reevaluation Report. The non-Federal sponsor for the ARCF Project is the State of California Central Valley Flood Protection Board (CVFPB).

Because the ARCF Project will be a complex undertaking that may be constructed in multiple phases; covers a large geographic area largely located along rivers, which has been shown to be sensitive for buried resources; and may result in adverse effects to historic properties, we are proposing to develop a programmatic agreement (PA) to govern the implementation of our compliance efforts. We want to make every effort to include all parties with an interest in the project and those agencies with responsibilities under Section 106 of the NHPA. We are writing to provide you with information on the proposed project, to inform you of the process we plan to follow, and to potentially include your participation in accordance with 36 CFR § 800.2(a)(4)(b)(1).

The Corps has undertaken, or has been the regulatory agency, for multiple efforts to reduce flood risk in the region and the Sacramento and American River watersheds. Many of these efforts have resulted from authority given in the Water Resources Development Acts of 1996 and 1999. Because of the complex nature of these different studies and efforts, we have prepared a summary document describing the authorizations for the projects in the region; what has been constructed, and by whom; previous compliance with the NHPA and the National Environmental Policy Act of 1969; and the planned future activities within the watersheds (Enclosure 1).

The area of potential effects (APE) for the ARCF Project includes approximately 12 miles of the north and south banks of the American River immediately upstream from the confluence with the Sacramento River; approximately 18 miles of the east bank of the

Sacramento River from immediately downstream of the Natomas Cross Canal (NCC) to the confluence with the American River; approximately 5 miles of the south bank of the NCC immediately upstream of the confluence with the Sacramento River; approximately 4 miles of the Pleasant Grove Creek Canal; approximately 8 miles of the Natomas East Main Drainage Canal; approximately 15 miles of the east bank of the Sacramento River downstream of the American River down to Morrison Creek; approximately 1.5 miles of the north and south banks of Dry/Robla Creeks; and approximately 2 miles of the north and south banks of Arcade Creek. The APE is shown in Enclosure 2.

Because of the possible adverse effects, and due to the complex, multi-phase nature of the ARCF Project, we are developing a PA that will include stipulations for determination of the APE for different phases of the project, identification of historic properties, evaluation of historic properties, determination of effects to historic properties, preparation of historic properties treatment plans, public participation, and communication with Native Americans. Pursuant to 36 CFR § 800.6(a)(1) after the PA has undergone coordination with the non-Federal sponsor, the CVFPB, and the State Historic Preservation Office, we plan to send a draft of the PA to you and ask for your review and comment.

We invite any comments you may have on the proposed ARCF Project. Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information about the Section 106 compliance and consultation, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil. Please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372 with any specific project questions.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUL 16 2012

Mr. Reid Nelson
Advisory Council on Historic Preservation
Office of Federal Agency Programs
Old Post Office Building
1100 Pennsylvania Avenue, NW, Suite 803
Washington, DC 20004

Dear Mr. Nelson:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to transmit a draft programmatic agreement (PA) for the proposed American River Common Features (ARCF) Project near Sacramento, California. The ARCF Project is being developed to reduce flood risk to the City of Sacramento, including the Natomas Basin, areas along the north and south banks of the American River, and the east bank of the Sacramento River. The ARCF Project is a part of the Common Features General Reevaluation Report. The non-Federal sponsor for the ARCF Project is the State of California Central Valley Flood Protection Board.

We previously contacted you in a letter dated February 1, 2012, inviting your comments on the proposed project and informing you of the proposed process we plan to follow, to include the development of a PA for the ARCF Project (Enclosure 1). The ARCF Project will be a complex undertaking that may be constructed in multiple phases, the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and it may result in adverse effects to historic properties. As a result, pursuant to 36 CFR § 800.14(b), we have drafted a PA to establish a framework for the resolution of potential adverse effects that may result from implementation of the ARCF Project. The draft PA is enclosed for your review and comment (Enclosure 2).

Included as attachments to the PA are a map of the area of potential effects (APE) (Enclosure 2, Attachment 1) and a project description for the ARCF Project (Enclosure 2, Attachment 2). We have also contacted the California State Historic Preservation Officer to ask for their comments on the proposed ARCF Project. They have also received the draft PA for their review and comment.

On several prior occasions we have been in contact with potentially interested Native Americans, asking for their participation in the Section 106 compliance efforts for the ARCF Project. We have met with the United Auburn Indian Community of the Auburn Rancheria and Shingle Springs Band of Miwok Indians on the ARCF Project. As we develop the PA and comply with Section 106, we will continue to involve these tribes, as well as other tribes identified by the Native American Heritage Commission as having an interest in the APE.

Pursuant to 36 CFR § 800.14(b)(2)(i), we request your involvement in the development of the PA for the ARCF Project. We ask that you review the enclosed PA and provide us with comments within 45 days. Additionally, we ask you to notify us if you plan to formally participate in the execution of the PA.

Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information about the Section 106 compliance and consultation, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil. Please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372 with any specific project questions.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

Preserving America's Heritage

November 2, 2015

Ms. Melissa Montag
Historian/Senior Environmental Manager
U.S. Army Corps of Engineers
Cultural, Recreation & Social Assessment Section (CESPK-PD-RC)
1325 J Street
Sacramento, CA 95814-2922

Ref: *USACE American River Common Features Project*

Dear Ms. Montag:

The Advisory Council on Historic Preservation (ACHP) has received the Programmatic Agreement (PA) for the above referenced project. In accordance with Section 800.6(b)(1)(iv) of the ACHP's regulations, the ACHP acknowledges receipt of the PA. The filing of the PA, and execution of its terms, completes the requirements of Section 106 of the National Historic Preservation Act and the ACHP's regulations.

We appreciate your providing us with a copy of the PA and will retain it for inclusion in our records regarding this project. Should you have any questions or require additional assistance, please contact Brian Lusher at (202) 517-0221 or via e-mail at blusher@achp.gov.

Sincerely,

Artisha Thompson
Historic Preservation Technician
Office of Federal Agency Programs

ADVISORY COUNCIL ON HISTORIC PRESERVATION
401 F Street NW, Suite 308 • Washington, DC 20001-2637
Phone: 202-517-0200 • Fax: 202-517-6381 • achp@achp.gov • www.achp.gov

American River Common Features GRR

EIS Cultural Resources Appendix

Enclosure 5

Consultation with American Indian Tribes and Individuals

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Dennis Ramirez, Chairperson
Mechoopda Indian Tribe of Chico Rancheria
125 Mission Ranch Boulevard
Chico, California 95926

MAY 04 2011

Dear Mr. Ramirez:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of proposed geotechnical explorations for the American River Common Features General Reevaluation (Common Features) Project. The Sacramento Area Flood Control Agency (SAFCA) has implemented and constructed prior phases of the Common Features Project and the U.S. Army Corps of Engineers, Sacramento District (Corps) is now proceeding with future planned phases of the project. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal (NCC), the Pleasant Grove Cross Canal (PGCC), and the Natomas East Main Drain Canal (NEMDC).

Enclosure 1 outlines the entire Common Features Project, including portions previously constructed by SAFCA. The Common Features Project is divided into three regions shown on Enclosure I: the Natomas Basin (NAT) shown in yellow, American River North (ARN) shown in blue, and American River South (ARS) shown in purple. NAT Reaches C and D were entirely constructed by SAFCA, as well as a portion of NAT Reach B, some of which is presently still under construction.

As part of the Corps' exploratory phase for the remaining reaches of the Common Features Project we are planning to complete a series of geotechnical explorations in the late spring, summer, and fall of 2011 along various project reaches. Along NAT Reach A, a total of 8 cone penetrometer tests (CPT) and 15 geotechnical borings at and adjacent to the Sacramento and American Rivers levees will be completed between May and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach A are shown red dots on Enclosure 2. Although there are no known prehistoric resources located within the areas identified for borings and CPTs, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil.

Within NAT Reach B, a total of 4 CPTs and 13 geotechnical borings along the Sacramento River levee crown and in adjacent agricultural fields will be completed between July and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach B are shown as red dots on Enclosure 3. Although there are no known prehistoric resources located within the

areas identified for borings and CPTs, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil.

Along NAT Reaches E, F, G, and H, a total of 45 CPTs at the PGCC and NEMDC levee toe and 16 geotechnical borings along the levee crown and in adjacent agricultural fields will be completed between May and October. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reaches E, F, G, and H are shown as blue and red dots on Enclosure 4. There are no known prehistoric resources located within the areas identified for borings and CPTs. Because the borings and CPTs are planned to occur within a heavily disturbed area along a manmade feature we do not plan to have an archeological monitor present during the geotechnical borings and CPTs along NAT Reaches E, F, G, and H.

Within ARN Reaches A and B and ARS Reaches A and B, three different types of geotechnical explorations are scheduled to be completed between August and September. These explorations include trenching, waterside berm borings, and in-channel borings. Enclosure 5 shows the probable locations of the various explorations along the American River. Shown as red lines in Enclosure 5, a total of 15 trenches will be dug to a maximum depth of 15 feet below the existing ground surface and a total linear footage of 150 feet at each location. Shown as red dots in Enclosure 5, a total of 10 waterside berm borings will be drilled to a maximum depth of 50 feet below the existing ground surface. And shown as blue dots in Enclosure 5, a total of 10 in-channel borings will be drilled to a maximum depth of 25 feet within the American River Channel.

There are no known prehistoric resources located within the areas identified for the trenching, waterside berm borings and in-channel borings. Prior to beginning the geotechnical explorations along Reaches A and B of ARN and ARS we will complete an archeological field investigation of the locations of the explorations. In the event that cultural resources are identified during the archeological field investigation, we will relocate those explorations to avoid possible sites. A qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil for the trenching and borings.

For all of the geotechnical explorations located at NAT A, B, E, F, G and H; ARN Reaches A and B; and ARS Reaches A and B, as well as for all future geotechnical explorations for the Common Features Project, in the event of an unanticipated discovery during the explorations all activity within the vicinity of the find would cease and a qualified archeologist would examine the find to determine treatment.

We are sensitive to traditional cultural properties and sacred sites, and make every effort to avoid them. Please let us know if you have knowledge of locations of archeological sites, or areas of traditional cultural interest or concern. If you are interested in further communication

regarding exploratory efforts or our continuing efforts to comply with Section 106 of the National Historic Preservation Act of 1966, as amended, we ask that you notify us. In accordance with 36 C.F.R. § 800.14 we plan to develop a Programmatic Agreement (PA) in order to initiate the Section 106 process early in the planning process for the Common Features Project and we will be contacting you in the future to determine your interest in involvement in the PA as a concurring party. Correspondence may be sent to: Ms. Melissa Montag (CESPK-PD-RC), U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814-2922.

We request that you reply within 30 days of receipt of this letter. If you have any questions of comments, please contact Ms. Montag, Historian, at (916) 557-7907.

Sincerely,

E. Scott Cecil

Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 04 2011

Mr. Nicholas Fonseca, Chairperson
Shingle Springs Band of Miwok Indians
P.O. Box 1340
Shingle Springs, California 95682

Dear Mr. Fonseca:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of proposed geotechnical explorations for the American River Common Features General Reevaluation (Common Features) Project. The Sacramento Area Flood Control Agency (SAFCA) has implemented and constructed prior phases of the Common Features Project and the U.S. Army Corps of Engineers, Sacramento District (Corps) is now proceeding with future planned phases of the project. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal (NCC), the Pleasant Grove Cross Canal (PGCC), and the Natomas East Main Drain Canal (NEMDC).

Enclosure 1 outlines the entire Common Features Project, including portions previously constructed by SAFCA. The Common Features Project is divided into three regions shown on Enclosure 1: the Natomas Basin (NAT) shown in yellow, American River North (ARN) shown in blue, and American River South (ARS) shown in purple. NAT Reaches C and D were entirely constructed by SAFCA, as well as a portion of NAT Reach B, some of which is presently still under construction.

As part of the Corps' exploratory phase for the remaining reaches of the Common Features Project we are planning to complete a series of geotechnical explorations in the late spring, summer, and fall of 2011 along various project reaches. Along NAT Reach A, a total of 8 cone penetrometer tests (CPT) and 15 geotechnical borings at and adjacent to the Sacramento and American Rivers levees will be completed between May and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach A are shown red dots on Enclosure 2. Although there are no known prehistoric resources located within the areas identified for borings and CPTs, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil.

Within NAT Reach B, a total of 4 CPTs and 13 geotechnical borings along the Sacramento River levee crown and in adjacent agricultural fields will be completed between July and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach B are shown as red dots on Enclosure 3. Although there are no known prehistoric resources located within the

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REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 04 2011

Ms. Cathy Bishop, Chairperson
Strawberry Valley Rancheria
P.O. Box 667
Marysville, California 95901

Dear Ms. Bishop:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of proposed geotechnical explorations for the American River Common Features General Reevaluation (Common Features) Project. The Sacramento Area Flood Control Agency (SAFCA) has implemented and constructed prior phases of the Common Features Project and the U.S. Army Corps of Engineers, Sacramento District (Corps) is now proceeding with future planned phases of the project. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal (NCC), the Pleasant Grove Cross Canal (PGCC), and the Natomas East Main Drain Canal (NEMDC).

Enclosure 1 outlines the entire Common Features Project, including portions previously constructed by SAFCA. The Common Features Project is divided into three regions shown on Enclosure 1: the Natomas Basin (NAT) shown in yellow, American River North (ARN) shown in blue, and American River South (ARS) shown in purple. NAT Reaches C and D were entirely constructed by SAFCA, as well as a portion of NAT Reach B, some of which is presently still under construction.

As part of the Corps' exploratory phase for the remaining reaches of the Common Features Project we are planning to complete a series of geotechnical explorations in the late spring, summer, and fall of 2011 along various project reaches. Along NAT Reach A, a total of 8 cone penetrometer tests (CPT) and 15 geotechnical borings at and adjacent to the Sacramento and American Rivers levees will be completed between May and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach A are shown red dots on Enclosure 2. Although there are no known prehistoric resources located within the areas identified for borings and CPTs, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil.

Within NAT Reach B, a total of 4 CPTs and 13 geotechnical borings along the Sacramento River levee crown and in adjacent agricultural fields will be completed between July and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach B are shown as red dots on Enclosure 3. Although there are no known prehistoric resources located within the

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 04 2011

Ms. Eileen Moon, Vice Chairperson
760 South Auburn Street, Suite 2-C
Grass Valley, California 95945

Dear Ms. Moon:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of proposed geotechnical explorations for the American River Common Features General Reevaluation (Common Features) Project. The Sacramento Area Flood Control Agency (SAFCA) has implemented and constructed prior phases of the Common Features Project and the U.S. Army Corps of Engineers, Sacramento District (Corps) is now proceeding with future planned phases of the project. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal (NCC), the Pleasant Grove Cross Canal (PGCC), and the Natomas East Main Drain Canal (NEMDC).

Enclosure 1 outlines the entire Common Features Project, including portions previously constructed by SAFCA. The Common Features Project is divided into three regions shown on Enclosure 1: the Natomas Basin (NAT) shown in yellow, American River North (ARN) shown in blue, and American River South (ARS) shown in purple. NAT Reaches C and D were entirely constructed by SAFCA, as well as a portion of NAT Reach B, some of which is presently still under construction.

As part of the Corps' exploratory phase for the remaining reaches of the Common Features Project we are planning to complete a series of geotechnical explorations in the late spring, summer, and fall of 2011 along various project reaches. Along NAT Reach A, a total of 8 cone penetrometer tests (CPT) and 15 geotechnical borings at and adjacent to the Sacramento and American Rivers levees will be completed between May and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach A are shown red dots on Enclosure 2. Although there are no known prehistoric resources located within the areas identified for borings and CPTs, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil.

Within NAT Reach B, a total of 4 CPTs and 13 geotechnical borings along the Sacramento River levee crown and in adjacent agricultural fields will be completed between July and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach B are shown as red dots on Enclosure 3. Although there are no known prehistoric resources located within the

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 04 2011

Mr. David Keyser, Chairperson
United Auburn Indian Community
Auburn Rancheria
Auburn, California 95603

Dear Mr. Keyser:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of proposed geotechnical explorations for the American River Common Features General Reevaluation (Common Features) Project. The Sacramento Area Flood Control Agency (SAFCA) has implemented and constructed prior phases of the Common Features Project and the U.S. Army Corps of Engineers, Sacramento District (Corps) is now proceeding with future planned phases of the project. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal (NCC), the Pleasant Grove Cross Canal (PGCC), and the Natomas East Main Drain Canal (NEMDC).

Enclosure 1 outlines the entire Common Features Project, including portions previously constructed by SAFCA. The Common Features Project is divided into three regions shown on Enclosure 1: the Natomas Basin (NAT) shown in yellow, American River North (ARN) shown in blue, and American River South (ARS) shown in purple. NAT Reaches C and D were entirely constructed by SAFCA, as well as a portion of NAT Reach B, some of which is presently still under construction.

As part of the Corps' exploratory phase for the remaining reaches of the Common Features Project we are planning to complete a series of geotechnical explorations in the late spring, summer, and fall of 2011 along various project reaches. Along NAT Reach A, a total of 8 cone penetrometer tests (CPT) and 15 geotechnical borings at and adjacent to the Sacramento and American Rivers levees will be completed between May and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach A are shown red dots on Enclosure 2. Although there are no known prehistoric resources located within the areas identified for borings and CPTs, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil.

Within NAT Reach B, a total of 4 CPTs and 13 geotechnical borings along the Sacramento River levee crown and in adjacent agricultural fields will be completed between July and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach B are shown as red dots on Enclosure 3. Although there are no known prehistoric resources located within the

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 04 2011

Ms. Mary Daniels-Tarango, Chairperson
Wilton Rancheria
7916 Farnell Way
Sacramento, California 95823

Dear Ms. Daniels-Tarango:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of proposed geotechnical explorations for the American River Common Features General Reevaluation (Common Features) Project. The Sacramento Area Flood Control Agency (SAFCA) has implemented and constructed prior phases of the Common Features Project and the U.S. Army Corps of Engineers, Sacramento District (Corps) is now proceeding with future planned phases of the project. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal (NCC), the Pleasant Grove Cross Canal (PGCC), and the Natomas East Main Drain Canal (NEMDC).

Enclosure 1 outlines the entire Common Features Project, including portions previously constructed by SAFCA. The Common Features Project is divided into three regions shown on Enclosure 1: the Natomas Basin (NAT) shown in yellow, American River North (ARN) shown in blue, and American River South (ARS) shown in purple. NAT Reaches C and D were entirely constructed by SAFCA, as well as a portion of NAT Reach B, some of which is presently still under construction.

As part of the Corps' exploratory phase for the remaining reaches of the Common Features Project we are planning to complete a series of geotechnical explorations in the late spring, summer, and fall of 2011 along various project reaches. Along NAT Reach A, a total of 8 cone penetrometer tests (CPT) and 15 geotechnical borings at and adjacent to the Sacramento and American Rivers levees will be completed between May and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach A are shown red dots on Enclosure 2. Although there are no known prehistoric resources located within the areas identified for borings and CPTs, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil.

Within NAT Reach B, a total of 4 CPTs and 13 geotechnical borings along the Sacramento River levee crown and in adjacent agricultural fields will be completed between July and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach B are shown as red dots on Enclosure 3. Although there are no known prehistoric resources located within the

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 04 2011

Mr. Cosme Valdez, Interim Chief Executive Officer
Nashville-El Dorado Miwok
P.O. Box 580986
Elk Grove, California 95758

Dear Mr. Valdez:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of proposed geotechnical explorations for the American River Common Features General Reevaluation (Common Features) Project. The Sacramento Area Flood Control Agency (SAFCA) has implemented and constructed prior phases of the Common Features Project and the U.S. Army Corps of Engineers, Sacramento District (Corps) is now proceeding with future planned phases of the project. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal (NCC), the Pleasant Grove Cross Canal (PGCC), and the Natomas East Main Drain Canal (NEMDC).

Enclosure 1 outlines the entire Common Features Project, including portions previously constructed by SAFCA. The Common Features Project is divided into three regions shown on Enclosure 1: the Natomas Basin (NAT) shown in yellow, American River North (ARN) shown in blue, and American River South (ARS) shown in purple. NAT Reaches C and D were entirely constructed by SAFCA, as well as a portion of NAT Reach B, some of which is presently still under construction.

As part of the Corps' exploratory phase for the remaining reaches of the Common Features Project we are planning to complete a series of geotechnical explorations in the late spring, summer, and fall of 2011 along various project reaches. Along NAT Reach A, a total of 8 cone penetrometer tests (CPT) and 15 geotechnical borings at and adjacent to the Sacramento and American Rivers levees will be completed between May and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach A are shown red dots on Enclosure 2. Although there are no known prehistoric resources located within the areas identified for borings and CPTs, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil.

Within NAT Reach B, a total of 4 CPTs and 13 geotechnical borings along the Sacramento River levee crown and in adjacent agricultural fields will be completed between July and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach B are shown as red dots on Enclosure 3. Although there are no known prehistoric resources located within the

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
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1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 04 2011

Ione Band of Miwok Indians
P.O. Box 699
Plymouth, California 95699

Dear Ione Band of Miwok Indians:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of proposed geotechnical explorations for the American River Common Features General Reevaluation (Common Features) Project. The Sacramento Area Flood Control Agency (SAFCA) has implemented and constructed prior phases of the Common Features Project and the U.S. Army Corps of Engineers, Sacramento District (Corps) is now proceeding with future planned phases of the project. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal (NCC), the Pleasant Grove Cross Canal (PGCC), and the Natomas East Main Drain Canal (NEMDC).

Enclosure 1 outlines the entire Common Features Project, including portions previously constructed by SAFCA. The Common Features Project is divided into three regions shown on Enclosure 1: the Natomas Basin (NAT) shown in yellow, American River North (ARN) shown in blue, and American River South (ARS) shown in purple. NAT Reaches C and D were entirely constructed by SAFCA, as well as a portion of NAT Reach B, some of which is presently still under construction.

As part of the Corps' exploratory phase for the remaining reaches of the Common Features Project we are planning to complete a series of geotechnical explorations in the late spring, summer, and fall of 2011 along various project reaches. Along NAT Reach A, a total of 8 cone penetrometer tests (CPT) and 15 geotechnical borings at and adjacent to the Sacramento and American Rivers levees will be completed between May and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach A are shown red dots on Enclosure 2. Although there are no known prehistoric resources located within the areas identified for borings and CPTs, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil.

Within NAT Reach B, a total of 4 CPTs and 13 geotechnical borings along the Sacramento River levee crown and in adjacent agricultural fields will be completed between July and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach B are shown as red dots on Enclosure 3. Although there are no known prehistoric resources located within the

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 04 2011

El Dorado Miwok Tribe
P.O. Box 711
El Dorado, California 95623

Dear El Dorado Miwok Tribe:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of proposed geotechnical explorations for the American River Common Features General Reevaluation (Common Features) Project. The Sacramento Area Flood Control Agency (SAFCA) has implemented and constructed prior phases of the Common Features Project and the U.S. Army Corps of Engineers, Sacramento District (Corps) is now proceeding with future planned phases of the project. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal (NCC), the Pleasant Grove Cross Canal (PGCC), and the Natomas East Main Drain Canal (NEMDC).

Enclosure 1 outlines the entire Common Features Project, including portions previously constructed by SAFCA. The Common Features Project is divided into three regions shown on Enclosure 1: the Natomas Basin (NAT) shown in yellow, American River North (ARN) shown in blue, and American River South (ARS) shown in purple. NAT Reaches C and D were entirely constructed by SAFCA, as well as a portion of NAT Reach B, some of which is presently still under construction.

As part of the Corps' exploratory phase for the remaining reaches of the Common Features Project we are planning to complete a series of geotechnical explorations in the late spring, summer, and fall of 2011 along various project reaches. Along NAT Reach A, a total of 8 cone penetrometer tests (CPT) and 15 geotechnical borings at and adjacent to the Sacramento and American Rivers levees will be completed between May and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach A are shown red dots on Enclosure 2. Although there are no known prehistoric resources located within the areas identified for borings and CPTs, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil.

Within NAT Reach B, a total of 4 CPTs and 13 geotechnical borings along the Sacramento River levee crown and in adjacent agricultural fields will be completed between July and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach B are shown as red dots on Enclosure 3. Although there are no known prehistoric resources located within the

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 04 2011

Ms. Glenda Nelson, Chairperson
Enterprise Rancheria of Maidu Indians
2133 Monta Vista Avenue
Oroville, California 95966

Dear Ms. Nelson:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of proposed geotechnical explorations for the American River Common Features General Reevaluation (Common Features) Project. The Sacramento Area Flood Control Agency (SAFCA) has implemented and constructed prior phases of the Common Features Project and the U.S. Army Corps of Engineers, Sacramento District (Corps) is now proceeding with future planned phases of the project. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal (NCC), the Pleasant Grove Cross Canal (PGCC), and the Natomas East Main Drain Canal (NEMDC).

Enclosure 1 outlines the entire Common Features Project, including portions previously constructed by SAFCA. The Common Features Project is divided into three regions shown on Enclosure 1: the Natomas Basin (NAT) shown in yellow, American River North (ARN) shown in blue, and American River South (ARS) shown in purple. NAT Reaches C and D were entirely constructed by SAFCA, as well as a portion of NAT Reach B, some of which is presently still under construction.

As part of the Corps' exploratory phase for the remaining reaches of the Common Features Project we are planning to complete a series of geotechnical explorations in the late spring, summer, and fall of 2011 along various project reaches. Along NAT Reach A, a total of 8 cone penetrometer tests (CPT) and 15 geotechnical borings at and adjacent to the Sacramento and American Rivers levees will be completed between May and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach A are shown red dots on Enclosure 2. Although there are no known prehistoric resources located within the areas identified for borings and CPTs, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil.

Within NAT Reach B, a total of 4 CPTs and 13 geotechnical borings along the Sacramento River levee crown and in adjacent agricultural fields will be completed between July and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach B are shown as red dots on Enclosure 3. Although there are no known prehistoric resources located within the

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 04 2011

Ms. Rhonda Morningstar Pope, Chairperson
Buena Vista Rancheria
P.O. Box 162283
Sacramento, California 95814

Dear Ms. Pope:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of proposed geotechnical explorations for the American River Common Features General Reevaluation (Common Features) Project. The Sacramento Area Flood Control Agency (SAFCA) has implemented and constructed prior phases of the Common Features Project and the U.S. Army Corps of Engineers, Sacramento District (Corps) is now proceeding with future planned phases of the project. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal (NCC), the Pleasant Grove Cross Canal (PGCC), and the Natomas East Main Drain Canal (NEMDC).

Enclosure 1 outlines the entire Common Features Project, including portions previously constructed by SAFCA. The Common Features Project is divided into three regions shown on Enclosure 1: the Natomas Basin (NAT) shown in yellow, American River North (ARN) shown in blue, and American River South (ARS) shown in purple. NAT Reaches C and D were entirely constructed by SAFCA, as well as a portion of NAT Reach B, some of which is presently still under construction.

As part of the Corps' exploratory phase for the remaining reaches of the Common Features Project we are planning to complete a series of geotechnical explorations in the late spring, summer, and fall of 2011 along various project reaches. Along NAT Reach A, a total of 8 cone penetrometer tests (CPT) and 15 geotechnical borings at and adjacent to the Sacramento and American Rivers levees will be completed between May and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach A are shown red dots on Enclosure 2. Although there are no known prehistoric resources located within the areas identified for borings and CPTs, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil.

Within NAT Reach B, a total of 4 CPTs and 13 geotechnical borings along the Sacramento River levee crown and in adjacent agricultural fields will be completed between July and September. The maximum depth of the borings and CPTs would be 100 feet and all borings and CPTs would be backfilled. The boring locations and CPTs for NAT Reach B are shown as red dots on Enclosure 3. Although there are no known prehistoric resources located within the

Mechoopda Indian Tribe of Chico Rancheria

May 9, 2011

Department of the Army
U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 J. Street
Sacramento, CA. 95814-2922

Re: American River Common Features General Reevaluation Project

Dear Ms. Montag,

I am writing in response to your letter that we received on May 5th. This letter indicates that you are proposing geotechnical explorations for the American River Common Features General Reevaluation (Common Features) Project. This is said to take place in Sacramento and Sutter Counties.

The Tribe is very concerned with the preservation of any Native American Archaeological or Cultural Sites within the project area, or which may be impacted as a result of project activities (pursuant to 14 CCR § 895.1) These sites include, but are not limited to: village sites, camp sites, petroglyphs, prehistoric trails, quarries, milling stations, cemeteries, ceremonial sites, or traditional cultural sites and properties. We are not aware of any cultural resources in the planned project area. If during project activities any cultural resources are found, we ask you to stop activities and that a funded monitor be placed on site for the remainder of the project.

It is also the Tribe's position that extreme care be taken to preserve all watersheds, all Riparian Habitat Conservation Areas; and in general, the prohibition of any project activities which would diminish water quality.

We appreciate your notification. Please also contact Shingle Springs Rancheria and United Auburn Indian Community because this may also be their ancestral area. If there is any other assistance that I can provide during this process, please do not hesitate to contact me.

Thank you.

Michael D. DeSpain

Michael D. DeSpain
Director of OEPP
mdespain@mechoopda-nsn.gov

MIWOK
MAIDU

United Auburn Indian Community
of the Auburn Rancheria

David Keyser
Chairperson

Kimberly DuBach
Vice Chair

Gene Whitehouse
Secretary

Brenda Conway
Treasurer

Calvin Moman
Council Member

June 2, 2011

Melissa Montag
CESPK-PD-RC
U.S. Army Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Subject: The American River Common Features General Re-evaluation Project

Dear Ms. Montag,

Thank you for requesting information regarding the above referenced project. The United Auburn Indian Community (UAIC) of the Auburn Rancheria is comprised of Miwok and Southern Maidu (Nisenan) people whose tribal lands are within Placer County and ancestral territory spans into El Dorado, Nevada, Sacramento, Sutter, and Yuba counties. The UAIC is concerned about development within its aboriginal territory that has potential to impact the lifeways, cultural sites, and landscapes that may be of sacred or ceremonial significance. We appreciate the opportunity to comment on this and other projects in your jurisdiction.

In order to ascertain whether or not the project could affect cultural resources that may be of importance to the UAIC, we would like to receive copies of any archaeological reports that have been, or will be, completed for the project. We also request copies of future environmental documents for the proposed project so that we have the opportunity to comment on potential impacts and proposed mitigation measures related to cultural resources. The UAIC would also like the opportunity to have our cultural consultants accompany you during the field survey. The information gathered will provide us with a better understanding of the project and cultural resources on site and is invaluable for consultation purposes.

The UAIC's preservation committee would like to set up a fieldvisit and consult about the proposed project. The UAIC would like to be concurring party on any sort of treatment plans, programmatic agreements, or memorandum of agreements. Thank you again for taking these matters into consideration, and for involving the UAIC early in the planning process. We look forward to reviewing the aforementioned documents as requested and setting up a meeting. Please contact Marcos Guerrero, cultural resources specialist, at (530) 883-2364 or email at mguerrero@auburnrancheria.com if you have any questions.

Sincerely,

Gregory S. Baker,
Tribal Administrator

CC: Marcos Guerrero, UAIC

SHINGLE SPRINGS RANCHERIA

Shingle Springs Band of Miwok Indians,
Shingle Springs Rancheria
(Verona Tract), California
5281 Honpie Road, Placerville, CA 95667
P.O. Box 1340, Shingle Springs, CA 95682
(530) 676-8010 Office (530)676-8033 Fax

April 3, 2012

Department of the Army
U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 J Street
Sacramento, CA 95814-2922

RE: American River Common Features Project in Sacramento County

Dear Alicia E. Kirchner

The Most likely Descendant, Daniel Fonseca would like to initiate consultation process with the Department of the Army for the American River Common Features project located in Sacramento County. Among other things, we would like this consultation to address the cultural and historic resource issues, pursuant to the regulations implementing Section 106 of the National Historic Preservation Act.

Prior to meeting we would like to request any and all completed record searches and or surveys that were done in or around the project area up to and including environmental, archaeological and cultural reports.

Please let this letter serve as a formal request for the Shingle Springs Band of Miwok Indians to be added as a consulting party in identifying any Traditional Cultural Properties (TCPs) that may exist within the project's Area of Potential Effects (APE).

Please contact Crystal Dilworth, Cultural Resource Office Manager at 530-698-1471 to schedule a consultation meeting pursuant to Section 106 of the NHPA.

Sincerely,

Daniel Fonseca
Cultural Resources Director

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Daniel Fonseca
Cultural Resources Director
Shingle Springs Band of Miwok Indians
Shingle Springs Rancheria
P.O. Box 1340
Shingle Springs, California 95682

APR 2 5 2012

Dear Mr. Fonseca:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation on the American River Common Features General Reevaluation (Common Features) Project. We previously contacted you in reference to geotechnical explorations for this Project in a letter dated May 4, 2011. The U.S. Army Corps of Engineers, Sacramento District (Corps) has previously authorized work under the American River Common Features Project and additional levee improvements are being evaluated as part of the Project. The State of California is the non-Federal partner on the Project. The overall Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Creek Canal, the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks (Enclosure).

We received your letter dated April 3, 2012, where you requested to meet with us on the project in order to address cultural and historic issues. You also requested to be formally added as a consulting party in identifying any Traditional Cultural Properties (TCPs) within the Project's Area of Potential Effect (APE), and you requested completed records searches, surveys, and environmental, archaeological and cultural reports.

We look forward to meeting with you on the Project. As you requested, Ms. Melissa Montag of my office will contact Ms. Crystal Dilworth to schedule a consultation meeting. We will make every effort to avoid archeological sites, TCPs, areas of traditional cultural value, interest, or concern and your input during the early stages of planning for the Project is valuable in our efforts to identify historic properties within the Project APE.

You may request previously completed records searches, surveys, and archaeological and cultural reports from within the APE from the Northeast Information Center at California State University, Chico for Sutter County and the North Central Information Center at California State University, Sacramento for Sacramento County. You may also make a Freedom of Information Act (FOIA) request for those documents within our agency records to SPK-FOIA@usace.army.mil. If you have questions about submitting a FOIA request, please contact Ms. Phyllis Svetich, FOIA/Privacy Act Officer, at (916) 557-7236 or Phyllis.M.Svetich@usace.army.mil. Also included with this letter is a disc that includes various available environmental documents for the Project APE. Many other related documents are

available at http://www.safca.org/Programs_Natomas.html. We will add you to our mailing this to receive relevant future documents within the Project APE.

We will be contacting you soon with information on additional geotechnical explorations we are planning within the Project APE. In accordance with 36 CFR § 800.14 we are developing a Programmatic Agreement (PA) in order to initiate the Section 106 process early in the planning process for the Project and we will be contacting you to determine your interest in involvement in the PA as a consulting or concurring party. Correspondence may be sent to: Ms. Melissa Montag (CESPK-PD-RC), U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or comments, please contact Ms. Montag, Historian, at (916) 557-7907. For specific Project questions please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

CF (w/enclosures):
Ms. Crystal Dilworth, Cultural Resources Office Manager, Shingle Springs Band of Miwok Indians, Shingle Springs Rancheria, P.O. Box 1340, Shingle Springs, California 95682

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF:

Environmental Resources Branch

Mr. Gregory S. Baker
Tribal Administrator
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

APR 2 5 2012

Dear Mr. Baker:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation on the American River Common Features General Reevaluation (Common Features) Project. We previously contacted you in reference to geotechnical explorations for this Project in a letter dated May 4, 2011. The U.S. Army Corps of Engineers, Sacramento District (Corps) has previously authorized work under the American River Common Features Project and additional levee improvements are being evaluated as part of the Project. The State of California is the non-Federal partner on the Project. The overall Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Creek Canal, the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks (Enclosure).

We received your request for future environmental documents and we will add you to our mailing list to receive those documents as they are distributed to the public. You asked to have the opportunity to have your cultural consultants accompany us during future field surveys for the Project and you asked to set up a field visit to consult on the Project. Additionally, you requested to be a concurring party on any treatment plans, programmatic agreements, or memorandum of agreements for the Project, and you requested completed records searches, surveys, and environmental, archaeological, and cultural reports within the Project's Area of Potential Effect (APE).

We look forward to meeting with you on the Project. As you requested, Ms. Melissa Montag of my office will contact Mr. Marcos Guerrero to schedule a consultation meeting. We will make every effort to avoid archeological sites, traditional cultural properties, areas of traditional cultural value, interest, or concern and your input during the early stages of planning for the Project is valuable in our efforts to identify historic properties within the Project APE. For future field survey efforts we will contact you to determine if your cultural consultants are able to accompany us during the field survey. We will be contacting you soon with information on additional geotechnical explorations we are planning within the Project APE.

You may request previously completed records searches, surveys, and archaeological and cultural reports from within the APE from the Northeast Information Center at California State University, Chico for Sutter County and the North Central Information Center at California State

University, Sacramento for Sacramento County. You may also make a Freedom of Information Act (FOIA) request for those documents we have as a part of our agency records to SPK-FOIA@usace.army.mil. If you have questions about submitting a FOIA request, please contact Ms. Phyllis Svetich, FOIA/Privacy Act Officer, at (916) 557-7236 or Phyllis.M.Svetich@usace.army.mil.

In accordance with 36 CFR § 800.14 we are developing a Programmatic Agreement (PA) in order to initiate the Section 106 process early in the planning process for the Project and we will be contacting you to determine your interest in involvement in the PA and subsequent treatment plans and agreement documents as a consulting or concurring party. Correspondence may be sent to: Ms. Melissa Montag (CESPK-PD-RC), U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or comments, please contact Ms. Montag, Historian, at (916) 557-7907. For specific Project questions please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

CF (w/enclosures):
Mr. Marcos Guerrero, Cultural Resources Specialist, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Rhonda Morningstar Pope, Chairperson
Buena Vista Rancheria
P.O. Box 162283
Sacramento, California 95816

MAY 11 2012

Dear Ms. Pope :

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to keep you informed of our continued geotechnical exploration work for the American River Common Features Project (Common Features) following our initial consultation with you in a letter dated May 4, 2011. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Cross Canal, and the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks.

As part of the U.S. Army Corps of Engineers' (Corps) exploratory phase for the Common Features Project, we are completing a series of geotechnical explorations. The work will consist of soil testing to depths of 80 feet, soil surface testing of erodibility, in-channel borings, trenching, and various geophysical surveys. The geotechnical borings will occur at 23 locations along the American River between river miles 0.0 and 22.4 while the trenching will occur at five locations between river miles 5 and 14. The borings will be taken in various locations along the toe and bench within the American River Parkway. The sonic drilling method will be used to collect continuous samples for geologic and engineering characteristics at all sites.

Additionally, 12 of the locations will include a second boring using the air rotary cased hammer method to collect undisturbed samples. Trenching will consist of excavating an area 15 feet deep and 150 feet long to perform a visual verification of the soil patterns. The maximum depth for borings will not exceed 80 feet and all borings and trenches will be backfilled upon completion. Enclosed is a map of the proposed locations for the geotechnical borings (shown as blue and white dots) and trenching (outlined in red) testing locations.

A comparison between the records search and the map of the boring/testing locations indicates that there are no known sites at any of these locations. An archaeological field investigation of the specific geotechnical exploration locations will be completed prior to any ground disturbing activities. In the event that cultural resources are identified during the archeological field investigation, we will relocate those explorations to avoid possible sites. Although there are no known prehistoric resources located within the areas identified for borings and testing locations, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil at every testing location.

For all the geotechnical explorations located on the American River, as well as for all future geotechnical explorations for the Common Features Project, in the event of an unanticipated discovery during the explorations all activity within the vicinity of the find would cease and a qualified archeologist would examine the find to determine treatment.

We are sensitive to traditional cultural properties and sacred sites, and make every effort to avoid them. Please let us know if you have knowledge of locations of archeological sites, or areas of traditional cultural interest or concern within the locations identified for the borings and testing. If you are interested in further communication regarding exploratory efforts or our continuing efforts to comply with Section 106 of the National Historic Preservation Act of 1966, as amended, we ask that you notify us. Correspondence may be sent to: Ms. Melissa Montag (CESPK-PD-RC), U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814-2922.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Dennis Ramirez, Chairperson
Mechoopda Indian Tribe of Chico Rancheria
125 Mission Ranch Boulevard
Chico, California 95926

MAY 11 2012

Dear Mr. Ramirez:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to keep you informed of our continued geotechnical exploration work for the American River Common Features Project (Common Features) following our initial consultation with you in a letter dated May 4, 2011. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Cross Canal, and the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks.

As part of the U.S. Army Corps of Engineers' (Corps) exploratory phase for the Common Features Project, we are completing a series of geotechnical explorations. The work will consist of soil testing to depths of 80 feet, soil surface testing of erodibility, in-channel borings, trenching, and various geophysical surveys. The geotechnical borings will occur at 23 locations along the American River between river miles 0.0 and 22.4 while the trenching will occur at five locations between river miles 5 and 14. The borings will be taken in various locations along the toe and bench within the American River Parkway. The sonic drilling method will be used to collect continuous samples for geologic and engineering characteristics at all sites.

Additionally, 12 of the locations will include a second boring using the air rotary cased hammer method to collect undisturbed samples. Trenching will consist of excavating an area 15 feet deep and 150 feet long to perform a visual verification of the soil patterns. The maximum depth for borings will not exceed 80 feet and all borings and trenches will be backfilled upon completion. Enclosed is a map of the proposed locations for the geotechnical borings (shown as blue and white dots) and trenching (outlined in red) testing locations.

A comparison between the records search and the map of the boring/testing locations indicates that there are no known sites at any of these locations. An archaeological field investigation of the specific geotechnical exploration locations will be completed prior to any ground disturbing activities. In the event that cultural resources are identified during the archeological field investigation, we will relocate those explorations to avoid possible sites. Although there are no known prehistoric resources located within the areas identified for borings and testing locations, a qualified archeological monitor will be present during ground disturbing activities for the first 20 feet of previously undisturbed soil at every testing location.

For all the geotechnical explorations located on the American River, as well as for all future geotechnical explorations for the Common Features Project, in the event of an unanticipated discovery during the explorations all activity within the vicinity of the find would cease and a qualified archeologist would examine the find to determine treatment.

We are sensitive to traditional cultural properties and sacred sites, and make every effort to avoid them. Please let us know if you have knowledge of locations of archeological sites, or areas of traditional cultural interest or concern within the locations identified for the borings and testing. If you are interested in further communication regarding exploratory efforts or our continuing efforts to comply with Section 106 of the National Historic Preservation Act of 1966, as amended, we ask that you notify us. Correspondence may be sent to: Ms. Melissa Montag (CESPK-PD-RC), U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814-2922.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

Copy Furnished (w/enclosure):
Mr. Michael D. DeSpain, Director of OEPP, Mechoopda Indian Tribe of Chico Rancheria, 125 Mission Ranch Boulevard, Chico, California 95926

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Mary Daniels-Tarango, Chairperson
Wilton Rancheria
7916 Farnell Way
Sacramento, California 95823

MAY 11 2012

Dear Ms. Daniels-Tarango:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to keep you informed of our continued geotechnical exploration work for the American River Common Features Project (Common Features) following our initial consultation with you in a letter dated May 4, 2011. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Cross Canal, and the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks.

As part of the U.S. Army Corps of Engineers' (Corps) exploratory phase for the Common Features Project, we are completing a series of geotechnical explorations. The work will consist of soil testing to depths of 80 feet, soil surface testing of erodibility, in-channel borings, trenching, and various geophysical surveys. The geotechnical borings will occur at 23 locations along the American River between river miles 0.0 and 22.4 while the trenching will occur at five locations between river miles 5 and 14. The borings will be taken in various locations along the toe and bench within the American River Parkway. The sonic drilling method will be used to collect continuous samples for geologic and engineering characteristics at all sites.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 11 2012

Mr. Gregory Baker, Tribal Administrator
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

Dear Mr. Baker:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to keep you informed of our continued geotechnical exploration work for the American River Common Features Project (Common Features) following our initial consultation with you in a letter dated May 4, 2011. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Cross Canal, and the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks.

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For all the geotechnical explorations located on the American River, as well as for all future geotechnical explorations for the Common Features Project, in the event of an unanticipated discovery during the explorations all activity within the vicinity of the find would cease and a qualified archeologist would examine the find to determine treatment.

We are sensitive to traditional cultural properties and sacred sites, and make every effort to avoid them. Please let us know if you have knowledge of locations of archeological sites, or areas of traditional cultural interest or concern within the locations identified for the borings and testing. If you are interested in further communication regarding exploratory efforts or our continuing efforts to comply with Section 106 of the National Historic Preservation Act of 1966, as amended, we ask that you notify us. Correspondence may be sent to: Ms. Melissa Montag (CESPK-PD-RC), U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814-2922.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

Copy Furnished (w/enclosure):
Mr. Marcos Guerrero, Cultural Resources Specialist, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 11 2012

Ms. Eileen Moon, Vice Chairperson
760 South Auburn Street, Suite 2-C
Grass Valley, California 95945

Dear Ms. Moon:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to keep you informed of our continued geotechnical exploration work for the American River Common Features Project (Common Features) following our initial consultation with you in a letter dated May 4, 2011. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Cross Canal, and the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 11 2012

Ms. Cathy Bishop, Chairperson
Strawberry Valley Rancheria
P.O. Box 667
Marysville, California 95901

Dear Ms. Bishop:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to keep you informed of our continued geotechnical exploration work for the American River Common Features Project (Common Features) following our initial consultation with you in a letter dated May 4, 2011. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Cross Canal, and the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 11 2012

Mr. Daniel Fonseca
Cultural Resources Director
Shingle Springs Band of Miwok Indians
Shingle Springs Rancheria
P.O. Box 1340
Shingle Springs, California 95682

Dear Mr. Fonseca:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to keep you informed of our continued geotechnical exploration work for the American River Common Features Project (Common Features) following our initial consultation with you in a letter dated May 4, 2011. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Cross Canal, and the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks.

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Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

Copy Furnished (w/enclosure):
Ms. Crystal Dilworth, Cultural Resources Office Manager , Shingle Springs Band of Miwok Indians, Shingle Springs, P.O. Box 1340, Shingle Springs, California 95682

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 11 2012

Mr. Cosme Valdez
Interim Chief Executive Officer
Nashville-El Dorado Miwok
P.O. Box 580986
Elk Grove, California 95758

Dear Mr. Valdez:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to keep you informed of our continued geotechnical exploration work for the American River Common Features Project (Common Features) following our initial consultation with you in a letter dated May 4, 2011. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Cross Canal, and the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ione Band of Miwok Indians
P.O. Box 699
Plymouth, California 95669

MAY 11 2012

Dear Ione Band of Miwok Indians:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to keep you informed of our continued geotechnical exploration work for the American River Common Features Project (Common Features) following our initial consultation with you in a letter dated May 4, 2011. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Cross Canal, and the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Glenda Nelson, Chairperson
Enterprise Rancheria of Maidu Indians
2133 Monta Vista Avenue
Oroville, California 95966

MAY 11 2012

Dear Ms. Nelson:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to keep you informed of our continued geotechnical exploration work for the American River Common Features Project (Common Features) following our initial consultation with you in a letter dated May 4, 2011. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Cross Canal, and the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

El Dorado Miwok Tribe
P.O. Box 711
El Dorado, California 95623

MAY 11 2012

Dear El Dorado Miwok Tribe:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to keep you informed of our continued geotechnical exploration work for the American River Common Features Project (Common Features) following our initial consultation with you in a letter dated May 4, 2011. The overall Common Features Project is located in Sacramento and Sutter Counties along the Sacramento River, the American River, the Natomas Cross Canal, the Pleasant Grove Cross Canal, and the Natomas East Main Drain Canal, Arcade Creek, and Dry/Robla Creeks.

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June 21, 2012

Ms Melissa Montag (CESPK-PD-RC)
U.S Army Corps of Engineers,
1325 J Street, Sacramento CA 95814-2922

Dear Ms Melissa Montag,

We are in receipt of a letter dated May 11, 2012 from Alicia E. Kirchner, Chief, Planning Division informing us of the continued geotechnical exploration work for the American River Common Features Project.

As per your request, Buena Vista Rancheria is interested in continued consultation with U.S Army Corps of Engineers pursuant to Section106 of the National Historic Preservation Act of 1966. In order for us to better understand the project we would like to request additional information on the full range of proposed project activities for which the drilling and trenching is being proposed, including detail project descriptions with maps and photographs. We also request the schedule for the proposed borings and trenching, and a site visit. Buried archeological deposits and other cultural resources could be present at some drilling and trenching sites that could potentially be impacted by proposed project activities.

In addition, Buena Vista Rancheria would like to review the results of your records search concerning cultural resources including archeological sites and other resources of interest and concern to American Indians. The Tribe requests to be involved in developing the scope of work, sampling strategy and research design, as well as field investigations, laboratory analysis, and report writing for the proposed archeological investigations Please provide a schedule for your proposed cultural resources studies. A site visit to the proposed study area is requested, as well.

Buena Vista Rancheria is pleased that the Department of the Army plans to have a qualified archaeologist on site during geotechnical exploration excavations. We request that you consider having the Tribe's Cultural Monitors present during the borings and trenching and all related activities involving substantial ground disturbing actions, in addition to the field investigations mentioned above.

We look forward to receiving additional project information from you to review prior to a site visit, as well as working with you to develop the studies to investigate cultural resources of interest and concern to the American Indian people in the project area of potential effect.

If you have any questions regarding this letter feel free to call me at telephone number (916) 491-0011.

Respectfully,

Roselynn Lwenya, PhD
Tribal Historic Preservation Officer and
Environmental Resources Director

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Roselynn Lwenya, THPO
Buena Vista Rancheria Me-Wuk Indians
P.O. Box 162283
Sacramento, California 95816

JUL 19 2012

Dear Ms. Lwenya:

In response to your letter dated June 21, 2012 and in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to keep you informed of our continued work for the American River Common Features General Reevaluation (Common Features) Project. The area of potential effects for the Common Features Project is shown on Enclosure 1. The geotechnical borings, for which we originally consulted with you back in May, will no longer be occurring as planned. However, we are still moving forward with the Section 106 consultation process for the overall Common Features Project and we would like to keep you informed of our upcoming efforts on the project.

A draft programmatic agreement will be available soon. In accordance with 36 CFR Part 800.14(b)(2)(i), you will be invited to review this document as a concurring party. Additionally, in accordance with 36 CFR Part 800.2, we would like to propose the prospect of setting up a meeting with you to discuss our current and future Section 106 compliance efforts for the Common Features Project. We will be contacting you soon to schedule a consultation meeting.

We are sensitive to traditional cultural properties and sacred sites, and make every effort to avoid them. If you have any questions or concerns, please feel free to contact us. Correspondence may be sent to: Ms. Melissa Montag (CESPK-PD-RC), U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814-2922. For specific project questions please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

APR 05 2013

Ms. Rhonda Morningstar Pope, Chairperson
Buena Vista Rancheria
P.O. Box 162283
Sacramento, California 95816

Dear Ms. Pope:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

In the Sacramento area the Sacramento and American rivers form a flood plain covering roughly 110,000 acres in their confluence. The flood plain includes most of the developed portions of the city of Sacramento. The ARCF Project area of potential effects (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; approximately 4 miles of the Pleasant Grove Creek Canal; the Sacramento Bypass and Sacramento Weir; 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 (Enclosure 1).

The ARCF Project is a single purpose flood risk management project with the measures described in Enclosure 2 proposed for implementation. The ARCF Project APE is within an area known to be sensitive for prehistoric and historic cultural resources. The Corps has determined that ARCF Project will be a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties. As a result, pursuant to 36 CFR § 800.14(b), we have drafted a programmatic agreement (PA) to establish a framework for the resolution of potential adverse effects that may result from implementation of the ARCF Project. The draft PA is enclosed for your review and comment (Enclosure 3).

Included as attachments to the draft PA are a map of the APE (Enclosure 3, Attachment 1) and a draft project description for the ARCF Project (Enclosure 3, Attachment 3). We have contacted the Advisory Council on Historic Preservation and the State Historic Preservation Officer to ask for their comments on the proposed ARCF Project. They have also received the draft PA for their review and comment.

Pursuant to 36 CFR § 800.14(b)(2)(i), we request your involvement in the development of the PA for the ARCF Project. We ask that you review the enclosed draft PA and provide us with comments within 45 days. Additionally, if you would like to meet with us so that we may answer any questions you may have about ARCF Project, our proposed Section 106 compliance efforts, or the draft PA, we ask that you contact us to schedule a meeting.

Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information about the Section 106 compliance and consultation for the ARCF Project, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil. Please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372 with any specific project questions.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

APR 05 2013

Mr. Ambar Mohammed
Cachil DeHe Band of Wintun Indians of the
Colusa Indian Community of the Colusa Rancheria
3730 State Highway 45 # B
Colusa, California 95932

Dear Mr. Mohammed:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

APR 05 2013

Mr. Guy Taylor, Representative
Mooretown Rancheria of Maidu Indians
31 Alverde Drive
Oroville, California 95966

Dear Mr. Taylor:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

APR 05 2013

Mr. Michael D. DeSpain, Director of OEPP
Mechoopda Indian Tribe of Chico Rancheria
125 Mission Ranch Boulevard
Chico, California 95926

Dear Mr. DeSpain:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

APR 05 2013

Mr. Dennis Ramirez, Chairperson
Mechoopda Indian Tribe of Chico Rancheria
125 Mission Ranch Boulevard
Chico, California 95926

Dear Mr. Ramirez:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Mary Daniels-Tarango, Chairperson
Wilton Rancheria
7916 Farnell Way
Sacramento, California 95823

APR 05 2013

Dear Ms. Daniels-Tarango:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Danny Rey, Tribal Historic Preservation Officer
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

APR 05 2013

Dear Mr. Rey:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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CORPS OF ENGINEERS
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SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Marcos Guerrero, Cultural Resources Specialist
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

APR 05 2013

Dear Mr. Guerrero:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

APR 05 2013

Ms. Eileen Moon, Vice Chairperson
760 South Auburn Street, Suite 2-C
Grass Valley, California 95945

Dear Ms. Moon:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Cathy Bishop, Chairperson
Strawberry Valley Rancheria
P.O. Box 667
Marysville, California 95901

APR 05 2013

Dear Ms. Bishop:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

APR 05 2013

Ms. Angela Rivera
Shingle Springs Band of Miwok Indians
P.O. Box 1340
Shingle Springs, California 95682

Dear Ms. Rivera:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Daniel Fonseca, Cultural Resources Director
Shingle Springs Band of Miwok Indians
P.O. Box 1340
Shingle Springs, California 95682

APR 05 2013

Dear Mr. Fonseca:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Cosme Valdez, Interim Chief Executive Officer
Nashville-El Dorado Miwok
P.O. Box 580986
Elk Grove, California 95758

APR 05 2013

Dear Mr. Valdez:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Yvonne Miller, Chairperson
Ione Band of Miwok Indians
P.O. Box 699
Plymouth, California 95669

APR 05 2013

Dear Ms. Miller:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Glenda Nelson, Chairperson
Enterprise Rancheria of Maidu Indians
2133 Monta Vista Avenue
Oroville, California 95966

APR 05 2013

Dear Ms. Nelson:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

APR 05 2013

El Dorado Miwok Tribe
P.O. Box 711
El Dorado, California 95623

Dear El Dorado Miwok Tribe:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

APR 05 2013

Ms. Roselynn Lwenya
Tribal Historic Preservation Officer
Buena Vista Rancheria
P.O. Box 162283
Sacramento, California 95816

Dear Ms. Lwenya:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Art Angle
Enterprise Rancheria of Maidu Indians
2133 Monta Vista Avenue
Oroville, California 95966

JUN 06 2013

Dear Mr. Angle:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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Included as attachments to the draft PA are a map of the APE (Enclosure 3, Attachment 1) and a draft project description for the ARCF Project (Enclosure 3, Attachment 3). We have contacted the Advisory Council on Historic Preservation and the State Historic Preservation Officer to ask for their comments on the proposed ARCF Project. They have also received the draft PA for their review and comment.

Pursuant to 36 CFR § 800.14(b)(2)(i), we request your involvement in the development of the PA for the ARCF Project. We ask that you review the enclosed draft PA and provide us with comments within 45 days. Additionally, if you would like to meet with us so that we may answer any questions you may have about ARCF Project, our proposed Section 106 compliance efforts, or the draft PA, we ask that you contact us to schedule a meeting.

Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information about the Section 106 compliance and consultation for the ARCF Project, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil. Please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372 with any specific project questions.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Steven Hutchason
Wilton Rancheria
9300 W. Stockton, Suite 200
Elk Grove, California 95758

JUN 0 6 2013

Dear Mr. Hutchason:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Cathy Bishop, Chairperson
Strawberry Valley Rancheria
1540 Strader Avenue
Sacramento, California 95815

JUN 06 2013

Dear Ms. Bishop:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Kesner Flores
P.O. Box 1047
Wheatland, California 95692

JUN 06 2013

Dear Mr. Flores:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Cortina Wintun Environmental Protection Agency
P.O. Box 1630
Williams, California 95987

JUN 06 2013

To Whom It May Concern:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Marshall McKay
Yocha Dehe Wintun Nation
P.O. Box 18
Brooks, California 95606

JUN 06 2013

Dear Mr. McKay:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Leland Kinter
Yocha Dehe Wintun Nation
P.O. Box 18
Brooks, California 95606

JUN 06 2013

Dear Mr. Kinter:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Cynthia Clarke
Yocha Dehe Wintun Nation
P.O. Box 18
Brooks, California 95606

JUN 06 2013

Dear Ms. Clarke:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

In the Sacramento area, the Sacramento and American rivers form a flood plain covering roughly 110,000 acres. The flood plain includes most of the developed portions of the city of Sacramento. The ARCF Project area of potential effects (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; approximately 4 miles of the Pleasant Grove Creek Canal; the Sacramento Bypass and Sacramento Weir; 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 (Enclosure 1).

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Rose Enos
15310 Bancroft Road
Auburn, California 95603

JUN 06 2013

Dear Ms. Enos:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Randy Yonemura
4305 39th Avenue
Sacramento, California 95824

JUN 06 2013

Dear Mr. Yonemura:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. April Wallace Moore
19630 Placer Hills Road
Colfax, California 95713

JUN 06 2013

Dear Ms. Moore:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Judith Marks
Colfax-Todds Valley Consolidated Tribe
1068 Silverton Circle
Lincoln, California 95648

JUN 06 2013

Dear Ms. Marks:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Pamela Cubbler
Colfax-Todds Valley Consolidated Tribe
P.O. Box 734
Foresthill, California 95631

JUN 06 2013

Dear Ms. Cubbler:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Anthony Burris
Ione Band of Miwok Indians
P.O. Box 699
Plymouth, California 95699

JUN 06 2013

Dear Mr. Burris:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Sam Daniels
Shingle Springs Band of Miwok Indians
P.O. Box 1340
Shingle Springs, California 95682

JUN 06 2013

Dear Mr. Daniels:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Grayson Coney
Tsi-Akim Maidu
P.O. Box 1316
Colfax, California 95713

JUN 06 2013

Dear Mr. Coney:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Andrew Franklin
Wilton Rancheria
9300 W. Stockton, Suite 200
Elk Grove, California 95758

JUN 06 2013

Dear Mr. Franklin:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to provide flood risk reduction to the City of Sacramento and the Natomas Basin pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

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June 13, 2013

Melissa Montag, Senior Environmental Manager/Historian
U.S. Army Corps of Engineers
Cultural, Recreation & Social Assessment Section (CESPK-PD-RC)
1325 J Street
Sacramento, CA 95814-2922

Re: American River Common Features Project - Draft Programmatic Agreement

Dear Ms. Montag:

I am writing on behalf of the Buena Vista Rancheria of Me-Wuk Indians (BVR) to express concerns and share comments about the enclosed American River Common Features Project Draft Programmatic Agreement (PA).

This draft PA requests tribal governments to concur with procedural documents that have not yet been prepared, such as the Historic Properties Management Plan (HPMP) and the Historic Properties Treatment Plans (HPTPs). This is problematic for a couple reasons. First, tribes were not involved in determining the area of potential effect (APE), the presence of historic properties, the effect of the undertaking on historic properties, or the identification of resources having spiritual and cultural significance to American Indians. Further, despite requests, BVR has been denied adequate information and documentation on known historic properties within the APE.

BVR believes that the draft PA was prepared with inadequate tribal government to government consultation, as required under Section 106 of the National Historic Preservation Act and Executive Order 13175. BVR has only received copies of letters sent to other agencies and letters of invitation to initiate consultation. Substantive government to government consultation at the earliest possible stage is crucial in order for consultation to be meaningful.

The meeting between representatives of the Army Corps and BVR, on May 29, 2013, is an example of how the process should work, and BVR looks forward to many more opportunities to consult with the U.S. Army Corps of Engineers on local projects.

If you have any questions regarding our comments please feel free to contact Roselynn Lwenya, Ph.D., Environmental Resources Director, at (916) 491-0011.

Respectfully,

Rhonda L. Morningstar Pope, Chairwoman
Buena Vista Rancheria of Me-Wuk Indians

Tribal Council

Marshall McKay
Chairman
James Kinter
Secretary
Anthony Roberts
Treasurer
Mia Durham
Member
Matthew Lowell, Jr.
Member

July 9th, 2013

Melissa Montag
US Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento, CA 95814-2922

RE: ARCF Project

Dear Ms. Montag:

Thank you for your project notification letter and programmatic agreement (PA) dated, June 6th, 2013, regarding cultural information on or near the proposed ARCF project, Sacramento area, CA. We appreciate your effort to contact us.

The Cultural Resources Department has reviewed the project and concluded that it is not within the aboriginal territories of the Yocha Dehe Wintun Nation. Therefore, we respectively decline any comment on this project or the PA.

Should you have any questions, please feel free to contact the following individual:

Mr. James Sarmento
Cultural Resources Manager
Yocha Dehe Wintun Nation
Office: (530) 723-0452, Email: jsarmento@yochadehe-nsn.gov

Please refer to identification number YD-06202013-01 in any correspondences concerning this project.

Thank you for providing us with this notice and the opportunity to comment.

Sincerely,

Marshall McKay
Tribal Chairman

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 12 2014

Ms. Cathy Bishop
Chairperson
Strawberry Valley Rancheria
1540 Strader Avenue
Sacramento, California 95815

Dear Ms. Bishop:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated June 6, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

c. Provided the Corps' determination, pursuant to 36 CFR § 800.14(b), that a programmatic agreement (PA) to establish a framework for the resolution of potential adverse effects that may result from implementation of the ARCF Project would be the means for the Corps to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

We are providing the most recent final draft of the PA for the ARCF Project for your final review and comment before we plan to execute the PA. The final draft of the PA is included in Enclosure 1. We have prepared a short summary document describing the authorizations for the projects in the region, what has been constructed, what agency or partner completed the construction, previous compliance with the National Historic Preservation Act of 1966, as amended, and the National Environmental Policy Act of 1969, and the planned future activities within the watersheds (Enclosure 1, Attachment 4). The APE for the ARCF Project is further described and shown in Enclosure 1, Attachment 3.

Because the APE for the ARCF Project covers a large geographic area and is mostly located along rivers, which have been shown to be sensitive for buried resources, we have developed two predictive models to extrapolate archaeological sensitivity over un-surveyed portions of the APE. The first model is a general model of site locations that anticipates the likelihood that any one or more spots in the study area will be in an archaeological site. The second model highlights portions of the APE where we would be more or less likely to find buried archaeological materials. Ultimately we plan to use the predictive models to assist with planning and evaluating alternatives to avoid adverse effects to cultural resources whenever and wherever possible. The models and detailed information on the archaeological sensitivity assessment are included in Enclosure 2. We request any comments you may have on the archaeological sensitivity assessment.

The PA has been provided to the State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation (ACHP), CVFPP, Department of Water Resources (DWR), SAFCA, and potentially interested American Indian Tribes and interested American Indian individuals for review and comment. In a letter dated August 7, 2012, the ACHP declined to participate in consultation for the ARCF Project (Enclosure 1, Attachment 2). Comments were received from the CVFPP, DWR, SAFCA, and American Indian Tribes and have been considered in this current final draft of the PA. A consultation log of communications with American Indian tribes and American Indian individuals for the ARCF Project is included as Enclosure 3.

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 APE. One response, from the Center for Sacramento History, was received, noting they would keep our letter on file. In accordance with 36 CFR § 800.14(b)(2)(ii), we will also provide potentially interested American Indian Tribes and interested American Indian individuals and the groups and agencies listed above the final draft PA with the forthcoming Environmental

Impact Statement/Environmental Impact Report which will be released for public review this summer.

Pursuant to 36 CFR § 800.14(b)(2)(i), we have requested your involvement in the development of the PA for the ARCF Project. As a potential Concurring Party to the PA, we ask that you review the enclosed final draft PA and archaeological sensitivity assessment and provide us with comments within 30 days. Any comments on the draft final PA received during the review period will be considered for the final PA. If you would like to meet with us so that we may answer any questions you may have about ARCF Project, our proposed Section 106 compliance efforts, or the draft PA, we ask that you contact us to schedule a meeting. Additionally, we request that you inform us if you are interested in signing the PA as a Concurring Party and if there are any required alterations to your signature page of the PA.

Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information about the Section 106 compliance and consultation for the ARCF Project, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil. Please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372 with any specific project questions.

Sincerely,

For Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Anthony Burris
Ione Band of Miwok Indians
P.O. Box 699
Plymouth, California 95699

Dear Mr. Burris:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated June 6, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

c. Provided the Corps' determination, pursuant to 36 CFR § 800.14(b), that a programmatic agreement (PA) to establish a framework for the resolution of potential adverse effects that may result from implementation of the ARCF Project would be the means for the Corps to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 12 2014

Mr. Jason Camp
Tribal Historic Preservation Officer
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

Dear Mr. Camp:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted the United Auburn Indian Community of the Auburn Rancheria via a letter dated April 5, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

c. Provided the Corps' determination, pursuant to 36 CFR § 800.14(b), that a programmatic agreement (PA) to establish a framework for the resolution of potential adverse effects that may result from implementation of the ARCF Project would be the means for the Corps to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Grayson Coney
Tsi-Akim Maidu
P.O. Box 1316
Colfax, California 95713

Dear Mr. Coney:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Ms. Pamela Cubbler
Colfax-Todds Valley Consolidated Tribe
P.O. Box 734
Foresthill, California 95631

Dear Ms. Cubbler:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated June 6, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Sam Daniels
Shingle Springs Band of Miwok Indians
P.O. Box 1340
Shingle Springs, California 95682

Dear Mr. Daniels:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

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c. Provided the Corps' determination, pursuant to 36 CFR § 800.14(b), that a programmatic agreement (PA) to establish a framework for the resolution of potential adverse effects that may result from implementation of the ARCF Project would be the means for the Corps to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Ms. Mary Daniels-Tarango
Chairperson
Wilton Rancheria
7916 Farnell Way
Sacramento, California 95823

Dear Ms. Daniels-Tarango:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated April 5, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Michael D. DeSpain
Director of OEPP
Mechoopda Indian Tribe of Chico Rancheria
125 Mission Ranch Boulevard
Chico, California 95926

Dear Mr. DeSpain:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated April 5, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

c. Provided the Corps' determination, pursuant to 36 CFR § 800.14(b), that a programmatic agreement (PA) to establish a framework for the resolution of potential adverse effects that may result from implementation of the ARCF Project would be the means for the Corps to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

El Dorado Miwok Tribe
P.O. Box 711
El Dorado, California 95623

To Whom It May Concern:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated April 5, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

c. Provided the Corps' determination, pursuant to 36 CFR § 800.14(b), that a programmatic agreement (PA) to establish a framework for the resolution of potential adverse effects that may result from implementation of the ARCF Project would be the means for the Corps to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Ms. Rose Enos
15310 Bancroft Road
Auburn, California 95603

Dear Ms. Enos:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated June 6, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Kesner Flores
P.O. Box 1047
Wheatland, California 95692

Dear Mr. Flores:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated June 6, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

c. Provided the Corps' determination, pursuant to 36 CFR § 800.14(b), that a programmatic agreement (PA) to establish a framework for the resolution of potential adverse effects that may result from implementation of the ARCF Project would be the means for the Corps to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Daniel Fonseca
Cultural Resources Director
Shingle Springs Band of Miwok Indians
P.O. Box 1340
Shingle Springs, California 95682

Dear Mr. Fonseca:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated April 5, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Nicholas Fonseca
Chairperson
Shingle Springs Band of Miwok Indians
P.O. Box 1340
Shingle Springs, California 95682

Dear Mr. Fonseca:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted the Shingle Springs Band of Miwok Indians via a letter dated April 5, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 12 2014

Mr. Andrew Franklin
Wilton Rancheria
9300 W. Stockton, Suite 200
Elk Grove, California 95758

Dear Mr. Franklin:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Reno Franklin
Tribal Historic Preservation Officer
The Enterprise Rancheria of Maidu Indians
2213 Monte Vista Avenue
Oroville, California 95966

Dear Mr. Franklin:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Marcos Guerrero
Cultural Resources Specialist
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

Dear Mr. Guerrero:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated April 5, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

c. Provided the Corps' determination, pursuant to 36 CFR § 800.14(b), that a programmatic agreement (PA) to establish a framework for the resolution of potential adverse effects that may result from implementation of the ARCF Project would be the means for the Corps to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Steven Hutchason
Wilton Rancheria
9300 W. Stockton, Suite 200
Elk Grove, California 95758

Dear Mr. Hutchason:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated June 6, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

c. Provided the Corps' determination, pursuant to 36 CFR § 800.14(b), that a programmatic agreement (PA) to establish a framework for the resolution of potential adverse effects that may result from implementation of the ARCF Project would be the means for the Corps to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Ms. Judith Marks
Colfax-Todds Valley Consolidated Tribe
1068 Silverton Circle
Lincoln, California 95648

Dear Ms. Marks:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated June 6, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Ms. Yvonne Miller
Chairperson
Ione Band of Miwok Indians
P.O. Box 699
Plymouth, California 95669

Dear Ms. Miller:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated April 5, 2013 wherein we:

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Ambar Mohammed
Cachil DeHe Band of Wintun Indians of the
Colusa Indian Community of the Colusa Rancheria
3730 State Highway 45 # B
Colusa, California 95932

Dear Mr. Mohamrned:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Ms. Eileen Moon
Vice Chairperson
Tsi-Akim Maidu
760 South Auburn Street, Suite 2-C
Grass Valley, California 95945

Dear Ms. Moon:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Ms. April Wallace Moore
19630 Placer Hills Road
Colfax, California 95713

Dear Ms. Moore:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated June 6, 2013 wherein we:

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Ms. Glenda Nelson
Chairperson
Enterprise Rancheria of Maidu Indians
2133 Monte Vista Avenue
Oroville, California 95966

Dear Ms. Nelson:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated April 5, 2013 wherein we:

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Dennis Ramirez
Chairperson
Mechoopda Indian Tribe of Chico Rancheria
125 Mission Ranch Boulevard
Chico, California 95926

Dear Mr. Ramirez:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted you via a letter dated April 5, 2013 wherein we:

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Guy Taylor
Representative
Mooretown Rancheria of Maidu Indians
31 Alverde Drive
Oroville, California 95966

Dear Mr. Taylor:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Cosme Valdez
Interim Chief Executive Officer
Nashville-El Dorado Miwok
P.O. Box 580986
Elk Grove, California 95758

Dear Mr. Valdez:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 12 2014

Mr. Gene Whitehouse
Chairperson
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

Dear Mr. Whitehouse:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted the United Auburn Indian Community of the Auburn Rancheria via a letter dated April 5, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 1 2 2014

Mr. Charlie Wright
Chairperson
Cortina Band Wintun of Indians
P.O. Box 1630
Williams, California 95987

Dear Mr. Wright:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

We most recently contacted the Cortina Band Wintun of Indians via a letter dated June 6, 2013 wherein we:

a. Provided the ARCF Project area of potential effects (APE) and project description.

b. Provided the Corps' determination that the ARCF Project is a complex undertaking that may be constructed in multiple phases, that the effects on historic properties cannot be fully determined prior to the approval of the undertaking, and that the ARCF Project may result in adverse effects to historic properties.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 12 2014

Mr. Randy Yonemura
4305 39th Avenue
Sacramento, California 95824

Dear Mr. Yonemura:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Rhonda Morningstar Pope
Chairperson
Buena Vista Rancheria
1418 20th Street, Suite 200
Sacramento, CA 95811

JUN 25 2014

Dear Ms. Pope:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUN 2 5 2014

Roselynn Lwenya, Ph.D
Tribal Historic Preservation Officer
Buena Vista Rancheria
1418 20th Street, Suite 200
Sacramento, CA 95811

Dear Dr. Lwenya:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin and areas along the north and south banks of the American River as well as the east bank of the Sacramento River pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999. The ARCF Project is a part of the Common Features General Reevaluation Report. The State of California Central Valley Flood Protection Board (CVFPP), in cooperation with the Sacramento Area Flood Control Agency (SAFCA), is the non-Federal sponsor for the ARCF Project.

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d. Requested your involvement in the development of the PA for the ARCF Project.

e. Enclosed the ARCF Project draft PA for your review and comment.

MIWOK United Auburn Indian Community
MAIDU of the Auburn Rancheria

Gene Whitehouse Chairman | John L. Williams Vice Chairman | Danny Rey Secretary | Brenda Adams Treasurer | Calvin Moman Council Member

August 19, 2014

Ms. Melissa Montag
U.S. Army Corp of Engineers
Sacramento District
1325 J Street
Sacramento California 95814-29922

Subject: American River Commons Features (ARCF) Project

Dear Melissa Montag,

Thank you for requesting information regarding the above referenced project. The United Auburn Indian Community (UAIC) of the Auburn Rancheria is comprised of Miwok and Southern Maidu (Nisenan) people whose tribal lands are within Placer County and whose service area includes El Dorado, Nevada, Placer, Sacramento, Sutter, and Yuba counties. The UAIC is concerned about development within its aboriginal territory that has potential to impact the lifeways, cultural sites, and landscapes that may be of sacred or ceremonial significance. We appreciate the opportunity to comment on this and other projects in your jurisdiction.

In order to ascertain whether or not the project could affect cultural resources that may be of importance to the UAIC, we would like to receive copies of any archaeological reports that have been, or will be, completed for the project. We also request copies of future environmental documents for the proposed project so that we have the opportunity to comment on potential impacts and proposed mitigation measures related to cultural resources. Finally, we would like the opportunity to have our tribal monitors accompany you during the field survey. The information gathered will provide us with a better understanding of the project and cultural resources on site and is invaluable for consultation purposes.

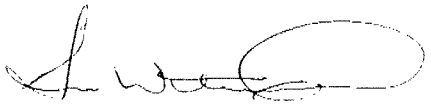
Our preservation committee has identified many cultural resources within your project area and in close proximity, and would like to request a site visit to confirm their locations and meet with you regarding this project. In addition, we have several specific requests that arose out of your meeting with our committee members and staff on August 5, 2014. We ask that the USACE and DWR provide the UAIC with:

- A confidentiality and/or data sharing agreement;
- A burial plan;
- A Historic Properties Treatment Plan that is approved before ground disturbing activities begin;
- A confederacy agreement between the tribes that wish to consult on the project;
- Signatory status on the Programmatic Agreement.

Each of these is crucial to ensuring that the many cultural resources within your project area are protected and that any disturbance to the resources is minimized.

We will begin preparing comments to the PA and look forward to meeting with you again so that we can maintain an open dialogue. Thank you again for taking these matters into consideration, and for involving the UAIC early in the planning process. We look forward to reviewing the documents we requested. Please contact Marcos Guerrero, Cultural Resources Manager, at (530) 883-2364 or by email at mguerrero@auburnrancheria.com if you have any questions.

Sincerely,



Gene Whitehouse,
Chairman

CC: Marcos Guerrero, CRM

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Mr. Charlie Wright
Chairperson
Cortina Wintun Environmental Protection Agency
P.O. Box 1630
Williams, California 95987

Dear Mr. Wright:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

The geotechnical study consists of drilling thirty eight (38) soil borings within the levee prism, levee toe, waterside berm, or adjacent field along the American River and NEMDC. The borings will be performed by a truck mounted drill rig or hand auger. There will be a total of eleven (11) borings using a truck or track mounted drill rig and twenty-seven (27) hand augers taking place. The borings will be up to 8 inches in diameter and up to 80 feet deep, and the augers will be up to 8 inches in diameter and up to 15 feet deep. The main access and travel paths to the boring and auger locations would be from the existing levee roads, levee access ramps, bike paths, and adjacent streets. After boring and augering is complete all holes/excavations will be backfilled and the surface returned to pre-work conditions. Enclosed is a map of the proposed boring and augering locations and a table describing the activities (Enclosures 1 and 2).

A records search and archeological survey completed on October 14, 2014 revealed that the locations for the geotechnical study have been previously subjected to cultural resources inventory twice and that there are no known prehistoric resources located

within or adjacent to the locations for the geotechnical study. Although there are three previously recorded historic-era features (NEMDC west levee, Del Paso Road, and Northgate Boulevard) within the area, none will be affected by the geotechnical study. A recent archeological field verification of the boring and augering locations did not result in the identification of previously unknown prehistoric resources. A single, isolated, potentially historic-era feature was identified in the NEMDC channel just north of San Juan Road, but it is located outside the area planned for the geotechnical study. However, in the event of an unanticipated discovery during the borings or augering, all work at the location of the discovery would stop and both the State Historic Preservation Officer and tribes would be notified.

Previous consultation with Native American tribes on other Corps projects in the vicinity of the geotechnical study locations has noted the area is potentially sensitive for cultural resources. As a result, an archeological monitor meeting 36 CFR § 61 and the Secretary of the Interior's Professional Qualifications Standards for Archeology will inspect the available soil for the presence of cultural resources and will collect samples of organic matter from a variety of subsurface sediments for radiocarbon dating in order to better understand the age of alluvial deposits and inform the Corps' assessments of the probability of encountering buried archaeological sites.

We are sensitive toward the protection of traditional cultural properties and sacred sites, and make every effort to avoid them. Please let us know if you have knowledge of locations of archeological sites, sacred sites, or areas of traditional cultural value or concern in or near the locations identified for the borings and augering. Correspondence may be sent to: Ms. Melissa Montag (CESPK-PD-RC), U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814. If you have any questions or would like additional information, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Mr. Kesner Flores
P.O. Box 1047
Wheatland, California 95692

Dear Mr. Flores:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Ms. Rose Enos
15310 Bancroft Road
Auburn, California 95603

Dear Ms. Enos:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

El Dorado Miwok Tribe
P.O. Box 711
El Dorado, California 95623

To Whom It May Concern:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Ms. Cathy Bishop
Chairperson
Strawberry Valley Rancheria
1540 Strader Avenue
Sacramento, California 95815

Dear Ms. Bishop:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Mr. Andrew Franklin
Chairperson
Wilton Rancheria
9728 Kent Street
Elk Grove, California 95624

Dear Mr. Franklin:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Mr. Ambar Mohammed
Cachil DeHe Band of Wintun Indians of the Colusa Indian Community of the Colusa Rancheria
3730 State Highway 45 # B
Colusa, California 95932

Dear Mr. Mohammed:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Ms. Yvonne Miller
Chairperson
Ione Band of Miwok Indians
P.O. Box 699
Plymouth, California 95669

Dear Ms. Miller:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Ms. Judith Marks
Colfax-Todds Valley Consolidated Tribe
1068 Silverton Circle
Lincoln, California 95648

Dear Ms. Marks:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Ms. April Wallace Moore
19630 Placer Hills Road
Colfax, California 95713

Dear Ms. Moore:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Ms. Glenda Nelson
Chairperson
Enterprise Rancheria of Maidu Indians
2133 Monte Vista Avenue
Oroville, California 95966

Dear Ms. Nelson:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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A records search and archeological survey completed on October 14, 2014 revealed that the locations for the geotechnical study have been previously subjected to cultural resources inventory twice and that there are no known prehistoric resources located

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Ms. Rhonda Morningstar Pope
Chairperson
Buena Vista Rancheria
1418 20th Street, Suite 200
Sacramento, California 95811

Dear Ms. Pope:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Mr. Dennis Ramirez
Chairperson
Mechoopda Indian Tribe of Chico Rancheria
125 Mission Ranch Boulevard
Chico, California 95926

Dear Mr. Ramirez:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Mr. Randy Yonemura
4305 39th Avenue
Sacramento, California 95824

Dear Mr. Yonemura:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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A records search and archeological survey completed on October 14, 2014 revealed that the locations for the geotechnical study have been previously subjected to cultural resources inventory twice and that there are no known prehistoric resources located within or adjacent to the locations for the geotechnical study. Although there are three previously recorded historic-era features (NEMDC west levee, Del Paso Road, and

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Mr. Gene Whitehouse
Chairperson
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

Dear Mr. Whitehouse:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Mr. Cosme Valdez
Interim Chief Executive Officer
Nashville-El Dorado Miwok
P.O. Box 580986
Elk Grove, California 95758

Dear Mr. Valdez:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Mr. Guy Taylor
Representative
Mooretown Rancheria of Maidu Indians
31 Alverde Drive
Oroville, California 95966

Dear Mr. Taylor:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 2 0 2014

Mr. Don Ryberg
Chairman
Tsi-Akim Maidu
1239 East Main Street
Grass Valley, California 95945

Dear Mr. Ryberg:

The U.S. Army Corps of Engineers (Corps), along with its non-Federal sponsors, the Central Valley Flood Protection Board (CVFPB) and Sacramento Area Flood Control Agency (SAFCA), are conducting geotechnical study as a part of the American River Watershed Common Features Project Natomas Basin, specifically Reach H, which extends from Northgate Boulevard to the Natomas East Main Drainage Canal (NEMDC) Stormwater Pump Station. Authorization for the Common Features project is provided by Section 7002 of Water Resources Reform and Development Act (WRRDA) (PL 113-121) of 2014. As part of these studies, soil borings will be performed to collect, classify, and test soil samples along the American River and NEMDC near Sacramento, California. Additionally, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR § 800.4, and as part of efforts to identify historic properties, the Corps will collect samples of organic matter (e.g. charcoal, wood) encountered during the studies for radiocarbon dating. This work is expected to occur between December 2014 and February of 2015.

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MIWOK United Auburn Indian Community
MAIDU of the Auburn Rancheria

Gene Whitehouse, Chairman | John L. Williams, Vice Chairman | Danny Rey, Secretary | Brenda Adams, Treasurer | Calvin Moman, Council Member

May 18, 2015

Colonel Michael Farrell, District Commander
U.S. Army Corps of Engineers
Sacramento District
1325 J Street, Room 1513
Sacramento, California 95814

RE: Formal Request for Government-to-Government Consultation, American River Watershed Common Features General Reevaluation Report, Draft Environmental Impact Statement/Environmental Impact Report, March 2015

Dear Colonel Farrell,

The United Auburn Indian Community (UAIC) is sending this letter to the U.S. Army Corps of Engineers (USACE) requesting formal Government-to-Government Consultation for the American River Common Features (ARCF) Project, located in Sacramento County. The primary purpose of government-to-government consultation as described in Federal Executive Order 13175 "Consultation and Coordination with Indian Tribal Governments" is to ensure that the UAIC is given the opportunity to provide meaningful and timely input regarding proposed USACE actions that uniquely or significantly affect our burial and sacred sites and places.

With this letter, the UAIC is notifying the USACE that unique or significant historic properties will be adversely affected by your project-related planned and proposed levee improvements. Early identification of Tribal concerns will allow the USACE to consider alternatives to avoid and minimize potential impacts to our burial sites and cultural resources. The UAIC would like to be a signatory party to the Programmatic Agreement and be involved early and often as the project planning, alternatives, and documentation are developed and refined.

The UAIC understands and has concerns regarding the confidentiality of information on areas or resources of religious, traditional and cultural importance to the Tribe. We would be happy to discuss these concerns and develop procedures to ensure the confidentiality of such information is strictly maintained.

Your timely response will greatly assist us in being able to have our concerns incorporated into project planning and the Final EIR/EIS. Please contact Marcos Guerrero, Cultural Resources Manager, at (530) 883-2364 or email at mguerrero@auburnrancheria.com if you have any questions.

Sincerely,

Gene Whitehouse,
Chairman

CC:
Mark A. Gilfillan, USACE

Melissa L. Montag, USACE
Jason Camp, THPO
Danny Rey, Secretary

Tribal Office 10720 Indian Hill Road Auburn, CA 95603 (530) 883-2390 FAX (530) 883-2380

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO, CA 95814-2922

REPLY TO
ATTENTION OF

JUL 0 7 2015

Environmental Resources Branch

Mr. Gene Whitehouse
Chairperson
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

Dear Mr. Whitehouse:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), we are writing to continue our consultation with you regarding the proposed American River Common Features (ARCF) Project. The U.S. Army Corps of Engineers (Corps) is authorized to reduce flood risk to the City of Sacramento and the Natomas Basin, and areas along the north and south banks of the American River, as well as the east bank of the Sacramento River, pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999 and the Water Resources Reform and Development Act of 2014. In addition to the work contained in these authorizations, a General Reevaluation Report is being prepared to identify the extent of Federal interest in additional levee improvements in the greater Sacramento area. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

As a result of your stated interest in the ARCF Project, and in compliance with Section 106 of the NHPA, we have been meeting with the United Auburn Indian Community of the Auburn Rancheria (UAIC) quarterly with the most recent meeting occurring on May 19, 2015. We also received your email dated April 16, 2015, wherein you provided several comments on the ARCF Draft Environmental Impact Statement/Draft Environmental Impact Report. Based on several of your comments we request any specific information the UAIC may be able to provide in order to ensure that the Corps completely and accurately understands the UAIC's issues and concerns with the ARCF Project:

a. Comment 1: What specific design features would the UAIC prefer be incorporated to reduce the potential for direct cultural impacts?

b. Comment 2: Please provide specific information on the tribal values the UAIC would like considered under construction timing, project and alternatives screening criteria, environmental commitments for cultural resources, social effects, and environmental justice.

c. Comment 2: Please provide specific information on how the UAIC should be identified as a viewer group for visual impacts.

d. Comment 5: Please provide specific information on tribal cultural values, sanctified cemeteries, and/or cultural landscapes that the Corps should consider.

e. Comment 7: Please provide specific information on how the UAIC believes there will be cumulative effects or effects to cultural resources and/or cultural landscapes across several phases or projects over wide geography.

f. Comment 11: Please provide information on how the UAIC believes vibration or compression effects on cultural resources should be considered.

g. Comment 11: Please provide specific information on the vegetation the UAIC considers to be native or cultural plants, their relationships to burial mounds or tribal cultural landscapes, and the impacts the UAIC believes should be considered.

h. Comment 11: Please provide information on traditional cultural properties and cultural landscapes and the importance of place, setting, and landscape to the UAIC.

We welcome your input on any of the subjects above, or any other information the UAIC would be willing to provide that the Corps may take into consideration while preparing the Final Environmental Impact Statement/Final Environmental Impact Report (FEIS/FEIR). If there is information you would like us to consider but not include in the FEIS/FEIR we welcome the opportunity to discuss accommodating those kinds of requests as well. In order to allow time to consider this information, please provide any responses within 15 calendar days of receipt of this letter.

Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922.

If you have any questions or would like additional information about the Section 106 compliance and consultation for the ARCF Project, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil. Please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372 with any specific project questions.

Sincerely,

FOR Alicia E. Kirchner
Chief, Planning Division

CF:
Jason Camp, Tribal Historic Preservation Officer, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603
Marcos Guerrero, Cultural Resources Manager, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

AUG 24 2015

Mr. Gene Whitehouse
Chairperson
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

Dear Mr. Whitehouse:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) and the U.S. Army Corps of Engineers, Sacramento District (Corps), Tribal Consultation Policy (Nov. 1, 2012), we are writing to continue consultation with you regarding the proposed American River Common Features (ARCF) Project. The Corps is authorized to reduce flood risk to the City of Sacramento, the Natomas Basin, areas along the north and south banks of the American River, and the east bank of the Sacramento River, pursuant to the Water Resources Development Act (WRDA) of 1996 with additional authority provided in WRDA 1999 and the Water Resources Reform and Development Act of 2014. We are further pursuing additional authorization of levee and flow conveyance improvements. The State of California Central Valley Flood Protection Board, in cooperation with the Sacramento Area Flood Control Agency, is the non-Federal sponsor for the ARCF Project.

We received your letter dated May 18, 2015 in which you requested formal Government-to-Government Consultation, notified the Corps that historic properties will be adversely affected by the ARCF Project, and requested that the Corps invite the UAIC to sign the ARCF Project Programmatic Agreement (PA) as a signatory party. The Corps' Tribal Liaison, Mark Gilfillan, has been in contact with your staff to initiate formal Government-to-Government Consultation and to reiterate our commitment to working closely and openly with the UAIC to provide meaningful and timely input regarding the Corps' ARCF Project.

I have given your request careful consideration and would like to invite the tribe to join our PA as a concurring party. With the role as a concurring party, along with my staff working closely and cooperatively with yours, it is my sincere hope and intent to address our mutual concerns regarding any adverse effects to historic properties. As a concurring party, the tribe reserves the ability to object to the manner in which the PA is implemented, if at any point you believe that your voice is not being heard. My goal is that your ideas and concerns are addressed as part of implementation of the PA throughout this project. I share your concerns regarding potential adverse

effects to historic properties, and I am committed to ensuring that our project avoids or minimizes to the maximum extent any adverse effects through implementation of the PA and throughout construction of the project.

We look forward to continuing consultation with the UAIC on the ARCF Project. Correspondence may be sent to Mr. Dan Tibbitts, Project Manager, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. I am looking forward to meeting with you to further engage in Government-to-Government Consultation for the ARCF Project. Please contact Mark Gilfillan, Corps Tribal Liaison, at (970) 243-1199 x15, or by email at: Mark.A.Gilfillan@usace.army.mil to further coordinate a Government-to-Government Consultation meeting. Please contact Mr. Dan Tibbitts, Project Manager, at (916) 557-7372 with any specific project questions.

Sincerely,

Michael J. Farrell
Colonel, U.S. Army
District Commander

cc:
Jason Camp, Tribal Historic Preservation Officer, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603
Marcos Guerrero, Cultural Resources Manager, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Ms. Rhonda Morningstar Pope
Chairperson
Buena Vista Rancheria
1418 20th Street, Suite 200
Sacramento, California 95811

Dear Ms. Morningstar Pope:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

Please return an original signed copy of the appropriate signature page if you wish to participate in this agreement as a concurring party. The signed page and/or any questions or comments may be directed to Ms. Melissa Montag, CESPK-PD-RC, U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814; email at Melissa.L.Montag@usace.army.mil; or telephone at (916) 557-7907.

Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

Cc: (w/enclosure)
Ms. Roselynn Lwenya, Tribal Historic Preservation Officer, Buena Vista Rancheria,
1418 20th Street, Suite 200, Sacramento, California 95811

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Mr. Ambar Mohammed
Cachil DeHe Band of Wintun Indians of the Colusa Indian Community of the Colusa Rancheria
3730 State Highway 45 # B
Colusa, California 95932

Dear Mr. Mohammed:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Ms. Judith Marks
Colfax-Todds Valley Consolidated Tribe
1068 Silverton Circle
Lincoln, California 95648

Dear Ms. Marks:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Ms. Pamela Cubbler
Colfax-Todds Valley Consolidated Tribe
P.O. Box 734
Foresthill, California 95631

Dear Ms. Cubbler:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Mr. Charlie Wright
Chairperson
Cortina Wintun Environmental Protection Agency
P.O. Box 1630
Williams, California 95987

Dear Mr. Wright:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

El Dorado Miwok Tribe
P.O. Box 711
El Dorado, California 95623

Dear Sir or Madam:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Ms. Rose Enos
15310 Bancroft Road
Auburn, California 95603

Dear Ms. Enos:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Ms. Glenda Nelson
Chairperson
Enterprise Rancheria of Maidu Indians
2133 Monte Vista Avenue
Oroville, California 95966

Dear Ms. Nelson:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

Cc: (w/enclosure)
Mr. Reno Franklin, Tribal Historic Preservation Officer, Enterprise Rancheria of Maidu Indians, 2133 Monte Vista Avenue, Oroville, California 95669

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Mr. Kesner Flores
P.O. Box 1047
Wheatland, California 95692

Dear Mr. Flores:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Dr. Crystal Martinez
Chairperson
Ione Band of Miwok Indians
P.O. Box 699
Plymouth, California 95669

Dear Dr. Martinez:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

Cc: (w/enclosure)
Cultural Committee, Ione Band of Miwok Indians, PO Box 699, Plymouth, California 95669

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC (

Mr. Dennis Ramirez
Chairperson
Mechoopda Indian Tribe of Chico Rancheria
125 Mission Ranch Boulevard
Chico, California 95926

DEC 07 2015

Dear Mr. Ramirez:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

Cc: (w/enclosure)
Mr. Michael D. DeSpain, Director of OEPP, Mechoopda Indian Tribe of Chico Rancheria, 125 Mission Ranch Boulevard, Chico, California 95926

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Mr. Guy Taylor
Representative
Mooretown Rancheria of Maidu Indians
31 Alverde Drive
Oroville, California 95966

Dear Mr. Taylor:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Mr. Cosme Valdez
Interim Chief Executive Officer
Nashville-El Dorado Miwok
P.O. Box 580986
Elk Grove, California 95758

Dear Mr. Valdez:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Mr. Nicholas Fonseca
Chairperson
Shingle Springs Band of Miwok Indians
P.O. Box 1340
Shingle Springs, California 95682

Dear Mr. Fonseca:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

Cc: (w/enclosure)
Mr. Daniel Fonseca, Cultural Resources Director, Shingle Springs Band of Miwok Indians, PO Box 1340, Shingle Springs, California 95682
Mr. Hermo Olanio, Vice Chairperson, Shingle Springs Band of Miwok Indians, PO Box 1340, Shingle Springs, California 95682
Ms. Kara Perry, Administrative Assistant, Cultural Resources Department, Shingle Springs Band of Miwok Indians, PO Box 1340, Shingle Springs, California 95682

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Ms. Cathy Bishop
Chairperson
Strawberry Valley Rancheria
1540 Strader Avenue
Sacramento, California 95815

Dear Ms. Bishop:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Mr. Don Ryberg
Chairman
Tsi-Akim Maidu
1239 East Main Street
Grass Valley, California 95945

Dear Mr. Ryberg:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

Cc: (w/enclosure)
Ms. Eileen Moon, Vice Chairperson, Tsi-Akim Maidu, 1239 East Main Street, Grass Valley, California 95945
Mr. Grayson Coney, Tsi-Akim Maidu, P.O. Box 1316, Colfax, California 95713

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

DEC 07 2015

Environmental Resources Branch

Mr. Gene Whitehouse
Chairperson
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

Dear Mr. Whitehouse:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

Cc: (w/enclosure)
Mr. Marcos Guerrero, Cultural Resources Specialist, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603
Mr. Jason Camp, Tribal Historic Preservation Officer, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Mr. Raymond Hitchcock
Chairperson
Wilton Rancheria
9728 Kent Street
Elk Grove, California 95642

Dear Mr. Hitchcock:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

Cc: (w/enclosure)
Mr. Steven Hutchason, Wilton Rancheria, 9728 Kent Street, Elk Grove, California 95642

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Mr. Randy Yonemura
4305 39th Avenue
Sacramento, California 95824

Dear Mr. Yonemura:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

American River Common Features GRR

EIS Cultural Resources Appendix

Enclosure 6

Letters to the Interested Public

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

State of California Central Valley Flood Protection Board
Andrea Buckley
3310 El Camino Avenue, Room 151
Sacramento, California 95821

Dear Ms. Buckley:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Fair Oaks Historical Society
P.O. Box 2044
Fair Oaks, California 95628

Dear Sir or Madam:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Golden Gate State Museum
1020 O Street
Sacramento, California 95814

Dear Sir or Madam:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Sacramento County Historical Society
P.O. Box 160065
Sacramento, California 95816

Dear Sir or Madam:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

Please return an original signed copy of the appropriate signature page if you wish to participate in this agreement as a concurring party. The signed page and/or any questions or comments may be directed to Ms. Melissa Montag, CESPK-PD-RC, U.S. Army Corps of Engineers, 1325 J Street, Sacramento, California 95814; email at Melissa.L.Montag@usace.army.mil; or telephone at (916) 557-7907.

Sincerely,

Mark T. Z

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Society for California Archaeology
1692 Mangrove Avenue, #153
Chico, California 95926

Dear Sir or Madam:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Sutter County Historical Society
P.O. Box 1004
Yuba City, California 95992

Dear Sir or Madam:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

West Sacramento Historical Society
P.O. Box 1202
West Sacramento, California 95691

Dear Sir or Madam:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

Environmental Resources Branch

DEC 07 2015

Yolo County Historical Society
P.O. Box 1447
Woodland, California 95776

Dear Sir or Madam:

We thank you for your interest in the American River Common Features Project (Project). The U.S. Army Corps of Engineers, Sacramento District (Corps), is proceeding to implement aspects of the Project as authorized in the Water Resources Development Act (WRDA) of 1996, as amended by the WRDA 1999 and the Energy and Water Development and Related Agencies Appropriations Act of 2008, and as authorized by Section 7002 of the Water Resources Reform and Development Act of 2014. At this time, we are submitting the signed Programmatic Agreement for your records and to invite you to sign the document as a concurring party.

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Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosure

APPENDIX D

AIR QUALITY APPENDIX

Air Quality Technical Appendix

AIR QUALITY

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

- The project will require 14 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;
- All required administrative, legal, real estate and environmental clearances/approvals will be acquired prior to initiation of construction.
- All project plans and specifications will require that construction contractors use only off-road equipment that implements the Sacramento Metropolitan Air Quality Management Districts' (SMAQMD) Enhanced Exhaust Control Practices and only use on-road hauling equipment that was manufactured in 2010, or later.
- If the off-road equipment and on-road hauling specifications stated above are not met, it cannot be assured that the project air emissions can meet the Federal *de minimis* standards.

It was determined through internal discussions, as well as 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.

The project team determined that construction in the second year within Reach F of the American River South basin would be the construction season that would result in the most combined air emissions. 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), construction of a retaining wall to allow corrections to the levee height and width, reconstruction of the levee, relocation of utilities, and delivery and installation of rip-rap on the waterside slope. The second year of construction in Reach F was chosen because 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 uses 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 Joint Federal Project (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 Common Features 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, NOx, 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 same amount of material to be barged to the project site, would be trucked to the site in the same period of time. Those results are shown in Tables 1a and 2a (calculated in pounds per day under local standards) and 1b and 2b (calculated in tons per construction project under 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 NOx (Tables 1a and 2a), however, the trucking alternative would require a lower overall mitigation fee cost. In the case of the Federal *de minimis* standards (Tables 1b and 2b) the alternative that involves trucking the rip-rap is within the Federal de minimis standard, even without mitigation, while the barging alternative would likely meet the standard using the mitigation provided by the implementation of Enhance Exhaust Control Practices for off-road equipment and only using on-road hauling equipment that was manufactured in 2010, or later.

Table 1a. Estimated Air Emissions for the Americau River Common Features Project (South) – Reach F (Year 2)
(with Truck Rip-Rap Delivery)
Maximum Pounds per Day

Project Tasks	ROG	CO	NO_x	NO_x (*mitigated)	Mitigation Fee **	Total PM_{10}	Exhaust PM_{10}	Fugitive Dust PM_{10}	Total $PM_{2.5}$	Exhaust $PM_{2.5}$	Fugitive Dust $PM_{2.5}$	CO_2
1. Clear Vegetation (3 days)	4.5	22.7	194.3	159.1	$1,993.36	71.2	4.2	67.0	16.6	2.7	13.9	38,068
2. Tree Removal (11 days)	1.4	9.0	33.4	N/A		1.0	1.0	-	0.8	0.8	-	5,303
3. Strip to Stockpile (3 days)	10.5	51.7	129.2	104.3	$519.19	72.4	5.4	67.0	18.8	4.9	13.9	12,179
4. Strip to Spoils (1 day)	13.7	66.8	272.4	245.5	$1,439.20	75.4	8.4	67.0	20.7	6.8	13.9	40,202
5. Excavation to Stockpile (31 days)	11.2	55.5	139.6	112.7	$7,699.96	72.7	5.7	67.0	19.1	5.2	13.9	13,162
6. Excavation to Spoils (1 day)	18.3	89.6	335.9	298.5	$1,914.45	77.8	10.8	67.0	22.9	9.0	13.9	47,018
7. Import Sand (8 days)	6.2	27.7	167.0	158.6	$5,279.80	71.7	4.7	67.0	17.4	3.5	13.9	29,264
8. Import Cohesive Fill (5 days)	8.5	41.5	196.0	182.3	$4,362.45	72.8	5.8	67.0	18.4	4.5	13.9	32,565
9. Cutoff Wall SCB (34 days)	4.8	30.0	50.1	N/A		69.6	2.6	67.0	16.3	2.4	13.9	6,182
10. Cutoff Wall DSM (110 days)	16.9	100.5	155.6	124.5	$38,961.62	75.4	8.4	67.0	21.6	7.7	13.9	18,598
11a. Retaining Wall (Concrete) (2 days)	4.0	19.6	146.3	142.6	$1,033.00	70.6	3.6	67.0	16.3	2.4	13.9	28,259
11b. Retaining Wall (Forms/Steel) (32 days)	1.1	5.2	13.1	N/A		67.7	0.7	67.0	14.6	0.6	13.9	1,560
12. Fill from Stockpile (30 days)	4.5	24.0	56.3	N/A		69.4	2.4	67.0	16.1	2.2	13.9	6,281
13. Import Random Fill (7 days)	6.7	34.2	176.2	166.0	$5,084.29	71.8	4.8	67.0	17.5	3.6	13.9	30,691
14. Import Topsoil Fill (6 days)	5.9	29.9	148.9	139.7	$2,942.97	71.2	4.2	67.0	17.1	3.1	13.9	25,646
15. Surfacing (1 day)	14.5	64.3	331.0	309.7	$2,014.88	77.5	10.5	67.0	22.1	8.2	13.9	55,317
16. Import Rip-Rap (Truck) (80 days)	4.9	25.9	160.9	154.9	$50,143.46	71.0	4.0	67.0	16.8	2.8	13.9	30,116
17. Utilities #1 (3 days)	2.1	11.3	24.7	N/A		101.7	1.2	100.5	22.0	1.1	20.9	2,400
18. Utilities #2 (52 days)	1.1	5.1	11.7	N/A		101.2	0.7	100.5	21.5	0.6	20.9	1,264
Maximum (lbs/day)	**18.3**	**100.5**	**335.9**	**309.7**		**101.7**	**10.8**	**100.5**	**22.9**	**9.0**	**20.9**	**55,317**
SMAQMD thresholds (lbs/day)	**N/A**	**N/A**	**85**	**85**		**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Estimated Mitigation Fee					**$123,388.63**							

Notes:
* Values based on a 20% mitigation for off-road equipment
** Calculation of Mitigation Fee: (any mitigated value over the 85 lbs/day threshold) X (number of days the task is performed) X ($8.54/lb) X (5% Administrative Fee) (As of 12/18/2012)

Table 1b. Estimated Air Emissions for the Americau River Common Features Project (South) – Reach F (Year 2)
(with Barge Rip-Rap Delivery)
Maximum Pounds per Day

Project Tasks	ROG	CO	NO_x	NO_x (*mitigated)	Mitigation Fee **	Total PM_{10}	Exhaust PM_{10}	Fugitive Dust PM_{10}	Total $PM_{2.5}$	Exhaust $PM_{2.5}$	Fugitive Dust $PM_{2.5}$	CO_2
1. Clear Vegetation (3 days)	4.5	22.7	194.3	159.1	$1,993.36	71.2	4.2	67.0	16.6	2.7	13.9	38,068
2. Tree Removal (11 days)	1.4	9.0	33.4	N/A		1.0	1.0	-	0.8	0.8	-	5,303
3. Strip to Stockpile (3 days)	10.5	51.7	129.2	104.3	$519.19	72.4	5.4	67.0	18.8	4.9	13.9	12,179
4. Strip to Spoils (1 day)	13.7	66.8	272.4	245.5	$1,439.20	75.4	8.4	67.0	20.7	6.8	13.9	40,202
5. Excavation to Stockpile (31 days)	11.2	55.5	139.6	112.7	$7,699.96	72.7	5.7	67.0	19.1	5.2	13.9	13,162
6. Excavation to Spoils (1 day)	18.3	89.6	335.9	298.5	$1,914.45	77.8	10.8	67.0	22.9	9.0	13.9	47,018
7. Import Sand (8 days)	6.2	27.7	167.0	158.6	$5,279.80	71.7	4.7	67.0	17.4	3.5	13.9	29,264
8. Import Cohesive Fill (5 days)	8.5	41.5	196.0	182.3	$4,362.45	72.8	5.8	67.0	18.4	4.5	13.9	32,565
9. Cutoff Wall SCB (34 days)	4.8	30.0	50.1	N/A		69.6	2.6	67.0	16.3	2.4	13.9	6,182
10. Cutoff Wall DSM (110 days)	16.9	100.5	155.6	124.5	$38,961.62	75.4	8.4	67.0	21.6	7.7	13.9	18,598
11a. Retaining Wall (Concrete) (2 days)	4.0	19.6	146.3	142.6	$1,033.00	70.6	3.6	67.0	16.3	2.4	13.9	28,259
11b. Retaining Wall (Forms/Steel) (32 days)	1.1	5.2	13.1	N/A		67.7	0.7	67.0	14.6	0.6	13.9	1,560
12. Fill from Stockpile (30 days)	4.5	24.0	56.3	N/A		69.4	2.4	67.0	16.1	2.2	13.9	6,281
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14. Import Topsoil Fill (6 days)	5.9	29.9	148.9	139.7	$2,942.97	71.2	4.2	67.0	17.1	3.1	13.9	25,646
15. Surfacing (1 day)	14.5	64.3	331.0	309.7	$2,014.88	77.5	10.5	67.0	22.1	8.2	13.9	55,317
16. Import Rip-Rap (Barge) (80 days)	27.6	106.5	256.8	222.4	$98,565.26	10.0	1.0	67.0	4.5	1.2	13.9	9,726
17. Utilities #1 (3 days)	2.1	11.3	24.7	N/A		101.7	1.2	100.5	22.0	1.1	20.9	2,400
18. Utilities #2 (52 days)	1.1	5.1	11.7	N/A		101.2	0.7	100.5	21.5	0.6	20.9	1,264
Maximum (lbs/day)	**18.3**	**100.5**	**335.9**	**309.7**		**101.7**	**10.8**	**100.5**	**22.9**	**9.0**	**20.9**	**55,317**
SMAQMD thresholds (lbs/day)	**N/A**	**N/A**	**85**	**85**		**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Total Estimated Mitigation Fee					**$171,810.43**							

Notes:
* Values based on a 20% mitigation for off-road equipment
** Calculation of Mitigation Fee: (any mitigated value over the 85 lbs/day threshold) X (number of days the task is performed) X ($8.54/lb) X (5% Administrative Fee) (As of 12/18/2012)

Table 2a. Estimated Air Emissions for the American River Common Features Project (South) – Reach F (Year 2) (with Truck Rip-Rap Delivery)
Total Tons Per Construction Project

Project Tasks	ROG	CO	NO_x	Total PM_{10}	Exhaust PM_{10}	Fugitive Dust PM_{10}	Total $PM_{2.5}$	Exhaust $PM_{2.5}$	Fugitive Dust $PM_{2.5}$	CO_2
1. Clear Vegetation	0.0	0.0	0.3	0.1	0.0	0.1	0.0	0.0	0.0	62.8
2. Tree Removal	0.0	0.0	0.2	0.0	0.0	-	0.0	0.0	-	29.2
3. Strip to Stockpile	0.0	0.1	0.2	0.1	0.0	0.1	0.0	0.0	0.0	20.1
4. Strip to Spoils	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	22.1
5. Excavation to Stockpile	0.2	0.9	2.1	0.6	0.1	0.5	0.2	0.1	0.1	202.7
6. Excavation to Spoils	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	25.9
7. Import Sand	0.0	0.1	0.7	0.1	0.0	0.1	0.0	0.0	0.0	128.8
8. Import Fill	0.0	0.1	0.5	0.1	0.0	0.1	0.0	0.0	0.0	89.6
9. Cutoff Wall SCB	0.1	0.5	0.8	0.5	0.0	0.5	0.1	0.0	0.1	102.0
10. Cutoff Wall DSM	0.9	5.5	8.6	2.1	0.5	1.7	0.8	0.4	0.3	1,022.9
11a. Retaining Wall (Concrete)	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	31.1
11b. Retaining Wall (Forms/Steel)	0.0	0.1	0.2	0.5	0.0	0.5	0.1	0.0	0.1	25.7
12. Fill from Stockpile	0.1	0.4	0.9	0.5	0.0	0.5	0.1	0.0	0.1	96.7
13. Import Random Fill	0.0	0.1	0.6	0.1	0.0	0.1	0.0	0.0	0.0	101.3
14. Import Topsoil Fill	0.0	0.1	0.5	0.1	0.0	0.1	0.0	0.0	0.0	84.6
15. Surfacing	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	30.4
16. Import Rip-Rap (Truck)	0.2	1.0	6.4	1.4	0.2	1.2	0.4	0.1	0.2	1,192.6
17. Utilities #1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	4.0
18. Utilities #2	0.0	0.1	0.3	1.2	0.0	1.2	0.3	0.0	0.2	33.4
Total (tons/construction project)	**1.5**	**9.0**	**23.0**	**7.5**	**0.8**	**6.8**	**2.0**	**0.6**	**1.1**	**3,305.9**
Federal standards (tons/year)	**25**	**100**	**25**	**100**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Table 2b. Estimated Air Emissions for the American River Common Features Project (South) – Reach F (Year 2) (with Barge Rip-Rap Delivery)
Total Tons Per Construction Project

Project Tasks	ROG	CO	NO_x	Total PM_{10}	Exhaust PM_{10}	Fugitive Dust PM_{10}	Total $PM_{2.5}$	Exhaust $PM_{2.5}$	Fugitive Dust $PM_{2.5}$	CO_2
1. Clear Vegetation	0.0	0.0	0.3	0.1	0.0	0.1	0.0	0.0	0.0	62.8
2. Tree Removal	0.0	0.0	0.2	0.0	0.0	-	0.0	0.0	-	29.2
3. Strip to Stockpile	0.0	0.1	0.2	0.1	0.0	0.1	0.0	0.0	0.0	20.1
4. Strip to Spoils	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	22.1
5. Excavation to Stockpile	0.2	0.9	2.1	0.6	0.1	0.5	0.2	0.1	0.1	202.7
6. Excavation to Spoils	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	25.9
7. Import Sand	0.0	0.1	0.7	0.1	0.0	0.1	0.0	0.0	0.0	128.8
8. Import Fill	0.0	0.1	0.5	0.1	0.0	0.1	0.0	0.0	0.0	89.6
9. Cutoff Wall SCB	0.1	0.5	0.8	0.5	0.0	0.5	0.1	0.0	0.1	102.0
10. Cutoff Wall DSM	0.9	5.5	8.6	2.1	0.5	1.7	0.8	0.4	0.3	1,022.9
11a. Retaining Wall (Concrete)	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	31.1
11b. Retaining Wall (Forms/Steel)	0.0	0.1	0.2	0.5	0.0	0.5	0.1	0.0	0.1	25.7
12. Fill from Stockpile	0.1	0.4	0.9	0.5	0.0	0.5	0.1	0.0	0.1	96.7
13. Import Random Fill	0.0	0.1	0.6	0.1	0.0	0.1	0.0	0.0	0.0	101.3
14. Import Topsoil Fill	0.0	0.1	0.5	0.1	0.0	0.1	0.0	0.0	0.0	84.6
15. Surfacing	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	30.4
16. Import Rip-Rap (Barge)	1.1	4.5	10.6	0.4	0.0	0.4	0.0	0.0	0.1	401.6
17. Utilities #1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	4.0
18. Utilities #2	0.0	0.1	0.3	1.2	0.0	1.2	0.3	0.0	0.2	33.4
Total (tons/construction project)	**2.4**	**12.5**	**27.2**	**6.5**	**0.6**	**6.0**	**1.6**	**0.5**	**1.0**	**2,514.9**
Federal standards (tons/year)	**25**	**100**	**25**	**100**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Harbor Craft Model Emission Factors

Hp	Year	NO_x	PM	ROG	CO	SO_x	CO_2
40	2013	0.30	0.03	0.10	0.19	0.000	10.15
	2014	0.30	0.03	0.10	0.19	0.000	10.15
	2015	0.30	0.03	0.10	0.19	0.000	10.15
	2016	0.30	0.03	0.10	0.19	0.000	10.15
	2017	0.30	0.03	0.10	0.19	0.000	10.15
200	2013	2.09	0.08	0.21	0.74	0.001	56.38
	2014	1.99	0.08	0.20	0.73	0.001	56.38
	2015	1.94	0.07	0.20	0.73	0.001	56.38
	2016	1.91	0.07	0.20	0.73	0.001	56.38
	2017	1.88	0.07	0.20	0.74	0.001	56.38
250	2013	2.70	0.11	0.26	0.87	0.001	78.31
	2014	2.58	0.10	0.26	0.91	0.001	78.31
	2015	2.46	0.10	0.26	0.94	0.001	78.31
	2016	2.34	0.09	0.26	0.98	0.001	78.31
	2017	2.27	0.09	0.25	0.99	0.001	78.31
400	2013	4.31	0.18	0.42	1.40	0.001	125.29
	2014	4.13	0.17	0.42	1.45	0.001	125.29
	2015	3.94	0.16	0.41	1.51	0.001	125.29
	2016	3.75	0.15	0.41	1.57	0.001	125.29
	2017	3.63	0.14	0.41	1.58	0.001	125.29
450	2013	4.85	0.20	0.48	1.57	0.001	140.95
	2014	4.64	0.19	0.47	1.63	0.001	140.95
	2015	4.43	0.18	0.47	1.70	0.001	140.95
	2016	4.22	0.16	0.46	1.76	0.001	140.95
	2017	4.08	0.16	0.46	1.77	0.001	140.95
500	2013	5.39	0.22	0.53	1.75	0.002	156.61
	2014	5.16	0.21	0.52	1.82	0.002	156.61
	2015	4.93	0.20	0.52	1.89	0.002	156.61
	2016	4.69	0.18	0.51	1.96	0.002	156.61
	2017	4.54	0.18	0.51	1.97	0.002	156.61

15 ppm sulfur diesel
0.000015

64.066 Mol Wt. SO2
32.065 Mol Wt. S

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (C&G Clear Vegetation)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	4.5	22.7	194.3	71.2	4.2	67.0	16.6	2.7	13.9	38,067.8
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	4.5	22.7	194.3	71.2	4.2	67.0	16.6	2.7	13.9	38,067.8
Total (tons/construction project)	0.0	0.0	0.3	0.1	0.0	0.1	0.0	0.0	0.0	62.8

Notes:

Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	3910

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (C&G Clear Vegetation)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	2.0	10.3	88.3	32.4	1.9	30.5	7.6	1.2	6.3	17,303.6
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	2.0	10.3	88.3	32.4	1.9	30.5	7.6	1.2	6.3	17,303.6
Total (megagrams/construction project)	0.0	0.0	0.3	0.1	0.0	0.1	0.0	0.0	0.0	57.0

Notes:

Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	2989

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (C&G Clear Vegetation)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	0.2	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported		yd^3/day
Soil Exported	3910.0	yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.02
Grading/Excavation	0.15	0.09
Drainage/Utilities/Sub-Grade	0.00	0.06
Paving	0.00	0.03
Totals	0.15	0.20

Please note: You have entered a different number of months than the project length shown in cell C13.

Hauling emission default values can be overridden in cells C45 through C46.								
Soil Hauling Emissions	User Override of							
User Input	Soil Hauling Defaults	Default Values						
Miles/round trip	50.00	30						
Round trips/day		196						
Vehicle miles traveled/day (calculated)			9775					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	3.4	177.7	15.1	3.6	2.1	36168.7		
Tons per contruction period	0.01	0.29	0.02	0.01	0.00	59.68		
Worker commute default values can be overridden in cells C60 through C65.								
Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust		2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02	
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.96	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.1	13.9	0.0
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

Grubbing/Land Clearing	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Crawler Tractors	0.92	5.59	11.90	0.46	0.42	1031.11
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Skid Steer Loaders	0.15	1.77	1.86	0.10	0.10	275.98
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	1.1	7.4	13.8	0.6	0.5	1307.1
	Grading	tons per phase	0.0	0.0	0.0	0.0	0.0	2.2

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.0	0.0	0.0	0.0	2.2

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.								
		Default Values		Default Values				
Equipment		Horsepower		Hours/day				
Aerial Lifts		63		8				
Air Compressors		106		8				
Bore/Drill Rigs		206		8				
Cement and Mortar Mixers		10		8				
Concrete/Industrial Saws		64		8				
Cranes		226		8				
Crawler Tractors		208	10.00	8				
Crushing/Proc. Equipment		142		8				
Excavators		163		8				
Forklifts		89		8				
Generator Sets		66		8				
Graders		175		8				
Off-Highway Tractors		123		8				
Off-Highway Trucks		400		8				
Other Construction Equipment		172		8				
Other General Industrial Equipment		88		8				
Other Material Handling Equipment		167		8				
Pavers		126		8				
Paving Equipment		131		8				
Plate Compactors		8		8				
Pressure Washers		26		8				
Pumps		53		8				
Rollers		81		8				
Rough Terrain Forklifts		100		8				
Rubber Tired Dozers		255		8				
Rubber Tired Loaders		200		8				
Scrapers		362		8				
Signal Boards		20		8				
Skid Steer Loaders		65	10.00	8				
Surfacing Equipment		254		8				
Sweepers/Scrubbers		64		8				
Tractors/Loaders/Backhoes		98		8				
Trenchers		81		8				
Welders		45		8				
20								
END OF DATA ENTRY SHEET								

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (C&G Strip to Spoils)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	13.7	66.8	272.4	75.4	8.4	67.0	20.7	6.8	13.9	40,202.0
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	13.7	66.8	272.4	75.4	8.4	67.0	20.7	6.8	13.9	40,202.0
Total (tons/construction project)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	22.1

Notes:	
Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	3040

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (C&G Strip to Spoils)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Oust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	6.2	30.4	123.8	34.3	3.8	30.5	9.4	3.1	6.3	18,273.6
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	6.2	30.4	123.8	34.3	3.8	30.5	9.4	3.1	6.3	18,273.6
Total (megagrams/construction project)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	20.1

Notes:	
Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported (meters^3/day)->	2324

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (C&G Strip to Spoils)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	0.1	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported		yd^3/day
Soil Exported	3040.0	yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.01
Grading/Excavation	0.05	0.05
Drainage/Utilities/Sub-Grade	0.00	0.03
Paving	0.00	0.02
Totals	0.05	0.10

Please note: You have entered a different number of months than the project length shown in cell C13.

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of							
User Input	Soil Hauling Defaults	Default Values						
Miles/round trip	50.00	30						
Round trips/day		152						
Vehicle miles traveled/day (calculated)			7600					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	2.6	138.1	11.7	2.8	1.7	28120.9		
Tons per contruction period	0.00	0.08	0.01	0.00	0.00	15.47		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day		
Grubbing/Land Clearing - Exhaust	0.00	2		80		
Grading/Excavation - Exhaust		2		80		
Drainage/Utilities/Subgrade	0.00	1		40		
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.33
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.0	13.9	0.0
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

	Default							
Grubbing/Land Clearing	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Crawler Tractors	1.85	11.17	23.79	0.92	0.84	2062.23
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
1.00	2	Graders	1.33	4.35	12.98	0.73	0.67	838.78
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.58	3.01	6.12	0.32	0.30	547.89
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
4.00	1	Scrapers	7.28	36.27	88.48	3.57	3.28	8040.11
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	11.0	54.8	131.4	5.5	5.1	11489.0
	Grading	tons per phase	0.0	0.0	0.1	0.0	0.0	6.3

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.0	0.1	0.0	0.0	6.3

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment		Default Values Horsepower		Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		106		8
Bore/Drill Rigs		206		8
Cement and Mortar Mixers		10		8
Concrete/Industrial Saws		64		8
Cranes		226		8
Crawler Tractors		208	10.00	8
Crushing/Proc. Equipment		142		8
Excavators		163		8
Forklifts		89		8
Generator Sets		66		8
Graders		175	10.00	8
Off-Highway Tractors		123		8
Off-Highway Trucks		400		8
Other Construction Equipment		172	10.00	8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		167		8
Pavers		126		8
Paving Equipment		131		8
Plate Compactors		8		8
Pressure Washers		26		8
Pumps		53		8
Rollers		81		8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		255		8
Rubber Tired Loaders		200		8
Scrapers		362	10.00	8
Signal Boards		20		8
Skid Steer Loaders		65		8
Surfacing Equipment		254		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		98		8
Trenchers		81		8
Welders		45		8

40

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (C&G Strip to Stockpile)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	10.5	51.7	129.2	72.4	5.4	67.0	18.8	4.9	13.9	12,179.0
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	10.5	51.7	129.2	72.4	5.4	67.0	18.8	4.9	13.9	12,179.0
Total (tons/construction project)	0.0	0.1	0.2	0.1	0.0	0.1	0.0	0.0	0.0	20.1

Notes:	
Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	2520

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (C&G Strip to Stockpile)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	4.8	23.5	58.7	32.9	2.4	30.5	8.6	2.2	6.3	5,535.9
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	4.8	23.5	58.7	32.9	2.4	30.5	8.6	2.2	6.3	5,535.9
Total (megagrams/construction project)	0.0	0.1	0.2	0.1	0.0	0.1	0.0	0.0	0.0	18.2

Notes:	
Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	1927

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (C&G Strip to Stockpile)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	0.2	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported		yd^3/day
Soil Exported	2520.0	yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.02
Grading/Excavation	0.15	0.09
Drainage/Utilities/Sub-Grade	0.00	0.06
Paving	0.00	0.03
Totals	0.15	0.20

Please note: You have entered a different number of months than the project length shown in cell C13.

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of							
User Input	Soil Hauling Defaults	Default Values						
Miles/round trip	2.00	30						
Round trips/day		126						
Vehicle miles traveled/day (calculated)			252					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	0.1	4.6	0.4	0.1	0.1	932.4		
Tons per contruction period	0.00	0.01	0.00	0.00	0.00	1.54		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust		2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02	
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.96	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.1	13.9	0.0
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

Grubbing/Land Clearing	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Crawler Tractors	1.66	10.06	21.41	0.83	0.76	1856.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
1.00	2	Graders	1.20	3.92	11.68	0.66	0.60	754.90
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.52	2.71	5.51	0.29	0.27	493.10
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Rollers	0.39	1.70	3.48	0.26	0.24	314.47
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
4.00	1	Scrapers	6.55	32.65	79.63	3.21	2.95	7236.10
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	10.3	51.0	121.7	5.2	4.8	10654.6
	Grading	tons per phase	0.0	0.1	0.2	0.0	0.0	17.6

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.1	0.2	0.0	0.0	17.6

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment	Default Values Horsepower		Default Values Hours/day
Aerial Lifts	63		8
Air Compressors	106		8
Bore/Drill Rigs	206		8
Cement and Mortar Mixers	10		8
Concrete/Industrial Saws	64		8
Cranes	226		8
Crawler Tractors	208	9.00	8
Crushing/Proc. Equipment	142		8
Excavators	163		8
Forklifts	89		8
Generator Sets	66		8
Graders	175	9.00	8
Off-Highway Tractors	123		8
Off-Highway Trucks	400		8
Other Construction Equipment	172	9.00	8
Other General Industrial Equipment	88		8
Other Material Handling Equipment	167		8
Pavers	126		8
Paving Equipment	131		8
Plate Compactors	8		8
Pressure Washers	26		8
Pumps	53		8
Rollers	81	9.00	8
Rough Terrain Forklifts	100		8
Rubber Tired Dozers	255		8
Rubber Tired Loaders	200		8
Scrapers	362	9.00	8
Signal Boards	20		8
Skid Steer Loaders	65		8
Surfacing Equipment	254		8
Sweepers/Scrubbers	64		8
Tractors/Loaders/Backhoes	98		8
Trenchers	81		8
Welders	45		8

45

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (C&G Tree Removal)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	PM2.5 (lbs/day)	PM2.5 (lbs/day)	PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	1.4	9.0	33.4	1.0	1.0	-	0.8	0.8	-	5,303.2
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	1.4	9.0	33.4	1.0	1.0	-	0.8	0.8	-	5,303.2
Total (tons/construction project)	0.0	0.0	0.2	0.0	0.0	-	0.0	0.0	-	29.2

Notes:

Project Start Year ->	2016
Project Length (months) ->	1
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	1505

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (C&G Tree Removal)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	PM10 (kgs/day)	PM10 (kgs/day)	PM10 (kgs/day)	PM2.5 (kgs/day)	PM2.5 (kgs/day)	PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	0.7	4.1	15.2	0.4	0.4	-	0.3	0.3	-	2,410.6
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	0.7	4.1	15.2	0.4	0.4	-	0.3	0.3	-	2,410.6
Total (megagrams/construction project)	0.0	0.0	0.2	0.0	0.0	-	0.0	0.0	-	26.5

Notes:

Project Start Year ->	2016
Project Length (months) ->	1
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	1151

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model

Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (C&G Tree Removal)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction
		2 Road Widening
		3 Bridge/Overpass Construction
Project Construction Time	0.5	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel
		2. Weathered Rock-Earth
		3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported		yd^3/day
Soil Exported	1505.0	yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.05
Grading/Excavation	0.50	0.23
Drainage/Utilities/Sub-Grade	0.00	0.15
Paving	0.00	0.08
Totals	0.50	0.50

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values						
User Input								
Miles/round trip	40.00	30						
Round trips/day	25.00	75						
Vehicle miles traveled/day (calculated)			1000					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	0.3	18.2	1.5	0.4	0.2	3700.1		
Tons per contruction period	0.00	0.10	0.01	0.00	0.00	20.35		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust	1.00	2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.03	1.45	0.12	0.03	0.02	296.01	
Tons per const. Period - Grading/Excavation	0.00	0.01	0.00	0.00	0.00	1.63	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation	0.00	6.7	0.0	0.0	0.0	0.0
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

	Default							
Grubbing/Land Clearing	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Crawler Tractors	0.92	5.59	11.90	0.46	0.42	1031.11
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Skid Steer Loaders	0.15	1.77	1.86	0.10	0.10	275.98
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	1.1	7.4	13.8	0.6	0.5	1307.1
	Grading	tons per phase	0.0	0.0	0.1	0.0	0.0	7.2

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.0	0.1	0.0	0.0	7.2

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment		Default Values Horsepower		Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		106		8
Bore/Drill Rigs		206		8
Cement and Mortar Mixers		10		8
Concrete/Industrial Saws		64		8
Cranes		226		8
Crawler Tractors		208	10.00	8
Crushing/Proc. Equipment		142		8
Excavators		163		8
Forklifts		89		8
Generator Sets		66		8
Graders		175		8
Off-Highway Tractors		123		8
Off-Highway Trucks		400		8
Other Construction Equipment		172		8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		167		8
Pavers		126		8
Paving Equipment		131		8
Plate Compactors		8		8
Pressure Washers		26		8
Pumps		53		8
Rollers		81		8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		255		8
Rubber Tired Loaders		200		8
Scrapers		362		8
Signal Boards		20		8
Skid Steer Loaders		65	10.00	8
Surfacing Equipment		254		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		98		8
Trenchers		81		8
Welders		45		8

20

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Cutoff Wall DSM)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	PM2.5 (lbs/day)	PM2.5 (lbs/day)	PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	16.9	100.5	155.6	75.4	8.4	67.0	21.6	7.7	13.9	18,598.4
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	16.9	100.5	155.6	75.4	8.4	67.0	21.6	7.7	13.9	18,598.4
Total (tons/construction project)	0.9	5.5	8.6	2.1	0.5	1.7	0.8	0.4	0.3	1,022.9

Notes:

Project Start Year ->	2016
Project Length (months) ->	5
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Cutoff Wall DSM)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	PM10 (kgs/day)	PM10 (kgs/day)	PM10 (kgs/day)	PM2.5 (kgs/day)	PM2.5 (kgs/day)	PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	7.7	45.7	70.7	34.3	3.8	30.5	9.8	3.5	6.3	8,453.8
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	7.7	45.7	70.7	34.3	3.8	30.5	9.8	3.5	6.3	8,453.8
Total (megagrams/construction project)	0.8	5.0	7.8	1.9	0.4	1.5	0.7	0.4	0.3	927.8

Notes:

Project Start Year ->	2016
Project Length (months) ->	5
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E Cutoff Wall DSM)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	5.0	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported		yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.50
Grading/Excavation	5.00	2.25
Drainage/Utilities/Sub-Grade	0.00	1.50
Paving	0.00	0.75
Totals	5.00	5.00

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values
User Input		
Miles/round trip		30
Round trips/day		0
Vehicle miles traveled/day (calculated)		0

Hauling Emissions	ROG	NOx	CO	PM10	PM2.5	CO2
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
Tons per contruction period	0.00	0.00	0.00	0.00	0.00	0.00

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values
Miles/ one-way trip		20
One-way trips/day		2
No. of employees: Grubbing/Land Clearing	0.00	10
No. of employees: Grading/Excavation		15
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11
No. of employees: Paving	0.00	13

	ROG	NOx	CO	PM10	PM2.5	CO2
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust		2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02	
Tons per const. Period - Grading/Excavation	0.00	0.16	0.01	0.00	0.00	32.56	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	1.7	13.9	0.3
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

Grubbing/Land Clearing	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
2.00		Aerial Lifts	0.15	2.16	2.32	0.10	0.09	446.54
2.00		Air Compressors	1.71	8.55	10.96	0.92	0.84	1269.86
2.00		Bore/Drill Rigs	0.92	9.50	13.22	0.39	0.36	2364.04
4.00		Cement and Mortar Mixers	0.34	1.77	2.11	0.09	0.08	289.41
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Crawler Tractors	1.85	11.17	23.79	0.92	0.84	2062.23
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
2.00	3	Excavators	1.02	6.97	11.17	0.55	0.51	1432.16
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
4.00		Generator Sets	2.57	14.92	19.32	1.37	1.26	2435.33
0.00	2	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
2.00	1	Other Construction Equipment	1.72	8.99	18.27	0.96	0.88	1635.48
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
6.00		Pumps	3.28	18.49	23.94	1.75	1.61	2971.06
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Rough Terrain Forklifts	0.56	5.07	6.83	0.38	0.35	931.86
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
	2	Rubber Tired Loaders	1.31	7.79	16.28	0.56	0.51	1656.55
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Welders	1.42	4.93	4.51	0.36	0.33	511.86
	Grading/Excavation	pounds per day	16.8	100.3	152.7	8.3	7.7	18006.4
	Grading	tons per phase	0.9	5.5	8.4	0.5	0.4	990.3

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.9	5.5	8.4	0.5	0.4	990.3

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment		Default Values Horsepower		Default Values Hours/day
Aerial Lifts		63	10.00	8
Air Compressors		106	10.00	8
Bore/Drill Rigs		206	10.00	8
Cement and Mortar Mixers		10	10.00	8
Concrete/Industrial Saws		64		8
Cranes		226		8
Crawler Tractors		208	10.00	8
Crushing/Proc. Equipment		142		8
Excavators		163	10.00	8
Forklifts		89		8
Generator Sets		66	10.00	8
Graders		175		8
Off-Highway Tractors		123		8
Off-Highway Trucks		400		8
Other Construction Equipment		172	10.00	8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		167		8
Pavers		126		8
Paving Equipment		131		8
Plate Compactors		8		8
Pressure Washers		26		8
Pumps		53	10.00	8
Rollers		81		8
Rough Terrain Forklifts		100	10.00	8
Rubber Tired Dozers		255		8
Rubber Tired Loaders		200	10.00	8
Scrapers		362		8
Signal Boards		20		8
Skid Steer Loaders		65		8
Surfacing Equipment		254		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		98		8
Trenchers		81		8
Welders		45	10.00	8

120

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Cutoff Wall SCB)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	4.8	30.0	50.1	69.6	2.6	67.0	16.3	2.4	13.9	6,181.5
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	4.8	30.0	50.1	69.6	2.6	67.0	16.3	2.4	13.9	6,181.5
Total (tons/construction project)	0.1	0.5	0.8	0.5	0.0	0.5	0.1	0.0	0.1	102.0

Notes:

Project Start Year ->	2016
Project Length (months) ->	2
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Cutoff Wall SCB)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	2.2	13.7	22.8	31.6	1.2	30.5	7.4	1.1	6.3	2,809.8
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	2.2	13.7	22.8	31.6	1.2	30.5	7.4	1.1	6.3	2,809.8
Total (megagrams/construction project)	0.1	0.4	0.8	0.5	0.0	0.5	0.1	0.0	0.1	92.5

Notes:

Project Start Year ->	2016
Project Length (months) ->	2
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E Cutoff Wall SCB)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	1.5	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported		yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.15
Grading/Excavation	1.50	0.68
Drainage/Utilities/Sub-Grade	0.00	0.45
Paving	0.00	0.23
Totals	1.50	1.50

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values						
User Input								
Miles/round trip		30						
Round trips/day		0						
Vehicle miles traveled/day (calculated)			0					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	0.0	0.0	0.0	0.0	0.0	0.0		
Tons per contruction period	0.00	0.00	0.00	0.00	0.00	0.00		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day		
Grubbing/Land Clearing - Exhaust		2		80		
Grading/Excavation - Exhaust		2		80		
Drainage/Utilities/Subgrade		1		40		
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02
Tons per const. Period - Grading/Excavation	0.00	0.05	0.00	0.00	0.00	9.77
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.5	13.9	0.1
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

	Default							
Grubbing/Land Clearing	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
	3	Excavators	1.54	10.46	16.75	0.82	0.76	2148.24
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Generator Sets	0.64	3.73	4.83	0.34	0.32	608.83
0.00	2	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.58	3.01	6.12	0.32	0.30	547.89
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Pumps	1.09	6.16	7.98	0.58	0.54	990.35
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Rough Terrain Forklifts	0.28	2.53	3.42	0.19	0.17	465.93
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
1.00	2	Rubber Tired Loaders	0.66	3.89	8.14	0.28	0.26	828.28
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	4.8	29.8	47.2	2.5	2.3	5589.5
	Grading	tons per phase	0.1	0.5	0.8	0.0	0.0	92.2

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.1	0.5	0.8	0.0	0.0	92.2

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment	Default Values Horsepower		Default Values Hours/day
Aerial Lifts	63		8
Air Compressors	106		8
Bore/Drill Rigs	206		8
Cement and Mortar Mixers	10		8
Concrete/Industrial Saws	64		8
Cranes	226		8
Crawler Tractors	208		8
Crushing/Proc. Equipment	142		8
Excavators	163	10.00	8
Forklifts	89		8
Generator Sets	66	10.00	8
Graders	175		8
Off-Highway Tractors	123		8
Off-Highway Trucks	400		8
Other Construction Equipment	172	10.00	8
Other General Industrial Equipment	88		8
Other Material Handling Equipment	167		8
Pavers	126		8
Paving Equipment	131		8
Plate Compactors	8		8
Pressure Washers	26		8
Pumps	53	10.00	8
Rollers	81		8
Rough Terrain Forklifts	100	10.00	8
Rubber Tired Dozers	255		8
Rubber Tired Loaders	200	10.00	8
Scrapers	362		8
Signal Boards	20		8
Skid Steer Loaders	65		8
Surfacing Equipment	254		8
Sweepers/Scrubbers	64		8
Tractors/Loaders/Backhoes	98		8
Trenchers	81		8
Welders	45		8

60

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Fill from Stockpile)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	4.5	24.0	56.3	69.4	2.4	67.0	16.1	2.2	13.9	6,281.3
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	4.5	24.0	56.3	69.4	2.4	67.0	16.1	2.2	13.9	6,281.3
Total (tons/construction project)	0.1	0.4	0.9	0.5	0.0	0.5	0.1	0.0	0.1	96.7

Notes:	
Project Start Year ->	2016
Project Length (months) ->	1
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	3030

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Fill from Stockpile)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	2.0	10.9	25.6	31.6	1.1	30.5	7.3	1.0	6.3	2,855.1
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	2.0	10.9	25.6	31.6	1.1	30.5	7.3	1.0	6.3	2,855.1
Total (megagrams/construction project)	0.1	0.3	0.8	0.5	0.0	0.4	0.1	0.0	0.1	87.7

Notes:	
Project Start Year ->	2016
Project Length (months) ->	1
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	2317

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E Fill from Stockpile)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	1.4	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported		yd^3/day
Soil Exported	3030.0	yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.14
Grading/Excavation	1.40	0.63
Drainage/Utilities/Sub-Grade	0.00	0.42
Paving	0.00	0.21
Totals	1.40	1.40

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of							
User Input	Soil Hauling Defaults	Default Values						
Miles/round trip	2.00	30						
Round trips/day		152						
Vehicle miles traveled/day (calculated)			303					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	0.1	5.5	0.5	0.1	0.1	1121.1		
Tons per contruction period	0.00	0.08	0.01	0.00	0.00	17.27		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust		2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02	
Tons per const. Period - Grading/Excavation	0.00	0.04	0.00	0.00	0.00	9.12	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.5	13.9	0.1
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

Grubbing/Land Clearing	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Crawler Tractors	0.92	5.59	11.90	0.46	0.42	1031.11
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
1.00	2	Graders	1.33	4.35	12.98	0.73	0.67	838.78
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.58	3.01	6.12	0.32	0.30	547.89
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Rollers	0.44	1.89	3.86	0.28	0.26	349.42
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Tractors/Loaders/Backhoes	1.02	8.43	13.06	0.45	0.42	1800.91
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	4.3	23.3	47.9	2.2	2.1	4568.1
	Grading	tons per phase	0.1	0.4	0.7	0.0	0.0	70.3

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.1	0.4	0.7	0.0	0.0	70.3

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.									
		Default Values		Default Values					
Equipment		Horsepower		Hours/day					
Aerial Lifts		63		8					
Air Compressors		106		8					
Bore/Drill Rigs		206		8					
Cement and Mortar Mixers		10		8					
Concrete/Industrial Saws		64		8					
Cranes		226		8					
Crawler Tractors		208	10.00	8					
Crushing/Proc. Equipment		142		8					
Excavators		163		8					
Forklifts		89		8					
Generator Sets		66		8					
Graders		175	10.00	8					
Off-Highway Tractors		123		8					
Off-Highway Trucks		400		8					
Other Construction Equipment		172	10.00	8					
Other General Industrial Equipment		88		8					
Other Material Handling Equipment		167		8					
Pavers		126		8					
Paving Equipment		131		8					
Plate Compactors		8		8					
Pressure Washers		26		8					
Pumps		53		8					
Rollers		81	10.00	8					
Rough Terrain Forklifts		100		8					
Rubber Tired Dozers		255		8					
Rubber Tired Loaders		200		8					
Scrapers		362		8					
Signal Boards		20		8					
Skid Steer Loaders		65		8					
Surfacing Equipment		254		8					
Sweepers/Scrubbers		64		8					
Tractors/Loaders/Backhoes	425.00	98	10.00	8					
Trenchers		81		8					
Welders		45		8					
475									
END OF DATA ENTRY SHEET									

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Import Cohesive Fill)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	8.5	41.5	196.0	72.8	5.8	67.0	18.4	4.5	13.9	32,565.1
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	8.5	41.5	196.0	72.8	5.8	67.0	18.4	4.5	13.9	32,565.1
Total (tons/construction project)	0.0	0.1	0.5	0.1	0.0	0.1	0.0	0.0	0.0	89.6

Notes:

Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (acres) ->	26
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	2810

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Import Cohesive Fill)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	3.9	18.9	89.1	33.1	2.7	30.5	8.4	2.0	6.3	14,802.3
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	3.9	18.9	89.1	33.1	2.7	30.5	8.4	2.0	6.3	14,802.3
Total (megagrams/construction project)	0.0	0.1	0.5	0.1	0.0	0.1	0.0	0.0	0.0	81.2

Notes:

Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported (meters^3/day)->	2148

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E Import Cohesive Fill)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	0.3	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	26.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported	2810.0	yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.03
Grading/Excavation	0.25	0.11
Drainage/Utilities/Sub-Grade	0.00	0.08
Paving	0.00	0.04
Totals	0.25	0.25

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of							
User Input	Soil Hauling Defaults	Default Values						
Miles/round trip	50.00	30						
Round trips/day		141						
Vehicle miles traveled/day (calculated)			7025					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	2.4	127.7	10.8	2.6	1.5	25993.4		
Tons per contruction period	0.01	0.35	0.03	0.01	0.00	71.48		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day		
Grubbing/Land Clearing - Exhaust	0.00	2		80		
Grading/Excavation - Exhaust		2		80		
Drainage/Utilities/Subgrade	0.00	1		40		
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02
Tons per const. Period - Grading/Excavation	0.00	0.01	0.00	0.00	0.00	1.63
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.1	13.9	0.0
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

	Default							
Grubbing/Land Clearing	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Crawler Tractors	0.92	5.59	11.90	0.46	0.42	1031.11
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
1.00	3	Excavators	0.41	2.79	4.47	0.22	0.20	572.86
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
	2	Graders	2.67	8.70	25.95	1.46	1.34	1677.56
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.58	3.01	6.12	0.32	0.30	547.89
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Rollers	0.44	1.89	3.86	0.28	0.26	349.42
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Tractors/Loaders/Backhoes	1.02	8.43	13.06	0.45	0.42	1800.91
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	6.0	30.4	65.4	3.2	2.9	5979.8
	Grading	tons per phase	0.0	0.1	0.2	0.0	0.0	16.4

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.1	0.2	0.0	0.0	16.4

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

		Default Values		Default Values
Equipment		Horsepower		Hours/day
Aerial Lifts		63		8
Air Compressors		106		8
Bore/Drill Rigs		206		8
Cement and Mortar Mixers		10		8
Concrete/Industrial Saws		64		8
Cranes		226		8
Crawler Tractors		208	10.00	8
Crushing/Proc. Equipment		142		8
Excavators		163		8
Forklifts		89		8
Generator Sets		66		8
Graders		175	10.00	8
Off-Highway Tractors		123		8
Off-Highway Trucks		400		8
Other Construction Equipment		172	10.00	8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		167		8
Pavers		126		8
Paving Equipment		131		8
Plate Compactors		8		8
Pressure Washers		26		8
Pumps		53		8
Rollers		81	10.00	8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		255		8
Rubber Tired Loaders		200		8
Scrapers		362		8
Signal Boards		20		8
Skid Steer Loaders		65		8
Surfacing Equipment		254		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes	425.00	98	10.00	8
Trenchers		81		8
Welders		45		8

475

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Import Random Fill)				Total	Exhaust	Fugitive Oust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	6.7	34.2	176.2	71.8	4.8	67.0	17.5	3.6	13.9	30,691.0
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	6.7	34.2	176.2	71.8	4.8	67.0	17.5	3.6	13.9	30,691.0
Total (tons/construction project)	0.0	0.1	0.6	0.1	0.0	0.1	0.0	0.0	0.0	101.3

Notes:

Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	2760

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Import Random Fill)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	3.1	15.5	80.1	32.7	2.2	30.5	8.0	1.6	6.3	13,950.4
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	3.1	15.5	80.1	32.7	2.2	30.5	8.0	1.6	6.3	13,950.4
Total (megagrams/construction project)	0.0	0.1	0.5	0.1	0.0	0.1	0.0	0.0	0.0	91.9

Notes:

Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	2110

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E Import Random Fill)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	0.3	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported	2760.0	yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.03
Grading/Excavation	0.30	0.11
Drainage/Utilities/Sub-Grade	0.00	0.08
Paving	0.00	0.04
Totals	0.30	0.25

Please note: You have entered a different number of months than the project length shown in cell C13.

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of							
User Input	Soil Hauling Defaults	Default Values						
Miles/round trip	50.00	30						
Round trips/day		138						
Vehicle miles traveled/day (calculated)			6900					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	2.4	125.4	10.7	2.5	1.5	25530.9		
Tons per contruction period	0.01	0.41	0.04	0.01	0.00	84.25		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust		2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02	
Tons per const. Period - Grading/Excavation	0.00	0.01	0.00	0.00	0.00	1.95	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.1	13.9	0.0
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

Grubbing/Land Clearing	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Crawler Tractors	0.92	5.59	11.90	0.46	0.42	1031.11
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
1.00	2	Graders	1.33	4.35	12.98	0.73	0.67	838.78
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.58	3.01	6.12	0.32	0.30	547.89
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Rollers	0.44	1.89	3.86	0.28	0.26	349.42
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Tractors/Loaders/Backhoes	1.02	8.43	13.06	0.45	0.42	1800.91
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	4.3	23.3	47.9	2.2	2.1	4568.1
	Grading	tons per phase	0.0	0.1	0.2	0.0	0.0	15.1

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.1	0.2	0.0	0.0	15.1

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.									
		Default Values		Default Values					
Equipment		Horsepower		Hours/day					
Aerial Lifts		63		8					
Air Compressors		106		8					
Bore/Drill Rigs		206		8					
Cement and Mortar Mixers		10		8					
Concrete/Industrial Saws		64		8					
Cranes		226		8					
Crawler Tractors		208	10.00	8					
Crushing/Proc. Equipment		142		8					
Excavators		163		8					
Forklifts		89		8					
Generator Sets		66		8					
Graders		175	10.00	8					
Off-Highway Tractors		123		8					
Off-Highway Trucks		400		8					
Other Construction Equipment		172	10.00	8					
Other General Industrial Equipment		88		8					
Other Material Handling Equipment		167		8					
Pavers		126		8					
Paving Equipment		131		8					
Plate Compactors		8		8					
Pressure Washers		26		8					
Pumps		53		8					
Rollers		81	10.00	8					
Rough Terrain Forklifts		100		8					
Rubber Tired Dozers		255		8					
Rubber Tired Loaders		200		8					
Scrapers		362		8					
Signal Boards		20		8					
Skid Steer Loaders		65		8					
Surfacing Equipment		254		8					
Sweepers/Scrubbers		64		8					
Tractors/Loaders/Backhoes	425.00	98	10.00	8					
Trenchers		81		8					
Welders		45		8					
475									
END OF DATA ENTRY SHEET									

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Import Rip Rap - Barge+)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	1.2	9.3	17.5	67.6	0.6	67.0	14.5	0.5	13.9	2,377.0
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	1.2	9.3	17.5	67.6	0.6	67.0	14.5	0.5	13.9	2,377.0
Total (tons/construction project)	0.0	0.4	0.7	1.2	0.0	1.2	0.3	0.0	0.2	94.1

Notes:
Project Start Year -> 2016
Project Length (months) -> 4
Total Project Area (acres) -> 28
Maximum Area Disturbed/Day (acres) -> 7
Total Soil Imported/Exported (yd^3/day)-> 0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Import Rip Rap - Barge+)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	0.5	4.2	8.0	30.7	0.3	30.5	6.6	0.2	6.3	1,080.5
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	0.5	4.2	8.0	30.7	0.3	30.5	6.6	0.2	6.3	1,080.5
Total (megagrams/construction project)	0.0	0.3	0.6	1.1	0.0	1.1	0.2	0.0	0.2	85.4

Notes:
Project Start Year -> 2016
Project Length (months) -> 4
Total Project Area (hectares) -> 11
Maximum Area Disturbed/Day (hectares) -> 3
Total Soil Imported/Exported ($meters^3$/day)-> 0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E Import Rip Rap - Barge+)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction
		2 Road Widening
		3 Bridge/Overpass Construction
Project Construction Time	3.6	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel
		2. Weathered Rock-Earth
		3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported	0.0	yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.36
Grading/Excavation	3.60	1.62
Drainage/Utilities/Sub-Grade	0.00	1.08
Paving	0.00	0.54
Totals	3.60	3.60

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values						
User Input								
Miles/round trip		30						
Round trips/day		0						
Vehicle miles traveled/day (calculated)			0					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	0.0	0.0	0.0	0.0	0.0	0.0		
Tons per contruction period	0.00	0.00	0.00	0.00	0.00	0.00		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day		
Grubbing/Land Clearing - Exhaust	0.00	2		80		
Grading/Excavation - Exhaust		2		80		
Drainage/Utilities/Subgrade	0.00	1		40		
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02
Tons per const. Period - Grading/Excavation	0.00	0.12	0.01	0.00	0.00	23.44
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	1.2	13.9	0.2
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

	Default							
Grubbing/Land Clearing	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
1.00	0	Cranes	0.97	8.27	13.69	0.48	0.45	1655.80
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
3.00		Plate Compactors	0.15	0.79	0.94	0.04	0.03	129.18
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	1.1	9.1	14.6	0.5	0.5	1785.0
	Grading	tons per phase	0.0	0.4	0.6	0.0	0.0	70.7

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.4	0.6	0.0	0.0	70.7

Equipment default values for horsepower and hours/day can be overridden in cells C269 through C322 and E269 through E322.

		Default Values		Default Values
Equipment		Horsepower		Hours/day
Aerial Lifts		63		8
Air Compressors		106		8
Bore/Drill Rigs		206		8
Cement and Mortar Mixers		10		8
Concrete/Industrial Saws		64		8
Cranes	500.00	226	10.00	8
Crawler Tractors		208		8
Crushing/Proc. Equipment		142		8
Excavators		163		8
Forklifts		89		8
Generator Sets		66		8
Graders		175		8
Off-Highway Tractors		123		8
Off-Highway Trucks		400		8
Other Construction Equipment		172		8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		167		8
Pavers		126		8
Paving Equipment		131		8
Plate Compactors		8	10.00	8
Pressure Washers		26		8
Pumps		53		8
Rollers		81		8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		255		8
Rubber Tired Loaders		200		8
Scrapers		362		8
Signal Boards		20		8
Skid Steer Loaders		65		8
Surfacing Equipment		254		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		98	10.00	8
Trenchers		81		8
Welders		45		8

530

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Import Rip Rap - Truck)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	4.9	25.9	160.9	71.0	4.0	67.0	16.8	2.8	13.9	30,116.1
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	4.9	25.9	160.9	71.0	4.0	67.0	16.8	2.8	13.9	30,116.1
Total (tons/construction project)	0.2	1.0	6.4	1.4	0.2	1.2	0.4	0.1	0.2	1,192.6

Notes:
- Project Start Year -> 2016
- Project Length (months) -> 4
- Total Project Area (acres) -> 28
- Maximum Area Disturbed/Day (acres) -> 7
- Total Soil Imported/Exported (yd^3/day)-> 3200

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Import Rip Rap - Truck)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	2.2	11.8	73.1	32.3	1.8	30.5	7.6	1.3	6.3	13,689.1
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	2.2	11.8	73.1	32.3	1.8	30.5	7.6	1.3	6.3	13,689.1
Total (megagrams/construction project)	0.2	0.9	5.8	1.2	0.1	1.1	0.3	0.1	0.2	1,081.7

Notes:
- Project Start Year -> 2016
- Project Length (months) -> 4
- Total Project Area (hectares) -> 11
- Maximum Area Disturbed/Day (hectares) -> 3
- Total Soil Imported/Exported ($meters^3$/day)-> 2446

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E Import Rip Rap - Truck)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	3.6	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported	3200.0	yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	40.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.36
Grading/Excavation	3.60	1.62
Drainage/Utilities/Sub-Grade	0.00	1.08
Paving	0.00	0.54
Totals	3.60	3.60

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of							
User Input	Soil Hauling Defaults	Default Values						
Miles/round trip	90.00	30						
Round trips/day		80						
Vehicle miles traveled/day (calculated)			7200					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	2.5	130.9	11.1	2.6	1.6	26640.9		
Tons per contruction period	0.10	5.18	0.44	0.10	0.06	1054.98		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust		2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02	
Tons per const. Period - Grading/Excavation	0.00	0.12	0.01	0.00	0.00	23.44	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	1.2	13.9	0.2
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

Grubbing/Land Clearing	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Crawler Tractors	0.92	5.59	11.90	0.46	0.42	1031.11
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
2.00	3	Excavators	1.02	6.97	11.17	0.55	0.51	1432.16
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Tractors/Loaders/Backhoes	0.45	1.97	4.09	0.31	0.29	419.90
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	2.4	14.5	27.2	1.3	1.2	2883.2
	Grading	tons per phase	0.1	0.6	1.1	0.1	0.0	114.2

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.1	0.6	1.1	0.1	0.0	114.2

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment		Default Values Horsepower		Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		106		8
Bore/Drill Rigs		206		8
Cement and Mortar Mixers		10		8
Concrete/Industrial Saws		64		8
Cranes		226		8
Crawler Tractors		208	10.00	8
Crushing/Proc. Equipment		142		8
Excavators		163	10.00	8
Forklifts		89		8
Generator Sets		66		8
Graders		175		8
Off-Highway Tractors		123		8
Off-Highway Trucks		400		8
Other Construction Equipment		172		8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		167		8
Pavers		126		8
Paving Equipment		131		8
Plate Compactors		8		8
Pressure Washers		26		8
Pumps		53		8
Rollers		81		8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		255		8
Rubber Tired Loaders		200		8
Scrapers		362		8
Signal Boards		20		8
Skid Steer Loaders		65		8
Surfacing Equipment		254		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		98	10.00	8
Trenchers		81		8
Welders		45		8

30

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Import Sand)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	6.2	27.7	167.0	71.7	4.7	67.0	17.4	3.5	13.9	29,263.7
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	6.2	27.7	167.0	71.7	4.7	67.0	17.4	3.5	13.9	29,263.7
Total (tons/construction project)	0.0	0.1	0.7	0.1	0.0	0.1	0.0	0.0	0.0	128.8

Notes:	
Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	2755

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Import Sand)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	2.8	12.6	75.9	32.6	2.1	30.5	7.9	1.6	6.3	13,301.7
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	2.8	12.6	75.9	32.6	2.1	30.5	7.9	1.6	6.3	13,301.7
Total (megagrams/construction project)	0.0	0.1	0.7	0.1	0.0	0.1	0.0	0.0	0.0	116.8

Notes:	
Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	2106

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E Import Sand)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	0.4	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported	2755.0	yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.04
Grading/Excavation	0.40	0.16
Drainage/Utilities/Sub-Grade	0.00	0.11
Paving	0.00	0.05
Totals	0.40	0.36

Please note: You have entered a different number of months than the project length shown in cell C13.

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values					
User Input							
Miles/round trip	50.00	30					
Round trips/day		138					
Vehicle miles traveled/day (calculated)			6887.5				
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day	2.4	125.2	10.6	2.5	1.5	25484.6	
Tons per contruction period	0.01	0.55	0.05	0.01	0.01	112.13	

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values					
Miles/ one-way trip		20					
One-way trips/day		2					
No. of employees: Grubbing/Land Clearing	0.00	10					
No. of employees: Grading/Excavation		15					
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11					
No. of employees: Paving	0.00	13					
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000	
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000	
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000	
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000	
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592	
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000	
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000	
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000	
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000	
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000	
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000	
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000	
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000	
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000	
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000	
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000	

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day				
Grubbing/Land Clearing - Exhaust	0.00	2		80				
Grading/Excavation - Exhaust		2		80				
Drainage/Utilities/Subgrade	0.00	1		40				
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00		
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00		
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00		
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02		
Tons per const. Period - Grading/Excavation	0.00	0.01	0.00	0.00	0.00	2.60		
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00		
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00		

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period		
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0		
Fugitive Dust - Grading/Excavation		6.7	67.0	0.1	13.9	0.0		
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0		

Off-Road Equipment Emissions

	Default							
Grubbing/Land Clearing	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Crawler Tractors	0.92	5.59	11.90	0.46	0.42	1031.11
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
1.00	2	Graders	1.33	4.35	12.98	0.73	0.67	838.78
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.58	3.01	6.12	0.32	0.30	547.89
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Rollers	0.44	1.89	3.86	0.28	0.26	349.42
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Tractors/Loaders/Backhoes	0.45	1.97	4.09	0.31	0.29	419.90
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	3.7	16.8	38.9	2.1	1.9	3187.1
	Grading	tons per phase	0.0	0.1	0.2	0.0	0.0	14.0

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.1	0.2	0.0	0.0	14.0

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment		Default Values Horsepower		Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		106		8
Bore/Drill Rigs		206		8
Cement and Mortar Mixers		10		8
Concrete/Industrial Saws		64		8
Cranes		226		8
Crawler Tractors		208	10.00	8
Crushing/Proc. Equipment		142		8
Excavators		163		8
Forklifts		89		8
Generator Sets		66		8
Graders		175	10.00	8
Off-Highway Tractors		123		8
Off-Highway Trucks		400		8
Other Construction Equipment		172	10.00	8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		167		8
Pavers		126		8
Paving Equipment		131		8
Plate Compactors		8		8
Pressure Washers		26		8
Pumps		53		8
Rollers		81	10.00	8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		255		8
Rubber Tired Loaders		200		8
Scrapers		362		8
Signal Boards		20		8
Skid Steer Loaders		65		8
Surfacing Equipment		254		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		98	10.00	8
Trenchers		81		8
Welders		45		8

50

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Import Topsoil Fill)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	5.9	29.9	148.9	71.2	4.2	67.0	17.1	3.1	13.9	25,646.0
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	5.9	29.9	148.9	71.2	4.2	67.0	17.1	3.1	13.9	25,646.0
Total (tons/construction project)	0.0	0.1	0.5	0.1	0.0	0.1	0.0	0.0	0.0	84.6

Notes:

Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	2830

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Import Topsoil Fill)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	2.7	13.6	67.7	32.3	1.9	30.5	7.8	1.4	6.3	11,657.3
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	2.7	13.6	67.7	32.3	1.9	30.5	7.8	1.4	6.3	11,657.3
Total (megagrams/construction project)	0.0	0.1	0.4	0.1	0.0	0.1	0.0	0.0	0.0	76.8

Notes:

Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	2164

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E Import Topsoil Fill)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	0.3	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported	2830.0	yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.03
Grading/Excavation	0.30	0.11
Drainage/Utilities/Sub-Grade	0.00	0.08
Paving	0.00	0.04
Totals	0.30	0.25

Please note: You have entered a different number of months than the project length shown in cell C13.

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of							
User Input	Soil Hauling Defaults	Default Values						
Miles/round trip	40.00	30						
Round trips/day		142						
Vehicle miles traveled/day (calculated)			5660					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	2.0	102.9	8.7	2.1	1.2	20942.7		
Tons per contruction period	0.01	0.34	0.03	0.01	0.00	69.11		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust		2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02	
Tons per const. Period - Grading/Excavation	0.00	0.01	0.00	0.00	0.00	1.95	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.1	13.9	0.0
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

Grubbing/Land Clearing	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Crawler Tractors	0.83	5.03	10.71	0.41	0.38	928.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
1.00	2	Graders	1.20	3.92	11.68	0.66	0.60	754.90
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.52	2.71	5.51	0.29	0.27	493.10
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Rollers	0.39	1.70	3.48	0.26	0.24	314.47
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Tractors/Loaders/Backhoes	0.92	7.59	11.76	0.41	0.37	1620.82
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	3.9	20.9	43.1	2.0	1.9	4111.3
	Grading	tons per phase	0.0	0.1	0.1	0.0	0.0	13.6

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.1	0.1	0.0	0.0	13.6

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.								
		Default Values		Default Values				
Equipment		Horsepower		Hours/day				
Aerial Lifts		63		8				
Air Compressors		106		8				
Bore/Drill Rigs		206		8				
Cement and Mortar Mixers		10		8				
Concrete/Industrial Saws		64		8				
Cranes		226		8				
Crawler Tractors		208	9.00	8				
Crushing/Proc. Equipment		142		8				
Excavators		163		8				
Forklifts		89		8				
Generator Sets		66		8				
Graders		175	9.00	8				
Off-Highway Tractors		123		8				
Off-Highway Trucks		400		8				
Other Construction Equipment		172	9.00	8				
Other General Industrial Equipment		88		8				
Other Material Handling Equipment		167		8				
Pavers		126		8				
Paving Equipment		131		8				
Plate Compactors		8		8				
Pressure Washers		26		8				
Pumps		53		8				
Rollers		81	9.00	8				
Rough Terrain Forklifts		100		8				
Rubber Tired Dozers		255		8				
Rubber Tired Loaders		200		8				
Scrapers		362		8				
Signal Boards		20		8				
Skid Steer Loaders		65		8				
Surfacing Equipment		254		8				
Sweepers/Scrubbers		64		8				
Tractors/Loaders/Backhoes	425.00	98	9.00	8				
Trenchers		81		8				
Welders		45		8				
470								
END OF DATA ENTRY SHEET								

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (Retaining Wall - Concrete)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	4.0	19.6	146.3	70.6	3.6	67.0	16.3	2.4	13.9	28,259.0
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	4.0	19.6	146.3	70.6	3.6	67.0	16.3	2.4	13.9	28,259.0
Total (tons/construction project)	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	31.1

Notes:		
	Project Start Year ->	2016
	Project Length (months) ->	0
	Total Project Area (acres) ->	28
	Maximum Area Disturbed/Day (acres) ->	7
	Total Soil Imported/Exported (yd^3/day)->	1580

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (Retaining Wall - Concrete)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	1.8	8.9	66.5	32.1	1.6	30.5	7.4	1.1	6.3	12,845.0
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	1.8	8.9	66.5	32.1	1.6	30.5	7.4	1.1	6.3	12,845.0
Total (megagrams/construction project)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	28.2

Notes:		
	Project Start Year ->	2016
	Project Length (months) ->	0
	Total Project Area (hectares) ->	11
	Maximum Area Disturbed/Day (hectares) ->	3
	Total Soil Imported/Exported (meters^3/day)->	1208

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a
yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (Retaining Wall - Concrete)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction
		2 Road Widening
		3 Bridge/Overpass Construction
Project Construction Time	0.1	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel
		2. Weathered Rock-Earth
		3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported	1580.0	yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	9.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.01
Grading/Excavation	0.10	0.05
Drainage/Utilities/Sub-Grade	0.00	0.03
Paving	0.00	0.02
Totals	0.10	0.10

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values						
User Input								
Miles/round trip	40.00	30						
Round trips/day		176						
Vehicle miles traveled/day (calculated)			7022.222222					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	2.4	127.6	10.8	2.6	1.5	25983.1		
Tons per contruction period	0.00	0.14	0.01	0.00	0.00	28.58		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day		
Grubbing/Land Clearing - Exhaust	0.00	2		80		
Grading/Excavation - Exhaust		2		80		
Drainage/Utilities/Subgrade	0.00	1		40		

	ROG	NOx	CO	PM10	PM2.5	CO2
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.65
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.0	13.9	0.0
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

	Default							
Grubbing/Land Clearing	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
1.00	3	Excavators	0.51	3.49	5.58	0.27	0.25	716.08
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.58	3.01	6.12	0.32	0.30	547.89
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Tractors/Loaders/Backhoes	0.45	1.97	4.09	0.31	0.29	419.90
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	1.5	8.5	15.8	0.9	0.8	1683.9
	Grading	tons per phase	0.0	0.0	0.0	0.0	0.0	1.9

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.0	0.0	0.0	0.0	1.9

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment	Default Values Horsepower		Default Values Hours/day
Aerial Lifts	63		8
Air Compressors	106		8
Bore/Drill Rigs	206		8
Cement and Mortar Mixers	10		8
Concrete/Industrial Saws	64		8
Cranes	226		8
Crawler Tractors	208		8
Crushing/Proc. Equipment	142		8
Excavators	163	10.00	8
Forklifts	89		8
Generator Sets	66		8
Graders	175		8
Off-Highway Tractors	123		8
Off-Highway Trucks	400		8
Other Construction Equipment	172	10.00	8
Other General Industrial Equipment	88		8
Other Material Handling Equipment	167		8
Pavers	126		8
Paving Equipment	131		8
Plate Compactors	8		8
Pressure Washers	26		8
Pumps	53		8
Rollers	81		8
Rough Terrain Forklifts	100		8
Rubber Tired Dozers	255		8
Rubber Tired Loaders	200		8
Scrapers	362		8
Signal Boards	20		8
Skid Steer Loaders	65		8
Surfacing Equipment	254		8
Sweepers/Scrubbers	64		8
Tractors/Loaders/Backhoes	98	10.00	8
Trenchers	81		8
Welders	45		8

30

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Retaining Wall - Form & S				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	1.1	5.2	13.1	67.7	0.7	67.0	14.6	0.6	13.9	1,559.8
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	1.1	5.2	13.1	67.7	0.7	67.0	14.6	0.6	13.9	1,559.8
Total (tons/construction project)	0.0	0.1	0.2	0.5	0.0	0.5	0.1	0.0	0.1	25.7

Notes:

Project Start Year ->	2016
Project Length (months) ->	2
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Retaining Wall - Form & S				Total	Exhaust	Fugitive Oust	Total	Exhaust	Fugitive Oust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	0.5	2.4	6.0	30.8	0.3	30.5	6.6	0.3	6.3	709.0
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	0.5	2.4	6.0	30.8	0.3	30.5	6.6	0.3	6.3	709.0
Total (megagrams/construction project)	0.0	0.1	0.2	0.5	0.0	0.5	0.1	0.0	0.1	23.3

Notes:

Project Start Year ->	2016
Project Length (months) ->	2
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E Retaining Wall - Form & Steel)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	1.5	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported		yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.15
Grading/Excavation	1.50	0.68
Drainage/Utilities/Sub-Grade	0.00	0.45
Paving	0.00	0.23
Totals	1.50	1.50

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of							
User Input	Soil Hauling Defaults	Default Values						
Miles/round trip	40.00	30						
Round trips/day		0						
Vehicle miles traveled/day (calculated)			0					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	0.0	0.0	0.0	0.0	0.0	0.0		
Tons per contruction period	0.00	0.00	0.00	0.00	0.00	0.00		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust		2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02	
Tons per const. Period - Grading/Excavation	0.00	0.05	0.00	0.00	0.00	9.77	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.5	13.9	0.1
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

Grubbing/Land Clearing	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.58	3.01	6.12	0.32	0.30	547.89
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Tractors/Loaders/Backhoes	0.45	1.97	4.09	0.31	0.29	419.90
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	1.0	5.0	10.2	0.6	0.6	967.8
	Grading	tons per phase	0.0	0.1	0.2	0.0	0.0	16.0

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.1	0.2	0.0	0.0	16.0

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.								
		Default Values		Default Values				
Equipment		Horsepower		Hours/day				
Aerial Lifts		63		8				
Air Compressors		106		8				
Bore/Drill Rigs		206		8				
Cement and Mortar Mixers		10		8				
Concrete/Industrial Saws		64		8				
Cranes		226		8				
Crawler Tractors		208		8				
Crushing/Proc. Equipment		142		8				
Excavators		163		8				
Forklifts		89		8				
Generator Sets		66		8				
Graders		175		8				
Off-Highway Tractors		123		8				
Off-Highway Trucks		400		8				
Other Construction Equipment		172	10.00	8				
Other General Industrial Equipment		88		8				
Other Material Handling Equipment		167		8				
Pavers		126		8				
Paving Equipment		131		8				
Plate Compactors		8		8				
Pressure Washers		26		8				
Pumps		53		8				
Rollers		81		8				
Rough Terrain Forklifts		100		8				
Rubber Tired Dozers		255		8				
Rubber Tired Loaders		200		8				
Scrapers		362		8				
Signal Boards		20		8				
Skid Steer Loaders		65		8				
Surfacing Equipment		254		8				
Sweepers/Scrubbers		64		8				
Tractors/Loaders/Backhoes		98	10.00	8				
Trenchers		81		8				
Welders		45		8				
20								
END OF DATA ENTRY SHEET								

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E to Spoils)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	18.3	89.6	335.9	77.8	10.8	67.0	22.9	9.0	13.9	47,017.6
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	18.3	89.6	335.9	77.8	10.8	67.0	22.9	9.0	13.9	47,017.6
Total (tons/construction project)	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	25.9

Notes:	
Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (acres) ->	26
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	4090

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E to Spoils)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	8.3	40.7	152.7	35.4	4.9	30.5	10.4	4.1	6.3	21,371.7
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	8.3	40.7	152.7	35.4	4.9	30.5	10.4	4.1	6.3	21,371.7
Total (megagrams/construction project)	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	23.5

Notes:	
Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	3127

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E to Spoils)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	0.1	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported		yd^3/day
Soil Exported	4090.0	yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.01
Grading/Excavation	0.05	0.02
Drainage/Utilities/Sub-Grade	0.00	0.02
Paving	0.00	0.01
Totals	0.05	0.05

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values						
User Input								
Miles/round trip	40.00	30						
Round trips/day	205.00	205						
Vehicle miles traveled/day (calculated)			8200					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	2.8	149.0	12.7	3.0	1.8	30341.0		
Tons per contruction period	0.00	0.08	0.01	0.00	0.00	16.69		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day		
Grubbing/Land Clearing - Exhaust	0.00	2		80		
Grading/Excavation - Exhaust		2		80		
Drainage/Utilities/Subgrade	0.00	1		40		

	ROG	NOx	CO	PM10	PM2.5	CO2
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.33
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.0	13.9	0.0
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

	Default							
Grubbing/Land Clearing	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Crawler Tractors	2.59	15.64	33.31	1.28	1.18	2887.12
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
1.00	2	Graders	1.87	6.09	18.17	1.02	0.94	1174.29
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.81	4.22	8.57	0.45	0.41	767.04
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
4.00	1	Scrapers	10.19	50.78	123.87	4.99	4.59	11256.15
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	15.4	76.7	183.9	7.7	7.1	16084.6
	Grading	tons per phase	0.0	0.0	0.1	0.0	0.0	8.8

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.0	0.1	0.0	0.0	8.8

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment	Default Values Horsepower		Default Values Hours/day
Aerial Lifts	63		8
Air Compressors	106		8
Bore/Drill Rigs	206		8
Cement and Mortar Mixers	10		8
Concrete/Industrial Saws	64		8
Cranes	226		8
Crawler Tractors	208	14.00	8
Crushing/Proc. Equipment	142		8
Excavators	163		8
Forklifts	89		8
Generator Sets	66		8
Graders	175	14.00	8
Off-Highway Tractors	123		8
Off-Highway Trucks	400		8
Other Construction Equipment	172	14.00	8
Other General Industrial Equipment	88		8
Other Material Handling Equipment	167		8
Pavers	126		8
Paving Equipment	131		8
Plate Compactors	8		8
Pressure Washers	26		8
Pumps	53		8
Rollers	81		8
Rough Terrain Forklifts	100		8
Rubber Tired Dozers	255		8
Rubber Tired Loaders	200		8
Scrapers	362	14.00	8
Signal Boards	20		8
Skid Steer Loaders	65		8
Surfacing Equipment	254		8
Sweepers/Scrubbers	64		8
Tractors/Loaders/Backhoes	98		8
Trenchers	81		8
Welders	45		8

56

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E to Stockpile)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	PM2.5 (lbs/day)	PM2.5 (lbs/day)	PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	11.2	55.5	139.6	72.7	5.7	67.0	19.1	5.2	13.9	13,161.5
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	11.2	55.5	139.6	72.7	5.7	67.0	19.1	5.2	13.9	13,161.5
Total (tons/construction project)	0.2	0.9	2.1	0.6	0.1	0.5	0.2	0.1	0.1	202.7

Notes:

Project Start Year ->	2016
Project Length (months) ->	1
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	2920

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E to Stockpile)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	PM10 (kgs/day)	PM10 (kgs/day)	PM10 (kgs/day)	PM2.5 (kgs/day)	PM2.5 (kgs/day)	PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	5.1	25.2	63.4	33.0	2.6	30.5	8.7	2.4	6.3	5,982.5
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	5.1	25.2	63.4	33.0	2.6	30.5	8.7	2.4	6.3	5,982.5
Total (megagrams/construction project)	0.2	0.8	1.9	0.5	0.1	0.4	0.2	0.1	0.1	183.8

Notes:

Project Start Year ->	2016
Project Length (months) ->	1
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	2232

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E to Stockpile)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	1.4	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported		yd^3/day
Soil Exported	2920.0	yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.14
Grading/Excavation	1.40	0.63
Drainage/Utilities/Sub-Grade	0.00	0.42
Paving	0.00	0.21
Totals	1.40	1.40

Hauling emission default values can be overridden in cells C45 through C46.									
Soil Hauling Emissions	User Override of								
User Input	Soil Hauling Defaults	Default Values							
Miles/round trip	2.00	30							
Round trips/day	146.00	146							
Vehicle miles traveled/day (calculated)			292						
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**			
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86			
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00			
Pounds per day	0.1	5.3	0.5	0.1	0.1	1080.4			
Tons per contruction period	0.00	0.08	0.01	0.00	0.00	16.64			
Worker commute default values can be overridden in cells C60 through C65.									
	User Override of Worker								
Worker Commute Emissions	Commute Default Values	Default Values							
Miles/ one-way trip		20							
One-way trips/day		2							
No. of employees: Grubbing/Land Clearing	0.00	10							
No. of employees: Grading/Excavation		15							
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11							
No. of employees: Paving	0.00	13							
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**			
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000			
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650			
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000			
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000			
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000			
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592			
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000			
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000			
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000			
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000			
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000			
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000			
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000			
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000			
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000			
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000			
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000			

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust		2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.06	2.91	0.25	0.06	0.03	592.02	
Tons per const. Period - Grading/Excavation	0.00	0.04	0.00	0.00	0.00	9.12	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.5	13.9	0.1
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

Grubbing/Land Clearing	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Crawler Tractors	1.85	11.17	23.79	0.92	0.84	2062.23
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
1.00	2	Graders	1.33	4.35	12.98	0.73	0.67	838.78
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.58	3.01	6.12	0.32	0.30	547.89
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
4.00	1	Scrapers	7.28	36.27	88.48	3.57	3.28	8040.11
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	11.0	54.8	131.4	5.5	5.1	11489.0
	Grading	tons per phase	0.2	0.8	2.0	0.1	0.1	176.9

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.2	0.8	2.0	0.1	0.1	176.9

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.								
		Default Values		Default Values				
Equipment		Horsepower		Hours/day				
Aerial Lifts		63		8				
Air Compressors		106		8				
Bore/Drill Rigs		206		8				
Cement and Mortar Mixers		10		8				
Concrete/Industrial Saws		64		8				
Cranes		226		8				
Crawler Tractors		208	10.00	8				
Crushing/Proc. Equipment		142		8				
Excavators		163		8				
Forklifts		89		8				
Generator Sets		66		8				
Graders		175	10.00	8				
Off-Highway Tractors		123		8				
Off-Highway Trucks		400		8				
Other Construction Equipment		172	10.00	8				
Other General Industrial Equipment		88		8				
Other Material Handling Equipment		167		8				
Pavers		126		8				
Paving Equipment		131		8				
Plate Compactors		8		8				
Pressure Washers		26		8				
Pumps		53		8				
Rollers		81		8				
Rough Terrain Forklifts		100		8				
Rubber Tired Dozers		255		8				
Rubber Tired Loaders		200		8				
Scrapers		362	10.00	8				
Signal Boards		20		8				
Skid Steer Loaders		65		8				
Surfacing Equipment		254		8				
Sweepers/Scrubbers		64		8				
Tractors/Loaders/Backhoes		98		8				
Trenchers		81		8				
Welders		45		8				
40								
END OF DATA ENTRY SHEET								

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Surfacing)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	14.5	64.3	331.0	77.5	10.5	67.0	22.1	8.2	13.9	55,317.2
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	14.5	64.3	331.0	77.5	10.5	67.0	22.1	8.2	13.9	55,317.2
Total (tons/construction project)	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	30.4

Notes:	
Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	8228

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (G&E Surfacing)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	6.6	29.2	150.4	35.2	4.8	30.5	10.1	3.7	6.3	25,144.2
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	6.6	29.2	150.4	35.2	4.8	30.5	10.1	3.7	6.3	25,144.2
Total (megagrams/construction project)	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	27.6

Notes:	
Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	6291

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (G&E Surfacing)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	0.1	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported	8228.0	yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.01
Grading/Excavation	0.05	0.05
Drainage/Utilities/Sub-Grade	0.00	0.03
Paving	0.00	0.02
Totals	0.05	0.10

Please note: You have entered a different number of months than the project length shown in cell C13.

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values						
User Input								
Miles/round trip		30						
Round trips/day		411						
Vehicle miles traveled/day (calculated)			12342					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	4.3	224.3	19.1	4.5	2.7	45666.9		
Tons per contruction period	0.00	0.12	0.01	0.00	0.00	25.12		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust	3.00	2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.08	4.36	0.37	0.09	0.05	888.03	
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.49	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	67.0	0.0	13.9	0.0
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

	Default							
Grubbing/Land Clearing	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Crawler Tractors	1.02	6.15	13.08	0.50	0.46	1134.22
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
	3	Excavators	1.23	8.37	13.40	0.66	0.61	1718.59
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
3.00	2	Graders	4.40	14.36	42.82	2.41	2.21	2767.98
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.64	3.31	6.73	0.35	0.33	602.67
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
3.00		Rollers	1.44	6.23	12.75	0.94	0.86	1153.07
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
3.00		Tractors/Loaders/Backhoes	1.48	6.49	13.49	1.04	0.96	1385.69
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	10.2	44.9	102.3	5.9	5.4	8762.2
	Grading	tons per phase	0.0	0.0	0.1	0.0	0.0	4.8

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
0.00		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.0	0.1	0.0	0.0	4.8

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment		Default Values Horsepower		Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		106		8
Bore/Drill Rigs		206		8
Cement and Mortar Mixers		10		8
Concrete/Industrial Saws		64		8
Cranes		226		8
Crawler Tractors		208	11.00	8
Crushing/Proc. Equipment		142		8
Excavators		163		8
Forklifts		89		8
Generator Sets		66		8
Graders		175	11.00	8
Off-Highway Tractors		123		8
Off-Highway Trucks		400		8
Other Construction Equipment		172	11.00	8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		167		8
Pavers		126		8
Paving Equipment		131		8
Plate Compactors		8		8
Pressure Washers		26		8
Pumps		53		8
Rollers		81	11.00	8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		255		8
Rubber Tired Loaders		200		8
Scrapers		362		8
Signal Boards		20		8
Skid Steer Loaders		65		8
Surfacing Equipment		254		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		98	11.00	8
Trenchers		81		8
Welders		45		8

55

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (Utilities #1)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	2.1	11.3	24.7	101.7	1.2	100.5	22.0	1.1	20.9	2,399.7
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	2.1	11.3	24.7	101.7	1.2	100.5	22.0	1.1	20.9	2,399.7
Total (tons/construction project)	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	4.0

Notes:

Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (Utilities #1)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	1.0	5.1	11.2	46.2	0.6	45.7	10.0	0.5	9.5	1,090.8
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	1.0	5.1	11.2	46.2	0.6	45.7	10.0	0.5	9.5	1,090.8
Total (megagrams/construction project)	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	3.6

Notes:

Project Start Year ->	2016
Project Length (months) ->	0
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (Utilities #1)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	0.2	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported		yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.02
Grading/Excavation	0.15	0.09
Drainage/Utilities/Sub-Grade	0.00	0.06
Paving	0.00	0.03
Totals	0.15	0.20

Please note: You have entered a different number of months than the project length shown in cell C13.

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values
User Input		
Miles/round trip		30
Round trips/day		0
Vehicle miles traveled/day (calculated)		0

Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
Tons per contruction period	0.00	0.00	0.00	0.00	0.00	0.00

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values
Miles/ one-way trip		20
One-way trips/day		2
No. of employees: Grubbing/Land Clearing	0.00	10
No. of employees: Grading/Excavation		15
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11
No. of employees: Paving	0.00	13

	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust	1.00	2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.03	1.45	0.12	0.03	0.02	296.01	
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.49	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	100.5	0.1	20.9	0.0
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

Grubbing/Land Clearing	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Crawler Tractors	0.92	5.59	11.90	0.46	0.42	1031.11
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.58	3.01	6.12	0.32	0.30	547.89
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Rollers	0.13	0.57	1.16	0.09	0.08	104.82
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Tractors/Loaders/Backhoes	0.45	1.97	4.09	0.31	0.29	419.90
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	2.1	11.1	23.3	1.2	1.1	2103.7
	Grading	tons per phase	0.0	0.0	0.0	0.0	0.0	3.5

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
0.00		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.0	0.0	0.0	0.0	3.5

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.								
		Default Values		Default Values				
Equipment		Horsepower		Hours/day				
Aerial Lifts		63		8				
Air Compressors		106		8				
Bore/Drill Rigs		206		8				
Cement and Mortar Mixers		10		8				
Concrete/Industrial Saws		64		8				
Cranes		226		8				
Crawler Tractors		208	10.00	8				
Crushing/Proc. Equipment		142		8				
Excavators		163		8				
Forklifts		89		8				
Generator Sets		66		8				
Graders		175		8				
Off-Highway Tractors		123		8				
Off-Highway Trucks		400		8				
Other Construction Equipment		172	10.00	8				
Other General Industrial Equipment		88		8				
Other Material Handling Equipment		167		8				
Pavers		126		8				
Paving Equipment		131		8				
Plate Compactors		8		8				
Pressure Washers		26		8				
Pumps		53		8				
Rollers		81	3.00	8				
Rough Terrain Forklifts		100		8				
Rubber Tired Dozers		255		8				
Rubber Tired Loaders		200		8				
Scrapers		362		8				
Signal Boards		20		8				
Skid Steer Loaders		65		8				
Surfacing Equipment		254		8				
Sweepers/Scrubbers		64		8				
Tractors/Loaders/Backhoes		98	10.00	8				
Trenchers		81		8				
Welders		45		8				
33								
END OF DATA ENTRY SHEET								

Road Construction Emissions Model, Version 7.1.2

Emission Estimates for -> ARCF ARS Reach F-Year 2 (Utilities #2)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NOx (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**PM2.5 (lbs/day)**	**CO2 (lbs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	1.1	5.1	11.7	101.2	0.7	100.5	21.5	0.6	20.9	1,263.8
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	1.1	5.1	11.7	101.2	0.7	100.5	21.5	0.6	20.9	1,263.8
Total (tons/construction project)	0.0	0.1	0.3	1.2	0.0	1.2	0.3	0.0	0.2	33.4

Notes:

Project Start Year ->	2016
Project Length (months) ->	2
Total Project Area (acres) ->	28
Maximum Area Disturbed/Day (acres) ->	7
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> ARCF ARS Reach F-Year 2 (Utilities #2)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NOx (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**PM2.5 (kgs/day)**	**CO2 (kgs/day)**
Grubbing/Land Clearing	-	-	-	-	-	-	-	-	-	-
Grading/Excavation	0.5	2.3	5.3	46.0	0.3	45.7	9.8	0.3	9.5	574.5
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	0.5	2.3	5.3	46.0	0.3	45.7	9.8	0.3	9.5	574.5
Total (megagrams/construction project)	0.0	0.1	0.3	1.1	0.0	1.1	0.2	0.0	0.2	30.3

Notes:

Project Start Year ->	2016
Project Length (months) ->	2
Total Project Area (hectares) ->	11
Maximum Area Disturbed/Day (hectares) ->	3
Total Soil Imported/Exported ($meters^3$/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model — Version 7.1.2

Data Entry Worksheet

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a
yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Input Type		
Project Name	ARCF ARS Reach F-Year 2 (Utilities #2)	
Construction Start Year	2016	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction
		2 Road Widening
		3 Bridge/Overpass Construction
Project Construction Time	2.4	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel
		2. Weathered Rock-Earth
		3. Blasted Rock
Project Length	1.5	miles
Total Project Area	28.0	acres
Maximum Area Disturbed/Day	6.7	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported		yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	20.0	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.00	0.24
Grading/Excavation	2.40	1.08
Drainage/Utilities/Sub-Grade	0.00	0.72
Paving	0.00	0.36
Totals	2.40	2.40

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values						
User Input								
Miles/round trip		30						
Round trips/day		0						
Vehicle miles traveled/day (calculated)			0					
Hauling Emissions	**ROG**	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86		
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00		
Pounds per day	0.0	0.0	0.0	0.0	0.0	0.0		
Tons per contruction period	0.00	0.00	0.00	0.00	0.00	0.00		

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values						
Miles/ one-way trip		20						
One-way trips/day		2						
No. of employees: Grubbing/Land Clearing	0.00	10						
No. of employees: Grading/Excavation		15						
No. of employees: Drainage/Utilities/Sub-Grade	0.00	11						
No. of employees: Paving	0.00	13						
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**		
Emission rate - Grubbing/Land Clearing (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/mile)	0.147	0.194	1.744	0.047	0.020	443.650		
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grubbing/Land Clearing (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Grading/Excavation (grams/trip)	0.505	0.323	4.200	0.004	0.003	95.592		
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grubbing/Land Clearing	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Grading/Excavation	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Drainage/Utilities/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Drain/Util/Sub-Grade	0.000	0.000	0.000	0.000	0.000	0.000		
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000		
tons per construction period	0.000	0.000	0.000	0.000	0.000	0.000		

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day			
Grubbing/Land Clearing - Exhaust	0.00	2		80			
Grading/Excavation - Exhaust	1.00	2		80			
Drainage/Utilities/Subgrade	0.00	1		40			
	ROG	**NOx**	**CO**	**PM10**	**PM2.5**	**CO2**	
Emission rate - Grubbing/Land Clearing (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Emission rate - Grading/Excavation (grams/mile)	0.16	8.25	0.70	0.17	0.10	1679.86	
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.00	
Pound per day - Grading/Excavation	0.03	1.45	0.12	0.03	0.02	296.01	
Tons per const. Period - Grading/Excavation	0.00	0.04	0.00	0.00	0.00	7.81	
Pound per day - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.00	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0	0.0	0.0	0.0	0.0
Fugitive Dust - Grading/Excavation		6.7	100.5	1.2	20.9	0.2
Fugitive Dust - Drainage/Utilities/Subgrade		0	0.0	0.0	0.0	0.0

Off-Road Equipment Emissions

	Default							
Grubbing/Land Clearing	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Grubbing/Land Clearing	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Grading/Excavation	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
	1	Other Construction Equipment	0.58	3.01	6.12	0.32	0.30	547.89
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Tractors/Loaders/Backhoes	0.45	1.97	4.09	0.31	0.29	419.90
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	1.0	5.0	10.2	0.6	0.6	967.8
	Grading	tons per phase	0.0	0.1	0.3	0.0	0.0	25.5

	Default							
Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
	2	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
0.00		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Drainage	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0

	Default							
Paving	Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
		Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			0.0	0.1	0.3	0.0	0.0	25.5

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment	Default Values Horsepower		Default Values Hours/day
Aerial Lifts	63		8
Air Compressors	106		8
Bore/Drill Rigs	206		8
Cement and Mortar Mixers	10		8
Concrete/Industrial Saws	64		8
Cranes	226		8
Crawler Tractors	208		8
Crushing/Proc. Equipment	142		8
Excavators	163		8
Forklifts	89		8
Generator Sets	66		8
Graders	175		8
Off-Highway Tractors	123		8
Off-Highway Trucks	400		8
Other Construction Equipment	172	10.00	8
Other General Industrial Equipment	88		8
Other Material Handling Equipment	167		8
Pavers	126		8
Paving Equipment	131		8
Plate Compactors	8		8
Pressure Washers	26		8
Pumps	53		8
Rollers	81		8
Rough Terrain Forklifts	100		8
Rubber Tired Dozers	255		8
Rubber Tired Loaders	200		8
Scrapers	362		8
Signal Boards	20		8
Skid Steer Loaders	65		8
Surfacing Equipment	254		8
Sweepers/Scrubbers	64		8
Tractors/Loaders/Backhoes	98	10.00	8
Trenchers	81		8
Welders	45		8

20

END OF DATA ENTRY SHEET

Additional air quality analysis for the proposed Sacramento Weir and Bypass Widening is performed separately due to the spatial separation between the Sacramento Weir and the additional portion of the project in Alternatives 1 and 2. It should be noted that the Sacramento Weir and Bypass Widening portion of the project is only proposed under Alternative 2.

The air quality emissions analysis for the Sacramento Weir and Bypass Widening was developed based on the following assumptions:

- The Sacramento Weir and Bypass Widening would be constructed as three phases over three years: the Weir, the new levee, and the deconstruction of the old levee;
- The Sacramento Weir would be constructed on dry land on the portion of land between the railroad property and the Old River Road;
- The Old River Road and the railroad would be realigned onto the new weir crown under a separate construction agreement;
- The existing weir would remain in place, and a small transitional island would remain between the new weir and the existing weir;
- The new levee would be constructed using soil existing in the Sacramento Bypass, and no new soil would be imported from other borrow sites.

Sacramento Weir Widening

The construction and design for the proposed widening of the Sacramento Weir has not yet been determined. For the purpose of air quality analysis, it is assumed that the new portion of the weir would be constructed with cement formed on site, requiring haul trucks of both cement and treated wood for the forms. At the peak of construction, as many as 20 trucks could deliver cement or other materials in a day; however, for the purposes of air quality analysis it is anticipated that an average of 5 haul trucks per day would deliver materials to the site over a six month period. Waste materials would be exported on as as-needed basis. The construction of the weir would also include a new section of railroad tracks and a new segment of road in order to connect the existing Yolo Shortline Railroad and the existing Old River Road across the weir. It is currently assumed that the Yolo Shortline Railroad and the Old River Road would remain active during construction, and the only closures and detours would occur when the old section is connected with the new; however, it is possible that the Yolo Shortline Railroad would be closed during construction due to the proximity of the railroad to the footprint of the new weir section. If the railroad requires closure during construction, the goods normally transported by rail could be rerouted onto large cargo trucks; however, the potential emissions from rerouting rail goods onto trucks are outside the scope of this analysis. Construction design, additional traffic analysis, and additional air quality analysis would be conducted during the PED phase.

Construction of the Sacramento Weir and Bypass portion of Alternative 2 is assumed to take place over three years in three different phases: construction of the new levee, construction of the

new weir, and demolition of the old levee. For the purposes of air quality analysis, several assumptions associated with each of these phases have been made.

It is assumed that the construction of the new levee segment would utilize soil available either from the existing bypass area or from the area that will be integrated into the new, larger bypass. This nearby borrow source would eliminate the use of haul trucks; therefore, the model analysis included in Appendix D reflects no haul trucks for this portion of construction. Large construction equipment such as scrapers would be needed in order to take the soil from the source to the site of the new levee. Upon completion of the new levee, a new road to take the place of County Road 126 would be constructed on the levee crown. Although construction is assumed to take place over a single construction season (approximately 6 months), the complete design may determine that additional time is needed to construct this portion of the project. Additional analysis may be needed at that time.

Table 3. Estimated Air Emissions for the Sacramento Bypass New Levee Construction.

	Annual Emissions in Tons					**Maximum Daily Emissions in Pounds**				
Construction Year	**ROG**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emissions generated in YSAQMD										
Construction of levee	0.7	7.3	6.5	2.5	0.8	18.5	184.7	157.9	47.9	15.6
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					

It is assumed that the construction of the new portion of the weir would be of similar design and materials of the existing weir and would therefore consist mostly of concrete formed on site. It is currently unknown how many cement trucks would be needed for the actual construction of the weir; however, for the purposes of air quality analysis it is assumed that approximately five loads of cement would be delivered to the site daily for the duration of the six month construction project. Additional analysis would be performed once the design of the new weir is completed. Upon completion of the new weir, a new segment of road and railroad would be constructed on the top of the weir and connected to the existing Old River Road and Yolo Shortline Railroad.

Table 4. Estimated Air Emissions for the Sacramento Bypass Weir Construction.

	Annual Emissions in Tons					Maximum Daily Emissions in Pounds				
Construction Year	**ROG**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emissions generated in YSAQMD										
Construction of weir	0.8	7.5	5.9	2.6	0.8	15.2	148.6	114.6	47.0	6.3
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					

Upon completion of the new levee and the new weir, the existing levee would be deconstructed and the soil from the degraded levee would be redistributed across the entire bypass area in order to encourage positive drainage toward the Yolo Bypass. Additionally, the segment of land that is currently between the existing Yolo Shortline Railroad and the Sacramento River would be lowered in order to connect the new section of the widened Sacramento Bypass to the Sacramento River. Soil removed from this segment of land would also be redistributed across the entire bypass area in order to meet elevation requirements as determined by future design. It is assumed that the majority of the existing river bank would remain in place; however, some vegetation and large trees could be removed. Full analysis of these potential impacts would be performed once the design is completed. Due to the large amount of soil that would be displaced and redistributed in this phase of work, as many as 20 scrapers could be in use at one time during the peak of construction; however, it is not anticipated that any soil would be brought in or removed from the site using haul trucks. The model analysis included in Appendix D reflects no haul trucks for this portion of construction.

Table 5. Estimated Air Emissions for the Sacramento Bypass Existing Levee Removal and Soil Redistribution.

	Annual Emissions in Tons					Maximum Daily Emissions in Pounds				
Construction Year	**ROG**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emissions generated in YSAQMD										
Levee Removal	1.5	14.2	13.1	3.0	1.1	30.3	297.2	281.8	52.4	19.7
CEQA Threshold	10	10	NA	NA	NA				80	
Exceed Threshold?	No	Yes							No	
General Conformity *de Minimis* Threshold	25	25	100	100	100					
Exceed Threshold?	No	No	No	No	No					

Maximum daily emissions are estimated for ROG, NO_X, PM_{10}, and $PM_{2.5}$ to evaluate emissions against YSAQMD thresholds. Those results are shown in Table 6. Construction-related emissions from the Sacramento Weir and Bypass Widening portion of the project would exceed the YSAQMD's emission threshold for NO_X. The actual emissions may be reduced by reducing the number and type of large construction vehicles utilized on site at one time and by following the mitigation measures as recommended by SMAQMD; however, the overall construction emissions under the alternative would likely exceed the thresholds and would therefore result in a significant effect. The Corps would be required to pay an off-site mitigation fee for NO_X emissions in the SVAB in order to reduce the effect to a less-than-significant level.

Table 6. Estimated Air Emissions for Alternative 2, Sacramento Bypass and Weir Widening Construction.

Construction Year	**Annual Emissions in Tons**					**Maximum Daily Emissions in Pounds**				
	ROG	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emissions generated in YSAQMD										
Construction of New Levee	0.7	7.3	6.5	2.5	0.8	18.5	184.7	157.9	47.9	15.6
Construction of New Weir	0.8	7.5	5.9	2.8	0.8	1532	148.6	114.6	47.0	6.3
Demolition of Old Levee	1.5	14.2	13.1	3.0	1.1	30.3	297.2	281.8	52.4	19.7
CEQA Threshold	10	10	NA	NA	NA				80	
Exceed Threshold?	No	Yes							No	
General Conformity *de Minimis* Threshold	25	25	100	100	100					
Exceed Threshold?	No	No	No	No	No					

Although Alternative 2 would reduce the number of levee raises along the Sacramento River compared to Alternative 1, for the purposes of air quality analysis the emissions estimates are assumed to be the same as Alternative 1. 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 6, the greatest potential emissions impacts would occur during the demolition of the old levee due to the large number of scrapers and other large construction equipment to displace and redistribute soil. These emissions are combined with the previously analyzed emissions from Alternative 1 in Tables 7 and 8, below.

Table 7. Estimated Air Emissions for the Truck Delivery Scenario With Bypass Widening.

	Annual Emissions in Tons					Maximum Daily Emissions in Pounds				
Construction Year	**ROG**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**NO_X**	**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	66.8	29.9	5.4
Year 2 Off-Site Soil Borrow	0	0.7	0.1	0.1	0	6.7	176.2	34.2	71.8	17.5
Year 2 Total	1.5	23.0	9.0	7.5	2.0	18.3	335.9	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	30.78	65.67	15.75
Bypass Widening: Levee Demolition	1.5	14.2	13.1	3.0	1.1	30.3	297.2	281.8	52.4	19.7
Total	1.5	14.8	13.2	3.01	1.1	36.6	456.0	312.58	118.07	35.45
CEQA Threshold	10	10	NA	NA	NA				80	
Exceed Threshold?	No	Yes							No	
General Conformity *de Minimis* Threshold	25	25	100	100	100					
Exceed Threshold?	No	No	No	No	No					

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 8. 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 and the Corps would be required to pay an off-site mitigation fee for NO_X emissions in the SVAB. Payment of these mitigation fees would reduce the impacts to a less-than-significant level. Borrow activities and barge delivery emissions would not exceed YSAQMD thresholds; however, the addition of the Sacramento Weir and Bypass Widening portion of Alternative 2 would exceed the YSAQMD's emission threshold for NO_X. The actual emissions may be reduced by reducing the number and type of large construction vehicles utilized on site at one time and by following the mitigation measures as recommended by SMAQMD; however, the overall construction emissions under the alternative would likely exceed the thresholds and would therefore result in a significant effect. The Corps would be required to pay an off-site mitigation fee for NO_X emissions in the SVAB in

order to reduce the effect to a less-than-significant level. 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 8. Estimated Air Emissions for the Barge Delivery Scenario With Bypass Widening.

	Annual Emissions in Tons					**Maximum Daily Emissions in Pounds**				
Construction Year	**ROG**	**NO_X**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**NO_X**	**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	66.8	29.9	5.4
Year 2 Off-Site Soil Borrow	0	0.7	0.1	0.1	0	6.7	176.2	34.2	71.8	17.5
Year 2 Barge Delivery	0.41	3.92	1.67	0.15	0	10.2	95.0	39.4	3.7	1.7
Year 2 Total	2.4	27.2	12.5	6.5	1.6	28.5	430.9	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	30.78	65.67	15.75
Year 2 Barge Delivery	0.24	2.33	1	.01	0	6.07	56.5	23.43	2.2	1
Bypass Widening Levee Demolition	1.5	14.2	13.1	3.0	1.1	30.3	297.2	281.80	52.4	19.7
Year 2 Total	1.74	17.13	14.2	3.02	1.1	42.4	512.5	336.01	120.27	36.45
CEQA Threshold	10	10	NA	NA	NA				80	
Exceed Threshold?	No	Yes							Yes	
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	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: **Only on-water exhaust emissions generated from towboats are expected to occur within the BAAQMD.

Road Construction Emissions Model, Version 7.1.5.1

Emission Estimates for -> Sac Bypass Widening: NEW LEVEE Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	6.1	49.3	62.2	42.9	2.9	40.0	11.0	2.7	8.3	10,244.4
Grading/Excavation	20.8	157.9	217.0	49.3	9.3	40.0	16.9	8.5	8.3	34,015.3
Drainage/Utilities/Sub-Grade	4.9	38.1	42.8	42.4	2.4	40.0	10.5	2.2	8.3	7,262.2
Paving	3.6	35.3	32.6	1.8	1.8	-	1.7	1.7	-	6,747.9
Maximum (pounds/day)	20.8	157.9	217.0	49.3	9.3	40.0	16.9	8.5	8.3	34,015.3
Total (tons/construction project)	0.8	6.5	8.5	2.6	0.4	2.2	0.8	0.3	0.5	1,370.1

Notes:

Project Start Year ->	2021
Project Length (months) ->	6
Total Project Area (acres) ->	20
Maximum Area Disturbed/Day (acres) ->	4
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Sac Bypass Widening: NEW LEVEE Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	Total PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	Total PM2.5 (kgs/day)	Exhaust PM2.5 (kgs/day)	Fugitive Dust PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	2.8	22.4	28.3	19.5	1.3	18.2	5.0	1.2	3.8	4,656.5
Grading/Excavation	9.4	71.8	98.6	22.4	4.2	18.2	7.7	3.9	3.8	15,461.5
Drainage/Utilities/Sub-Grade	2.2	17.3	19.4	19.3	1.1	18.2	4.8	1.0	3.8	3,301.0
Paving	1.6	16.0	14.8	0.8	0.8	-	0.8	0.8	-	3,067.2
Maximum (kilograms/day)	9.4	71.8	98.6	22.4	4.2	18.2	7.7	3.9	3.8	15,461.5
Total (megagrams/construction project)	0.8	5.9	7.7	2.3	0.3	2.0	0.7	0.3	0.4	1,242.7

Notes:

Project Start Year ->	2021
Project Length (months) ->	6
Total Project Area (hectares) ->	8
Maximum Area Disturbed/Day (hectares) ->	2
Total Soil Imported/Exported ($meters^3$/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model

Version 7.1.5.1

Data Entry Worksheet

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a
yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

Input Type		
Project Name	Sac Bypass Widening: NEW LEVEE	
Construction Start Year	2021	Enter a Year between 2009 and 2025 (inclusive)
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	6.00	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	2.00	miles
Total Project Area	20.00	acres
Maximum Area Disturbed/Day	4.00	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported	0.00	yd^3/day
Soil Exported	0.00	yd^3/day
Average Truck Capacity	20	yd^3 (assume 20 if unknown)

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	0.50	0.60
Grading/Excavation	3.00	2.70
Drainage/Utilities/Sub-Grade	1.00	1.80
Paving	1.50	0.90
Totals	6.00	6.00

2005	%	2006	%	2007	%
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00

NOTE: soil hauling emissions are included in the Grading/Excavation Construction Period Phase, therefore the Construction Period for Grading/Excavation cannot be zero if hauling is part of the project.
Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values
User Input		
Miles/round trip		30
Round trips/day		0
Vehicle miles traveled/day (calculated)		0

Hauling Emissions	ROG	NOx	CO	PM10	PM2.5	CO2

Emission rate (grams/mile)	0.17	2.87	0.77	0.15	0.09	1551.98
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day	0.00	0.00	0.00	0.00	0.00	0.00
Tons per contruction period	0.00	0.00	0.00	0.00	0.00	0.00

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values
Miles/ one-way trip		20
One-way trips/day		2
No. of employees: Grubbing/Land Clearing		8
No. of employees: Grading/Excavation		20
No. of employees: Drainage/Utilities/Sub-Grade		18
No. of employees: Paving		14

	ROG	NOx	CO	PM10	PM2.5	CO2
Emission rate - Grubbing/Land Clearing (grams/mile)	0.101	0.120	1.122	0.047	0.020	441.814
Emission rate - Grading/Excavation (grams/mile)	0.101	0.120	1.122	0.047	0.020	441.814
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.101	0.120	1.122	0.047	0.020	441.814
Emission rate - Paving (grams/mile)	0.101	0.120	1.122	0.047	0.020	441.814
Emission rate - Grubbing/Land Clearing (grams/trip)	0.330	0.185	2.592	0.004	0.004	96.043
Emission rate - Grading/Excavation (grams/trip)	0.330	0.185	2.592	0.004	0.004	96.043
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.330	0.185	2.592	0.004	0.004	96.043
Emission rate - Paving (grams/trip)	0.330	0.185	2.592	0.004	0.004	96.043
Pounds per day - Grubbing/Land Clearing	0.077	0.085	0.827	0.031	0.013	295.121
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.005	0.000	0.000	1.623
Pounds per day - Grading/Excavation	0.207	0.227	2.205	0.083	0.035	786.989
Tons per const. Period - Grading/Excavation	0.007	0.007	0.073	0.003	0.001	25.971
Pounds per day - Drainage/Utilities/Sub-Grade	0.181	0.199	1.929	0.072	0.030	688.616
Tons per const. Period - Drain/Util/Sub-Grade	0.002	0.002	0.021	0.001	0.000	7.575
Pounds per day - Paving	0.142	0.156	1.516	0.057	0.024	541.055
Tons per const. Period - Paving	0.002	0.003	0.025	0.001	0.000	8.927
tons per construction period	0.012	0.013	0.124	0.005	0.002	44.096

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day
Grubbing/Land Clearing - Exhaust	2.00	1		40
Grading/Excavation - Exhaust	2.00	1		40
Drainage/Utilities/Subgrade	1.00	1		40

	ROG	NOx	CO	PM10	PM2.5	CO2
Emission rate - Grubbing/Land Clearing (grams/mile)	0.17	2.87	0.77	0.15	0.09	1551.98
Emission rate - Grading/Excavation (grams/mile)	0.17	2.87	0.77	0.15	0.09	1551.98
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.17	2.87	0.77	0.15	0.09	1551.98
Pounds per day - Grubbing/Land Clearing	0.03	0.51	0.14	0.03	0.02	273.48
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	1.50
Pound per day - Grading/Excavation	0.03	0.51	0.14	0.03	0.02	273.48
Tons per const. Period - Grading/Excavation	0.00	0.02	0.00	0.00	0.00	9.02

Pound per day - Drainage/Utilities/Subgrade	0.01	0.25	0.07	0.01	0.01	136.74	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	1.50	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		4	40.0	0.2	8.3	0.0
Fugitive Dust - Grading/Excavation		4	40.0	1.2	8.3	0.2
Fugitive Dust - Drainage/Utilities/Subgrade		4	40.0	0.8	8.3	0.2

Off-Road Equipment Emissions

Grubbing/Land Clearing Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	CO2 pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
	1	Crawler Tractors	0.71	5.58	8.52	0.32	0.30	1030.55
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
	1	Excavators	0.31	3.49	2.78	0.13	0.12	716.05
1.00		Forklifts	0.14	0.90	1.19	0.08	0.08	165.47
2.00		Generator Sets	0.72	7.21	6.36	0.35	0.32	1217.66
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Off-Highway Tractors	0.25	2.54	2.50	0.12	0.11	493.07
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Other Construction Equipment	0.54	4.49	5.40	0.28	0.26	817.30
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Scrapers	2.41	18.15	26.47	1.03	0.95	4021.92
0.00	4	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Tractors/Loaders/Backhoes	0.49	3.92	4.76	0.28	0.26	837.10
1.00		Trenchers	0.42	2.10	3.65	0.27	0.24	376.64

		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	6.0	48.4	61.6	2.9	2.6	9675.8
	Grubbing/Land Clearing	tons per phase	0.0	0.3	0.3	0.0	0.0	53.2

Grading/Excavation	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
	1	Crawler Tractors	0.71	5.58	8.52	0.32	0.30	1030.55
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
	3	Excavators	0.93	10.46	8.35	0.40	0.37	2148.15
1.00		Forklifts	0.14	0.90	1.19	0.08	0.08	165.47
2.00		Generator Sets	0.72	7.21	6.36	0.35	0.32	1217.66
	1	Graders	0.83	4.33	7.61	0.42	0.39	833.84
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Other Construction Equipment	0.54	4.49	5.40	0.28	0.26	817.30
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Plate Compactors	0.04	0.21	0.25	0.01	0.01	34.45
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
3.00	2	Rollers	0.74	5.66	7.16	0.44	0.40	1048.10
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Rubber Tired Dozers	1.83	8.83	18.08	0.83	0.76	1888.37
3.00	1	Rubber Tired Loaders	1.06	9.34	11.45	0.38	0.35	1987.16
10.00	2	Scrapers	12.03	90.73	132.35	5.15	4.74	20109.62
0.00	4	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
4.00	2	Tractors/Loaders/Backhoes	0.98	7.84	9.52	0.56	0.52	1674.19
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	20.6	155.6	216.3	9.2	8.5	32954.9
	Grading	tons per phase	0.7	5.1	7.1	0.3	0.3	1087.5

Drainage/Utilities/Subgrade	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
	1	Air Compressors	0.41	3.28	2.83	0.18	0.16	507.95
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00

		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Concrete/Industrial Saws	0.30	2.90	2.40	0.14	0.13	467.14
1.00		Cranes	0.42	3.00	4.71	0.19	0.18	601.63
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Forklifts	0.14	0.90	1.19	0.08	0.08	165.47
2.00	1	Generator Sets	0.72	7.21	6.36	0.35	0.32	1217.66
	1	Graders	0.83	4.33	7.61	0.42	0.39	833.84
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Other Construction Equipment	0.54	4.49	5.40	0.28	0.26	817.30
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
	1	Plate Compactors	0.04	0.21	0.25	0.01	0.01	34.45
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
	1	Rough Terrain Forklifts	0.13	2.03	1.63	0.06	0.06	372.90
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	4	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
2.00	2	Tractors/Loaders/Backhoes	0.49	3.92	4.76	0.28	0.26	837.10
1.00		Trenchers	0.42	2.10	3.65	0.27	0.24	376.64
1.00		Welders	0.31	1.70	1.51	0.08	0.07	204.74
	Drainage	pounds per day	4.7	36.1	42.3	2.3	2.2	6436.8
	Drainage	tons per phase	0.1	0.4	0.5	0.0	0.0	70.8

Paving	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Cement and Mortar Mixers	0.07	0.35	0.42	0.02	0.02	57.88
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Generator Sets	0.72	7.21	6.36	0.35	0.32	1217.66
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00

		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Other Material Handling Equipment	0.38	3.97	3.27	0.17	0.15	760.75
	1	Pavers	0.31	3.55	3.10	0.15	0.14	602.27
	1	Paving Equipment	0.24	3.37	2.37	0.12	0.11	532.69
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
	3	Rollers	0.74	5.66	7.16	0.44	0.40	1048.10
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	4	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Surfacing Equipment	0.25	4.18	2.95	0.11	0.10	880.33
1.00		Sweepers/Scrubbers	0.24	1.57	2.04	0.15	0.14	270.09
	2	Tractors/Loaders/Backhoes	0.49	3.92	4.76	0.28	0.26	837.10
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	3.4	33.8	32.4	1.8	1.6	6206.9
	Paving	tons per phase	0.1	0.6	0.5	0.0	0.0	102.4
Total Emissions all Phases (tons per construction period) =>			0.8	6.4	8.5	0.4	0.3	1313.9

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment		Default Values Horsepower		Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		106		8
Bore/Drill Rigs		206		8
Cement and Mortar Mixers		10		8
Concrete/Industrial Saws		64		8
Cranes		226		8
Crawler Tractors		208	10.00	8
Crushing/Proc. Equipment		142		8
Excavators		163	10.00	8
Forklifts		89		8
Generator Sets		66	10.00	8
Graders		175	10.00	8
Off-Highway Tractors		123		8
Off-Highway Trucks		400		8
Other Construction Equipment		172	10.00	8
Other General Industrial Equipment		88	10.00	8
Other Material Handling Equipment		167	10.00	8
Pavers		126	10.00	8
Paving Equipment		131	10.00	8
Plate Compactors		8		8
Pressure Washers		26		8

Pumps		53		8
Rollers		81	10.00	8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		255		8
Rubber Tired Loaders		200		8
Scrapers		362	10.00	8
Signal Boards		20		8
Skid Steer Loaders		65		8
Surfacing Equipment		254	10.00	8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		98	10.00	8
Trenchers		81		8
Welders		45		8

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.5.1

Emission Estimates for -> Sac Bypass Widening: WEIR ONLY Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	7.0	55.3	66.7	43.2	3.2	40.0	11.2	2.9	8.3	11,096.6
Grading/Excavation	13.8	114.4	129.7	46.1	6.1	40.0	13.8	5.5	8.3	23,724.5
Drainage/Utilities/Sub-Grade	3.3	27.5	26.6	41.5	1.5	40.0	9.6	1.3	8.3	5,330.0
Paving	3.9	39.7	34.1	1.7	1.7	-	1.6	1.6	-	7,332.4
Maximum (pounds/day)	13.8	114.4	129.7	46.1	6.1	40.0	13.8	5.5	8.3	23,724.5
Total (tons/construction project)	0.7	5.9	6.6	2.5	0.3	2.2	0.7	0.3	0.5	1,214.9

Notes:

Project Start Year ->	2022
Project Length (months) ->	6
Total Project Area (acres) ->	10
Maximum Area Disturbed/Day (acres) ->	4
Total Soil Imported/Exported (yd^3/day)->	120

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Sac Bypass Widening: WEIR ONLY Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	Total PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	Total PM2.5 (kgs/day)	Exhaust PM2.5 (kgs/day)	Fugitive Dust PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	3.2	25.1	30.3	19.6	1.5	18.2	5.1	1.3	3.8	5,043.9
Grading/Excavation	6.3	52.0	59.0	20.9	2.8	18.2	6.3	2.5	3.8	10,783.9
Drainage/Utilities/Sub-Grade	1.5	12.5	12.1	18.8	0.7	18.2	4.4	0.6	3.8	2,422.7
Paving	1.8	18.1	15.5	0.8	0.8	-	0.7	0.7	-	3,332.9
Maximum (kilograms/day)	6.3	52.0	59.0	20.9	2.8	18.2	6.3	2.5	3.8	10,783.9
Total (megagrams/construction project)	0.6	5.4	6.0	2.3	0.3	2.0	0.7	0.3	0.4	1,101.9

Notes:

Project Start Year ->	2022
Project Length (months) ->	6
Total Project Area (hectares) ->	4
Maximum Area Disturbed/Day (hectares) ->	2
Total Soil Imported/Exported ($meters^3$/day)->	92

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model

Version 7.1.5.1

Data Entry Worksheet

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Input Type		
Project Name	Sac Bypass Widening: WEIR ONLY	
Construction Start Year	2022	Enter a Year between 2009 and 2025 (inclusive)
Project Type	3	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	6.00	months
Predominant Soil/Site Type. Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	0.30	miles
Total Project Area	10.00	acres
Maximum Area Disturbed/Day	4.00	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported	100.00	yd^3/day
Soil Exported	20.00	yd^3/day
Average Truck Capacity	20	yd^3 (assume 20 if unknown)

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months	2005	%	2006	%	2007	%
Grubbing/Land Clearing	0.50	0.60	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation	4.00	2.70	0.00	0.00	0.00	0.00	0.00	0.00
Drainage/Utilities/Sub-Grade	0.50	1.80	0.00	0.00	0.00	0.00	0.00	0.00
Paving	1.00	0.90	0.00	0.00	0.00	0.00	0.00	0.00
Totals	6.00	6.00						

NOTE: soil hauling emissions are included in the Grading/Excavation Construction Period Phase, therefore the Construction Period for Grading/Excavation cannot be zero if hauling is part of the project.

Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values
User Input		
Miles/round trip	30.00	30
Round trips/day		6
Vehicle miles traveled/day (calculated)		180

Hauling Emissions	ROG	NOx	CO	PM10	PM2.5	CO2
Emission rate (grams/mile)	0.18	1.77	0.83	0.15	0.08	1546.69
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day	0.07	0.70	0.33	0.06	0.03	613.23
Tons per contruction period	0.00	0.03	0.01	0.00	0.00	26.98

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values
Miles/ one-way trip		20
One-way trips/day		2
No. of employees: Grubbing/Land Clearing		5
No. of employees: Grading/Excavation		28
No. of employees: Drainage/Utilities/Sub-Grade		18
No. of employees: Paving		8

	ROG	NOx	CO	PM10	PM2.5	CO2
Emission rate - Grubbing/Land Clearing (grams/mile)	0.097	0.112	1.056	0.047	0.020	441.772
Emission rate - Grading/Excavation (grams/mile)	0.097	0.112	1.056	0.047	0.020	441.772
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.097	0.112	1.056	0.047	0.020	441.772
Emission rate - Paving (grams/mile)	0.097	0.112	1.056	0.047	0.020	441.772
Emission rate - Grubbing/Land Clearing (grams/trip)	0.310	0.168	2.386	0.004	0.004	96.127
Emission rate - Grading/Excavation (grams/trip)	0.310	0.168	2.386	0.004	0.004	96.127
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.310	0.168	2.386	0.004	0.004	96.127
Emission rate - Paving (grams/trip)	0.310	0.168	2.386	0.004	0.004	96.127
Pounds per day - Grubbing/Land Clearing	0.049	0.053	0.518	0.021	0.009	196.730
Tons per const. Period - Grub/Land Clear	0.000	0.000	0.003	0.000	0.000	1.082
Pounds per day - Grading/Excavation	0.272	0.291	2.848	0.114	0.048	1082.017
Tons per const. Period - Grading/Excavation	0.012	0.013	0.125	0.005	0.002	47.609
Pounds per day - Drainage/Utilities/Sub-Grade	0.173	0.185	1.813	0.072	0.030	688.556
Tons per const. Period - Drain/Util/Sub-Grade	0.001	0.001	0.010	0.000	0.000	3.787
Pounds per day - Paving	0.074	0.079	0.777	0.031	0.013	295.096
Tons per const. Period - Paving	0.001	0.001	0.009	0.000	0.000	3.246
tons per construction period	0.014	0.015	0.147	0.006	0.002	55.724

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day
Grubbing/Land Clearing - Exhaust	1.00	1		40
Grading/Excavation - Exhaust	1.00	1		40
Drainage/Utilities/Subgrade	1.00	1		40

	ROG	NOx	CO	PM10	PM2.5	CO2
Emission rate - Grubbing/Land Clearing (grams/mile)	0.18	1.77	0.83	0.15	0.08	1546.69
Emission rate - Grading/Excavation (grams/mile)	0.18	1.77	0.83	0.15	0.08	1546.69
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.18	1.77	0.83	0.15	0.08	1546.69
Pounds per day - Grubbing/Land Clearing	0.02	0.16	0.07	0.01	0.01	136.27
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	0.75
Pound per day - Grading/Excavation	0.02	0.16	0.07	0.01	0.01	136.27
Tons per const. Period - Grading/Excavation	0.00	0.01	0.00	0.00	0.00	6.00
Pound per day - Drainage/Utilities/Subgrade	0.02	0.16	0.07	0.01	0.01	136.27
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	0.75

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		4	40.0	0.2	8.3	0.0
Fugitive Dust - Grading/Excavation		4	40.0	1.2	8.3	0.2
Fugitive Dust - Drainage/Utilities/Subgrade		4	40.0	0.8	8.3	0.2

Off-Road Equipment Emissions

Grubbing/Land Clearing Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	CO2 pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Concrete/Industrial Saws	0.28	2.89	2.21	0.12	0.11	467.14
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
	1	Crawler Tractors	0.63	5.57	7.35	0.28	0.26	1028.75
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
1.00	2	Excavators	0.27	3.48	2.30	0.11	0.10	715.80
1.00		Forklifts	0.12	0.90	1.06	0.07	0.06	165.47
2.00		Generator Sets	0.67	7.20	5.90	0.31	0.28	1217.66
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Other Construction Equipment	0.49	4.49	4.70	0.25	0.23	817.03
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Other Material Handling Equipment	0.34	3.97	2.75	0.15	0.14	760.75
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Rubber Tired Dozers	2.21	11.05	21.39	0.98	0.90	2362.06
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Scrapers	1.06	9.09	11.06	0.43	0.40	2014.23
0.00	1	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Tractors/Loaders/Backhoes	0.43	3.92	4.21	0.23	0.21	838.04
1.00		Trenchers	0.40	2.10	3.51	0.25	0.23	376.67
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	6.9	54.7	66.4	3.2	2.9	10763.6
	Grubbing/Land Clearing	tons per phase	0.0	0.3	0.4	0.0	0.0	59.2

Grading/Excavation	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
5.00		Cement and Mortar Mixers	0.42	2.21	2.64	0.10	0.09	361.76
1.00		Concrete/Industrial Saws	0.28	2.89	2.21	0.12	0.11	467.14
	1	Cranes	0.38	3.00	4.07	0.17	0.16	601.73
	2	Crawler Tractors	1.26	11.15	14.70	0.55	0.51	2057.50
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
	4	Excavators	1.10	13.94	9.18	0.44	0.41	2863.19
1.00		Forklifts	0.12	0.90	1.06	0.07	0.06	165.47
2.00		Generator Sets	0.67	7.20	5.90	0.31	0.28	1217.66
	2	Graders	1.45	8.65	12.98	0.72	0.66	1667.81
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Other Construction Equipment	0.49	4.49	4.70	0.25	0.23	817.03
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Plate Compactors	0.04	0.21	0.25	0.01	0.01	34.45
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Pumps	0.23	2.38	1.95	0.10	0.10	396.14
2.00	3	Rollers	0.43	3.77	4.28	0.25	0.23	698.78
2.00		Rough Terrain Forklifts	0.24	4.06	2.99	0.10	0.10	745.77
2.00		Rubber Tired Dozers	2.21	11.05	21.39	0.98	0.90	2362.06
3.00	3	Rubber Tired Loaders	0.90	9.35	8.97	0.30	0.28	1988.60
2.00	4	Scrapers	2.12	18.18	22.12	0.86	0.79	4028.45
0.00	1	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
	2	Tractors/Loaders/Backhoes	0.43	3.92	4.21	0.23	0.21	838.04
1.00		Trenchers	0.40	2.10	3.51	0.25	0.23	376.67
1.00		Welders	0.28	1.68	1.47	0.07	0.06	204.74
	Grading/Excavation	pounds per day	13.4	111.1	128.6	5.9	5.4	21893.0
	Grading	tons per phase	0.6	4.9	5.7	0.3	0.2	963.3

Drainage/Utilities/Subgrade Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*		ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	CO2 pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
	1	Air Compressors	0.38	3.28	2.62	0.16	0.14	507.95
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
5.00		Cement and Mortar Mixers	0.42	2.21	2.64	0.10	0.09	361.76
1.00		Concrete/Industrial Saws	0.28	2.89	2.21	0.12	0.11	467.14
1.00		Cranes	0.38	3.00	4.07	0.17	0.16	601.73
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Forklifts	0.12	0.90	1.06	0.07	0.06	165.47
	1	Generator Sets	0.33	3.60	2.95	0.15	0.14	608.83
0.00	2	Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
	1	Rough Terrain Forklifts	0.12	2.03	1.49	0.05	0.05	372.88
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
0.00	4	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
2.00	2	Tractors/Loaders/Backhoes	0.43	3.92	4.21	0.23	0.21	838.04
1.00		Trenchers	0.40	2.10	3.51	0.25	0.23	376.67
1.00		Welders	0.28	1.68	1.47	0.07	0.06	204.74
	Drainage	pounds per day	3.1	25.6	26.2	1.4	1.3	4505.2
	Drainage	tons per phase	0.0	0.1	0.1	0.0	0.0	24.8

Paving	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
5.00		Cement and Mortar Mixers	0.42	2.21	2.64	0.10	0.09	361.76
1.00		Concrete/Industrial Saws	0.28	2.89	2.21	0.12	0.11	467.14
1.00		Cranes	0.38	3.00	4.07	0.17	0.16	601.73
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Generator Sets	0.67	7.20	5.90	0.31	0.28	1217.66
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Other Material Handling Equipment	0.34	3.97	2.75	0.15	0.14	760.75
1.00	1	Pavers	0.26	3.55	2.51	0.12	0.11	602.53
	1	Paving Equipment	0.23	3.37	2.12	0.10	0.10	532.71
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
	1	Rollers	0.22	1.89	2.14	0.12	0.11	349.39
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
	1	Signal Boards	0.18	1.20	1.07	0.04	0.04	157.43
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Surfacing Equipment	0.23	4.17	2.62	0.10	0.09	878.04
1.00		Sweepers/Scrubbers	0.20	1.57	1.79	0.12	0.11	270.09
	2	Tractors/Loaders/Backhoes	0.43	3.92	4.21	0.23	0.21	838.04
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	3.8	38.9	34.0	1.7	1.5	7037.3
	Paving	tons per phase	0.0	0.4	0.4	0.0	0.0	77.4
Total Emissions all Phases (tons per construction period) =>			0.7	5.8	6.5	0.3	0.3	1124.7

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment		Default Values Horsepower		Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		106		8
Bore/Drill Rigs		206		8
Cement and Mortar Mixers		10	10.00	8
Concrete/Industrial Saws		64		8
Cranes		226		8
Crawler Tractors		208	10.00	8
Crushing/Proc. Equipment		142		8
Excavators		163	10.00	8
Forklifts		89		8
Generator Sets		66	10.00	8
Graders		175	10.00	8
Off-Highway Tractors		123		8
Off-Highway Trucks		400		8
Other Construction Equipment		172	10.00	8
Other General Industrial Equipment		88	10.00	8
Other Material Handling Equipment		167	10.00	8
Pavers		126	10.00	8
Paving Equipment		131	10.00	8
Plate Compactors		8		8
Pressure Washers		26		8
Pumps		53		8
Rollers		81	10.00	8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		255	10.00	8
Rubber Tired Loaders		200		8
Scrapers		362	10.00	8
Signal Boards		20		8
Skid Steer Loaders		65		8
Surfacing Equipment		254	10.00	8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		98	10.00	8
Trenchers		81		8
Welders		45		8

END OF DATA ENTRY SHEET

Road Construction Emissions Model, Version 7.1.5.1

Emission Estimates for -> Sac Bypass Widening, BYPASS Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	6.1	60.4	56.6	42.7	2.7	40.0	10.7	2.4	8.3	12,519.5
Grading/Excavation	30.3	271.8	297.2	52.4	12.4	40.0	19.7	11.3	8.3	58,683.4
Drainage/Utilities/Sub-Grade	5.0	44.7	43.3	42.2	2.2	40.0	10.3	2.0	8.3	9,199.0
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	30.3	271.8	297.2	52.4	12.4	40.0	19.7	11.3	8.3	58,683.4
Total (tons/construction project)	1.5	13.1	14.2	3.0	0.6	2.4	1.1	0.5	0.5	2,821.0

Notes:	
Project Start Year ->	2023
Project Length (months) ->	6
Total Project Area (acres) ->	320
Maximum Area Disturbed/Day (acres) ->	4
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Sac Bypass Widening, BYPASS Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	Total PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	Total PM2.5 (kgs/day)	Exhaust PM2.5 (kgs/day)	Fugitive Dust PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	2.8	27.4	25.7	19.4	1.2	18.2	4.9	1.1	3.8	5,690.7
Grading/Excavation	13.8	123.6	135.1	23.8	5.6	18.2	8.9	5.2	3.8	26,674.3
Drainage/Utilities/Sub-Grade	2.3	20.3	19.7	19.2	1.0	18.2	4.7	0.9	3.8	4,181.4
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	13.8	123.6	135.1	23.8	5.6	18.2	8.9	5.2	3.8	26,674.3
Total (megagrams/construction project)	1.3	11.9	12.9	2.7	0.5	2.2	1.0	0.5	0.5	2,558.7

Notes:	
Project Start Year ->	2023
Project Length (months) ->	6
Total Project Area (hectares) ->	130
Maximum Area Disturbed/Day (hectares) ->	2
Total Soil Imported/Exported (meters ^{3}/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model
Data Entry Worksheet

Version 7.1.5.1

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C25.

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

Input Type

Project Name	Sac Bypass Widening: BYPASS	
Construction Start Year	2023	Enter a Year between 2009 and 2025 (inclusive)
Project Type	2	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	6.00	months
Predominant Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
Project Length	4.00	miles
Total Project Area	320.00	acres
Maximum Area Disturbed/Day	4.00	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported	0.00	yd^3/day
Soil Exported	0.00	yd^3/day
Average Truck Capacity	20	yd^3 (assume 20 if unknown)

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C34 through C37.

Construction Periods	User Override of Construction Months	Program Calculated Months
Grubbing/Land Clearing	1.00	0.60
Grading/Excavation	4.00	2.70
Drainage/Utilities/Sub-Grade	1.00	1.80
Paving	0.00	0.90
Totals	6.00	6.00

2005	%	2006	%	2007	%
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00

NOTE: soil hauling emissions are included in the Grading/Excavation Construction Period Phase, therefore the Construction Period for Grading/Excavation cannot be zero if hauling is part of the project.
Hauling emission default values can be overridden in cells C45 through C46.

Soil Hauling Emissions	User Override of Soil Hauling Defaults	Default Values
User Input		
Miles/round trip		30
Round trips/day		0
Vehicle miles traveled/day (calculated)		0

Hauling Emissions	ROG	NOx	CO	PM10	PM2.5	CO2

Emission rate (grams/mile)	0.17	1.35	0.77	0.15	0.08	1541.90
Emission rate (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day	0.00	0.00	0.00	0.00	0.00	0.00
Tons per contruction period	0.00	0.00	0.00	0.00	0.00	0.00

Worker commute default values can be overridden in cells C60 through C65.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values
Miles/ one-way trip		20
One-way trips/day		2
No. of employees: Grubbing/Land Clearing		14
No. of employees: Grading/Excavation		29
No. of employees: Drainage/Utilities/Sub-Grade		23
No. of employees: Paving		19

	ROG	NOx	CO	PM10	PM2.5	CO2
Emission rate - Grubbing/Land Clearing (grams/mile)	0.093	0.105	0.999	0.047	0.020	441.716
Emission rate - Grading/Excavation (grams/mile)	0.093	0.105	0.999	0.047	0.020	441.716
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.093	0.105	0.999	0.047	0.020	441.716
Emission rate - Paving (grams/mile)	0.000	0.000	0.000	0.000	0.000	0.000
Emission rate - Grubbing/Land Clearing (grams/trip)	0.292	0.154	2.207	0.004	0.004	96.196
Emission rate - Grading/Excavation (grams/trip)	0.292	0.154	2.207	0.004	0.004	96.196
Emission rate - Draining/Utilities/Sub-Grade (gr/trip)	0.292	0.154	2.207	0.004	0.004	96.196
Emission rate - Paving (grams/trip)	0.000	0.000	0.000	0.000	0.000	0.000
Pounds per day - Grubbing/Land Clearing	0.130	0.137	1.344	0.057	0.024	540.946
Tons per const. Period - Grub/Land Clear	0.001	0.002	0.015	0.001	0.000	5.950
Pounds per day - Grading/Excavation	0.272	0.285	2.810	0.119	0.050	1131.069
Tons per const. Period - Grading/Excavation	0.012	0.013	0.124	0.005	0.002	49.767
Pounds per day - Drainage/Utilities/Sub-Grade	0.213	0.223	2.199	0.093	0.039	885.184
Tons per const. Period - Drain/Util/Sub-Grade	0.002	0.002	0.024	0.001	0.000	9.737
Pounds per day - Paving	0.000	0.000	0.000	0.000	0.000	0.000
Tons per const. Period - Paving	0.000	0.000	0.000	0.000	0.000	0.000
tons per construction period	0.016	0.017	0.163	0.007	0.003	65.454

Water truck default values can be overriden in cells C91 through C93 and E91 through E93.

Water Truck Emissions	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Miles Traveled/Day	Default Values Miles Traveled/Day
Grubbing/Land Clearing - Exhaust	2.00	1		40
Grading/Excavation - Exhaust	2.00	1		40
Drainage/Utilities/Subgrade	2.00	1		40

	ROG	NOx	CO	PM10	PM2.5	CO2
Emission rate - Grubbing/Land Clearing (grams/mile)	0.17	1.35	0.77	0.15	0.08	1541.90
Emission rate - Grading/Excavation (grams/mile)	0.17	1.35	0.77	0.15	0.08	1541.90
Emission rate - Draining/Utilities/Sub-Grade (gr/mile)	0.17	1.35	0.77	0.15	0.08	1541.90
Pounds per day - Grubbing/Land Clearing	0.03	0.24	0.14	0.03	0.01	271.70
Tons per const. Period - Grub/Land Clear	0.00	0.00	0.00	0.00	0.00	2.99
Pound per day - Grading/Excavation	0.03	0.24	0.14	0.03	0.01	271.70
Tons per const. Period - Grading/Excavation	0.00	0.01	0.01	0.00	0.00	11.95

Pound per day - Drainage/Utilities/Subgrade	0.03	0.24	0.14	0.03	0.01	271.70	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.00	0.00	0.00	0.00	2.99	

Fugitive dust default values can be overridden in cells C110 through C112.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		4	40.0	0.4	8.3	0.1
Fugitive Dust - Grading/Excavation		4	40.0	1.2	8.3	0.2
Fugitive Dust - Drainage/Utilities/Subgrade		4	40.0	0.8	8.3	0.2

Off-Road Equipment Emissions

Grubbing/Land Clearing Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	CO2 pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
	1	Crawler Tractors	0.57	5.57	6.27	0.24	0.22	1027.72
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
	2	Excavators	0.51	6.97	4.00	0.20	0.18	1431.85
1.00		Forklifts	0.11	0.90	0.97	0.06	0.06	165.47
2.00		Generator Sets	0.62	7.18	5.49	0.27	0.25	1217.66
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Off-Highway Tractors	0.40	5.07	3.36	0.16	0.15	986.29
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Other Construction Equipment	0.90	8.98	8.47	0.44	0.41	1633.88
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Scrapers	2.04	18.17	20.49	0.80	0.74	4028.00
0.00	8	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Tractors/Loaders/Backhoes	0.40	3.93	3.86	0.19	0.18	838.98
1.00		Trenchers	0.38	2.10	3.36	0.23	0.21	376.96

		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grubbing/Land Clearing	pounds per day	5.9	58.9	56.3	2.6	2.4	11706.8
	Grubbing/Land Clearing	tons per phase	0.1	0.6	0.6	0.0	0.0	128.8

Grading/Excavation	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
	0	Cranes	0.00	0.00	0.00	0.00	0.00	0.00
4.00	1	Crawler Tractors	2.27	22.27	25.08	0.97	0.89	4110.89
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
	3	Excavators	0.77	10.46	6.00	0.29	0.27	2147.78
2.00		Forklifts	0.22	1.80	1.94	0.12	0.11	330.93
2.00		Generator Sets	0.62	7.18	5.49	0.27	0.25	1217.66
	2	Graders	1.28	8.65	11.16	0.61	0.57	1667.45
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Other Construction Equipment	0.45	4.49	4.24	0.22	0.20	816.94
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Plate Compactors	0.04	0.21	0.25	0.01	0.01	34.45
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
4.00	2	Rollers	0.64	6.04	6.39	0.35	0.32	1118.06
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
2.00		Rubber Tired Dozers	1.66	8.84	15.69	0.72	0.66	1890.27
3.00	1	Rubber Tired Loaders	0.84	9.35	7.87	0.26	0.24	1988.26
20.00	2	Scrapers	20.36	181.73	204.86	8.03	7.39	40279.99
0.00	8	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
	4	Tractors/Loaders/Backhoes	0.80	7.86	7.71	0.38	0.35	1677.96
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day	30.0	268.9	296.7	12.2	11.3	57280.6
	Grading	tons per phase	1.3	11.8	13.1	0.5	0.5	2520.3

Drainage/Utilities/Subgrade	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
	1	Air Compressors	0.36	3.27	2.43	0.14	0.13	507.95
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00

1.00		Cement and Mortar Mixers	0.07	0.35	0.42	0.02	0.02	57.88
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Cranes	0.36	3.00	3.71	0.15	0.14	601.71
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
1.00		Forklifts	0.11	0.90	0.97	0.06	0.06	165.47
2.00	1	Generator Sets	0.62	7.18	5.49	0.27	0.25	1217.66
	1	Graders	0.64	4.33	5.58	0.31	0.28	833.72
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00
		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
	1	Plate Compactors	0.04	0.21	0.25	0.01	0.01	34.45
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
	1	Pumps	0.22	2.37	1.81	0.09	0.08	396.14
		Rollers	0.00	0.00	0.00	0.00	0.00	0.00
	1	Rough Terrain Forklifts	0.11	2.03	1.41	0.05	0.04	372.94
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
	1	Scrapers	1.02	9.09	10.24	0.40	0.37	2014.00
0.00	8	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
	3	Tractors/Loaders/Backhoes	0.60	5.89	5.78	0.29	0.26	1258.47
1.00		Trenchers	0.38	2.10	3.36	0.23	0.21	376.96
1.00		Welders	0.26	1.67	1.43	0.06	0.05	204.74
	Drainage	pounds per day	4.8	42.4	42.9	2.1	1.9	8042.1
	Drainage	tons per phase	0.1	0.5	0.5	0.0	0.0	88.5

Paving	Default Number of Vehicles		ROG	CO	NOx	PM10	PM2.5	CO2
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
		Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00
		Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00
		Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Excavators	0.00	0.00	0.00	0.00	0.00	0.00
		Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00
		Graders	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00

		Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other General Industrial Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Other Material Handling Equipment	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Pavers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00
		Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00
		Pumps	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2	Rollers	0.00	0.00	0.00	0.00	0.00	0.00
		Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00
		Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Scrapers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	8	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00
		Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3	Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00	0.00	0.00
		Welders	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	pounds per day	0.0	0.0	0.0	0.0	0.0	0.0
	Paving	tons per phase	0.0	0.0	0.0	0.0	0.0	0.0
Total Emissions all Phases (tons per construction period) =>			1.4	12.9	14.1	0.6	0.5	2737.6

Equipment default values for horsepower and hours/day can be overridden in cells C289 through C322 and E289 through E322.

Equipment		Default Values Horsepower		Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		106		8
Bore/Drill Rigs		206		8
Cement and Mortar Mixers		10		8
Concrete/Industrial Saws		64		8
Cranes		226		8
Crawler Tractors		208	10.00	8
Crushing/Proc. Equipment		142		8
Excavators		163	10.00	8
Forklifts		89		8
Generator Sets		66	10.00	8
Graders		175	10.00	8
Off-Highway Tractors		123		8
Off-Highway Trucks		400		8
Other Construction Equipment		172	10.00	8
Other General Industrial Equipment		88	10.00	8
Other Material Handling Equipment		167	10.00	8
Pavers		126	10.00	8
Paving Equipment		131	10.00	8
Plate Compactors		8		8
Pressure Washers		26		8

Pumps		53		8
Rollers		81		8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		255		8
Rubber Tired Loaders		200		8
Scrapers		362	10.00	8
Signal Boards		20		8
Skid Steer Loaders		65		8
Surfacing Equipment		254	10.00	8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		98	10.00	8
Trenchers		81		8
Welders		45		8

END OF DATA ENTRY SHEET

FOR CONTINUATION OF HOUSE DOCUMENT 114-169

AMERICAN RIVER WATERSHED COMMON FEATURES
GENERAL REEVALUATION REPORT

SEE PART 3