FOLSOM DAM RAISE PROJECT

DRAFT SUPPLEMENTAL
ENVIRONMENTAL IMPACT STATEMENT / ENVIRONMENTAL IMPACT REPORT

July 2016

State Clearinghouse SCH # 2006022091

US Army Corps of Engineers

U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION

SAFCA Sacramento Area Flood Control Agency

CENTRAL VALLEY FLOOD PROTECTION BOARD PUBLIC SAFETY AND FLOOD MANAGEMENT STATE OF CALIFORNIA

Abstract

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Type of Statement: Draft Supplemental Environmental Impact Statement/Environmental Impact Report (DSEIS/SEIR)

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

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

Cooperating Agency: U.S. Bureau of Reclamation

Abstract: The Corps and its non-Federal partners, the CVFPB and SAFCA, propose to provide flood risk management and increased flood protection to the Sacramento metropolitan area by constructing a 3.5-foot combination earthen raise and reinforced concrete flood wall for Folsom dams and reservoir dikes while implementing refinements to existing emergency spillway tainter gates. This draft DSEIS/SEIR evaluates the direct, indirect, and cumulative effects on environmental resources from alternative plans and identifies avoidance, minimization, and mitigation measures. The project is not expected to cause substantial loss, degradation or fragmentation of any natural communities or wildlife habitat – most potential adverse effects would be short-term, reduced, or avoided when conducted with best management practices (e.g. air quality, recreation, and noise impacts). The proposed project alternatives are evaluated and include mitigation measures to reduce, minimize, or avoid, where feasible, any significant and potentially significant adverse impacts.

Public Review and Comment: The 45 day public review period would begin on July 19, 2016, and the official closing date for receipt of comments on the draft DSEIS/SEIR would be September 1, 2016. All comments received would be considered and, as appropriate, incorporated into the final SEIS/SEIR. Written comments or questions concerning this document should be directed to the following: U.S. Army Corps of Engineers, Sacramento District; Attn: Ms. Mariah Brumbaugh.

EXECUTIVE SUMMARY

ES.1 PURPOSE OF THE DSEIS/SEIR

This draft Supplemental Environmental Impact Statement/Environmental Impact Report (DSEIS/SEIR) has been 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), for the Folsom Dam Raise Project. The Folsom Dam Raise proposed action is a cooperative effort between the Corps, the U.S. Bureau of Reclamation (USBR), the Sacramento Area Flood Control Agency (SAFCA), and the CVFPB, through the California Department of Water Resources (DWR).

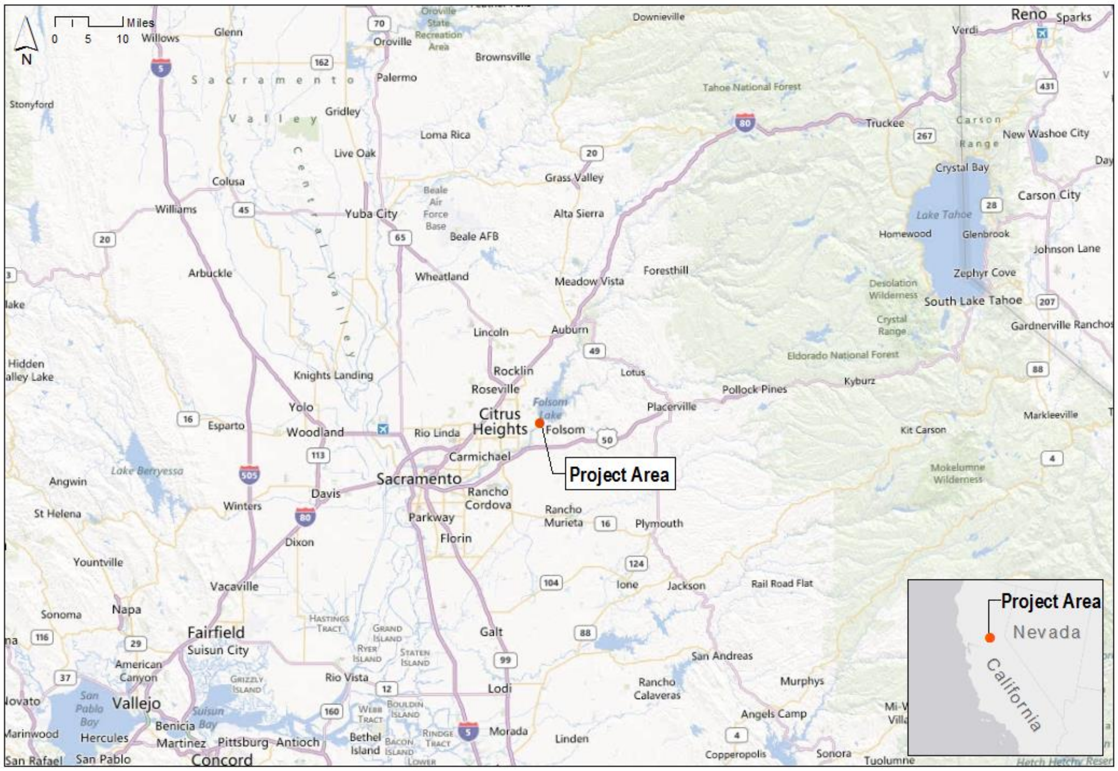
The Folsom Dam Raise Project, along with the Folsom Modifications Project, was reevaluated together in the Post Authorization Change Report (PACR) for the American River Watershed Project dated March 2007. This report resulted in the recommendation of a JFP auxiliary spillway at the Folsom Dam – to be constructed jointly with the USBR – as well as a 3.5-foot combination earthen raise and concrete floodwall construction on the dams and reservoir dikes, refinements to existing emergency and service spillway tainter gates, and three ecosystem restoration projects (design of this phase of the project would begin after construction of the dam raise features). After the authorization of emergency spillway gate work in the 2007 PACR, Reclamation completed structural improvements to the existing service and emergency tainter gates, as well as the spillway piers in 2011. Due to these improvements, emergency gate refinements have been developed in lieu of complete gate replacement – this resulted in the development of an Engineering Documentation Report (EDR) in 2013 to support a variation to the emergency spillway gate replacement concept. In addition, a series of Design Documentation Reports (DDRs) are being developed to determine the designs for increasing the height of Folsom dikes and dams by 3.5 feet – it is anticipated the DDRs for all of the engineering designs would be completed by the end of 2019.

This DSEIS/SEIR examines the impacts of proposed construction of the Spillway Gate Modification (Tainter Gate) and Combination Earthen Raise/Concrete Floodwall. The 3.5-foot raise was not fully designed in the 2007 PACR, nor was a full environmental analysis completed in the associated 2007 Folsom Dam Safety/Flood Damage Reduction DSEIS/SEIR (Folsom DS/FDR/EIS/EIR). Consequently, additional design documentation was determined to be necessary and this Folsom Dam Raise DSEIS/SEIR is being prepared to fully disclose revised project alternatives and updated project-related effects.

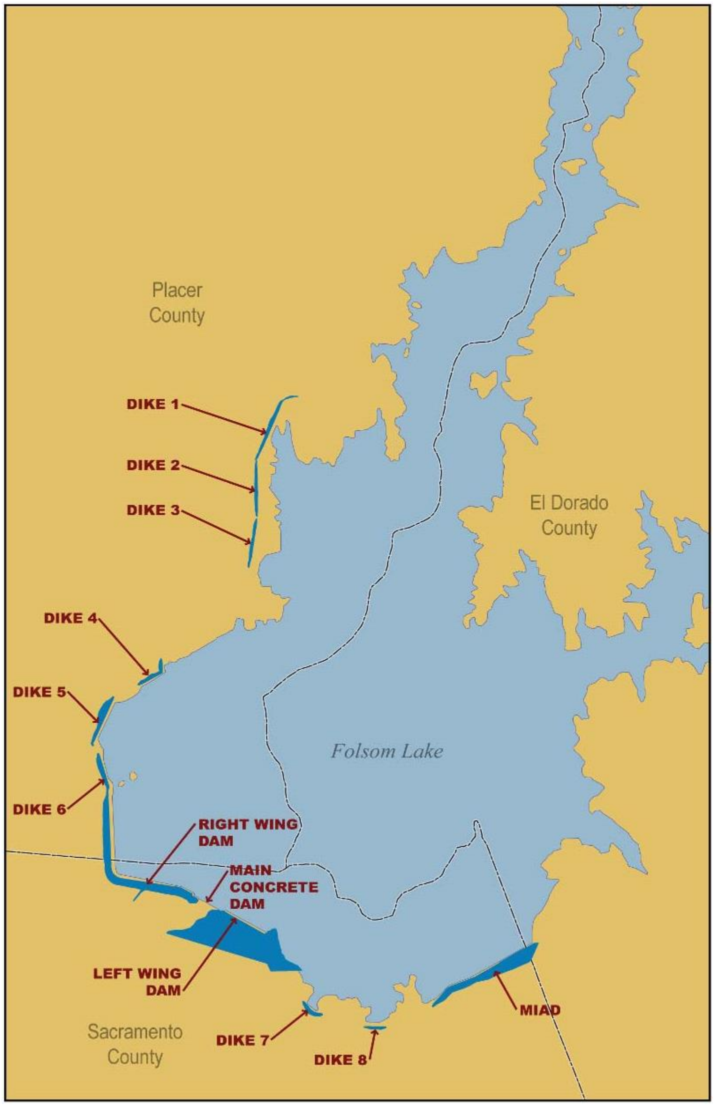
ES.2 PROJECT AREA

The project is located in the area surrounding Folsom Lake that falls within the Counties of Placer, El Dorado, and Sacramento – Folsom Dam and its associated facilities are located 23 miles northeast of the city of Sacramento. The Folsom Dam and Reservoir (Folsom Lake) are located downstream from the north and south forks of the American River. The study area is contained around the Folsom Facility which consists of four dams – the Main Concrete Dam, the Left Wing Dam (LWD), the Right Wing Dam (RWD), and the Mormon Island Auxiliary Dam (MIAD) – as well as eight Dikes (Dikes 1 through 8), and the emergency spillway. Site access to the project area would occur through a Bureau of Reclamation facility on existing paved roads and through the crest of the LWD. Staging areas proposed for the current Bureau of Reclamation (Reclamation) work yard are adjacent to the borders of remaining blue oak woodland.

In this document, the project area consists of the emergency spillway, Dikes 1 through 8 and MIAD, as well as the LWD and RWD (which tie into the main dam). The existing tainter gates on the emergency spillway, Dikes 1 through 8, and MIAD would have a 3.5-foot earthen embankment raise implemented, and the LWD and RWD (which tie into the main dam) would have a 3.5-foot concrete flood wall constructed and reinforced. General construction access to the site would come from Folsom Dam Road via Auburn-Folsom Road. A total of 31 staging areas have been defined within the project area – all the staging areas have been previously disturbed for a total of 157.2 acres. The project area is shown on maps ES.1 and ES.2.



ES.1 – Project Area Map.



ES.2. Folsom Lake and the Location of the Structural Aspects of the Folsom Dam.

ES.3 BACKGROUND AND NEED FOR ACTION

Currently, ongoing construction work, such as the Folsom Dam Modification Project Approach Channel, and updates to the Folsom Water Control Manual (WCM) may allow Folsom Dam to safely pass the PMF without further improvements, including the Folsom Dam Raise and Emergency Spillway Gate Modifications. However, affixing top seal bulkheads over the emergency gates would allow higher flood pools across the spillway, adding flood damage reduction benefits while still safely passing the PMF without overtopping the tainter gates. Raising the dam by 3.5 feet would allow for longer holding discharges by creating additional surcharge space (temporary water storage space utilized during rare flooding events) within the reservoir. Structural modifications associated with the Folsom Dam Raise Project are proposed to provide increased flood damage protection by increasing the flood storage capacity and/or pool release mechanisms at the Folsom Facility.

Sacramento is identified as one of the most at-risk communities in the nation for flooding, resulting in a need to reduce this risk through numerous flood damage reduction measures. The existing system leaves the highly urbanized Sacramento area at an unacceptably high level of flood risk. The Sacramento metropolitan area has a high probability of flooding due to its location at the confluence of (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 flood risk.

Historic flood events in 1986 and 1997 raised concerns over the adequacy of the existing flood risk management system; these concerns prompted a series of investigations regarding the need to provide additional protection to the Sacramento metropolitan area. The results of these investigations led to the authorization of several flood risk management projects in the American River watershed, including the Folsom Dam Raise Project.

National Environmental Policy Act (NEPA) evaluation is required when a major Federal action is under construction and may have significant impacts on natural and human environmental quality. The Corps has determined that the proposed project may have significant effects on the environment; therefore, an EIS is required. This draft DSEIS/SEIR provides supplemental documentation and evaluates the potential direct, indirect, and cumulative environmental effects of alternative plans for the Folsom Dam Raise. This draft DSEIS/SEIR also identifies mitigation measures to avoid, minimize, and compensate for impacts.

ES.4 ALTERNATIVES

The Folsom Dam Raise Project plan formulation process was developed and discussed in Chapter 4.0 of the 2002 Long Term Study, Plan Formulation and Screening of the Flood Damage Reduction Measures, in Chapter 5.0, Flood Control Alternatives, and in Chapter 6.0, Ecosystem Restoration for Flood Plain and Fisheries Resources.

Potential design alternatives were identified for assessment of engineering, environmental, and cost considerations. The two alternatives discussed in this DSEIS/SEIR are the final array of alternatives considered – the other alternatives were screened out for reasons described in the table below.

Table ES.1 Measures and Alternatives Considered but Eliminated.

Alternative	Reason for Elimination
Reduce the Stop Log Fabrication and Installation from Two Sets to Zero New Sets; Utilize Existing Set	Two gates would need to be non-operational during the construction, which Bureau of Reclamation does not agree with that action.
Tainter Gate Refinement: Replacement of Emergency Tainter Gates	Alternative 2 was chosen based on achieving the same benefit as this alternative but with more flexibility in operations for less cost.
Refined Emergency Gate Replacement	Alternative 2 was chosen based on achieving the same benefit as this alternative but with more flexibility in operations for less cost.
Tainter Gate Refinement: Horizontal Top Seal	The geometry and location of the Horizontal Top Seal made this refinement option more complex and difficult to design.
Tainter Gate Refinement: Skin Plate Extension	Modifications necessary for this alternative were deemed excessive and, more significantly, transverse seal loading is not recommended or practiced in tainter gate designs.
Dredging	Dredging would be expensive, and environmentally and culturally damaging process. Because of its very high cost, this measure was not considered further.
The 3.5-Foot Dam Raise: Concrete Floodwall	This alternative was not carried forward because of the potential recreation and environmental effects based on feedback from the public and environmental team.
The 3.5-Foot Dam Raise: Earthen Raise	It was rejected for the left and right wing dams due to space constraints associated with steeper embankment slopes compared to other reservoir dikes.
The 3.5-Foot Dam Raise: Concrete Masonry Unit (CMU)	This alternative was rejected because reinforced CMU tend to crack more readily during earthquakes and other heavy movements.
3.5-Foot Dam Raise: Mechanically-Stabilized Earthen (MSE) Cap	The primary concern is that the stress-strain differential between the anchors and soil material would cause a seepage path through the MSE wall.

ES.4.1 Alternative 1 – No Action

Under Alternative 1, the Corps would not implement the emergency spillway gate modifications or the 3.5-foot combination earthen raise and floodwall construction. Under the

No Action Alternative, significant loss of life is expected with a great enough flood event or PMF, as well as injuries, illnesses, and the release of hazardous and toxic contaminants to the downstream floodplain. The urban areas downstream of Folsom Dam would continue to be at risk of flooding, and lives would continue to be threatened. The gates and dam would be at risk for failure, threatening the levee system downstream with a surge of flow beyond the current 160,000 cfs levee capacity. If a dam or gate failure were to occur, the chance of levee failure downstream would increase. If a levee failure were to occur, major government facilities and transportation corridors would be impacted until flood waters recede. A temporary shut down or slowing of State and Local government functions would occur, and workers would be unable to perform their duties until the buildings are restored and can once again be occupied.

ES.4.2 Alternative 2 – Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall (environmentally preferred plan)

The 3.5-foot dam raise alternative is currently at a lesser level of general development and analysis than the Spillway Modification (tainter gates). It is likely that supplemental design and environmental documentation would be required for the dam raise prior to construction. Any post-construction operational changes would be defined in a WCM update and accompanying environmental documentation.

While there will be no changes in normal operations with the construction of the dam raise, the raise would result in an ablity to sustain an increased flow of 160,000 cfs for a longer period of time, and would have possible inundations up to 486.34' (NAVD88). The WCM update, based on the Folsom Joint Federal Project, is scheduled to be completed in October 2017; any new operations that the project would have as a result of the Dam Raise would be dependent upon the updated WCM. As it stands, the proposed 3.5-foot raise is only an increase in the surcharge zone, not the operational space, and would only have an effect in the events that encroach in that surcharge zone.

The 2013 Engineering Documentation Report (EDR) identified refinements to the existing tainter gates in lieu of the complete gate replacement originally proposed in the 2007 PACR. Refinements include additional strengthening features to the existing tainter gates and a new "top seal" bulkhead that would prevent overtopping of the spillway gates during a major flood event. This alternative includes the following modifications:

- A hydraulic structure (the top seal bulkhead) would be mounted above the spillway tainter gates in order to prevent overtopping during a major flood event.

- Additional retrofit elements (skin plate ribs, lower girder, and trunnion anchorage) on the tainter gates are necessary to address and account for the loading conditions imposed by the PMF.

- A vertical concrete extension to the top of the pier would provide the necessary elevated platform for the new hoist system. The top seal bulkheads would mount to and seal against the pier extension. This concrete extension would also serve as the water barrier between top seal bulkheads when the reservoir reaches elevations above 478.59’ NAVD88.

- Modifications to the existing steel “pier wrap” installed by Reclamation are specified to handle additional loads resulting from a PMF scenario. These modifications include extensions to the height and width of the existing steel “wrap” as well as additional anchoring requirements.

- A 3.5-foot raise to the heights of Dikes 1 through 8 and MIAD with an earthen embankment raise, using an engineered fill material similar to the existing composition of the earthen dikes, would allow seepage and pore pressure to be maintained through the interface between the old and the new material.

- A reinforced 3.5-foot concrete flood wall would be constructed on the LWD and the RWD that would tie into the main dam, the new control structure, and the existing terrain. A reinforced concrete retaining wall (parapet wall) with footing embedded in the earth-fill of the embankment would be constructed along the embankment crest to the required height.

ES.5 ENVIRONMENTAL EFFECTS AND MITIGATION MEASURES

Significant resources that may be affected by the alternatives include existing vegetation and wildlife resources. Under Alternative 1, the proposed construction would not occur. No construction related effects to vegetation and wildlife would occur, and the conditions in the project area would remain consistent with existing conditions.

Alternative 2 is proposed to have a construction footprint of up to 50 feet on both sides of Dikes 1 through 8 and MIAD, with vegetation removal and ground-surface disturbance in staging areas; disturbance caused by staging and stock pile construction activity, noise, traffic, and night lighting are expected to displace wildlife species through multiple years of construction from year 2017 to 2020. Disturbance from the project is expected to intermittently compromise water access to the shoreline for a period of five years. The duration of construction related disturbances would be overlapping and continuous throughout Dikes 1 through 8. However, displacement would be considered temporary in nature and would have a less than significant impact on wildlife populations with the implementation on mitigation, minimization, and avoidance measures.

Annual grassland constitutes a substantially higher acreage within the project area. To avoid significant impact to grassland habitat, mitigation measures would be employed. The project area would be returned to pre-existing condition (to the extent practicable) after project completion, and then improved with the use of native flora. Staging areas and other disturbed soil surfaces would be re-vegetated with native grass species directly after construction activities cease.

The emergency tainter gate improvements would result in a localized construction footprint for three years. Construction noise and traffic are expected to disturb and/or displace local wildlife that utilize oak and pine woodlands, as well as grasslands, over the project duration.

Construction staging areas are proposed primarily for disturbed areas that appear to have formerly supported oak woodland vegetation but now consist of bare soil or ruderal vegetation. Up to two acres of oak woodland savannah is included in staging area boundaries within the tainter gate project area. Though small in acreage, loss of these trees would contribute disproportionately to the reduction of oak woodland habitat in the project area. Mitigation measures for protecting existing trees would reduce these impacts to less-than-significant.

A wetland delination was conducted on 10 June 2014 (Appendix D). Additional delineation would be conducted at MIAD to determine wetland status or drainage characteristics which require protection. Any delineated wetlands in the project area would be fenced and signed for protection from construction activity. Alternative 2 would have no dredge or fill material below the ordinary high water mark of the reservoir, and is not expected to affect open or other waters of the U.S. as defined by Section 404 of the CWA.

Construction associated with raising embankment dams and dikes could temporarily disturb nesting birds in the project area. Certain species of migratory and resident birds have commonly nested on structures and construction equipment on the Folsom Dam Modification Project and are expected to continue this behavior on structures and equipment in Alternative 2. Pre-emptive measures would be conducted by a qualified biologist to prevent birds from nesting on construction equipment and the structures undergoing modification. Environmental protection training would occur for all construction personnel regarding avian nests and environmental protection.

The valley elderberry longhorn beetle (VELB) may be effected by incidental damage to elderberry shrubs caused by construction personnel or equipment. Impacts may also occur if elderberry shrubs need to be transplanted due to their location in areas that cannot be avoided by construction activities—this could cause direct mortality of beetles and/or disruption of their life cycle. Indirect effects from haul trucks driving in close proximity to elderberry shrubs and the resultant vibration and dust could disturb the beetle. Long-term effects of the project may include reduced viability of elderberry shrubs due to the placement of project area materials. Temporal loss of habitat or species abundance may also occur due to transplantation of elderberry shrubs. These direct and indirect effects would be considered potentially significant if they cause adverse effects on elderberry shrubs and/or cause mortality or stress to VELB residing in the shrubs. However, with the implementation of mitigation measures from the USFWS "Conservation Guidelines for the Valley Elderberry Longhorn Beetle," July 1999, in combination with transplanting of shrubs, mitigation plantings, and the creation of habitat, these impacts are not likely to adversely affect the valley elderberry longhorn beetle.

For the Folsom Dam Raise Project, the entire construction footprint of Dikes 1 through 8, the LWD, RWD, and MIAD, along with the Emergency Spillway, were analyzed under the CAA to determine the worst case scenario for air quality impacts. The analysis conducted determined that the emissions associated with construction of this action would be above the *de minimis* level – emission reductions were incorporated into the project analysis. Even with implementation of mitigation measures, emissions would not be reduced below the USEPA's general conformity *de minimis* threshold. Compliance with the CAA would be accomplished with the completion of a General Conformity Analysis, or with the inclusion in the State Implementation Plan.

Overall, Alternative 2 is not expected to cause substantial loss, degradation, or fragmentation of any natural communities or wildlife habitat when conducted with the specified mitigations, and is expected to have a less-than-significant effect. The project area would be returned to the pre-existing condition to the extent practicable at the completion of this project. The implementation of Alternative 2 is not expected to conflict with local policies or ordinances protecting biological resources because Sacramento County tree and USFWS recommended habitat protections and prescriptions would be observed. There are no applicable Habitat Conservation Plans (HCPs) or National Community Conservation Plans (NCCPs) in the project area. The implementation of Alternative 2 is not expected to conflict with any other approved local, regional, or state habitat conservation plan.

While there will be no changes in normal operations with the construction of the dam raise, the raise would result in an ablity to sustain an increased flow of 160,000 cfs for a longer period of time, and would have possible inundations up to 486.34' (NAVD88). Any new operations that the project would have as a result of the construction of the Dam Raise would be dependent upon the updated WCM. As it stands, the proposed 3.5-foot raise is only an increase in the surcharge zone, not the operational space, and would only have an effect in the events that encroach in that surcharge zone.

ES.6 COMPLIANCE WITH APPLICABLE LAWS, POLICIES, AND PLANS

This document would be adopted as a joint draft DSEIS/SEIR, and would fully comply with the National Environmental Policy Act and California Environmental Quality Act requirements. The project would comply with all Federal environmental laws and regulations, as well as all state, regional, and local laws, regulations, and ordinances. In addition, the non-Federal sponsor would comply with all State and local laws and permit requirements.

ES.7 PUBLIC INVOLVEMENT

Two public scoping meetings for the Folsom Dam Raise Project were held on Wednesday, February 19, 2014 at the Folsom Community Center and on Monday, February 24, 2014 at the Sacramento Library Galleria. Mail and e-mail announcements were also sent to stakeholders and other interested parties. In addition, a Notice of Intent was filed with the Federal Register on February 6, 2014.

ES.8 ISSUES OF KNOWN CONTROVERSY

Some significant and controversial issues have been raised by agencies and the public relating to the construction of the 3.5-foot dam raise, spillway modifications, and related features. These issues are based on feedback gathered in preliminary studies from formal and informal agency meetings, workshops, public meetings, telephone discourse, letters, and emails.

- Preliminary air quality emission calculations indicate that all active construction alternatives of the project would result in air emissions that could lead to violations of applicable State ambient air quality standards and would not comply with the Federal Clean Air Act (CAA). Concurrent construction activity within the Folsom Lake region would contribute additional emissions that could cumulatively fail to meet the general conformity rule of the CAA.

- Construction is expected to increase noise levels, affecting local recreationists and adjacent residents, even under circumstances of compliance with the City of Folsom noise ordinances.

- Degradation of public recreational experiences in and adjacent to the project – noise, visual aesthetics, and access would be compromised during construction from 2017 to 2020.

- Two homeowners and their homeowner's association want the Dike 7 Office Complex area fully restored as part of the proposed project, as described in the March 2016 Phase V SEA/EIR. Their concerns focus on the future conversion of a portion of this area to a public trailhead. Conversion to a trailhead is not included in the proposed project. Regardless of whether the area is restored, establishing a trailhead here would be a State Parks project beyond the control of the Corps since the Corps does not own the Dike 7 Office Complex property that is part of the Folsom Lake State Recreation Area.

ES.9 UNRESOLVED ISSUES

There are no unresolved environmental issues at this time.

ES.10 PREFERRED PLAN

Alternative 2, Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall, has been identified as the preferred plan. This alternative would include additional strengthening features to the existing spillway tainter gates with a new "top seal" bulkhead that would prevent overtopping of the spillway gates, a 3.5-foot earthen raise on the dikes and dam, as well as construction of a reinforced 3.5-foot concrete flood wall. Alternative 1 was not selected because it was not considered to be in the best interest of public safety – it did not provide for increased flood protection or allow for an increase in Folsom Dam safety measures. Alternative 2 is expected to provide continuous flood-risk management benefits to the Sacramento metropolitan area and provide flood damage reduction while safely passing the PMF flow without overtopping the spillway gates.

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ACRONYMS & ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
APE	Area of Potential Effects
ARB	California Air Resources Board
BA	Biological Assessment
BMPs	Best Management Practices
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Caltrans	California Department of Transportation
CCAO	Central California Area Office
CCTS	Central California Taxonomic System
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CMU	Concrete Masonry Unit
CNDDB	California Natural Diversity Database
Corps	U.S. Army Corps of Engineers
CSUS	California State University, Sacramento
CVFPB	State of California Central Valley Flood Protection Board
CVP	Central Valley Project
CWA	Clean Water Act
DDR	Design Documentation Reports
DPM	Diesel Particulate Matter
DPR	California Department of Parks and Recreation
DSEIS/SEIR	Draft Supplemental Environmental Impact Statement/Environmental Impact Report
DWR	California Department of Water Resources
EDR	Engineering Documentation Report
ESTG	Emergency Spillway Tainter Gates
EWDAA	Energy and Water Development Appropriations Act
FHWA	Federal Highway Administration
FLSRA	Folsom Lake State Recreation Area
GHG	Greenhouse Gas
GIS	Geographic Information System
HAP	Hazardous Air Pollutant
HCM	Highway Capacity Manual
HCP	Habitat Conservation Plans
HTRW	Hazardous, Toxic, and Radioactive Waste
ITE	Institute of Transportation Engineers
JFP	Joint Federal Project
kV	kilovolt
kW	kilowatts

LOS	Level of Service
LWD	Left Wing Dam
MBTA	Migratory Bird Treaty Act
MIAD	Mormon Island Auxiliary Dam
MPO	Metropolitan Planning Organization
MSE	Mechanically-Stabilized Earthen
NAAQS	National Ambient Air Quality Standards
NCCP	National Community Conservation Plans
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOA	Naturally Occurring Asbestos
NOx	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
PACR	Post Authorization Change Report
PG&E	Pacific Gas and Electric Company
PMF	Probable Maximum Flood
ROD	Record of Decision
ROG	Reactive Organic Gases
RWD	Right Wing Dam
RWQCB	Central Valley Regional Water Quality Control Board
SACOG	Sacramento Area Council of Governments
SAFCA	Sacramento Area Flood Control Agency
SIP	State Implementation Plans
SMAQMD	Sacramento Metropolitan Air Quality Management District
SMUD	Sacramento Metropolitan Utility District
SPCP	Spill Preventions and Countermeasure Plan
SVAB	Sacramento Valley Air Basin
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	Toxic Air Contaminants
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
USBR	Bureau of Reclamation
USEPA	U. S. Environmental Protection Agency
USEPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VELB	Valley Elderberry Longhorn Beetle
WAPA	Western Area Power Administration
WCM	Water Control Manual

CHAPTER 1.0 - INTRODUCTION

This document is a joint draft supplemental environmental impact statement/environmental impact report (DSEIS/SEIR) 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.

This DSEIS/SEIR is a supplement to the 2007 Final EIS/EIR for the Folsom Dam Safety and Flood Damage Reduction Project (FEIS/EIR) prepared by the U.S. Bureau of Reclamation. This DSEIS/SEIR has been prepared to evaluate the potential environmental impacts of the alternatives proposed in the Folsom Dam Raise Project. 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 Authorization

There are several authorizations that have led to this supplemental DSEIS/SEIR. They include:

- Section 209 of the Flood Control Act of 1962 (Pub. L. No. 87-875, § 209, 76 Stat. 1180, 1196-98 (1962)), authorizes studies for flood control in northern California. This is the basic authority for the Corps to study water resource related issues for the American and Sacramento Rivers.

- 1996 Water Resources Development Act (WRDA) (Pub. L. No. 104-303, § 101(a)(1), 110 Stat. 3658, 3662-3663 (1996)): Congress authorizes levee improvement features common to all three plans in the *1996 American River Watershed Project, California, Supplemental Information Report* (1996 SIR). The 1996 SIR described multiple alternative plans, of which certain levee and other flood system improvements were "common" to all alternatives: “Common Features.”

- 1999 WRDA, Section 101(a) (6) (Pub. L. 106-53, § 101, 113 Stat. 274 (1999)) authorizes the Folsom Modification Project (modified river outlets), as identified in the 1996 SIR.

- 2004 Energy and Water Development Appropriations Act (EWDAA), Section 128 ((Pub. L. No. 108-137, § 128, 117 Stat. 1838, (2003)) authorizes a 7-foot raise of Folsom Dam (including replacement of 8 spillway tainter gates), based on the recommendations contained in the November 2002 Chief of Engineers Report in the Corp's 2002 Long Term Study Final Supplemental Plan Formulation Report.

- 2006 EWDAA, Section 128, (Pub. L. No. 109-103, §128, 119 Stat. 2259-2260 (2006)) The Secretary of the Army and the Secretary of the Interior are directed to collaborate on authorized activities to maximize flood damage reduction improvements and address dam safety needs at Folsom Dam and Reservoir, California. The Secretaries shall expedite technical reviews for flood damage reduction and dam safety improvements. In developing improvements under this section, the Secretaries shall consider reasonable modifications to existing authorized activities. The Secretaries are authorized to expend funds for coordinated technical reviews, joint planning, and preliminary design activities.

- WRDA 2007, Section 3029 (b) (Pub. L. No. 110-114, §3029, 121 Stat. 1112 (2007)): Based on recommendations from the 2007 Post Authorization Change Report (PACR), the Folsom Dam Raise and Folsom Modification Projects were revised to include the Joint Federal Project (JFP) auxiliary spillway. It is a 3.5-foot dam raise, including reservoir dikes, replacing 3 emergency spillway tainter gates, and 3 ecosystem restoration projects.

1.2 Project Location and Study Area

The project is located in the area surrounding Folsom Lake that falls within Placer, El Dorado, and Sacramento Counties (Figure 1). The Folsom Dam and Reservoir ("Folsom Lake") are located downstream from the confluence of the north and south forks of the American River. The area mainly consists of Federally-owned lands that are leased to and managed by the California Department of Parks and Recreation (DPR). The study area is contained around Folsom Lake, at Dikes 1 through 8, the Left Wing Dam (LWD), Right Wing Dam (RWD), Mormon Island Auxiliary Dam (MIAD), and at the main dam and spillway (Appendix A).

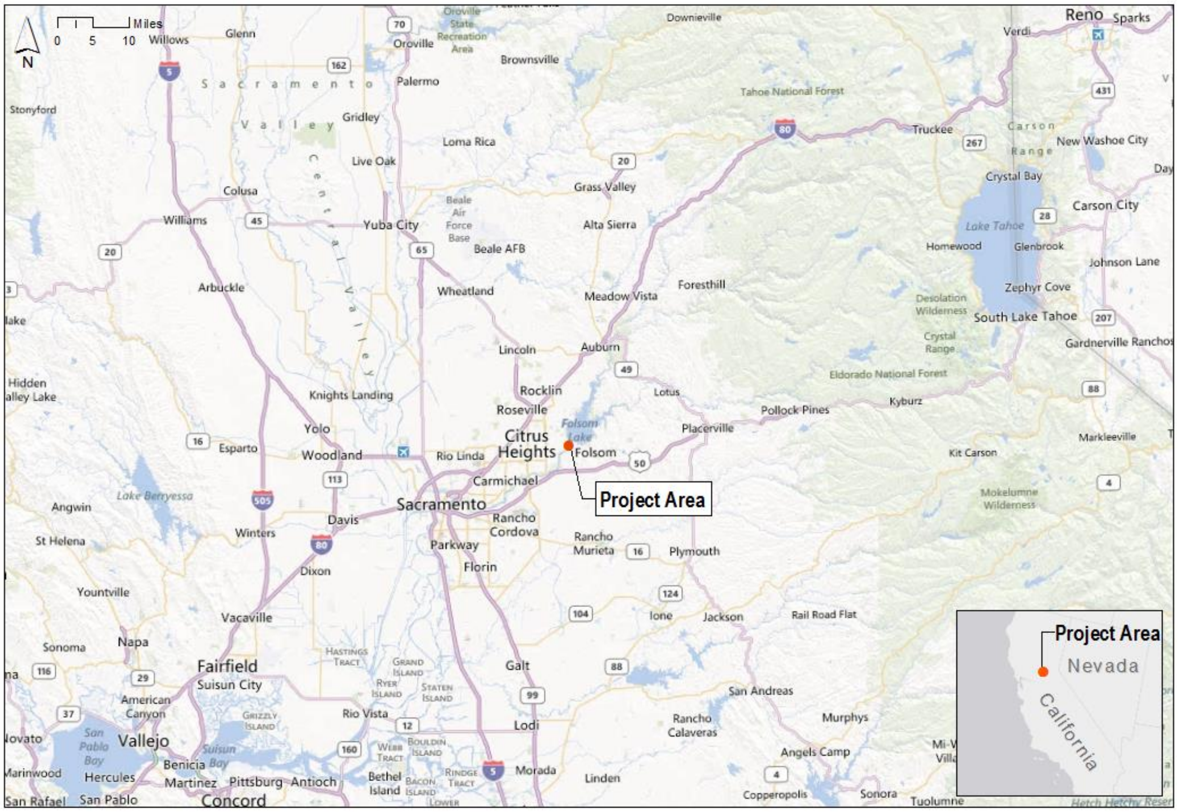

Figure 1. Project Area Map.

1.3 Background

Folsom Dam and Reservoir is located on the main stem of the American River approximately 29 miles upstream from the City of Sacramento. It is a multipurpose dam owned and operated by the Bureau of Reclamation (Reclamation) as part of the Central Valley Project (CVP). The Corps prescribes storage requirements for flood risk management purposes at the dam. Folsom Lake is a multiuse facility authorized for flood risk management, fish & wildlife, water quality, water supply, hydroelectricity, recreation, and navigation. However, it is primarily operated to maximize flood risk management and water supply benefits.

The Folsom Dam and Appurtenant Facilities consists of four (4) dams (Main Concrete Dam, MIAD, RWD, LWD), and 8 dikes (Dikes 1-8), which impound flows on the American River, forming Folsom Lake (Figure 2). Folsom Lake has a capacity of 977,000 acre-feet with a surface area of 11,450 acres. The maximum sustained flood control release that can currently be safely conveyed by the downstream channel is 115,000 cubic feet per second (cfs), however, the proposed project is being designed with the assumption that, with the construction of the American River Watershed Common Features GRR, the downstream levees have been improved to safely convey as much as 160,000 cfs.

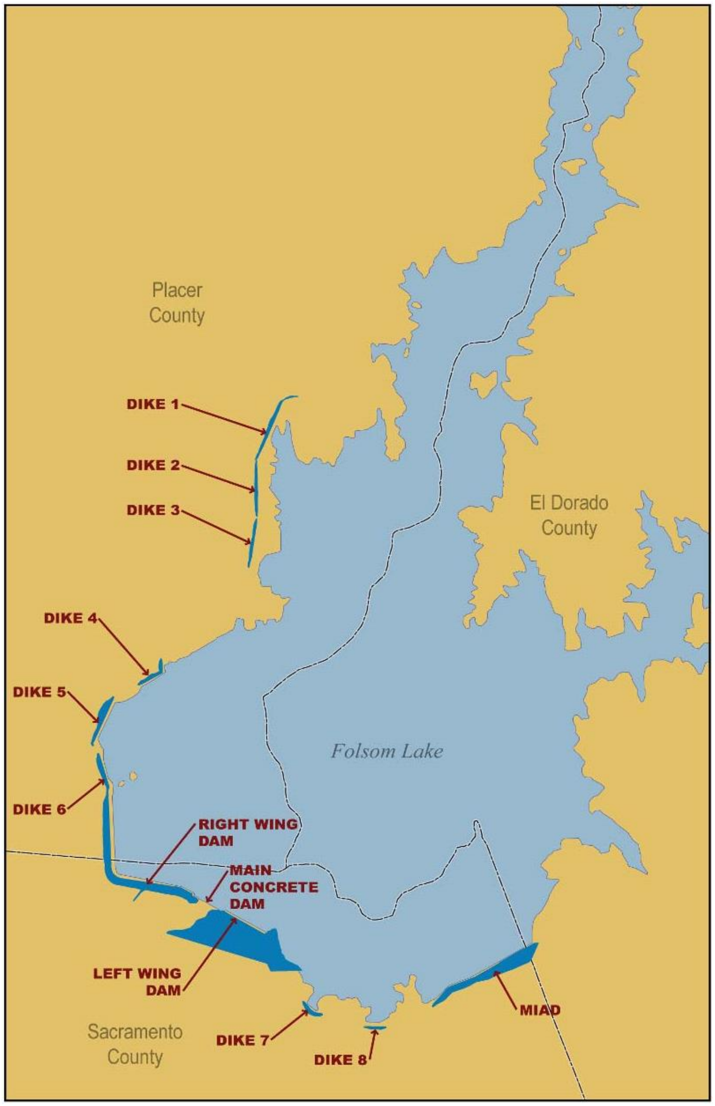

Figure 2. Folsom Lake and the Location of the Structural Aspects of the Folsom Dam.

Folsom Dam was originally authorized in 1944 for flood control, but was reauthorized in 1949 as a multi-purpose facility. The Corps constructed Folsom Dam and transferred it to the U.S. Bureau of Reclamation (USBR) for coordinated operation as an integral part of the Central Valley Project (CVP). Construction of the dam began in October 1948 and was completed in May 1956. Water was first stored in February 1955. In the Energy and Water Development Appropriations Act (EWDAA) of 2004, Congress authorized a plan to raise Folsom Dam; the Folsom Dam Raise Project, including raising Folsom Dam by 7 feet, modifies the spillway, constructs a bridge downstream from Folsom Dam, and modifies the emergency release operations to permit surcharge. This would provide flood benefits while also resolving certain dam safety issues associated with passing the probable maximum flood (PMF). The Folsom Dam Raise project and the Folsom Modifications Project were reevaluated together in the PACR for the American River Watershed Project, dated March 2007. This report resulted in the recommendation of a JFP auxiliary spillway at Folsom Dam (to be constructed jointly with USBR), a 3.5-foot dam raise (including emergency spillway gates, the reservoir dikes, and three ecosystem restoration projects). This automates/reconfigures the temperature control shutters at Folsom Dam and restores the Bushy and Woodlake sites downstream. Under the original authorized plan, the main concrete dam, the RWD and LWD, MIAD, and Dikes 1 through 8 would be raised 7 feet, adding approximately 93,000 acre-feet of flood storage capacity to the reservoir. In addition, the five main dam service tainter gates and the three main dam emergency tainter gates would be replaced.

Since the work authorization of emergency spillway gates in the 2007 PACR, Reclamation has completed structural improvements to the existing service and emergency tainter gates, as well as the spillway piers in 2011. In light of these improvements, emergency gate refinements have been developed in lieu of complete gate replacements. As a result, in 2013, an Engineering Documentation Report (EDR) was developed to support a variation to the emergency spillway gate replacement concept.

Additionally, a series of Design Documentation Reports (DDRs) are being developed to determine the designs for increasing the height of Folsom dikes and dams by 3.5 feet. It is anticipated the DDRs for all of the engineering designs would be completed by 2018. The 3.5-foot raise was not fully designed in the 2007 PACR, nor was a full environmental analysis completed in the associated 2007 Folsom Dam Safety/Flood Damage Reduction EIS/EIR (Folsom DS/FDR EIS/EIR). Therefore, additional design documentation was determined to be necessary and this supplemental Dam Raise EIS/EIR is being prepared to fully disclose revised project alternatives and updated project-related effects.

The primary objectives of the Folsom Dam Raise Project are (1) flood risk management, (2) ecosystem restoration, and (3) construction of a permanent bridge downstream of Folsom Dam, which was completed in 2009. The Dam Raise project has been prioritized with the first phase on the main dam tainter gates portion of the 3.5-foot raise. The beginning of construction is estimated to be concurrent with the Joint Federal Project, which includes construction of an auxiliary spillway consisting of an approach channel, a six tainter gate control structure, and a chute and stilling basin scheduled to be completed in 2017. Design on the remaining phases (ecosystem restoration) would begin after construction of the dam raise features. If necessary, a supplemental NEPA/CEQA document would be prepared for the ecosystem restoration.

1.4 Project Purpose and Need for Action

Purpose

The purpose of the Folsom Dam Raise project is to provide flood risk management benefits to the Sacramento area. The authorized top of flood pool would remain at reservoir water surface elevation 468.34 feet NAVD 88. Affixing top seal bulkheads over the emergency gates would allow higher flood pools across the spillway, adding flood damage reduction benefits while still safely passing the PMF without overtopping the tainter gates. With added operational flexibility and enhanced management of the enlarged flood storage capacity (in the form of surcharge), flood damage benefits are realized with delayed operation for the emergency gates and prolonged outflows at or below the 160,000 cfs threshold for more infrequent events up to a 1/240 year event (the authorized objective).

There would be no changes in normal operations with the construction of the dam raise; however, the raise would result in an ablity to sustain an increased flow of 160,000 cfs for an extended period (as defined by the Emergency Spillway Release Diagram in the Water Control Manual), and could have possible inundations up to 486.34’ (NAVD88). The dam raise project could eventually offer increased operational flexibility given the greater surcharge zone and ability to delay operation for the emergency gates and prolonged outflows at or below the 160,000 cfs threshold; however any new operations that might occur as a result of the Dam Raise would be dependent upon the updated WCM, as based on the Folsom JFP.

The 2006 EWDAA authorized activities to maximize flood damage reduction improvements and address dam safety needs at Folsom Dam. At this time, ongoing construction work, such as the Folsom Dam Modification Project Approach Channel, and updates to the Folsom WCM may allow Folsom Dam to safely pass the PMF without further improvements, including the Folsom Dam Raise and Emergency Spillway Gate Modifications. An economic update would be conducted to confirm the flood risk management benefits of the Dam Raise and related construction activities. As the WCM update is finalized, it would be determined whether additional dam safety measures are required to pass the PMF that could be addressed by the Dam Raise component.

Need

Sacramento is identified as one of the most at-risk communities in the nation for flooding. Therefore, there is a need to reduce this risk through numerous flood damage reduction measures. The existing system leaves the highly urbanized Sacramento area at an unacceptably high level of flood risk.

The initial need for increased flood protection in Sacramento was realized when major storms in northern California in 1986, and again in 1997, caused record flood flows in the American River watershed. Outflows from Folsom Dam, together with high flows in the Sacramento River, caused the river stages to exceed the designed safety margin of levees protecting the City of Sacramento. If these storms had lasted much longer, major sections of the levee would likely have failed, causing probable loss of human life and billions of dollars in damages.

The effects of the 1986 and 1997 storms raised concerns over the adequacy of the existing flood risk management system. This led to a series of investigations on the need to provide additional protection for the Sacramento metropolitan area. The results of these investigations led to authorization of several flood risk management projects in the American River watershed, including the Folsom Dam Raise Project.

With the construction of the Joint Federal Project, the current storage capacity of the reservoir does allow for passing the PMF. However, the current crest elevation of the reservoir dikes and embankment dams would not provide sufficient freeboard to meet design criteria for resisting wave height and wave runup[1]. A large enough flood event could cause the current dikes and/or embankment dams to sustain enough damage as to cause failure or overtop.

1.5 Purpose of the DSEIS/SEIR

Construction of the Folsom Dam Raise Project is considered to be a major Federal and State project subject to compliance with the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA), respectively. Because the proposed action has the potential to significantly affect the quality of the human environment, the Corps and the Central Valley Flood Protection Board (CVFPB) through the California Department of Water Resources (DWR) have prepared this joint Draft Supplemental Environmental Impact Statement/Supplemental Environmental Impact Report (DSEIS/SEIR) to satisfy the environmental evaluation and review requirements of these two laws.

This DSEIS/SEIR (1) describes the development and features of the alternatives; (2 discusses the environmental resources in the local and regional project areas; (3) evaluates the direct, indirect, and cumulative effects and significance of the alternatives on these resources; and (4) proposes best management practices and mitigation measures to avoid or reduce any effects to less than significant, when possible. The type and extent of any effects that cannot be reduced to less than significant are identified so that decision-makers can consider the trade-offs of implementing the proposed action.

[1] Wave runup is the maximum vertical extent of wave uprush on a beach or structure above the still water level.

1.5.1 National Environmental Policy Act

NEPA provides an interdisciplinary framework for Federal agencies to develop information that would help them to take environmental factors into account in their decision-making (42 U.S.C. § 4321 *et seq.* and 40 C.F.R. § 1500.1 *et seq.*) To comply with NEPA, an EIS is required whenever a proposed major Federal action may 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]). Additionally, in accordance with 40 C.F.R. § 1502.9[i] [ii], the Federal agency shall prepare a supplemental to either draft or final EIS documents when relevant, substantial changes in the proposed action occur or significant new circumstances or information relevant to environmental concerns are realized.

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 information 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 can 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. The Corps and the CVFPB intend to use this DSEIS/SEIR in their decision making (per 15124(d)(1)(A).

CEQA requires that state and local government agencies consider the environmental effects of projects of 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, whenever feasible, the significant environmental effects of the project 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, and/or other considerations that they believe, based upon substantial evidence, make significant and unavoidable effects acceptable.

Permits and approvals required to implement to project can be found in Chapter 5.0 of this document, a long with consultation requirements required by federal, state, or local laws, regulations or policies.

1.6 Related Documents and Resources Relied on in Preparation of the DSEIS/SEIR

In 2002, the Corps, along with the CVFPB and SAFCA, completed the American River Watershed Long-Term Study Final Supplemental Plan Formulation Report EIS/EIR (LTS EIS/EIR), which analyzed the environmental impacts of a 7-foot dam raise. There was no Record of Decision (ROD) for this analysis. In 2007, the Folsom Dam Raise was reevaluated in the PACR and the associated Folsom Dam Safety/Flood Damage ReductionEIS/EIR, which recommended the replacement of the three emergency spillway gates and a 3.5-foot raise, as well as various other Folsom projects.

Although the environmental analysis of the Folsom Dam Raise is generally covered in the Folsom DS/FDR EIS/EIR, it is not fully designed and a complete environmental analysis was not completed. Additionally, the project was not covered by the 2007 ROD. The PACR states "It is important to note that the effects associated with the authorized Corps projects (Folsom Modification and Folsom Dam Raise projects) are the impacts identified in the original environmental documents for those projects, and impacts are not updated to a current assessment." Therefore, the majority of the Dam Raise analysis in the Folsom Dam Safety/Flood Damage Reduction EIS/EIR is based on the 2002 LTS EIS/EIR and the description, evaluation, and analysis are outdated and incomplete. This supplemental Dam Raise EIS/EIR is being prepared to fully disclose revised project alternatives and updated project-related effects.

1.7 Significant Issues

Significant issues identified as areas of controversy by agencies and the public related to construction of the 3.5-foot dam raise, the spillway gate modifications, and related features are summarized below. These issues were based on preliminary studies and comments from formal and informal agency meetings, workshops, public meetings, telephone discourse, letters, and emails.

- Preliminary air quality emission calculations indicate that all active construction alternatives of the project would result in air emissions that could lead to violations of applicable State ambient air quality standards and would not comply with the Federal Clean Air Act (CAA). Concurrent construction activity within the Folsom Lake region would contribute additional emissions that could cumulatively fail to meet the general conformity rule of the CAA.

- Potential issues were identified with temporary turbidity, mobilization of existing sediment contaminants and reintroduction into the water column, and contaminants from constructions materials.

- Construction is expected to increase noise levels, affecting local recreationists and adjacent residents, even under circumstances of compliance with the City of Folsom noise ordinances.

- Degradation of recreational experience in and adjacent to the project area. Noise, visual aesthetics, and access would be compromised during construction years 2017 to 2020.

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 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 case in this document, both NEPA and CEQA terminology are used, as in Chapter one where the project purpose, need, and project objectives are discussed.

1.9 Organization of the DSEIS/SEIR

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

- The Executive Summary abridges the purpose and intended uses of the DSEIS/SEIR, lead agencies, project location, project background and phasing, need for action, and project purpose/objectives. It presents an overview of the proposed alternatives under consideration, as well as the major conclusions of the environmental analysis while documenting the known areas of controversy and issues to be resolved. It ends with a summary table that lists the environmental impacts, mitigation measures, and significance determination for the alternatives under consideration.

- Chapter 1 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 that the lead agencies are responding to in considering the proposed project and project alternatives; and outlines the organization of the document; .

- Chapter 2 presents the proposed alternatives under consideration. This chapter constitutes the project description and describes the 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 describes the baseline or existing environmental and regulatory conditions. It provides an analysis of the impacts of each alternative under consideration, and identifies mitigation measures that would avoid/reduce/eliminate significant impacts to less-than-significant levels, where feasible. In addition, compensation is discussed for significant, adverse effects that cannot be reduced to a less than significant level.

- Chapter 4 describes the cumulative impacts of the project when combined with other past, presents, and reasonably foreseeable future projects within the study area. In addition, it analyzes the growth-inducing impacts of the proposed action. The remainder of the chapter includes the requirements of NEPA and CEQA that are not addressed elsewhere in this DSEIS/SEIR such as the 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 summarizes Federal and State laws and regulations that apply to the project and describes the project's compliance with them, and also summarizes required permits, approvals, and authorizations

- Chapter 6 summarizes public involvement activities under NEPA and CEQA; Native American consultation; and coordination with other Federal, state, regional, and local agencies. A list of organizations and individuals receiving a copy and/or notice of this DSEIS/SEIR is also included.

- Chapter 7 lists the various people who were involved in preparing this document.

- Chapter 8 provides a bibliography of sources cited in this DSEIS/SEIR.

- Chapter 9 contains the NEPA-required index for easy reference of topics and issues.

- Appendices contain background information that supports this DSEIS/SEIR.

CHAPTER 2.0 - ALTERNATIVES

2.1 Introduction

The Folsom Dam Raise Project plan formulation process is discussed in Chapter 4.0 of the 2002 Long Term Study, Plan Formulation and Screening of the Flood Damage Reduction Measures, in Chapter 5.0 of the Flood Control Alternatives, and in Chapter 6.0 of the Ecosystem Restoration for Flood Plain and Fisheries Resources.

2.1.1 Alternative Formulation and Screening

American River Watershed Long-Term Study, 2002

The purpose of the Long-Term Study is to address the residual flood risk remaining once the Folsom Modifications project is completed. The Long-Term Study evaluated an array of flood risk management (FRM) alternatives that included dam raises ranging from 3.5 to 12 feet. The study determined that a 7.0-foot raise of Folsom Dam that provided both additional FRM and dam safety[2] would be the most optimal economic solution, exclusive of the Detention Dam alternative. Congress, through the Energy and Water Development Appropriations Act for Fiscal Year 2004, authorized several project features which were recommended by the Long-Term Study: raising Folsom Dam by 7 feet, modifying the L.L. Anderson Dam spillway, constructing a permanent bridge downstream from Folsom Dam, and modifying the emergency release operations to permit surcharge. At the time, this project was estimated to reduce the risk of flooding to about a 1 in 175 chance. Two project components of the 2002 Long-Term Study, the 3.5-foot dam raise and the 7.0-foot dam raise, were also evaluated in the 2007 PACR, which is described below.

American River Watershed PAC Report, 2007

The purpose of the 2007 PACR is to document changes to two authorized projects: the Folsom Modifications Project and the Folsom Dam Raise Project. Both projects share an objective of improving flood risk management on the Lower American River, primarily through structural modifications to the existing Folsom Dam. In the PAC report, project elements from both the Folsom Modifications and the Long-Term Study were considered not only for the purpose of flood risk management but also for

[2] Dam safety in this instance refers to enabling the dam facility to pass one-hundred probable percent of the maximum flood, or PMF.

dam safety. During the design refinements for Folsom Modifications, it was believed that due to significant increases in the cost estimates, the authorized project may not be optimal or even economically feasible. During this preliminary analysis, it appeared that adding operational gates to the proposed Bureau of Reclamation dam safety auxiliary spillway would provide a more efficient way to meet two project purposes. The Folsom Dam Joint Federal Project is intended to meet the goals of the Corps of Engineers as well as the Bureau of Reclamation; its analysis became one of the main focuses of the 2007 PACR which evaluated a final array of four action alternatives shown in Table 1 below. Alternative C was the recommended plan and included a six-submerged tainter gate auxiliary spillway, a 3.5-foot dam raise, and three emergency spillway gate replacements.

Table 1. 2007 PACR Final Array of Action Alternatives.

Alternative	Features
A	Eight Main Dam Outlets, Fuse Plug Spillway
B	A Six-Submerged Tainter Gate Auxiliary Spillway
C	A Six-Submerged Tainter Gate Auxiliary Spillway, 3.5’ Dam Raise, 3 Emergency and Service Spillway Gate Replacements
D	A Six-Submerged Tainter Gate Auxiliary Spillway, 7’ Dam Raise, 8 Emergency and Service Spillway Gate Replacements

Future Without Project Conditions

The future without project condition would be the most likely condition expected to exist in the future without a proposed Federal water resources project. 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. 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, neither the modifications to the spillway gates nor the 3.5-foot dam raise would be implemented, nor would the associated improved flood risk management benefits occur.

Under the future without project condition, significant loss of life is expected with a great enough flood event, or PMF, as well as injuries, illnesses, and the release of hazardous and toxic contaminants to the downstream floodplain. Post-flood debris clean-up, repairs, and recovery could be a major undertaking. Additionally, infrastructure, such as transportation corridors and power and water supplies, would be incapacitated. The economic impact of the restricted movement of people and goods across the region, the emergency costs associated with evacuation, and all the emergency services associated with such an event, would be huge.

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

- In 2017, the Folsom Joint Federal Project (JFP) auxiliary spillway at Folsom Dam would be completed and a new water control manual would be adopted (Folsom Dam Modifications). This includes a 400,000 acre-feet to 600,000 acre-feet (400/600) variable flood space operation that takes incidental storage space in upstream reservoirs into consideration when determining flood storage requirements at Folsom Dam during the flood season. The JFP would allow dam operators to release larger quantities of water at lower reservoir stages and more efficiently utilize flood space in the reservoir. Operation of the JFP is to some degree dependent on the American River levees downstream of the dam being able to safely pass the objective release of 160,000 cfs. At the time of the Folsom PAC report in 2007, assumptions were made based on the available information that the downstream improvements authorized by WRDA 1996 and 1999 would be in place and allow for the safe passage of the objective releases identified in the Folsom PAC report. However, as noted in the Folsom PACR, an erosion study of the downstream channel was needed to provide more information on this subject. Results of this erosion study identified the need for additional erosion protection. Therefore, erosion protection to these levees would enable more optimal operation of the JFP.

- The levee modifications recommended in the 2010 Natomas PAC Report and authorized by WRRDA 2014 (Pub. L. No 113-121) are assumed to be in place, which improve the levees surrounding the Natomas Basin but do not include levee raises to address higher volume, low frequency flows.

- The elements of the American River Common Features project as authorized by WRDA 1996 and WRDA 1999 are assumed to be in place. These features addressed the levee seepage and stability concerns along the American River but do not address the erosion risk.

2.1.2 Measures and Alternatives Considered but Eliminated

Some measures originally identified that could contribute to addressing the Folsom dam raise were reviewed and dropped from further consideration. These measures, which are described in the subsections below, include a skin plate extension, a horizontal top seal in order to refine the tainter gates, an earthen raise of the dam and dikes, dredging to lower the reservoir bottom, a Concrete Masonry Unit (CMU), or a Mechanically-Stabilized Earthen (MSE) cap to raise the dam. Variants of tainter gate refinement and the 3.5-foot dam raise alternative remains the common element between all alternatives and are the primary focus of the remaining alternatives detailed in Sections 2.1.2.1 through 2.1.2.10 below.

2.1.2.1 Reduce the Stop Log Fabrication and Installation from Two Sets to Zero New Sets; Utilize Existing Set

The Folsom Dam tainter gate upgrade includes the fabrication of two new sets of stop logs in order to complete construction within one year, a relatively short construction window. There already exists a set of stop logs which meet the height requirements. However, with the JFP auxiliary spillway expecting completion in 2017, there is a 3 year window for the Folsom Dam tainter gate upgrades to be constructed. The Corps would reduce the quantity of acquired stop log sets to zero and consequently extend the construction period to 3 years. This alternative essentially recommends the re-use of existing stop logs to meet upgrade requirements.

The advantages to this alternative are:

- Reduces risk of trying to complete all work within a one year construction window, the failure of which would result in cost overruns and potential reduction in release capacity during late calendar year conditions of rising pool elevation.

- Shifting costs from additional and unnecessary sets of stop logs to that of an additional two sets of mobilization and demobilization costs.

- Space constraints on the site make completing multiple gates at once difficult, and the proposed design would alleviate this issue by essentially extending the period of performance.

- “Re-using” the existing stop log sets eliminates arguably wasteful spending.

The disadvantages include:

- Loss of flexibility of having two new sets of stop logs.

- Increased mobilization costs.

The justification for this alternative is, although mobilization costs would approximately triple, the reduction in project costs of a single, full set of stop logs is $2,876,309.57 each compared to the complementary increase in mobilization/demobilization project costs of $289,383.91. Incrementally, this proposal decreases end performance by 1/3 (3 sets reduced to 2) for each set of stop logs, and decreases costs by approximately 45%. In terms of incremental performance, the third set of stop logs is not justified without additional inputs or performance requirements that would place a higher value on the third set of stop logs over the first and second ones.

Overall, this alternative was rejected as two gates would need to be non-operational during the raise of the gate hoists, gear assemblies, motors and gantry way. Construction would move more efficiently if more than two gates are taken off line at a time; however, Bureau of Reclamation (USBR) does not see this as an option and requires that no more than two gates be offline at a time. Therefore, as USBR already has one set of stop logs; one additional set of new stop logs would be needed for the project.

2.1.2.2 Tainter Gate Refinement: Replacement of Emergency Tainter Gates

As the current authorized alternative per the 2007 PACR, this alternative would include the complete replacement of the existing three emergency spillway tainter gates (ESTGs) with newly fabricated, larger tainter gates (64.16-ft high, 54.5-ft radius). Trunnions would be elevated and relocated further downstream, requiring vertical and horizontal extension of existing piers, supplemental rock-bolts, and trunnion anchorage requirements, as well as new, elevated mechanical hoisting features and associated pier modifications. This alternative allows for the emergency gates to remain closed until the pool elevation approaches the PMF pool. A 2-foot partial gate opening would provide one foot of freeboard above PMF pool (483.34-ft NAVD 88).

This alternative was not carried forward for analysis, as the Alternative 2 (Section 2.3 below) was chosen based on achieving the same benefit as this alternative but with more flexibility in operations for less cost. Additionally, the horizontal top seal portion of this alternative raised significant concerns on ability to install, and it requires double the amount of steel.

2.1.2.3 Refined Emergency Gate Replacement

This alternative would include the complete replacement of the existing three emergency gates, with newly fabricated, larger tainter gates (58.84-ft high, 48.33-ft radius). This alternative was developed based on hydraulic criteria that have been updated since the 2007 PACR. With the top of gate at elevation 478.34, operational requirements would require the emergency gates to open at a pool elevation of 476.34'. The gate geometry for this concept would not require extensive pier modifications such as those required for the PACR replacement concept.

While maintaining the same gate sill location as the existing tainter gates, the slightly longer gate radius moves the trunnion further downstream but within the footprint of the existing pier geometry. This alternative would provide one foot of freeboard on the gates when the gates are fully open with a PMF pool. This option would also require new mechanical hoisting equipment to be elevated in order to keep motors above PMF elevation.

Similar to the alternative described above (2.1.2.2 Tainter Gate Refinement: Replacement of Emergency Tainter Gates), this was not carried forward for analysis as the Alternative 2 (Section 2.3 below) was chosen based on achieving the same benefit with more flexibility in operations for less cost.

2.1.2.4 Tainter Gate Refinement: Horizontal Top Seal

The Horizontal Top Seal refinement option is characterized by the main bulkhead, which spans horizontally across the emergency spillway bays. With the upper bulkhead and lower bulkhead, the "Horizontal Top Seal" would hold back water when pool elevation exceeds the top of the emergency tainter gate.

The upper bulkhead would be comprised of I-beams while hangers would bear on the spillway bridge parapet and would be welded to the top of the upper bulkhead. The upper bulkhead would also rest on the stop log guide extension. The upper bulkhead would have clearance with the stop log extension, and thus would not restrain cross canyon movement of the piers. The upper bulkheads would seal against the stop log guide extension and the main bulkhead with J-bulb plastic seals. An elliptical skin plate extension would be connected to the bottom of the upper bulkhead to promote better hydraulic flow characteristics. The bolted connection would allow the skin plate extension to be added after both the main bulkhead and the upper bulkhead are in place. The exact shape of the skin plate extension would be determined by physical modeling by hydraulic engineers.

The lower bulkhead would be comprised of seal-welded, wide-flange I-beams. It would span across the spillway bay and be supported on top of the piers. Steel angles anchored on the pier faces would also support this feature. At the pier support, a low friction bearing pad would be installed to allow the lower bulkhead to move freely in the cross canyon direction. The lower bulkhead would have two hoist openings to allow for passage of the gate hoist chains. At each opening, a rubber seal would be installed to minimize leakage.

The horizontal top seal would address the emergency gates' hydraulic deficiency by allowing the gates to remain closed with pool elevation above the top of gate leaf. As for modifications needed to address the structural deficiency, the same gate modification for the Vertical Top Seal design would apply since the existing emergency tainter gates were reused for both design refinements.

This alternative was rejected for several reasons, including:

- With possible controlled leakage through the horizontal top seal bulkhead, the hoist motor may need to be elevated to maintain dry operation.

- The geometry and location of the Horizontal Top Seal made this refinement option more complex and difficult to design. All the bulkheads can be shop fabricated, but their large size can complicate installation.

- The larger main bulkhead in the Horizontal Top Seal concept would likely be more difficult to install than the vertical bulkhead of the Vertical Top Seal concept. The Horizontal Top Seal refinement would have the same constructability challenge at the downstream pier nose due to limited work space.

2.1.2.5 Tainter Gate Refinement: Skin Plate Extension

This concept considered extending the skin plate to a height that met the new freeboard elevation. To accomplish this, the skin plate would have to extend on a tangent path approximately 24-feet long. This would require at least one additional rib support girder, an additional gate strut arm, and a completely redesigned/replaced trunnion assembly.

The heightened skin plate and added members would increase the gate weight, requiring larger hoists. Further, tainter gate side seals typically seal against an embedded seal plate, in which the seal rubs along the arc of the gate as it is opened. The tangent section would not follow this arc and introduce transverse friction loads which side seals would not easily resist. The excessive wear induced on seals from transverse friction would also increase maintenance requirements. Pier modifications would likely be necessary to add extensive side seal plate embedment. These modifications were deemed excessive and, more significantly, transverse seal loading is not recommended or practiced in tainter gate designs.

2.1.2.6 Dredging

Dredging as a viable solution was initially analyzed and screened out in the LTS

EIS/EIR. The geology of Folsom Reservoir is rocky hills with a very thin (3-4 foot) soil veneer. The only major quantities of removable soil are found in the American River streambed, which is underwater most of the time. Thus, the removal would require soil and rock dredging which is expensive, and an environmentally and culturally damaging process. Because of its very high cost, this measure was not considered further and would not be considered in the current EIS/EIR. The environmental effect of disposal is also very high due to potential mercury content and would further increase the cost.

2.1.2.7 The 3.5-Foot Dam Raise: Concrete Floodwall

The 3.5-foot dam raise alternative would consist of a cast-in-place, reinforced concrete wall located near the reservoir side of the crest of each of the dikes, the left and right wing dams, and MIAD. The existing access ramps crossing the dikes would be raised 3.5 feet to match the new concrete crest wall height. The 2007 PACR, with supporting engineering documentation report (EDR), authorized this alternative to raise these features by means of a concrete "crest-wall" (otherwise referred to as floodwall or parapet wall). This floodwall would be installed on the lakeside edge of the crest.

This alternative was not carried forward because of the potential recreation and environmental effects based on feedback from the public and environmental team. Additionally, the main engineering rationale supporting the embankment design was the geotechnical preference for similar and consistent materials. The concrete wall has more susceptibility to seepage paths at concrete-soil interfaces.

2.1.2.8 The 3.5-Foot Dam Raise: Earthen Raise

This concept would raise all of the dams and dikes 3.5 feet through placement of fill derived from the auxiliary spillway excavation and/or from other borrow sources. It was rejected for the left and right wing dams due to space constraints associated with steeper embankment slopes compared to other reservoir dikes. There is inadequate space, particularly at the wing dam toes, at which an earthen fill would widen and conflict with existing project features and access.

2.1.2.9 The 3.5-Foot Dam Raise: Concrete Masonry Unit (CMU)

This alternative was rejected because reinforced CMU tend to crack more readily during earthquakes and other heavy movements. Additionally, CMU is not as effective at preventing water from seeping through and entering the landside. Reinforced concrete walls and/or an earthen raise in general would last longer than reinforced a CMU wall.

2.1.2.10 3.5-Foot Dam Raise: Mechanically-Stabilized Earthen (MSE) Cap

This alternative was not deemed feasible for several reasons. The primary concern is that the stress-strain differential between the anchors and soil material would cause a seepage path through the MSE wall. Further, the use of MSE for such a small height is not common and may further pose constructability challenges on the steep sloped, wing dam embankments. Another concern with the MSE concept is the vertical drop off on both upstream and downstream sides, which creates a safety risk or else requires additional guardrail features. Vertical alignment transitions would also be challenging at each end of the wing dams due to footprint limitations. The transitions would likely need a partial, water-stopped concrete flood wall tie-in to the MSE.

2.2 Alternative 1: No Action Alternative

A No Action Alternative is required pursuant to NEPA, and a No Project Alternative is required for CEQA (for consistency, in this DSEIS/SEIR, it is referred to as the No Action Alternative). The No Action Alternative constitutes the future without project conditions that would reasonably be expected in the absence of the proposed action and serves as the environmental baseline, per NEPA, against which the effects and benefits of the action alternatives are evaluated. The environmental baseline for CEQA is assumed to be the existing conditions.

Under the No Action Alternative, the Federal government would not implement the emergency spillway gate modifications or the 3.5-foot raise, and the associated improved flood risk management benefits would not occur, as also described in the Future Without Project Conditions. Since no other projects are currently planned that are similar or equivalent to the emergency spillway gate modifications or the 3.5-foot raise, it would be speculative to assume that any work would occur absent the Corps project.

Under the No Action Alternative, significant loss of life is expected with a great enough flood event or PMF, as well as injuries, illnesses, and the release of hazardous and toxic contaminants to the downstream floodplain. The urban areas downstream of Folsom Dam would continue to be at risk of flooding, and lives would continue to be threatened. The gates and dam would be at risk for failure, threatening the levee system downstream with a surge of flow beyond the current 160,000 cfs levee capacity. If a dam or gate failure were to occur, the chance of levee failure downstream would increase. If a levee failure were to occur, major government facilities and transportation corridors would be impacted until flood waters recede. A temporary shut down or slowing of State and Local government functions would occur, and workers would be unable to perform their duties until the buildings are restored and can once again be occupied.

2.3 Alternative 2: Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall

Proposed construction elements for Alternative 2 are discussed below in detail, beginning with the design elements of the tainter gates, followed by the design elements of the 3.5-foot dam raise. While modification to all 8 gates (3 ESTGs and 5 service spillway tainter gates (SSTG) are analyzed in this document, the modification of the gates would be phased. Currently, the top seal would only be constructed on the emergency gates, while the modifications to the service spillway tainter gates would occur at a later date.

The 3.5-foot dam raise is currently at a lesser level of general design development and analysis than the Spillway Modification (tainter gates). Because of this, the descriptions of the dam raise alternatives would be briefer than the descriptions of the tainter gate alternatives. It is likely that supplemental design and environmental documentation would be required for the dam raise prior to construction.

Operation and Maintenance requirements of the proposed alternatives would not initially change with Alternative 2. However, the raise would result in an ablity to sustain an increased flow of 160,000 cfs for a longer period of time, and would have possible inundations up to 486.34’ (NAVD88). Any post-construction operational changes would be defined in a Water Control Manual update and accompanying environmental documentation.

2.3.1 Tainter Gate Design Elements

The 2013 Engineering Documentation Report (EDR) identified refinements to the existing tainter gates in lieu of the complete gate replacement originally proposed in the 2007 PACR. Refinements include additional strengthening features to the existing tainter gates and a new “top seal” bulkhead that would prevent overtopping of the spillway gates during a major flood event. Design elements of the tainter gates include:

- **Top Seal Bulkhead:** The top seal bulkhead is a hydraulic structure that would be mounted above the spillway tainter gates in order to prevent overtopping during a major flood event.

- **Tainter Gate Retrofit:** Reclamation’s seismic retrofit of the tainter gates did not account for some of the loading conditions imposed by Probable Maximum Flood (PMF) design load case. As such, some additional retrofit elements are necessary to address this (skin plate ribs, lower girder, and trunnion anchorage).

- **Pier Height Extension:** A vertical concrete extension to the top of the pier would provide the necessary elevated platform for the new hoist system. The top seal bulkheads for the emergency spillway tainter gates would mount to and seal against the pier extension. When the gates are in the closed position, the concrete extension would also serve as the water barrier between top seal bulkheads when the reservoir reaches elevations above 468.34' NAVD88.

- **New Hoist System:** A new hoist system would be installed to handle increased hydrostatic PMF loads, as well as slightly heavier gates from additional retrofit requirements. The new hoist system would also incorporate a new cable.

In light of the Bureau of Reclamation's structural improvements to the tainter gates in 2011, this option would make use of these existing strengthened gates and incorporates a "top seal" feature that increases the height in which the emergency spillway bays can hold back a flood pool before requiring gate opening (EL. 483.34'). This alternative would provide top seals on all 8 gates (3 ESTGs and 5 service spillway tainter gates (SSTG). It would include bulkhead elements that are mounted vertically above the existing tainter gates and span between the emergency spillway piers.

The emergency gate top seal bulkhead would extend from the top of the emergency tainter gate at the closed position, to elevation 486.34 (NAVD 88), while the service gate top seal bulkhead would extend from the top of the service gate at the closed position, to elevation 486.34. This is the elevation of the PMF pool at elevation 483.34, with an additional 3 feet of freeboard.

The top seal bulkhead consists of welded, built-up plate sections. There is a skin plate on the upstream face, and downstream there would be welded, built-up T-sections consisting of a web and flange plate which span continuously across the spillway bays. Between every T-section along the elevation, there would be an intermediate web plate that is half the depth of the T-section and welded continuously along the span of the skin plate. The purpose of this configuration is to create an open cell structure and to reduce weight by removing the flange plate on alternating built-up sections. The top seal bulkheads would be supported by, and bear on, parallel steel angles which would be attached to each pier face with 1- ¼" epoxy anchors and shear lugs in the existing pier concrete, and with 1-¼" F1554 cast-in-place anchors in the new pier concrete. The anchors and shear lugs are designed to transfer the hydrostatic and dead loads to the piers. The dead weight would be supported by a built-up plate section which is welded to the top seal bulkhead, and bears on cantilevered wide flanges that are anchored to each face of the pier. The top seal bulkhead would not be restrained in the cross canyon direction, and therefore would not restrain pier movement during normal loading or seismic conditions. It would be sealed along the top of the tainter gate using a J-Bulb rubber seal with a 3/8" gap. This is to ensure that during normal gate operations, the top seal would not contact the tainter gate skin plate. During high pool elevations, the top seal should be flexible enough to bend toward the skin plate and seal the gate along the top edge.

The upstream spillway bridge parapet wall would provide three feet of freeboard consistent with the rest of the dikes and JFP Auxiliary Spillway. Due to increased hydrostatic load on the emergency gates, some additional retrofits are required to further strengthen the three emergency gates, including the replacement of gate arms, thickened skin plate girder flanges, and skin plate knee braces.

2.3.2 Earthen Raise Design Elements

The increased storage capacity associated with the Folsom Dam Raise project would allow an elevated probable maximum flood (PMF). As such, the current crest elevation of the reservoir dikes and embankment dams would not provide sufficient freeboard to meet design criteria for resisting wave height and runup. Accordingly, increasing the height of all reservoir dikes and embankment dams would be required.

The 3.5-foot dam raise alternative would raise the height of Dikes 1 through 8, and MIAD, with an earthen embankment raise using an engineered fill material similar to the existing composition of the earthen dikes. This would allow seepage and pore pressure to be maintained through the interface between the old and new material. The slopes of the dikes and crest widths would conform to the Corps' standards while maintaining Reclamation's requirements for security and maintenance. The existing riprap and underlying filter layers would be stripped off the upstream side of the dikes, as well as the existing dike top asphalt road and underlying base course, prior to placing the fill to raise the dike. The riprap would be reprocessed for use on the raised dike. The dike raise would have 1V:2.25H sideslopes and a varied width (*e.*g. 22 to 26-foot wide) crest width to allow for construction of the new dike tip road. Figure 3 is an example cross section.

Beyond any USBR modification, the remainder of the dike raise would straddle the existing dike in order to maintain alignment with the raise over the USBR modifications. For this portion of the raise, the protection layers would be stripped off both the upstream and downstream sides of the dike.

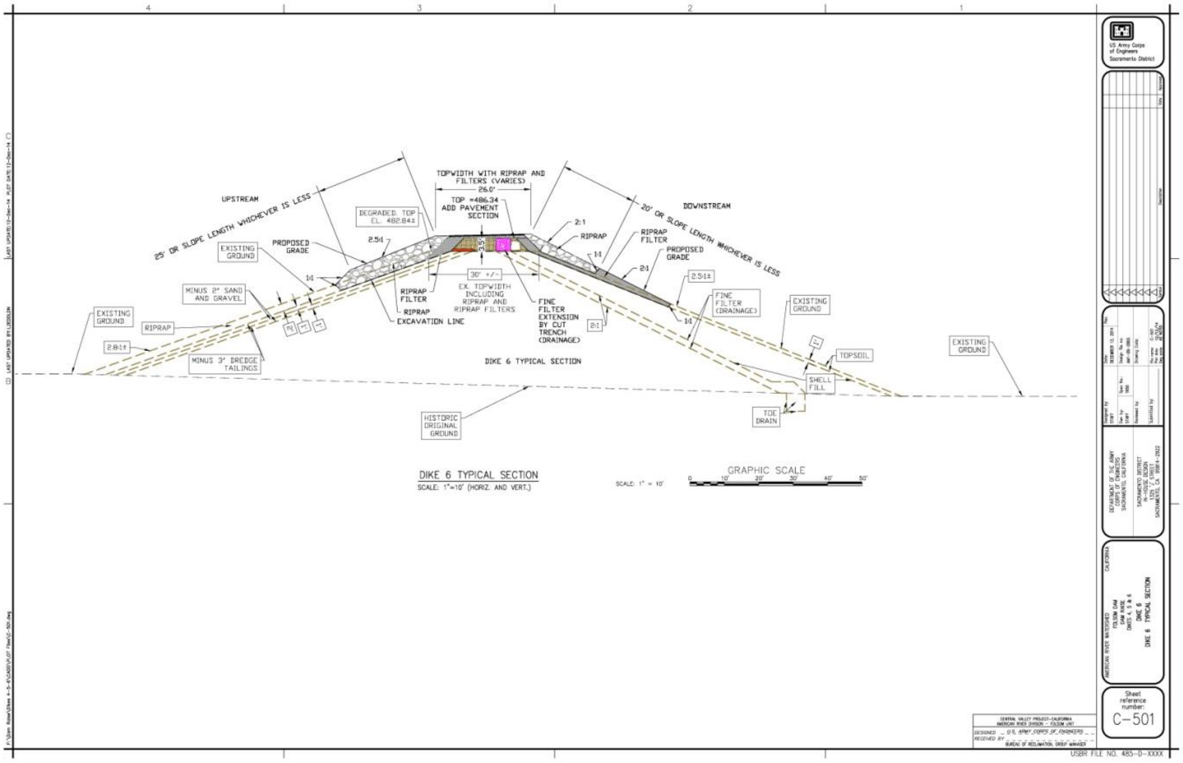

Figure 3. Example Cross Section of A 3.5-foot Earthen Dike Raise.

2.3.3 Concrete Floodwall Design Elements

In combination with the earthen dam raises on the dikes and MIAD, the Corps would also construct a reinforced 3.5-foot concrete flood wall on the LWD and RWD that would tie into the main dam, the new control structure, and the existing terrain (Figure 4). A reinforced concrete retaining wall (also termed a parapet wall), with footing embedded in the earthfill of the embankment, would be constructed along the embankment crest to the required height. This would require excavating a portion of the dam or dike crest to place the footing and to replace the embankment fill along with a drainage element to control pore pressures.

The analysis and design of the flood wall on the left wing dam and the right wing dam would be in accordance with EM 1110-2-2100, EM 1110-2-2104 and EM 1110-2-2502. The flood wall would be constructed using cast-in-place reinforced concrete. The reinforced concrete design and detailing would be in accordance with EM 1110-2- 2100, EM 1110-2-2104 and ACI 318-11. The floodwall would be designed with joints at every 30 feet. A construction joint type J would be provided in the base slab, and expansion joints would be provided in the wall. Seepage through the wall would be controlled by providing a Type “Y” water stop in the stem. Joint filler thickness would be determined from the estimated contraction and expansion from maximum temperature variation.

At the LWD and RWD, filter zones would be required only in the upper portion of the dams. Processed material filter zones would be constructed from the crest to an elevation of approximately 20 to 40-ft below the dam crest. This filter zone would be constructed by excavating a 20 to 40-ft portion of the downstream shell and placing the filter material against the core. The filter zone would then be covered by a layer of excavated shell material. This filter zone would exit into the downstream shell material of the embankment.

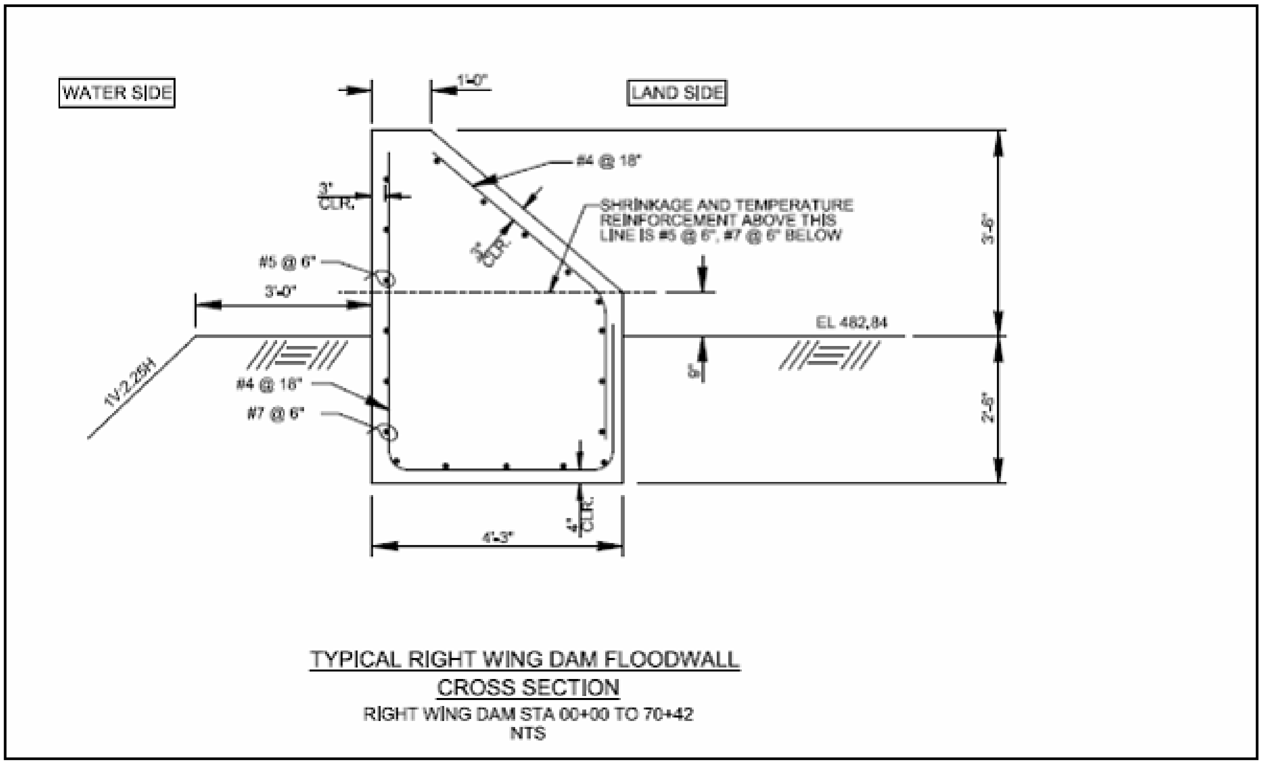

Figure 4. Example Cross Section of Concrete Floodwalls.

2.3.4 Construction Details

Tainter Gate Access, Staging Areas and Haul Roads

General construction access to the site would come from Folsom Dam Road via Auburn-Folsom Road. The contractor would require staging areas for activities including, but not limited to, assembly of construction and excavation equipment, stockpiling of materials, and fuel storage. Four potential staging areas have been defined (Figure 5), and are located within Reclamation's work yard just north of the Central California Area Office (CCAO) facilities and on top of the main concrete dam.

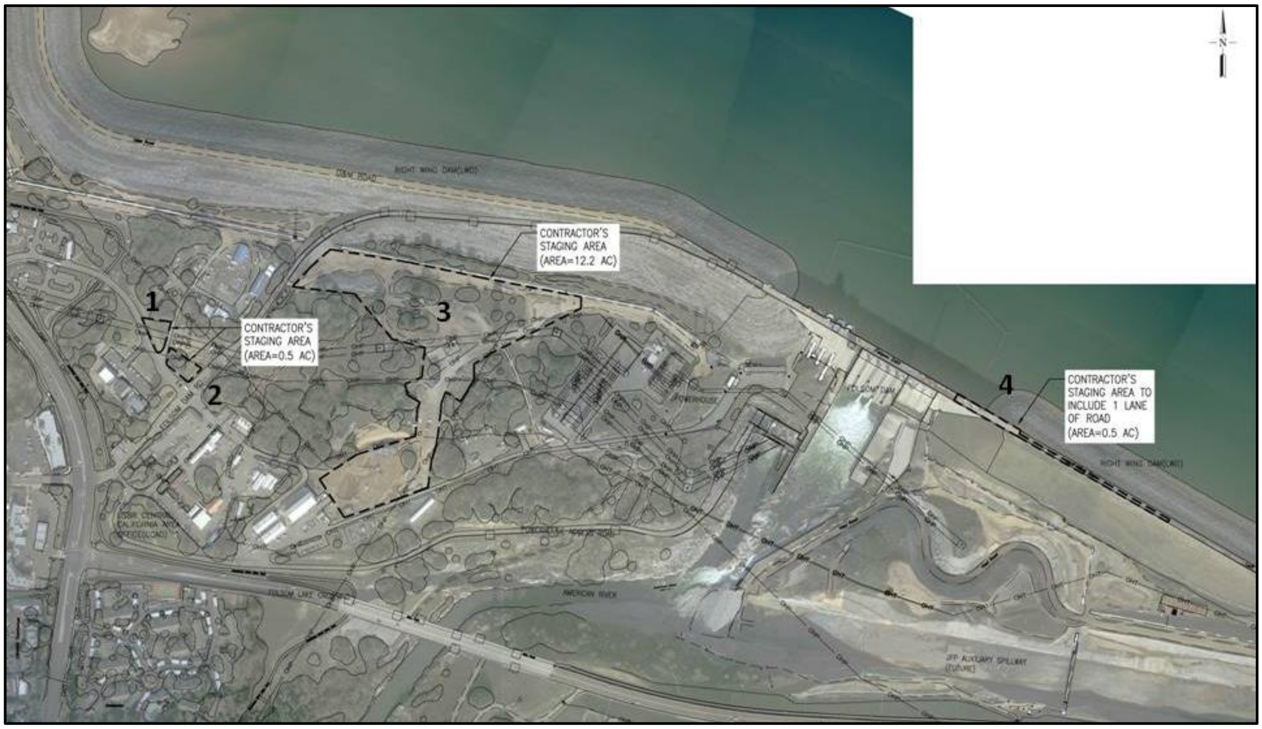

Figure 5. The Four Staging Areas for Spillway Modification with Existing Tainter Gates.

Staging areas 1 and 2 combined are 0.5 acres of previously disturbed area. Staging area 3 is 12.2 acres, the largest of the four areas. Staging area 4 is located on the left side of the main dam, is to include one lane of the road, and is approximately 0.5 acres. The vegetation and habitat within each of these staging areas is discussed in detail in Section 3.4.

There are two access points for the Right Wing Dam and the spillway (Figure 6 and Figure 7). The first is at the CCAO entrance at the USBR facility yard. The haul routes follow established roads along the top of the Right Wing Dam and through the CCAO/USBR facility. This access is restricted, however, used only with special request to USBR. The second access point, and the primary point of access for the Left Wing Dam and staging area, is at the Gate 1 access off of Folsom Lake Crossing, and the haul route would be over the control structure to the southeast end of the Left Wing Dam (Figures 6 and 7). One lane would be open to traffic across the dam at all times during the construction period. However, the traffic lane would not need to be continuous across the dam so long as a vehicle (auto/pickup) can navigate from one side to the other. Haul routes on public roads are further described in Section 3.9.

6. The CCAO Access Point to the Right Wing Dam and the Emergency Spillway. The Red Polygons Are Proposed Staging Areas; the Green Polygons are the Dam Structures.

Figure 7. The Gate 1 Access Point to the Left Wing Dam.

3.5-Foot Raise Access, Haul roads, and Staging Areas

There are several access points throughout the project area for the 3.5 dam raise alternative. Access to Dike 1 would be from the the Granite Point entrance. Haul roads would go to the top of Dike 1 as well as travel parallel to Dike 1 to the east (Figure 8), where the haul road would provide access to Dike 2. Access to Dike 3 would be from Douglas Blvd on the south end of the Dike; the haul road would follow the top of the dike.

Access to Dikes 4, 5, and 6 would be from Auburn-Folsom Road, near Dike 5 (Figure 9). The haul route to Dike 4 would follow previously used access roads from the southwest up to the toe of the dike. A second access point, also from Auburn-Folsom Road at Beal’s Point, is located south of Dike 6. This also offers access to the northern end of the Right Wing Dam. The haul roads to Dikes 5 and 6 follow previously used access roads from the access point on Auburn-Folsom Road south along the toe of both dikes (Figure 9). The route near the entrance of Dike 5 would need minor grading to make it passable.

There are two access points for the Right Wing Dam (Figure 9). The first, as previously mentioned, would be from Auburn-Folsom Road at Beal’s Point. The second would be at the Central California Area Office (CCAO) entrance at the USBR facility yard. This access, however, is for restricted use only. The haul routes follow established roads along the top of the Right Wing Dam and through the USBR facility. The access point for the Left Wing Dam and staging area is at the Gate 1 access off of Folsom Lake Crossing, and the haul route would be over the control structure to the southeast end of the Left Wing Dam (Figure 10).

While there are two access points off of Folsom Lake Crossing indicated on Figure 10, only one would be used to access Dike 7. The northern access point is along an established, paved entrance, and the southern access point indicated on Figure 10 would not be used at all. The haul route follows the northwestern end of Dike 7 around to the northeastern side, through the staging area and up to the previously established haul road down to Dike 8.

Dike 8 has a single access point off of E. Natoma Street and Briggs Ranch Road, along an established, paved access. The haul road, from the access point, is paved for approximately 0.01 miles before shifting to a previously disturbed dirt access road and haul routes along the east end of the dike (Figure 10).

There are three different ways to access MIAD and the associated staging areas. The first is to follow the haul road from Dike 8. The other two are off of Green Valley Road (Figure 11), one about 1/3rd up the dike, and the second at the northeastern end of the dike where Green Valley Road intersects with Access Road. The haul road, which comes from Dike 8, follows currently used access roads up to the top of MIAD and across to the Access Road (Figure 10).

In general, all the dirt haul routes would need to be routinely graded with a blade to repair ruts from truck usage. Rock would be added to control mud and dust, and water trucks would also be used to control dust on all roads. Haul routes on public roads are further described in Section 3.9. Entrances and exits of the roads at the toe of each dike would be rocked; there would be no need to rock the existing roads at the top of the dikes. The existing road base at the top of the dikes would be used to haul road rock, as necessary.

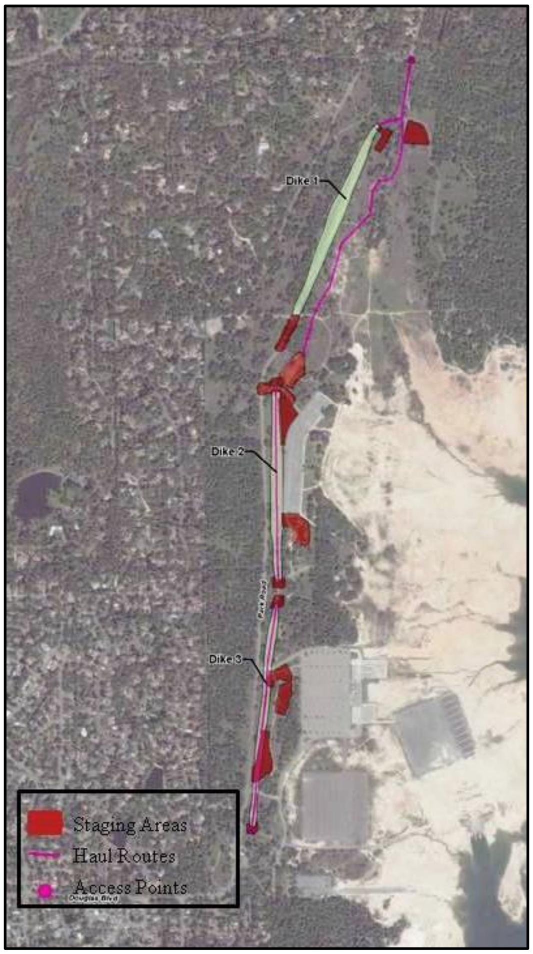

Figure 8. Staging Areas Associated with Dikes 1, 2, and 3.

Figure 9. Staging Areas Associated with Dikes 4, 5, and 6 and the Right Wing Dam.

Figure 10. Staging Areas Associated with Dikes 7 and 8 and the Left Wing Dam.

Figure 11. Staging Areas Associated with the Mormon Island Auxiliary Dam.

There are a total of 31 staging areas within the project area for this alternative (Figures 6 through 11, also Appendix B). All of the staging areas have been previously disturbed for a total of 157.2 acres. The vegetation and habitat within each of these staging areas is discussed in detail in Section 3.4. The staging areas would not be used simultaneously, but would be utilized in association with each construction phase of each dike (see *Construction Schedule* below). For example, the 12.91 acres of staging areas associated with Dikes 1, 2, and 3 would be utilized during the construction phase scheduled for calendar year 2018-2020.

Two staging areas near Dikes 4, 5, and 6 are located within the water-side of the lake. These staging areas are, during periods of drought-induced low water levels in the lake, have been used by the USBR for previous work on the three dikes. They are to be used for staging equipment, vehicle parking, stockpiling of random unsorted materials, etc. Fuels and other hazardous material would not be stored in the lakeside staging areas. However, if lake levels rise due to a change in drought conditions, these staging areas would not be used; other staging areas located on the land side of the dikes would be utilized instead. As a general note, all staging areas are proposed at this time, but staging would generally occur in previously disturbed areas with limited vegetation.

Borrow and Disposal Sites

The majority of materials necessary for each alternative would be obtained from an established borrow site within 30 miles of the proposed project site. All disposal sites would be at permitted landfills or established disposal sites within 30 miles of the proposed project site.

Some rip-rap could be available and utilized from the stockpile at the MIAD East location (resultant from Prior JFP phases and the restoration of the Dike 7 Office Complex staging area. See below, and Figure 12.) Rip-rap removed from the Dike 7 Office Complex (Dike 7) staging area for the post-construction restoration of the staging area would be placed within the disposal area of MIAD East. This could involve as much as 100,000 cy of rip-rap and would not exceed a maximum of 200,000 cy of rip-rap. The rip-rap would be removed from the Dike 7 staging area using equipment such as excavators and bulldozers, placed in dump trucks, then hauled to the MIAD East disposal area using the existing internal haul road. It is likely that the rip-rap would be placed (disposed of) in the northwestern portion of the disposal area near the existing haul road as shown in Figure 12 (purple hatching). The placement area would be positioned at least 100 feet away from the southern toe of the Mormon Island Auxiliary Dam. The maximum area occupied by the disposed rip-rap would range from approximately 6.5 to almost 8 acres, based on a rip-rap pile height ranging from 8 to 10 feet above the soil surface. The top of the completed rip-rap disposal pile would be relatively level, although it would follow the topography of the underlying soil, and edges of this pile would have approximately 1H:2V side slopes

As described in the Folsom Dam Modification Project: Phase V Site Restorationand Related Mitigation Activities Final Supplemental Environmental Assessment/Environmnetal Impact Report, March 2016 [Phase V]), following disposal of the rip-rap, a state agency such as DWR would have until October 1, 2017 to remove all the disposed rip-rap from the MIAD East Area and transport it off-site for use in another project. This deadline could be extended if approved by Reclamation via a third-party agreement between Reclamation and the state agency. The Corps would also execute an agreement with Reclamation indicating that if a state agency ultimately decides not to remove the rip-rap, then the Corps would remove the rip-rap from the MIAD East Area for use in the Dam Raise Project. Regardless of the party removing/using the rip-rap, it would ultimately be removed from the MIAD East Area, which is why the proposed initial disposal of rip-rap in this area is considered to be temporary. The reader is advised, however, that the rip-rap may not be removed from the MIAD East Area for several years.

If a state agency decides to remove the rip-rap, that agency would be responsible for preparing an appropriate environmental document to address the environmental impacts associated with the collection, transport, and use of the rip-rap removed from the MIAD East Area. If instead the Corps removes the rip-rap, the Corps would be responsible for preparing an appropriate environmental document to address the environmental impacts associated with removal and use of the rip-rap. Such environmental documents would include implementation of mitigation measures and/or BMPs if necessary (March 2016)

Site Preparation and Post-Construction Restoration and Cleanup

Prior to construction, the staging areas and dikes would be cleared of grasses and herbaceous vegetation. All the trees in the staging areas or in the footprint of the dikes would be avoided to the greatest extent practicable. If some trees need to be trimmed or removed prior to construction, the Corps would conduct a site visit to determine the impact to the trees and make a determination about possible actions prior to construction. All trimming of trees would be done outside of the nesting season as much as possible.

Following the completion of the major proposed construction activities within the proposed project area, a mixture of native grass and forb seeds would be planted throughout in order to establish a permanent vegetative groundcover. All seeds would be procured from California native seed growers. Table 2 below provides a preliminary list of the grass/forb seed mixture that would be planted. This list and/or the seeding rates (pounds per acre) may be revised somewhat to account factors such as specific site conditions, the planting method used, and the availability of seed stock.

Table 2. Preliminary list of grasses and forbs to be planted (seeded) in the proposed project area for restoration.

Common Name	Scientific Name	Pounds PLS per Acre
California brome	*Bromus carinatus*	10
Blue wildrye	*Elymus glaucus*	2
Squirrel tail	*Elymus elymoides*	2
California poppy	*Eschscholzia californica*	3
California fescue	*Festuca californica*	2
Meadow barley	*Hordeum brachyantherum*	5
Creeping wildrye	*Leymus triticoides*	4
Miniature lupine	*Lupinus bilcolor*	3
Nodding needlegrass	*Nasella cernua*	2
Purple needlegrass	*Nassella pulchra*	2
Pine bluegrass	*Poa secunda*	5
Tomcat clover	*Trifolium willdenovii*	3
Small fescue	*Vulpia microstachys*	2
Total Seed Mixture		**45**

PLS = Pure Live Seed. Pounds indicated are based on broadcast seeding or hydroseeding.

Disking would be performed prior to seeding to prepare the soil for seed placement. In compacted areas, the soil would be ripped or scarified to help reduce compaction. The method of seeding would be left to the contractor to determine, using hydroseeding, broadcast seeding, drill seeding, or a combination of these methods. In addition, soil imprinting may be employed in some areas to minimize seed runoff and help with local rainwater infiltration. Imprinting is a technique of soil-rolling that leaves small depressions in the soil surface that help break runoff, improve water infiltration, and prevent seed washout. Additonally, after the construction is complete, all temporary construction items such as signage, temporary fencing, etc., would be removed.

The staging area located at the Dike 7 Office Complex, currently a paved parking lot and temporary structures, would be restored to habitat. This area has been used by prior phases of the Folsom JFP (Phase V, March 2016), and the 2007 FEIS/EIR previously addressed use of the Dike 7 Office Complex Area as a construction staging and storage area. A construction office complex/construction staging and storage area was built immediately south of Dike 7 during prior phases of the Folsom JFP. This area includes two parking areas; one located southeast of the entry road to the complex and one located northwest of the entry road. Restoration work is necessary to comply with prior commitments set forth in the PACR 2007 FEIS/EIR and in the Land Use Agreement (LUA). All equipment, temporary buildings, fencing, and structures would be removed from the complex. Both parking lots, consisting of asphalt and base material, would be removed, stored at MIAD East, and eventually used as rip-rap, and the area would be restored topographically and revegetated, as described in the Phase V SEA/EIR (March 2016). The proposed topographic restoration of the Dike 7 Office Complex staging area would largely be accomplished by re-distributing the existing native ground materials ("soil") located within the area through excavation, filling, and grading. This process would not require importing new fill or exporting excavated soil. Restored areas would be re-contoured in a manner to mimic natural slope appearance and to restore natural hillside slopes where practicable to pre-project conditions, and would be reseeded with native grasses and forbs (see above). As described in the Phase V SEA/EIR (Corps 2016) the resultant rip-rap field stored at MIAD East from the Dike 7 Office Complex staging area restoration would occupy as much as 6.5 to 8 acres. See Figure 12 for the rip-rap storage site at MIAD East.

Figure 12. MIAD East Area and the Potential Stockpile (purple hatching) within this Area (Corps 2016).

Construction Works and Schedule

The number of private construction employees present onsite each day would vary with scheduled construction activities. Up to 60 workers can be expected onsite any one day for the Spillway Modification with Existing Tainter Gates work. Up to 50 workers can be expected onsite any one day for the 3.5 foot dam earthen raise and concrete floodwall portion of the alternative. The construction work schedule would consist of 10-hour days over 6 days per week throughout the entire year. Twenty-four hour shift schedules may be requested when the construction schedule cannot be met in any other way. However, the double-shift schedule would be temporary and short-term, and potential impacts resulting from a 24-hour work schedule would be analyzed in the event such would need to occur.

The work on the emergency spillway and tainter gates would have an expected project length of approximately 3 years, starting calendar year 2017. This includes pre-work planning, site preparations, setting up office facilities, haul route improvements, and the construction of the tainter gates. Demobilization and site restoration after construction would require approximately 16 days.

The 3.5 foot dam earthen raise and concrete floodwalls would have an expected project length of approximately 4 years, starting calendar year 2017. This includes pre-work planning, site preparations, setting up office facilities, haul route improvements, and the construction of the tainter gates. Demobilization and site restoration after construction would require approximately 16 days. The alternative would be broken up into three "work packages", separating out the dikes into work years. Work package 1, consisting of work on Dikes 4, 5, and 6, would be awarded in calendar year 2017, with a construction duration of 2 years. Work package 2, consisting of work on Dikes 7, 8, MIAD, and the LWD and RWD, would be awarded in calendar year 2019, with a construction duration of 2 years. Work package 3, consisting of work on Dikes 1, 2, and 3, would be awarded in calendar year 2018, with a construction duration of 2 years.

2.3.5 Operation and Maintenance

Operation and Maintenance requirements of the proposed project would not initially change with Alternative 2. However, the raise would result in an ablity to sustain an increased flow of 160,000 cfs for a longer period of time, and would have possible inundations up to 486.34' (NAVD88). Any post-construction operational changes would be defined in a Water Control Manual update and any O&M effects from the Dam Raise Project would be covered in a subsequent environmental document.

Generally speaking, until the Water Control Manual is updated after construction, the Operation and Maintenance requirements would be no different than existing O&M for both the 3.5-foot dam raise and the spillway tainter gate modification, with the exception of some reduced maintenance in a couple of areas:

- The new cable hoist system would be stainless steel with greaseless bearings, so chain maintenance is significantly reduced to periodic inspection.

- The removal of hoist motor redundancy linkage would also remove associated maintenance of this element.

- There would be an added inspection element with the new top seal. The current design is that it would be concrete with embedded steel components for connection of rubber seals and connections to the piers. The top seal would be an extremely low maintenance element but would be an extra item to look at during periodic inspections.

2.3.6 Environmental Commitments

The following avoidance and minimization measures are required and would be conducted by the Corps or the project contractor, as appropriate, to reduce impacts to a less-than-significant level for Recreational Resources:

- Throughout the construction period, an effort would be made to maintain as much public access to recreation areas and trails by implementing traffic control measures, grade separated vehicular and/or pedestrian crossings, and/or temporary alternate public access detours for both pedestrian and vehicular traffic, as described in Section 3.3.5.

- Warning signs and signs restricting access would be posted for public safety before and during construction, as necessary.

- Public outreach would be conducted through mailings, posting signs, meetings, and coordination with interested groups, if necessary, in order to provide information regarding changes to recreational access in and around Folsom Lake.

The following avoidance and minimization measures are required and would be conducted by the Corps or the project contractor, as appropriate, to reduce impacts to a less-than-significant level for Wildlife and Vegetation:

- To minimize dust impacts to vegetation, wetlands, and breeding wildlife, dust control measures consistent with SMAQMD fugitive dust control measures would be implemented. Unpaved access roads would be frequently watered with raw water to prevent visible dust.

- To prevent importation of exotic and invasive plant and animal material, contractors would clean all mud, soil, plant, and animal material from vehicles and equipment before entering the project area.

- Before the project commences, native vegetation and habitat areas would be identified to be protected. Detailed pre-construction site drawings would be created to identify vegetated and habitat areas to be avoid, and would be fenced and signed for protection. Site drawings would be accompanied by a narrative detailing the vegetation and wildlife protection plan. No off-road traffic would occur outside of identified staging areas.

- Areas not to be disturbed would be clearly defined by signing, fencing, or other techniques. Impact to native trees, shrubs, and aquatic vegetation would be avoided to the greatest extent possible. Construction would be implemented in a manner to minimize disturbance of such areas.

- Woody vegetation at all staging areas, borrow sites, and haul routes would be enclosed with protective construction fencing. Where possible, a buffer would be provided one and a half times the distance of the drip-line. Temporary fencing would also be used during construction to prevent damage to native trees. Coordination with a Corps biologist would occur prior to commencement.

- Except as identified in the project drawings or plans, no tree or shrub would be removed without prior agency consultation and examination of alternatives – all feasible construction or staging alternatives would be exhausted before removal of any oak, pine, or riparian tree occurs.

- Before and during the nesting season, a qualified biologist would conduct nesting surveys along proposed construction sites, haul roads, staging areas, and stockpile sites. Work activity around nests would be avoided until young have fledged.

- Avoidance measures would be conducted before nesting season to prevent nesting on equipment and structures. No active nests would be disturbed so as to cause take in the forms of disturbance, harassment, or nest abandonment.

- A qualified avian biologist/environmental monitor would be employed up to a full-time basis onsite, as needed, to ensure project compliance with the Migratory Bird Treaty Act and other environmental mitigations/protections.

- All construction personnel would undergo environmental protection training to be aware of all required environmental protections per these mitigations and by federal/state law.

- Construction materials least likely to lead to entrapment of wildlife would be used and/or removed nightly as applicable. All trash and food-related waste would be placed in self-closing trash containers and removed nightly.

- All BMPs would be strictly followed to prevent spills of toxic substances. No fueling would be allowed onsite, and appropriate materials for spill containment and cleanup would be maintained onsite. No staging of vehicles or equipment would be conducted within 50 feet of the water edge of Folsom Lake to prevent accidental inundation and toxic infiltrations.

The following avoidance and minimization measures would be required and conducted by the Corps or project contractor, as appropriate, to reduce impacts to a less-than-significant level for Special Status Species:

Valley Elderberry Longhorn Beetle

- A minimum setback of 100 feet from the drip-line of all elderberry shrubs would be established (if possible). If the 100-foot minimum buffer zone is not possible, the next maximum distance allowable would be established. These areas would be fenced, flagged, and maintained during construction. When a 100-foot (or wider) buffer is established and maintained around elderberry shrubs, complete avoidance (i.e. no adverse effects) would be assumed.

- Where encroachment on the 100-foot buffer has been approved by the USFWS, a setback of 20 feet from the drip-line of each elderberry shrub would be maintained whenever possible.

- During construction activities, all areas to be avoided would be fenced and flagged. Any damage done to the buffer area would be restored and buffer areas would continue to be protected after construction.

- Signs would be placed every 50 feet along the edge of the elderberry buffer zones. The signs would include: "This area is the habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment." The signs shall be readable from a distance of 20 feet and would be maintained during construction.

- No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant would be used in the buffer area.

- Elderberry shrubs that cannot be avoided would be transplanted to an appropriate riparian area at least 100 feet from construction activities – any areas that receive transplanted elderberry shrubs and elderberry cuttings would be protected in perpetuity.

- If possible, elderberry shrubs would be transplanted during dormant season (approximately November through the first two weeks in February). If transplantation occurs during the growing season, increased mitigation ratios would apply.

- Environmental awareness training would be conducted for all workers before they begin work. The training would include status, the need to avoid adversely affecting the elderberry shrub, avoidance areas and measures taken by the workers during construction, and contact information.

- Monitoring of the mitigation site would occur for ten consecutive years or for seven non-consecutive years over a 15-year period. Annual monitoring reports would be submitted to USFWS. The mitigation site would be selected prior to construction.

Swainson's Hawk

- Swainson's hawk surveys would be completed in compliance with the CDFW survey guidance (Swainson's hawk Technical Advisory Committee 2000).

- If active nests are found, a one-half mile buffer between construction activities and the active nest(s) would be maintained.

- In addition, a qualified biologist would be present onsite 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 observed and noted, construction activities would cease until a qualified biologist determines that fledglings have left an active nest.

Bald Eagle

- Bird nest surveys for bald eagles and other special status migratory birds could be conducted concurrently with Swainson's hawk surveys – at least one survey would be conducted no more than 48 hours before the initiation of project activities to confirm the absence of nesting.

- If active nests are found, a one-half mile buffer between construction activities and the active nest(s) would be maintained.

- In addition, a qualified biologist would be present onsite 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 observed and noted, construction activities would cease until a qualified biologist determines that fledglings have left an active nest.

- Would be conducted within one-half mile of construction activities, including grading, for all trees and shrubs that would be removed or disturbed.

The following avoidance and minimization measures would be required and conducted by the Corps or the project contractor, as appropriate, to reduce impacts to a less-than-significant level for Air Quality:

- Maintain all construction equipment in proper working condition according to manufacturer's specifications – equipment checked by certified mechanic before operation.

- Use diesel-fueled equipment manufactured in 2003 or later, or retrofit equipment manufactured prior to 2003 with diesel oxidation catalysts.

- Any equipment found to exceed 40 percent opacity (or Ringelmann 2.0) would be repaired immediately.

- At least 48 hours prior to use of heavy-duty, off-road equipment, the project contractor would provide SMAQMD with the anticipated construction timeline including start date, and the names and phone numbers of the project manager and onsite foreman.

- SMAQMD's Basic Construction Emissions Control Practices would be implemented to control fugitive dust and diesel exhaust emissions.

- To further reduce hydrocarbon emissions, SMAQMD recommends that the project implement a set of Enhanced Exhaust Control Practices.

- If the project's construction contractor determines that construction activities would actively disturb more than 15 acres per day, then the contractor would be required to conduct PM10 and PM2.5 dispersion modeling.

The following avoidance and minimization measures would be required and conducted by the Corps or project contractor, as appropriate, to reduce impacts to a less-than-significant level for Climate Change:

- Minimize the idling time of construction equipment to no more than 3 minutes or shut equipment off when not in use.

- Maintain all construction equipment in proper working condition.

- Encourage carpools, shuttle vans, and/or alternative modes of transportation for construction worker commutes.

- Use locally sourced or recycled materials for construction materials as much as practicable.

- Develop a plan to efficiently use water for adequate dust control.

- Use low carbon concrete if economically and engineering feasible.

- BMPs and the standard construction avoidance and minimization measures as recommended in the SMAQMD's "Guidance for Construction GHG Emissions Reductions" would be implemented to further reduce GHG emissions.

The following avoidance and minimization measures would be required and conducted by the Corps or project contractor, as appropriate, to reduce impacts to a less-than-significant level for Aesthetics and Visual Resources:

- Modifications to dikes and dams around Folsom Reservoir would occur in phases, limiting the extent of construction affects at any one time.

- Measures would be incorporated into the project design to minimize effects on riparian vegetation, and ensure use of appropriate erosion control methods, thereby lessening the visual effects of vegetation loss.

- Staging areas would be located throughout the project area on previously disturbed areas and their use would not constitute a substantial change from existing visual resource conditions.

The following avoidance and minimization measures would be required and conducted by the Corps or project contractor, as appropriate, to reduce impacts to a less-than-significant level for Traffic and Circulation:

- The construction contractor would be required to prepare a traffic management plan, outlining proposed routes to be approved by the appropriate agencies, and implement the plan prior to initiation of construction.

- High collision intersections would be identified by the appropriate local entity, and avoided if possible.

- Construction and haul drivers would be informed and trained on the various types of haul routes, and areas that are more sensitive (e.g. high level of residential or education centers, or narrow roadways).

- The project would develop and use signs to inform the public of the haul routes, route changes, detours, and planned road closures to minimize traffic congestion and ensure public safety.

The following avoidance and minimization measures would be required and conducted by the Corps or project contractor, as appropriate, to reduce significant impacts to a less-than-significant level for Noise:

- Construction times would be limited in accordance with the City of Sacramento Noise Ordinance exemption for construction (City of Folsom, 2009).

- Construction equipment noise would be minimized during project construction by muffling and shielding intakes and exhaust on construction equipment (per the manufacturer’s specifications), and by shrouding or shielding impact tools.

- All equipment, haul trucks, and worker vehicles would be turned off when not in use for more than 30 minutes.

- Equipment warm-up areas, water tanks, and equipment storage areas shall be located as far away from existing residences as feasible.

- Provide written notice of construction activities within 2,000 feet of residences or other sensitive receptors, identifying the type, duration, and frequency of construction activities. Notification materials would also identify a mechanism to register complaints if construction noise levels are overly intrusive or if construction occurs outside specified hours.

- Residences and businesses would be notified about the type and schedule of construction at least two weeks prior to mobilization.

- The contractor would measure surface velocity waves caused by equipment, monitoring vibration up to threshold values established and approved in writing by USACE – no vibrations would exceed 0.2 inch per second.

- Public meetings would be scheduled with affected residents to ensure they are informed of the project schedule and its potential effects.

The following avoidance and minimization measures would be required and conducted by the Corps or project contractor, as appropriate, to reduce impacts to a less-than-significant level for Water Quality:

- Implement appropriate measures, such as straw wattles and silt fencing, to prevent debris, soil, rock, or other material from entering the water.

- Use of a water truck or other appropriate measures to control dust on haul roads, construction areas, and stockpiles.

- Oil and other liquids would be properly disposed of. Fuels and hazardous materials would not be stored onsite. Inspect vehicles and equipment to prevent dripping of oil or other fluids.

- Fuel and maintain vehicles in a specified area that is designed to capture spills – cannot be near any ditch, stream, or other body of water or feature that may convey spills to a nearby body of water.

- Schedule construction to avoid the rainy season as much as possible. If rain is forecast during construction, additional erosion and sedimentation control measures would be implemented.

- Maintain sediment and erosion control measures during construction. Inspect the control measures before, during, and after a rain event.

- Train construction workers in storm water pollution prevention practices.

In addition, in accordance with 29 CFR 1926.62 Lead and 8 CCR 1532.1 Lead, on all construction jobs where lead is present, the following is required:

- Lead dust on surfaces, especially in eating areas, must be controlled by HEPA vacuuming, wet clean-up, or other effective methods.

- Workers must have washing facilities with soap and clean water for hand and face washing.

- Workers must receive training on lead hazards and how to protect themselves.

- A written compliance program to assure control of hazardous lead exposures.

- Employers must assess the amounts of lead breathed by workers – usually done by employee breathing-zone air sampling.

All consultation and permits required by federal, state or local laws, regulations or policies are found in Chapter 5.0 of this document.

2.4 Comparison of Alternatives

Table 3 shows the overall level of significance for each issue area. It also provides a comparison of significance determinations among the No Action Alternative and Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall. These three alternatives are analyzed in this DSEIS/SEIR as the final array of alternatives considered. Other alternatives have been screened out due to various reasons described in Section 2.1.1.

Table 3. Comparison of the Environmental Impacts of the Folsom Dam Raise Project.

	Alternative 1 – No Action Alternative	Alternative 2 — Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall
Recreational Resources		
Effects	Existing recreational opportunities would not be disturbed. The public would have continued use of the FLSRA without any closures or access restrictions unless a flood event occurs.	Modification of the spillway gates would not restrict access to recreational facilities or resources. There would be no substantial disruptions to the use of existing recreational facilities. The direct effects would result in a severe restriction to recreational facilities and resources with a substantial long-term disruption to the use of an existing recreational facility. Mitigation, avoidance, and minimization efforts would likely reduce the effects of the proposed alternative to recreational users to less-than-significant, however once the detours are identified and analyzed, a subsequent environmental document will be prepared if needed.
Significance	Not applicable.	Expected to be less than significant; however, significant effects could remain even with mitigation, avoidance, and minimization measures.
Mitigation	None required.	Traffic control measures, grade separated vehicular and/or temporary alternate public access detours for both pedestrian and vehicular traffic would be used. To ensure public safety, warning signs and signs restricting access would be posted before and during construction. Public outreach would be conducted through mailings, posting signs, coordination with interested groups, in order to provide information regarding changes to recreational access in and around Folsom Lake.
Vegetation and Wildlife		
Effect	No construction related effects (direct or indirect) to vegetation or wildlife would occur—conditions in the project area would remain consistent with existing conditions.	A construction footprint of up to 50 feet on both sides of Dikes 1 through 8 and MIAD would remove vegetation and disturb the ground surface at up to thirty-one staging areas.

		Indirect adverse impacts to woodland vegetation would include increased erosion, damage to roots of trees by heavy equipment, dust impacts to roadside vegetation, and invasion of exposed substrate by exotic and noxious plant species. Construction associated with gate modifications and raising embankment dams and dikes could temporarily disturb nesting birds. Disturbance from vehicle and pedestrian traffic and machinery would particularly disturb nesting raptors, turkeys, and migragtory birds in the project area. Construction noise and traffic is expected to disturb and/or displace local wildlife that utilizes oak and pine woodlands and grasslands over the project duration.
Significance	Not applicable.	Less than significant with mitigation.
Mitigation	None required.	State and USFWS protocols for survey and protection of nesting raptors and migratory birds would be followed for the project. Mitigation would occur, with the project area returned to pre-existing conditions to the extent practicable at the completion of this project. Mitigation will be completed for any oak woodland habitat adversely affected by the project. Implementation of BMPs listed in Section 3.4.5 would be conducted by the Corps or project contractor, as appropriate, to reduce impacts to a less-than-significant level.
Special Status Species		
Effects	There would be no construction-related effects to existing special status species or critical habitat; however, a PMF flood event may result in the loss of critical habitat and special status species could be adversely affected. The types of special status species and their associated habitats would remain the same.	Construction could potentially result in both direct and indirect effects to elderberry shrubs. Direct effects due to removal or damage to shrubs during site preparation and construction activities. Indirect effects would include physical vibration and an increase in the dust during operation of equipment and during construction activities.
Significance	Not applicable.	Less than significant with mitigation.

Mitigation	None required.	Loss/removal of elderberry shrubs would be compensated for by transplanting shrubs to an approved location and monitored for 5 years. Additionally, elderberry shrubs and associated natives would be planted at an existing Corps mitigation site or credits would be purchased at a USFWS approved mitigation bank. Implementation of BMPs discussed in Section 3.5.5 would also be necessary during construction to prevent mortality or incidental take of special status species (Valley Elderberry Longhorn Beetle, Swainson's Hawk, and the Bald Eagle).
Air Quality		
Effects	There would be no construction-related effects on air quality in the project area. Air quality would continue to be influenced by climatic and geographic conditions, local and regional emissions from vehicles and households, and local commercial and industrial land uses. A possible flood event may temporarily increase the amount of vehicle emissions during flood-fighting activities, as well as increase the amount of vehicle emissions resulting from clean-up activities.	Combustion emissions would result from the use of construction equipment, truck haul trips, and worker vehicle trips to and from the construction site. Combustion emissions would vary from day to day, and would temporarily contribute incrementally to regional ozone concentrations over the construction period. Exhaust emissions from these sources would include ROG, NOX, and PM10. Exhaust emissions would vary depending on the number and type of equipment, the duration of its use, and the number of construction worker and haul trips to and from the construction site. Construction emissions would last approximately 4 years.
Significance	Not applicable.	Significant effects would occur even with the implementation of avoidance and minimization measures. Emissions would not be reduced below the USEPA's general conformity *de minimis* threshold. However, compliance would be accomplished with the completion of a General Conoformity Analysis, or with the inclusion in the State Implementation plan, therefor impacts would be less than significant with mitigation.
Mitigation	None required.	SMAQMD recommends the project implement a set of Enhanced Exhaust

		Control Practices for further reduction in hydrocarbon emissions. In order to achieve the required reductions in emissions the BMPs in Section 3.6.5 would be followed, in addition to the SMAQMD Guidance for Construction GHG Emissions Reductions.
Climate Change		
Effects	There would be no construction-related effects on climate change. Locally generated emissions, including levee operations and maintenance, would continue.	There are no conflicts with any Statewide or local goals with regard to reduction of GHG; therefore, there would be no significant effects on climate change. Significant short-term increase in CO_2 would occur but this effect would be temporary.
Significance	Not applicable.	Less than significant with mitigation.
Mitigation	None required.	BMP and GHG mitigation plans would be implemented—the GHG mitigation plan would consist of feasible mitigation measures (one or multiple), being implemented to reduce impacts. BMPs to be implemented and incorporated in the design of the work are listed in Section 3.7.5. In addition to implementing BMPs, the State would monitor emissions and implement all feasible mitigation measures.
Aesthetics and Visual Resources		
Effects	The visual resources around Folsom Reservoir would remain undisturbed. Construction work, outside of routine maintenance and projects that are already underway or planned, would not contribute to any change in visual quality within the study area.	Raising the dams and dikes would not significantly alter the visual character of the FLSRA. The 3.5-foot raise of the dikes and dams may temporarily impair visual resources during each 2 year construction period. Increased construction traffic on Auburn-Folsom Road would affect views of the area from several homes from across the street and may be visible to recreation users on the trails. During construction, recreationalists would not have access to the trail on top of the dikes and would need to utilize the trail detour.
Significance	Not applicable.	Less than significant with mitigation.

Mitigation	None required.	Modifications to dikes and dams around Folsom reservoir would occur in phases. Measures would be incorporated into the project design to minimize effects on riparian vegetation and ensure use of appropriate erosion control methods. Staging areas would be located throughout the project area on previously disturbed areas.
Traffic and Circulation		
Effects	The project would not create additional traffic during construction around the proposed project area. The existing roadway network, types of traffic, and circulation patterns would be expected to increase traffic by 2% each year.	Vehicle trips to Folsom Dam from the surrounding area would increase slightly as a result of labor force trips and haul truck trips. Transportation and circulation effects resulting from this action are temporary in nature and would not result in permanent traffic increases to the surrounding area. Construction of the dike and dam raises would have temporary direct effects on the traffic and circulation in the project area. Traffic would substantially increase in relation to existing traffic load and capacity of the roadway system and has the potential to substantially disrupt the flow and/or travel time of traffic.
Significance	Not applicable.	Impacts are considered significant and unavoidable as it will substantially increase traffic even with proposed avoidance, minimization, and mitigation measures.
Mitigation	None required.	BMPs listed in Section 3.9.5 would be implemented to avoid or minimize any effects, as well as ensure public safety on project area roadways.
Noise		
Effects	There would be no construction-related effects to the acoustic environment, including the generation of ground-borne vibration. The noise levels in the study area would remain consistent with the existing ambient noise levels present under current conditions. Sources of noise and noise levels would continue to be determined by local activities, development, and natural sounds.	Construction on the southeastern perimeter of the reservoir could cause substantial temporary increase in the ambient noise level. Residents, wildlife, and recreationists could be affected and experience noise from construction vehicle motors and construction activities—noise increases would be temporary and intermittent.

		Temporary noise effects associated with the raise and modification of Folsom Dam would be considered less than significant, due to the distance between noise sources and potential receptors being large enough to attenuate noise.
Significance	Not applicable.	Implementation of minimization measures would reduce noise effects on residences close to the dam, but not to a less than significant level.
Mitigation	None required.	Construction times would be limited in accordance with the City of Folsom, Sacramento County, and Placer County Noise Ordinances. BMPs listed in 3.10.5 would be implemented to further reduce the effects of construction noise to a less-than-significant level.
Water Quality		
Effects	Water resources and quality would not be affected by construction in the project area. The surface and groundwater conditions would continue to be affected by contaminants through runoff. Extreme flooding events could wash siltation and contaminants into the water system, and if emergency work became necessary to prevent dike failure, measures required for the protection of water quality might not be used.	Some of the work on the spillway gates would be done over water with potential for lead paint to enter surface water downstream of the dam—lead paint is assumed present in all underlying primer on the structure. Project activities, such as drilling, excavation, hauling, and fill placement may disturb or mobilize sediments, having the potential to affect total suspended solids, pH, turbidity, and dissolved oxygen. The dike raises and construction of the concrete floodwall with the use of identified staging areas could have short-term direct impacts on water quality from ground-disturbing activities. Debris and inadvertent spills of fuels, oils, or concrete mix materials from construction equipment, work areas, or the staging areas could be a source of contamination into adjacent waterways. Run-off could result from excavation activities with potentially higher concentrations of total dissolved solids—

		there is a potential to create turbidity and introduce associated contaminants into the receiving waters. Across the entire construction site, debris, soil, or oil and fuel spills could temporarily adversely affect the water quality at Folsom Lake.
Significance	Not applicable.	Impacts would be less-than-significant with mitigation, NPDES permits, and implementation of BMPs.
Mitigation	None required.	Construction contractor is required to obtain permit coverage under the National Pollutant Discharge Elimination System (NPDES). BMPs listed in 3.11.5 would be incorporated into the project. All necessary measures would be followed as required when lead is present during construction in accordance with 29 CFR 1926.62 Lead and 8 CCR 1532.1 Lead. Construction and post-construction monitoring should be conducted to ensure that all pollution prevention efforts are being performed as described in the Storm Water Pollution Prevention Plan (SWPPP).
Cultural Resources		
Effects	A potential adverse effect to historic properties (cultural resources eligible for listing in or listed in the National Register of Historic Places) or tribal cultural resources could result from a large storm event. The effects would depend on the location of the failure in the system and severity of the storm. As a result, a precise determination of adverse effect and the significance of the effect is not possible and cannot be made.	Alternative 2 would result in no adverse effects to historic properties. Existing historic properties would undergo physical changes, however these modifications constitute no adverse effect to the qualities that make the historic properties eligible for inclusion in the NRHP. No adverse effects to tribal cultural resources are anticipated.
Significance	Not applicable.	Not applicable.
Mitigation	None required.	None required.

CHAPTER 3.0 - AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND MITIGATION

3.1 Introduction

This chapter describes the existing environmental resources in the area that would be affected if any of the alternatives are implemented, and it describes the environmental consequences of the alternative plans on those environmental resources. A description of the existing conditions is presented in the Affected Environment section of each resource. Potential effects of project alternatives to the resource are discussed in the Environmental Consequences section. Mitigation measures identified to avoid, minimize, or compensate for adverse project effects are discussed in the Mitigation Measures section. Further explanation on how these sections were developed follows.

This chapter describes existing conditions and future without project conditions in the study area. The future without project conditions are the expected physical, environmental, and social conditions in the study area if no dam raise or gate modifications are constructed. The without project condition is the condition against which flood protection plans are formulated and evaluated, and also serves as the environmental baseline for assessing effects of the alternatives. The No Action Alternative constitutes the future without project conditions that would reasonably be expected in the absence of the proposed action and serves as the environmental baseline, per NEPA, against which the effects and benefits of the action alternatives are evaluated. The environmental baseline for CEQA is assumed to be the existing conditions.

The baseline environmental conditions assumed in this DSEIS/SEIR for analyzing the effects of the Folsom Dam Raise Project consist of the existing physical environment as of 2014, the year when the Notice of Preparation (NOP) was published to prepare a DSEIS/SEIR with the State Clearinghouse. The 2014 existing physical environment is consistent with the current conditions in the project area because no major changes to resources has occurred within the last several years. The Corps published the Notice of Intent (NOI) in the Federal Register for this DSEIS/SEIR concurrent with issuance of the State's NOP.

3.1.1 Affected Environment

For each resource, this section describes the existing pre-project conditions of the environmental resource in the project area. Resources not evaluated in detail are described first, followed by the resources that may be significantly affected by the alternatives.

Although all conditions are subject to some change over time, most of these resources are not expected to change significantly over the 50-year period of analysis for this study. However, any changes expected in the future without project condition are described as part of the No Action Alternative in the Environmental Consequences section. The Analysis of Effects described in the Environmental Consequences sections uses the pre-project condition as its baseline to identify changes to the resource under future with and without project conditions. The baseline environmental conditions assumed in the DSEIS/SEIR for analyzing the effects of the Folsom Dam Raise Project consist of the existing physical environment as of 2014.

3.1.2 Environmental Consequences and Mitigation

In the evaluation of environmental consequences, the conditions described for each resource are compared with future conditions with each alternative plan in place. As appropriate, the effects are discussed either by the alternatives identified in Chapter 2, or for the study as a whole. This is because the effects of several resources are realized over the entire project area rather than limited to a specific part of the project area.

Under NEPA, the effects of the proposed action and alternatives under consideration, including the No Action Alternative, is determined by comparing effects between alternatives and against effects from the No Action Alternative. Under NEPA, the No Action Alternative (i.e., expected future conditions without the project) is the benchmark to which the action alternatives are compared, and the No Action Alternative is compared to existing conditions. Under CEQA, the environmental analysis compares the alternatives under consideration, including the No Project Alternative, to existing conditions as defined at the time when the NOP is prepared. For consistency, in this DSEIS/SEIR it is referred to as the No Action Alternative.

Both adverse and beneficial effects are considered, including direct effects during construction and indirect effects resulting from the alternatives. Each section, where appropriate, contains a discussion of the methods used to analyze effects. In addition, significance criteria for each resource is used to evaluate the level of significance of any adverse effects. Finally, measures are proposed to avoid, minimize, or mitigate (compensate) any significant adverse effects for each resource.

Significant criteria (or "thresholds of significance") are used to define the level at which an impact would be considered significant in accordance with CEQA. NEPA does not have specific thresholds of significance, and environmental effects are analyzed based on their intensity and duration. Because this DSEIS/SEIR is a joint NEPA/CEQA document, the CEQA thresholds have been applied because they are more stringent. Generally, however, thresholds of significance are consistent with Appendix G of the State CEQA Guidelines, as amended, and NEPA, where defined.

Thresholds may be quantitative and qualitative; they may be based on agency or professional standards, or on legislative or regulatory requirements that are relevant to the impact analysis.

Significance criteria used in this DESIS/SEIR are based on the checklist presented in Appendix G of the State CEQA Guidelines; factual or scientific information and data; and regulatory standards of Federal, State, regional, and local agencies. These thresholds also include the factors taken into account under NEPA to determine the significance of the action in terms of the context and the intensity of its effects.

An environmental document prepared to comply with CEQA must identify the significance of the environmental effects of a proposed project. Therefore, for each effect (impact), a conclusion is provided regarding its significance. A "significant effect on the environment means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affects by the project" (State CEQA Guidelines, 11 Section 15382).

This DSEIS/SEIR uses the following terminology based on CEQA to denote the significance of each environmental effect (impact), and includes consideration of the "context" of the action and the "intensity" (severity) of its effects in accordance with NEPA guidance (40 CFR 1508.27):

No Impact indicated that the construction, operation, and maintenance of the Proposed Action and Action Alternatives would not have any direct or indirect impacts on the environment. It means that no change from existing conditions would result. This impact level does not require mitigation.

Beneficial Impact would result in a beneficial change in the physical environment. This impact does not require mitigation.

Less Than Significant Impact would not result in a substantial or potentially substantial adverse change in the physical environment. This impact level does not require mitigation, even if applicable measures are available under CEQA.

Significant Impact is defined be CEQA Section 21068 as one that would cause "a substantial or potentially substantial adverse change in any of the physical conditions within the area affected by the project." Levels of Significance can vary by alternative based on the setting and the nature of the change in the existing physical condition. Under CEQA, mitigation measures or alternatives to the Proposed Action must be provided, where applicable, to avoid or reduce the magnitude of significant impact.

Potentially Significant Impact is one that if it were to occur, would be considered a significant impact as describe above. However, the occurrence of the impact cannot be immediately determined with certainty. For CEQA purposes, a potentially significant impact is treated as if it were a significant impact. Therefore, under CEQA, mitigation measures or alternatives to the Proposed Action must be provided, where necessary and applicable, to avoid or reduce the magnitude of significant impacts.

An impact may have a level of significance that is **too uncertain to be reasonably determined**, which would be designated too speculative for meaningful consideration, in accordance with State CEQA Guidelines Section 15145. Where some degree of evidence points to the reasonable potential for a significant effect, the DSEIS/SEIR may explain that a determination of significance is uncertain but is still assumed to be "potentially significant" as described above. In other circumstances, after thorough investigation, the determination of significance may still be too speculative to be meaningful. This is an effect for which the degree of significance cannot be determined for specific reasons, such as because aspects of the impact itself are either unpredictable or the severity of consequences cannot be known at this time.

3.2 Resources Not Considered in Detail

Initial evaluation of the effects of construction of the selected alternative indicated that there would likely be little to no direct, indirect, or cumulative effects on several resources. These resources are described in Sections 3.2.1 through 3.2.10 to add to the overall understanding of the environmental setting.

3.2.1 Hydrology and Hydraulics

Hydrology

<u>Surface Water</u>

The American River Basin covers an area of approximately 2,100 square miles, and has an average annual unregulated runoff of 2.7 million acre-feet; however, annual runoff has varied in the past from 900,000 acre-feet to 5,000,000 acre-feet. The major tributaries in the American River system include: the North Fork American River, Middle Fork American River, and South Fork American River. These tributaries drain the upper watershed carrying runoff from precipitation and snowmelt into Folsom Lake (Figure 13).

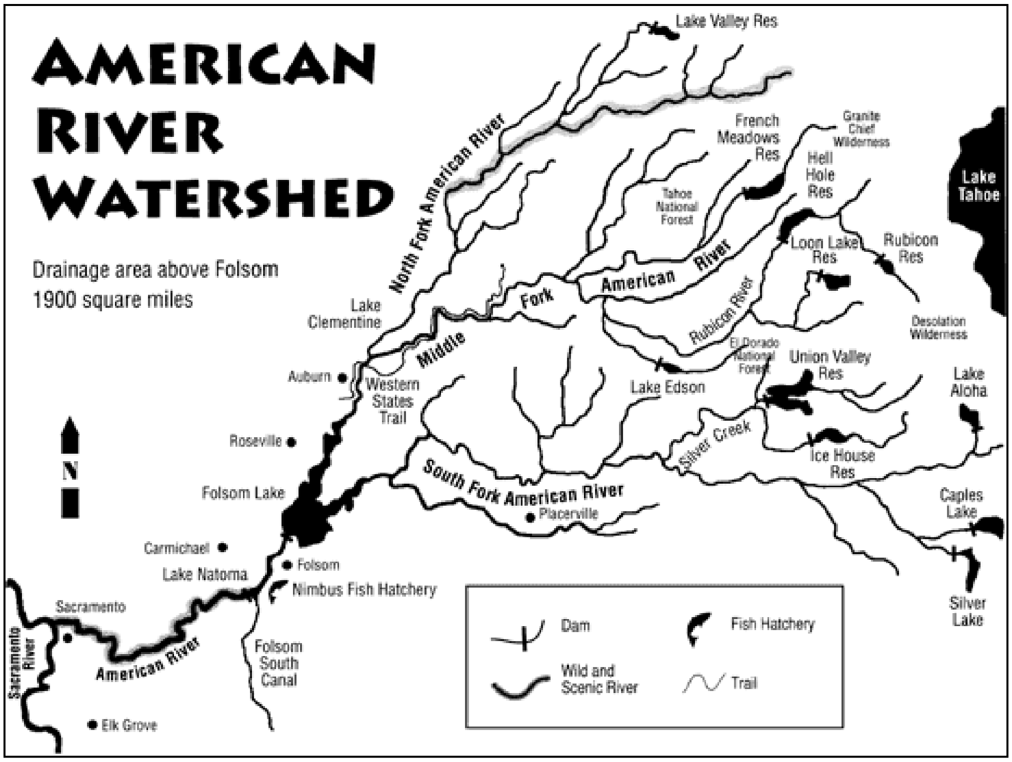

Figure 13. The Hydrology of Folsom Lake, Including Tributaries and Streams.

At an elevation of 466 feet above mean sea level (NGVD 29), Folsom Lake is the principal reservoir on the American River, impounding runoff from a drainage area of approximately 1,875 square miles. Folsom Lake has a normal full-pool storage capacity of approximately 975,000 acre-feet.

Flood-producing runoff occurs primarily during the months of October through April, and is usually most extreme between November and March. From April to July, runoff is primarily generated from snowmelt from the upper portions of the American River watershed. Runoff from snowmelt usually does not result in flood producing flows; however, it is normally adequate to fill Folsom Lake's available storage. Approximately 40 percent of the runoff from the watershed results from snowmelt.

The Lower American River extends 23 miles from Nimbus Dam to the confluence with the Sacramento River. The upper reaches of the Lower American River are unrestricted by levees and are hydrologically controlled by natural bluffs and terraces. Downstream, the river is leveed along its northern and southern banks for approximately 13 miles from the Sacramento River to the Mayhew drain on the south, and to the Carmichael Bluffs on the north.

Water levels would not be impacted during construction on the gates, dams or dikes. Therefore, the construction of any of these alternatives would not alter the hydrology of the

American River nor current reservoir operations. Water would continue to flow through the Basin in the same manner. The project would not substantially alter the existing drainage pattern of the site or area in a manner which would result in substantial erosion, siltation, or flooding on or off site. Therefore, there would be no effect on hydrology due to the spillway tainter gate modification; however, if as a result of the 3.5 foot dam final design, significant adverse effects to hydrology are expected and an appropriate NEPA/CEQA document would be prepared.

<u>Groundwater</u>

Folsom Lake is located at the eastern edge of the Sacramento Valley Groundwater Basin in the North American and South American sub-basins. The area surrounding Folsom Lake consists primarily of bedrock formations of the Sierra Nevada foothill complex.

Ground water is found primarily in fractured geologic formations, and water can be present within the fractured formations. Fractured aquifer systems are typically low yielding; therefore, surface water sources are primarily used for drinking water or irrigation sources rather than wells. Although groundwater is not a major resource in the vicinity of the Folsom site, small amounts of groundwater are typically found in granitic fissures and cracks. Bedrock is close to, or in some areas, at the surface; therefore, high water tables exist in a few locations. Due to the presence of the impermeable material near the surface, natural drainage cannot regularly occur, thus low areas frequently become water-logged.

The Dam Raise Project would not substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. Therefore, there would be no effects to groundwater hydrology with implementation of the project.

Hydraulics

Folsom Dam's current configuration has three general types of outlet structures including: 1) three power penstocks, 2) eight gated outlets (four upper and four lower), and 3) eight spillway gates (five operational service gates and three emergency gates). Reservoir releases are restricted by both the capacity of the discharge structures and by regulatory limits on the increases in release rates. The maximum capacity of the low-level outlets is 34,000 cfs (8,000 cfs total capacity through the three power penstocks and 26,000 cfs maximum total capacity through the eight gated river outlets).

During a flood event, releases are made through the low-level outlets until water levels in the reservoir reach the spillway crest and releases can be made from the main spillway gates. Once water is above the spillway crest, releases can then be raised incrementally to 115,000 cfs (design release), which represents the maximum safe carrying capacity of the lower American

River. The maximum rate of increase in flows is limited to 15,000 cfs per hour until outflow reaches 115,000 cfs. As inflows continue to increase, more water is released from the spillways to protect the dam. A maximum of 160,000 cfs can be released on a limited emergency basis without causing a downstream levee failure and flooding in the Sacramento area. The three emergency spillway gates may not be used unless the total outflow from the dam exceeds 300,000 cfs. This restriction makes the emergency gates unusable for normal flood management purposes and limits the use of the gates to dam safety outflows.

The JFP auxiliary spillway, under construction through 2017, would provide additional flood risk management benefits for Folsom Lake (the maximum discharge capacity of the newly constructed auxiliary spillway is approximately 312,000 cfs). The Water Control Manual (WCM) is currently being updated to take advantage of the additional release capabilities that the JFP would provide in 2017, the effects of which would be analyzed in a subsequent NEPA/CEQA document.

This DSEIS/SEIR focuses on effects associated with construction of the selected alternative. Because there would be no initial changes to the operation of Folsom Lake in this initial construction effort, impacts to hydraulics during the construction of the Dam Raise would be negligible. A subsequent WCM update would occur to take into account changes in operations due to additional capabilities of the Dam Raise; this would include appropriate NEPA/CEQA documentation.

3.2.2 Hydropower

The CVP hydropower system consists of eight power plants and two pumping-generating plants. This system is fully integrated into the Northern California Power System and provides a significant portion of the hydropower available for use in Northern and Central California. The installed power capacity of the system is 2,044,350 kilowatts (kW). By comparison, the combined capacity of the 368 operational hydropower plants in California is 12,866,000 kW. Pacific Gas and Electric Company (PG&E) is the area’s major power supplier with a generating capacity from all sources of over 20 million kW.

The Folsom power plant has three generating units with a total generating capacity of 196.72 megawatts (MW), and a release capacity of approximately 8,600 cfs. By design, the facility is operated as a peaking facility. Peaking plants schedule the daily water release volume during the peak electrical demand hours to maximize generation at the time of greatest need. At other hours during the day, there may be no release (and no power generation) from the plant.

The construction of the Folsom Dam Raise would have no effect on the ability of Folsom Dam to generate hydropower. The project would not change any water diversions that can affect power generation.

3.2.3 Water Supply

Folsom Lake is operated as part of the CVP for many purposes, including water supply. The reservoir meets the majority of water demands for the City of Roseville, the City of Folsom, the San Juan Water District, and Folsom Prison. The San Juan Water District provides water to the City of Folsom, Orangevale Water Company, Fair Oaks Water District, and Citrus Heights Water District. Placer County Water Agency and El Dorado Irrigation District also receive water from Folsom Lake (USBR 2005).

Folsom Lake provides water through a diversion at Folsom Dam to the cities of Folsom and Roseville, the San Juan Water District, and Folsom State Prison. An 84-inch pipeline, which is part of the North Fork distribution system, passes through the right abutment of the dam, providing water to the City of Roseville and San Juan Water District. A second 42-inch pipeline, which is part of the Natoma distribution system or Natoma Pipeline, passes through the left abutment. Water is conveyed from the Natoma Pipeline to the City of Folsom and California Department of Corrections water treatment plants, and the Corps' Resident Office Fire Protection System.

The Dam Raise Project would have no effect on groundwater supplies or interfere substantially with groundwater recharge. The project design, such as having concrete floodwalls on the Left and Right Wing Dams, was designed to avoid any impact to the Natoma Water Line. Thus, water allocations and the timing of deliveries would not be impacted by the construction of the proposed alternative. However, while it is expected that operation of the dam raise features would have no effect on water supply, effects related to a change in reservoir operations as a result of the dam raise would be investigated in a subsequent analysis.

3.2.4 Fisheries and Aquatic Resources

Native and introduced fishes are present in the Folsom Lake area. Native fishes occur primarily as a result of their continued existence in the tributaries of Folsom Lake and Lake Natoma. Two native species are planted in Folsom Lake for fishing, rainbow trout and Chinook salmon. The populations of most other species are currently self-supporting. Introduced fishes are more commonly found in the reservoirs than are native fishes. Most of these fishes were introduced into the State as game fish or as forage fish to support game fish populations.

No work would occur in a wet or aquatic environment, and there would be no interference with the movement of migratory fish. Therefore, the proposed action is not expected to affect fishery or aquatic resources. As part of standard construction practices, the contractor would be required to develop and submit a Storm Water Pollution Prevention Plan (SWPPP) and a Spill Preventions and Countermeasure Plan (SPCP) prior to initiating construction activities to minimize the potential for soil or other contaminants to enter the river. The SWPPP and SPCP must be approved by the Corps.

No materials would be discharged into Folsom Lake or the American River. Water trucks would be used for dust suppression along all areas of disturbed soil and along the haul routes; trucks would be monitored so over watering and runoff does not occur. The contractor would not be allowed to store fuels, lubricants, or other potential hazardous substances onsite. If equipment is to be refueled onsite, BMPs would be used to avoid and contain any possible spills. Although no adverse effects to fisheries or aquatic resources are expected, the SWPPP and SPCP in place ensures that this project would have no effect; therefore, impacts would be considered less than significant.

3.2.5 Geology, Mineral Resources, Seismicity, and Soils

The project area is between the Central Sierra Nevada and the Central Valley Geomorphic Provinces. The Sierra Nevada geomorphic region is characterized by a north-northwest trending mountain belt with extensive foothills on the western slope. The Folsom Lake geomorphic region primarily consists of rolling hills and upland plateaus between major river canyons. There are three major geologic divisions within the study area. The oldest consists of a north-northwest trending belt of metamorphic rocks. Younger granitic plutons have intruded and obliterated some of the metamorphic belt. The youngest geologic division consists of relatively flat deposits of volcanic ash, debris flows, and alluvial fan deposits. These deposits overlie the older rocks.

Igneous, metamorphic, and sedimentary rock types are present within the project area. The four major rock divisions of the project area include 1) ultramafic intrusive rocks, 2) metamorphics, 3) granodiorite intrusive rocks, and 4) volcanic mud flows and alluvial deposits.

The project area is within the Foothills Fault system, which is located in the metamorphic belt. This system consists of northwest trending vertical faults and is divided into two zones, the western Melones Fault zone and the western Bear Mountains Fault zone. The west trace of the Bear Mountains Fault zone transects the upper reaches of the North Fork arm near Manhattan Bar Road, and crosses the South Fork arm in the region of New York Creek.

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. No active faults have been mapped within the project area by the California Geological Survey or U.S. Geological Survey (Jennings, 1994). The project area is not located within the Alquist-Priolo Earthquake Fault Zones, and therefore the Alquist-Priolo Earthquake Fault Zoning Act does not apply to this project (California Geological Survey, 2007). The risk of fault ground rupture is negligible in the project area (Knudsen, et al. 2008).

The dikes throughout the project site were constructed in the mid-1950s. Each dike was constructed as a zoned embankment with a silty sand (SM) core of approximately 30% fines, and a silty sand (SM) embankment shell with a fines content of <30%, or less than that of the core material. This construction also included a coarse gravel blanket drain at the downstream toe. The foundation is hard, moderate to highly weathered granite. The slope protection materials consist of rock riprap underlain by a coarse filter primarily consisting of 3-inch minus dredge tailings, and a fine filter material of 2-inch minus sands and gravels placed in 1 foot layers. Additionally, USBR has recently (2007 through 2015) conducted dam safety improvements on Dikes 4, 5, 6, the Wing Dams, and MIAD. These include modification to the sand filters, toe drains, and the berms to mitigate against seismic and seepage concerns.

To ensure public safety, proposed new levees, other flood control facilities, and proposed modifications to existing flood control facilities would be designed to withstand the maximum earthquake and associated ground failures (EM 1110-2-2104, 2105, ER 1110-2-1806). Therefore, there would be no project-related effects to geology and or seismicity-related effects because flood control improvements would be designed to withstand ground shaking and associated ground failures. The project would not result in the loss of availability of a known mineral resource of value to the region. Therefore, there would be no adverse effects to mineral resources due to the project. The project is not located on expansive soil that can cause significant damage to or disruption of engineered utilities or structures, and would not result in soil erosion or the loss of topsoil. Although the dikes would be disturbed during construction of the 3.5-foot raise, the soil and road would be restored upon completion of the project.

3.2.6 Land Use and Planning

The land surrounding Folsom Dam and Reservoir is primarily Federally-owned and designated for recreation and flood control use. The major land use in the project area is USBR's Central California Area Office and the Folsom Dam industrial complex, along with a utility corridor. Additionally, residences on the southwestern perimeter of the reservoir near Granite Bay are located between 600 and 1,200 feet of Dikes 1 through 6. There are a few residences within 1,000 feet of the RWD, but none within the same distance of the LWD. On the southeastern perimeter of the reservoir, some residences are located within 400 feet of Dikes 7 and 8. The closest residences to MIAD are located approximately 1,200 feet away off Green Valley Road.

State Parks, under an agreement with USBR, manages Folsom Lake, Lake Natoma, and adjacent lands designated as the Folsom Lake State Recreation Area (FLSRA). Most of the project area is designated as part of the FLSRA; however, the lands directly surrounding the project area are closed to the public. As part of the FLSRA, a portion of the American River bicycle, pedestrian, and equestrian trail is located adjacent to the project area.

Adjacent to the project area is a portion of the California State Prison, Sacramento. This multi-mission institution consists of about 1,200 acres located on Prison Road. California's second oldest prison, Folsom State Prison, is located at 300 Prison Road on a 40-acre parcel adjacent to and south of Folsom Dam. Both prisons collectively house nearly 8,000 inmates, the Regional Corporation Yard for Inmate Day Labor, and the main headquarters for the Prison Industry Authority. The prison property includes access to the Sacramento-Folsom firing range, office and storage facilities, and the Green Valley Conservation Camp.

The land located west of the project area is within the City of Folsom and is zoned as an Open Space Conservation District. This zoning district was established to maintain these properties as open or undeveloped, or developed as permanent open uses such as parks or greenbelts. This zoning district also includes Folsom State Prison. East of the prison, the land is zoned as an Agricultural Reserve District. This area provides a buffer between Folsom Lake and developed areas to the south. This zoning district is intended to provide for interim agricultural and livestock grazing uses until community services are available for urban development (Reclamation 2006). The designated land zones within and adjacent to project area would remain unchanged after implementation of the selected alternative.

To access Dikes 1 through 3, construction vehicles will possibly use the park entrance at the concurrence of Douglas Blvd and Park Road (Folsom Lake Park/Granite Point). This impact to residential areas is temporary and less than significant. The land use in and around the project area, including the recreation and prison lands, would not change as a result of construction of the Dam Raise Project. The project would not physically divide an established community or conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project area. There would be no conflict with any applicable conservation plans or natural community conservation plans. Therefore, there would be no effect to land use as a result of the project.

3.2.7 Agriculture and Forestry Resources

There is no farmland or forestry land within the project area. Therefore, there would be no adverse effects on agricultural and forestry resources.

3.2.8 Socioeconomics

The City of Folsom is within Sacramento County, approximately 25 miles east of downtown Sacramento on Highway 50. The U.S. Census Bureau reports that the population of Folsom was 76,375 in 2015, which was a population growth of approximately 5.8% since the 2010 Census. The population of Folsom is approximately 74% white, 12% Asian, 6% African American, 0.6% Native American, and 0.2% Pacific Islander, with the remaining percentages classified as other or more than one race (Census 2015). People of Hispanic origin make up approximately 11% of the city's population. It is important to note that these estimates may not be accurate because the U.S. Census Bureau only updates population data every ten years, and the next update will not be until the year 2020.

The labor force in the City of Folsom was 35,487 people in May 2016, with an unemployment rate of 3.10%.. The city's unemployment rate is well below the unemployment rate for the Sacramento – Roseville – Arden-Arcade Metropolitan area at 4.7% during the same time period (EDD 2016). The median family income in the City of Folsom from the years 2010 through 2014 was $100,163, and the per capita income is $38,472 (Census 2015). Employment opportunities near the project area include technology, food manufacturers, retail, health care, and education (City of Folsom 2011).

No actions associated with the project would limit either current or future opportunities for agriculture, business, employment, or housing. While there are residents located adjacent to the project area, these populations do not comprise a substantial population of minorities. No populations would be displaced as a result of project construction, and no local industry would be disrupted by project activities. There would be no disproportionately adverse effects to minorities or low-income populations. Therefore, socioeconomics is not evaluated further in this DSEIS/SEIR.

3.2.9 Population and Housing

Although there are no homes located directly within the project footprint, there are several residences near the construction areas. Residences on the southwestern perimeter of the reservoir near Granite Bay are located between 600 and 1,200 feet of Dikes 1 through 6. There are a few residences within 1,000 feet of the RWD, but none within the same distance of the

LWD. On the southeastern perimeter of the reservoir, some residences are located within 400 feet of Dikes 7 and 8. The closest residences to MIAD are located approximately 1,200 feet away off Green Valley Road.

Because no existing housing is within the project area, the Dam Raise Project would not displace any existing housing or people, necessitating the construction of replacement housing elsewhere. The Dam Raise would not cause population growth in the nearby area, either directly or indirectly. Therefore, there would be no effects to population and/or housing.

3.2.10 Public Utilities and Services

Electric utilities near the project area include Sacramento Metropolitan Utility District (SMUD), Pacific Gas and Electric (PG&E), and Western Area Power Administration (WAPA) lines and facilities. SMUD owns and operates the Folsom-Elverta 230-kilovolt (kV) transmission line that runs along the northern boundary of Folsom Prison and carries electricity from the Upper American River Project facilities, to the Lake Folsom Transmission Line, and then to the Orangeville Transmission Line. The Folsom-Elverta transmission line also connects the SMUD grid, a component of the Sacramento County electrical system. The utility corridor north of the prison is considered a building-restricted area and does not permit certain uses incompatible with the safety, operation, maintenance, and construction of the transmission line facility. PG&E's only transmission line within the project area is the Halsey Junction-Newark 115 kV line. Additionally, WAPA has a 15-kilovolt Folsom-Nimbus transmission line and associated fiber optic link within the project area. No natural gas infrastructure or facilities exist within the project area.

Modifications to the wing dams and dikes could disrupt buried and aerial utilities including sewage, water, gas, electric, telephone, and cable lines. Severing any of these lines can result in substantial disruption to services provided by the utilities. Prior to initiating ground disturbing activities, the contractor would coordinate with Underground Service Alert to insure that all underground utilities are identified and marked. All utilities would be protected in place and no disruption of service is expected. If for any reason utilities would require a disruption in service, residents and businesses within the potentially affected area would be given notice of the anticipated time and duration of the disruption before the start of construction.

Wastewater services would not be disrupted as a result of the construction of this project, and no additional wastewater facilities would need to be constructed to deal with any project water discharges. No additional water supply or landfill resources are needed to support the project. The Dam Raise Project complies with federal, state, and local statutes and regulations related to solid waste.

At the current level of design, construction would not access or realign the existing potable water supply, sanitary sewerage, or storm sewer systems. Existing haul routes would be used by construction vehicles to avoid overloading public roadways and causing delays to public services. Therefore would be no effects to public utilities or services as a result of project construction.

3.2.11 Hazardous, Toxic, and Radioactive Waste

A Phase I Environmental Site Assessment (Phase I) was conducted in accordance with ASTM E1527-13 guidance. The Phase I did not identify any HTRW sites located at the project area; however, due to historical mining activities, the project has the potential to contact contaminated groundwater and soil. Elevated levels of arsenic have been detected in the groundwater adjacent to MIAD.

Dredge tailings from placer mining in the area were used in the construction of the dikes, a slope protection, and riprap bedding. Placer mine tailings do not typically contain elevated levels of HTRW, and do not represent an environmental impact if disturbed.

During construction, there is potential for hazardous materials such as fuels, oils, or paints to be accidentally spilled or released into the environment. Prior to construction, a hazardous materials management plan would be prepared and implemented. The plan would include measures to reduce the potential for spills of toxic chemicals and other hazardous materials during construction. The plan would also describe a specific protocol for the proper handling and disposal of these hazardous materials, as well as contingency procedures to follow in the event of an accidental spill.

As a result, construction of the project is not expected to result in any adverse effects due to HTRW. If any HTRW sites are identified during construction, appropriate response activities would be conducted to prevent potential adverse effects. Lead is assumed present in all underlying primer on the dam structure and is further addressed in Section 3.11, Water Quality.

The construction of the Dam Raise Project would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or release of hazardous materials into the environment. It would not interfere with any emergency response or evacuation plans. The project would not expose nearby schools or other sensitive receptors to hazardous emissions or materials. It is not located on a hazardous materials site that would create a significant hazard to the public or the environment. Therefore, the Dam Raise Project would not result in adverse effects to HTRW resources or to the public.

3.2.12 Public Safety

The construction of the Dam Raise Project would not create a significant hazard to the public or the environment through interference with any emergency response or evacuation plans. The project would not expose nearby schools or other sensitive receptors to hazardous emissions or materials. The Dam Raise Project would not increase the risk of wildland fires that would expose people or structures to a significant risk of loss, injury, or death. Therefore, the construction of the Dam Raise Project would little to no effect effect on public safety.

3.3 Recreation

3.3.1 Environmental Setting

The Folsom Lake State Recreation Area (FLSRA) is an important local, regional, and state recreation resource. Figure 14 shows recreation area features in conjunction with the Dam Raise Project dikes and wing dams. With an average of 1.5 million average annual visitors, the FLSRA is one of the most popular sites within California for recreation in the State Parks system (State Parks and USBR 2007). The popularity of FLSRA is largely due to easy public access, being located next to a growing metropolitan area, and opportunities for year-round use. Recreational uses include water-based activities and land-based activities.

Water-based activities account for approximately 85 percent of all visits to the FLSRA (State Parks and USBR 2007a) and include boating, personal water craft use, water skiing, wake boarding, sailing, windsurfing, swimming, and fishing. The remaining 15 percent of visitors participate in a variety of land-based activities, such as hiking, biking, picnicking, camping, and horseback riding. Approximately 75 percent of users visit the FSLRA during the warmer spring and summer months. State Parks obtains revenue from use fees paid by the public, and rental fees associated with concession operations in the FLSRA. FLSRA spans across three counties (El Dorado, Placer, and Sacramento), as well as the City of Folsom.

There are three campgrounds in the FLSRA providing a total of 176 campsites that accommodate tent, trailer, RV, and group camping. Peninsula campground includes 104 family campsites. Negro Bar campground is comprised of three reservation-only group campsites, two of which are designed to accommodate 50 people with the third site designed to accommodate 25 people. Beal’s Point campground includes 49 family campsites and 20 RV sites with full hookups, sanitary dump station, three restrooms, and two shower buildings. The RV sites were constructed as mitigation for the loss of the family campsites at Negro Bar that were removed for the construction of the Lake Natoma crossing. Campers have easy access to all of the day use facilities provided at Beal's Point, including trails, the beach, picnic area, and snack bar. Full capacity is often reached at all three campgrounds during the peak season.

There are 94 miles of existing trails within the FLSRA (Figures 12 and 13). Currently, there are 46 miles of pedestrian/equestrian trails, 20 miles of multi-use trails, 16 miles of Class 1 paved trails, 9 miles of mountain bike/pedestrian trails, and 3 miles of pedestrian-only trails, of which 2 miles are ADA accessible. Trails connect Folsom Lake to Lake Natoma and the Auburn State Recreation Area. There is not a continuous trail connection around Folsom Lake.

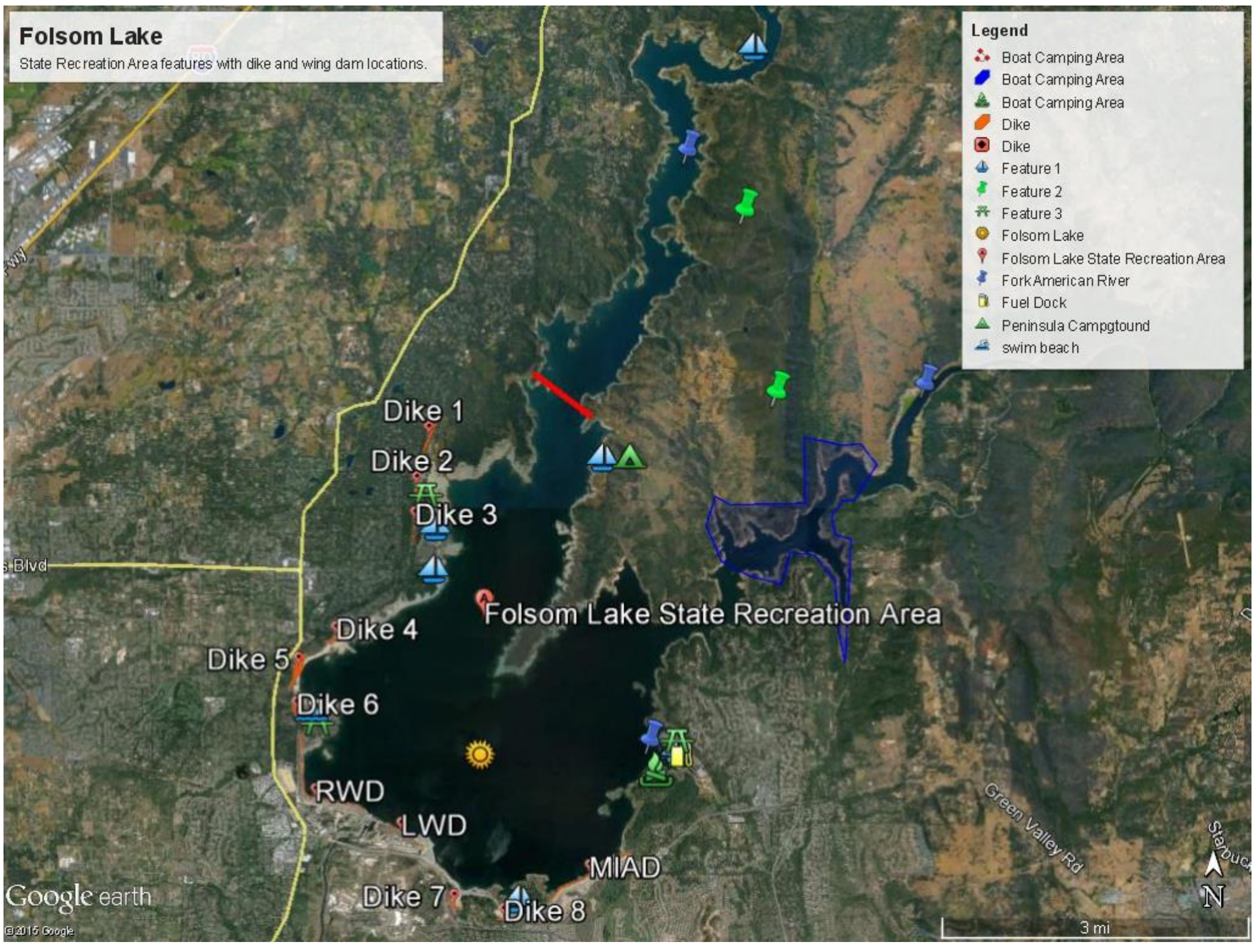

Figure 14. Folsom Lake State Recreation Area General Features, Associated with the Dikes and Wing Dams of Folsom Dam. Area above the red line and within the blue line denotes boat camping areas.

Granite Bay and Beal's Point are the primary visitor areas on the western shoreline of Folsom Lake. On the eastern shoreline, Brown's Ravine and Folsom Point are the primary visitor areas.

Granite Bay. Granite Bay is the most popular day use facility within the FLSRA. Annual attendance in 2011 was 499,630 visitors. Facilities include picnic areas; a guarded swim beach for summer use; informal unguarded swim areas; equestrian staging area; hiking trails including an Americans with Disabilities Act (ADA) accessible trail, a pedestrian only trail; parking; two reservable group picnic sites; and fishing and boating. There are also restrooms and bicycle/pedestrian trails. The boat launch area capacity varies with water levels. Dependent upon water levels, a maximum of 20 lanes of boat launch are available. Concessions in the area include a snack bar and beach equipment rentals, boat and personal watercraft rentals, equestrian trail rides, fitness training, and vessel repair and tow services.

The North Granite area is popular for fishing, horseback riding, and mountain biking and hiking. This area includes an informal beach area at Oak Point, an equestrian staging area, Doton's Point, and Beeks Bight. An activity center just north of the launch ramps is available by reservation for group use and includes a picnic area.

Trail facilities at Granite Bay include the equestrian and pedestrian Pioneer Express Trail running north to Auburn State Recreation Area, 8 miles of unpaved multi-use trails running through the area, and an unpaved ADA assessable, pedestrian only trail in the Beeks Bight area.

As with Beal's Point, capacity is a major concern at Granite Bay, particularly during peak season weekends when the day use parking area at Main Beach and the parking areas at the launch ramps fill by midday. There is only one entrance to Granite Bay at Douglas Boulevard, and significant backups occur along the roadway and onto Auburn-Folsom Road when the parking areas fill.

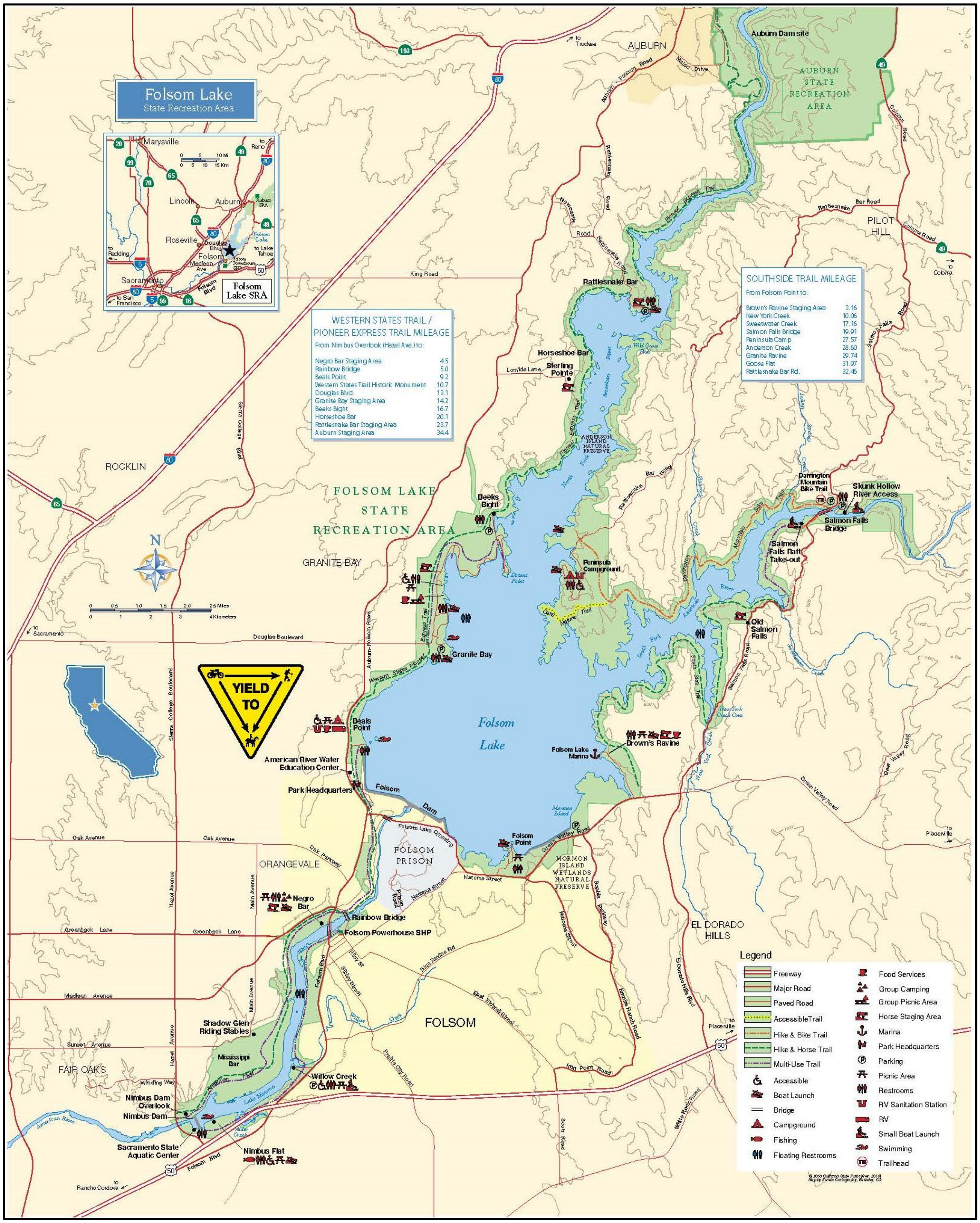

Figure 15. Recreational Trail System within the Folsom Lake State Recreation Area (Folsom Lake State Recreation Area, 2015).

In addition, there is no external access to the sprawling and relatively remote North Granite area. Unrestricted vehicle access along the shoreline at low water is also a concern. Unrestricted vehicle access causes erosion, potentially impacts water quality, damages vegetation, and threatens cultural resources below the high water line.

Maximum usable elevation of the boat launches areas range from about 360 feet to 470 feet. When the reservoir surface level is at 466 feet, a 16-lane ramp and a 4-lane ramp are usable. Elevations of the structures (other than the boat launch ramps), parking lot, and roads at Granite Bay range from approximately 465 feet to 475 feet.

Beal's Point. Beal's Point includes day use facilities and a campground. Annual attendance in 2011 was 244,148 visitors. Facilities include a guarded swim beach for summer use, parking for approximately 400 vehicles, hiking trails, picnic areas, and campsites. Concessions include a snack bar and beach equipment rentals. A large grassy area along the reservoir includes picnic tables, barbeques, and restroom facilities.

The paved multi-use Jedediah Smith Memorial Trail begins at Beal's Point and connects to Lake Natoma and the American River Parkway. The unpaved multi-use Granite Bay Trail connects Beal's Point to other facilities along Folsom Lake.

During peak season weekends, the parking area generally fills by midday, causing traffic to back up onto Auburn-Folsom Road and surrounding neighborhood streets. This also makes it difficult for campers with reservations to enter the FLSRA.

The structures, parking lot, and roads at Beal's Point range in elevation from 465 feet to 475 feet. When the reservoir surface level reaches 466 feet, water levels are just below the road, parking lot, restrooms/dressing room building, and concessions building. At 466 feet, the beach area would be inundated, although turf areas for picnicking, sunbathing, and other passive uses are still usable.

Brown's Ravine. Brown's Ravine is home to the Folsom Lake Marina which provides 675 wet slips, 175 dry storage spaces, boat launch facilities, marine provisions, pump-a-head station, a fueling station, a small picnic area, and restrooms. The Brown's Ravine Trail is an unpaved multi-use trail that extends four miles between Folsom Point and Brown's Ravine. The trail begins in the day use area at Folsom Point and ends at the Brown's Ravine. The equestrian/pedestrian Browns Ravine/Old Salmon Falls Trail begins at Browns Ravine and extends twelve miles to Old Salmon Falls.

Folsom Point. Folsom Point, located off East Natoma Street, is the most popular day use area on the Folsom Lake eastern shore. Attendance in 2011 from April through September was

85,917 visitors. Facilities include a picnic area with parking for 77 vehicles, and the largest formal boat launch area on the east side of the lake with parking for 121 vehicles with trailers. The maximum usable boat ramp elevation at Folsom Point is 468 feet with a minimum of approximately 405 feet. Aquatic and day use facilities quickly reach capacity during peak season weekends as it is a popular site for staging special aquatic events. During the summer, California State University, Sacramento (CSUS) utilizes Folsom Point at Folsom Lake for their youth wake board and water ski camp.

3.3.2 Environmental Consequences

Methodology

The FLSRA supports a diverse range of outdoor recreation activities and opportunities. Impacts to recreational opportunities within the project area are evaluated based on temporary and permanent changes to those resources that would occur during implementation of the project. In making a determination of the extent and implications of recreational changes, consideration was given to:

- The closure or reduced public availability to recreational sites and access points;
- Truck traffic and construction activities interfering with recreation activities and access points;
- Requirements for the construction or expansion of recreational facilities; and
- Potential receptors in the area include staff, day use recreationist, campers, boaters and other water based recreationists. All recreational groups were taken into account during analysis of impacts.

Basis of Significance

Effects to recreational resources are considered significant if construction would:

- Substantially restrict or reduce the availability or quality of existing recreational facilities and opportunities in the project vicinity; or
- Displaced recreation from sites affected by construction would substantially contribute to overcrowding or exceed the facility capacity at other recreational sites (including sites within the FLSRA).

3.3.3 Alternative 1: No Action Alternative

Under the No Action Alternative, the Dam Raise would not be constructed. Therefore, the project would not disturb existing recreational opportunities. The conditions at FLSRA would remain similar to existing conditions. The public would have continued use of the FLSRA without any closures or access restrictions.

3.3.4 Alternative 2: Spillway Tainter Gate Modification and Combination Earthen Raise and Concrete Floodwall

Under this alternative, there would be no effects to recreational opportunities due to the modification of the spillway gates, as this portion of the project area is not open to public access. Staging areas are on Reclamation’s work yard just south of the RWD, and site access is off Folsom-Auburn Road through Reclamation’s Central California Area Office (CCAO), both of which are not accessible to the public.

The implementation of Alternative 2 would not eliminate or severely restrict access to recreational facilities or resources, or result in substantial disruption to the use of an existing recreation facility. It would not have any significant effect on any nearby parks or require construction or expansion of recreational facilities. Therefore, the construction of the tainter gates and the modification of the spillway gates would not have an impact on these recreation resources.

During the construction of the 3.5-foot raise, access to the northern half of the Granite Bay State Park is via Park Road, a paved, two-lane road that runs across the crest of Dikes 1 through 3. Park Road would be closed for up to 2 years during construction. A detour for vehicles and pedestrian traffic would be established near Dikes 1 through 3. At the conclusion of construction, the detour would be removed and the area restored to pre-project conditions. Potential detours (Figure 16) would be determined prior to construction and discussed in further detail in subsequent environmental document, if needed. The location of detours will take into account the lake water level, the ease of signage and relation of information to the public, the potential impact on already heavily used parking lots, and emergency access issues.

Figure 16. Potential Dike 1 Vehicle Detour.

The trails on the tops of Dikes 4, 5, and 6 are heavily utilized by pedestrians, bicyclists, and equestrians. These trails would be closed to the public for up to 2 years for the duration of construction of the earthen embankment raise. Bicycle detours are currently in place that allow for continuous use of trails around the dikes during construction (Figure 17).

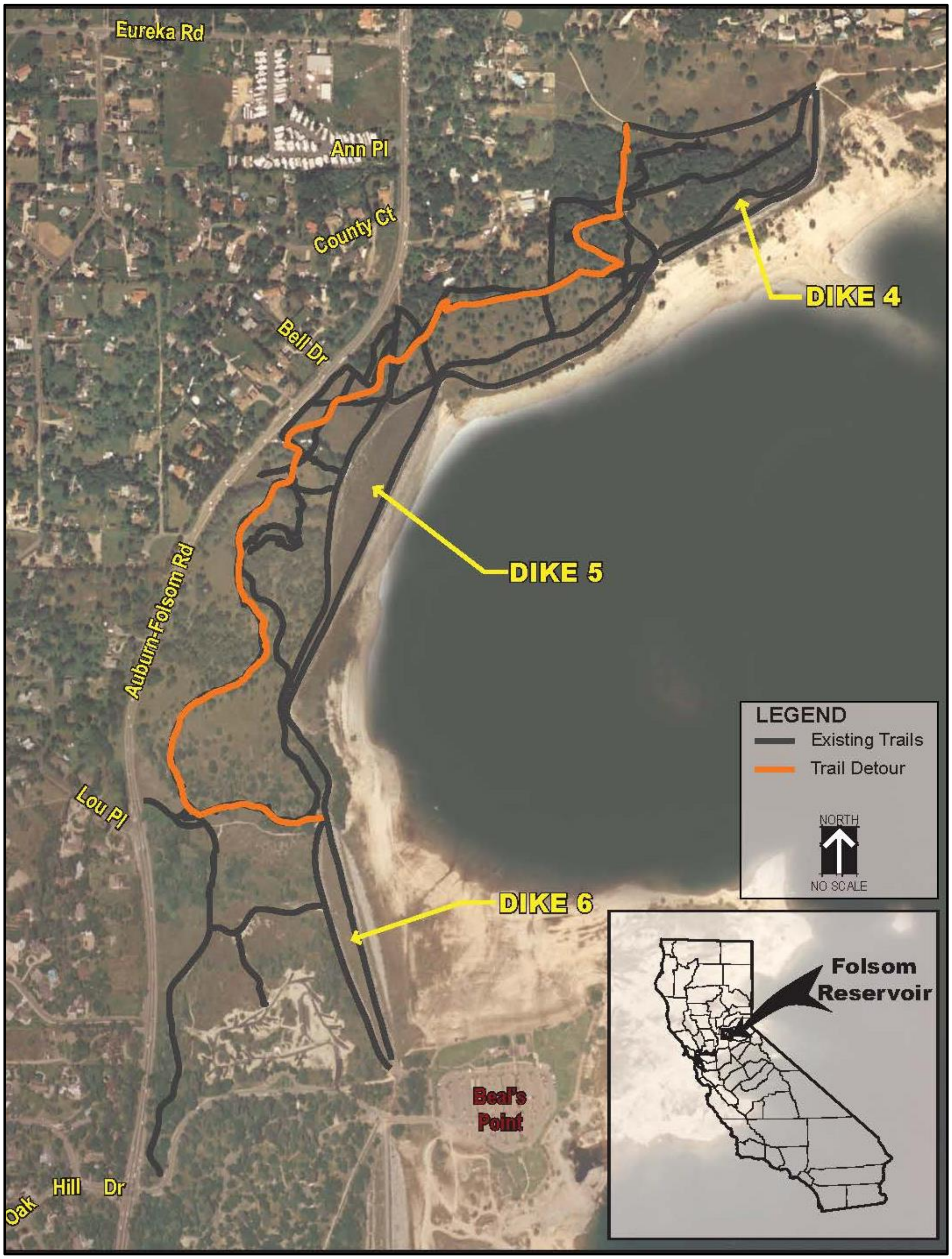

Figure 17. Potential Trail Detour for Dikes 4, 5, and 6.

Dikes 7 and 8, and MIAD, would be closed for up to 2 years during construction. A trail detour currently exists at MIAD, and this trail would remain accessible during construction (Figure 18) given that the access would provide reasonable pedestrian and equestrian access to Folsom Point. This detour area is not impacted by other, concurrent projects such as the widening of the Green Valley Road.

Figure 18. The Current MIAD Bike Trail Detour.

If there are such issues, another detour would be proposed and assessed prior to construction. As there is no access for vehicles or the general public at Dikes 7 and 8, a detour would not need to be established. A concrete floodwall on the top of the LWD and RWD would have no impact to recreation because these areas are not publically accessible. Construction duration of the floodwall would be up to one year.

Folsom Point may be used for construction access to MIAD and Dikes 7 and 8, but it would remain publically accessible during construction with the use of proper signage and public education. The Brown’s Ravine recreational area and trails are adjacent to a potential access point for MIAD at Sophia Parkway. If this potential access point is used, trail detours would be established. Use of these access points would be temporary. Beal’s Point would not be used for access.

Because trail detours would be maintained or established as necessary, it is unlikely that the project would increase the use of other nearby recreational facilities to the point that substantial physical deteriorations of the facilities would occur or accelerate. It is also unlikely that trail detours would have a significant adverse effect on the surrounding environment.

With the exception of the tops of the dikes and dams, as well as the staging areas, all existing recreational areas near the construction area would remain accessible to the public.

Because of the trail detours and other recreational opportunities in the area, it is assumed that the majority of the recreation activity would not change and that most recreation users would continue to visit the FLSRA and use the trails. Once construction has been completed, the tops of the dikes would again become publically accessible.

The direct effects to recreation as a result of the implementation of this alternative are considered significant because it would result in a severe restriction to recreational facilities and resources due to a substantial, long-term disruption of existing recreation facility usage. All trails in the FLSRA, including those on Dikes 1 through 6 and MIAD, are used extensively throughout the seasons. Existing trails on Dikes 1 through 6 and MIAD accommodate pedestrian, bicycle, and equestrian users. Additionally, these trails are approximately 20 feet wide and allow for a large number of people to use them at once. Although trail detours would be accessible, these detours would not offer the same level of service as the paved roads on the tops of the dikes and dams, and are not suitable for all types of recreation users. This would lead to both direct and indirect effects to those users who might choose to no longer recreate on the trails. Additionally, the creation of new trails would have the potential to cause adverse physical effects on the environment. Some trail users may decide to make their own trails or use trails not designated for their type of recreation. This can lead to both direct and indirect effects due to environmental impacts and may cause conflicts on existing trails leading to a potential increase of calls for service by the State Park Rangers, or the increased chance of accidents on unsanctioned trails.

3.3.5 Avoidance, Minimization, and Mitigation Measures

Although contractor staging would emphasize use of areas with no current public access and away from residential areas, there may be temporary impacts to recreation access. In an attempt to maintain as much public access to recreation areas and trails throughout the construction period as possible, traffic control measures, grade separated vehicular and/or pedestrian crossings, security fencing, and/or temporary alternate public access detours for pedestrian, equestrian, bicycle, and vehicular traffic would be used.

To ensure public safety, warning signs and signs restricting access would be posted before and during construction as necessary. Public outreach would be conducted through mailings, posting signs, coordination with interested groups, and meetings, if necessary, in order to provide information regarding changes to recreational access in and around Folsom Lake. The detours, traffic control measures, access restrictions, increased signage, increased education, and public outreach would help mitigate effects to recreational users of the FLSRA. The effects are expected to be less than significant, however, significant effects could remain even with mitigation, avoidance, and minimization measures in place. Once the detour routes are identified, an analysis of potential impacts would be completed and, if needed, included in a supplemental environmental document.

3.4 Vegetation and Wildlife

3.4.1 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 Chapter 5.0.

<u>Federal</u>

- Executive Order 13112, Invasive Species
- Fish and Wildlife Coordination Act (FWCA) (16 USA §§661 – 667e)
- Migratory Bird Treaty Act (16 USC §§703-712)

<u>Local</u>

- Sacramento County Ordinance, Chapter 19.12, Tree Preservation and Protection

This ordinance regulates the removal or disturbance to all species of oak trees native to Sacramento County. These species include valley oak (*Quercus lobata*), interior live oak (*Quercus wislizeni*), blue oak (*Quercus douglasii*), oracle oak (*Quercus x moreha*), and black oak (*Quercus kelloggii*). The ordinance applies to any native oak tree. Typically, only trees 6 inches in diameter at breast height (dbh), or greater, are protected.

Existing Conditions

<u>Vegetation and Wildlife</u>

This section describes the existing vegetation and wildlife resources in the project area. This description is based on field visits and a review of pertinent literature, and gathered in coordination with the U.S. Fish and Wildlife Service (FWS) in accordance with the Fish and Wildlife Coordination Act.

The project area currently supports the following habitat types: oak woodland, riparian woodland, seasonal wetland, chaparral, and annual grassland. In addition, developed areas are present and may be devoid of vegetation or host non-native grasses and ruderal vegetation in construction staging and material storage sites in the project area.

The Folsom Dam Raise Project footprint is dominated by annual grassland habitat (approximately fifty acres) as well as stands of oak woodland (approximately five acres) with scattered oak/pine woodland. Smaller areas (less than one acre each) of riparian woodland and seasonal wetlands are found within the project footprint. More specifically, the northern portion of the project area is predominantly oak woodland with pine, and the southern portion is characterized by larger annual grassland acreages situated among stands of oak and scattered pine woodland. In addition, urban/developed areas, Chaparral, as well as Lacustrine (open water), and Riverine habitat also occur within the project area.

Oak Woodland and Oak/Pine Woodland

Oak woodland and oak/pine woodland is the largest woodland acreage affected by the project. Oak and oak/pine woodland is characterized by various oak species and a single pine species. Tree canopy cover is continuous, intermittent, or savanna-like with grassy understories.

The understory shrub layer is usually sparse to intermittent, and can include species such as Mexican elderberry (*Sambucus Mexicana*), California buckeye (*Aesculus californicus*), Pacific poison oak (*Toxicodendron diversilobum*), and wedgeleaf ceanothus (*Ceanothus cuneatus*). However, mesic soils under valley oaks can contribute to a dense herbaceous understory and an increase in understory herbaceous layers. This lower tree canopy cover includes non-native grass species such as cheat grass (*Bromus diandrus*), slender oat (*Avena barbata*), soft chess (*Bromus hordeaceus*), and Italian thistle (*Carduus pycnocephalus*) (CNPS 2015). Other ruderal species include shortpod mustard (*Hirschfeldia* incana), telegraph weed (*Heterotheca grandiflora*), and yellow starthistle (*Centaurea solstitialis*). Bare ground or leaf litter is predominant in areas of dense tree cover.

In project areas where pine comprised a two to eight percent crown cover with oak, it was mapped as an oak woodland/pine association. Blue oak (*Quercus douglasii*) woodland is usually dominant or co-dominant where it intergrades with scattered foothill/grey pine (*Pinus sabiniana*). Other oak species include low densities of valley oak (*Quercus lobata*) and interior live oak (*Quercus wislizenii*). Associations of blue oak and valley oak are relatively rare and qualify for global and state rankings of G3 and S3 (CNPS 2015).

In project areas containing deeper soils, proportions of valley oak increases, and small pockets of dominant valley oak woodland can be found. Valley oak stands form woodlands and (rarely) forests along floodplains and terraces in seasonally saturated soils (CNPS 2015). Stands of dominant valley oak were not mapped as distinct alliances in the project area due to small size; however, valley oak associations with alder (*Alnus rhombifolia*), California scrub oak (*Quercus berberidifolia*), poison oak (*Toxicodendron diversilobum*), and Himalayan blackberry (*Rubus armeniacus*) have global and state rankings of G3 and S3 respectively, indicating rarity of these alliances (CNPS 2015).

Oaks in particular provide a highly productive mast food (acorns) utilized by organisms found in the project area including deer, birds, and small mammals. It has been reported that thirty bird species are known to include acorns in their diet (Verner 1980). In addition, oak woodland and oak/pine woodland provides nesting cavities for birds and small mammals, including bats, as well as dense, contiguous coverage that provides connectivity (wildlife corridors) for larger, ranging mammals. Two dozen breeding bird species have been documented in the oak woodland (Gaines 1977). Most species found in oak woodlands, including deer and wild turkeys, also utilize annual grasslands.

Annual Grassland

Annual grassland is the largest acreage affected within the Dam Raise Project footprint. Annual grassland lacks a vegetative overstory and consists of a heterogeneous mix of non-native grasses, annual forbs, and wildflowers. The general grouping of California annual grassland includes a large variety of plant species, the majority of which are non-native and considered to be dominant species (J.O. Sawyer and T. Keeler-Wolf 2011).

Introduced annual grasses include wild oat (*Avena fatua*), ripgut brome (*Bromus diandrus*), and rattail fescue (*Festuca myuros*) (CNPS 2015). Herbaceous forbs and wildflowers within this group include both native species such as fiddle neck (*Amsinckia spp*.), western ragweed (*Ambrosia psilostachya*), popcorn flower (*Plagiobothrys spp*.), and non-native species such as shortpod mustard (*Hirschfeldia incana*), yellow starthistle (*Centaurea solstitialis*), and dove weed (*Eremocarpus setigerus*).

Quail, wild turkeys, and deer are the most common species observed within the project area grasslands; however, numerous wildlife species have been observed within the project area, including various species of birds, snakes, and mammals.

Raptors (predacious birds) utilize expanses of grasslands for primary foraging of rodents such as voles, and include red-tailed hawks (*Buteo jamaicensis*), turkey vultures (*Cathartes aura*), great horned owls (*Bubo virginianus*), and white-tailed kites (*Elanus leucurus*). Within the grassland and water interface other bird species including Canada geese (*Branta canadensis*), the great egret (*Ardea alba*), house finches (*Carpodacus mexicanus*), and spotted towhees (*Piplio maculates*) can also be seen. Other animals include snakes such as gopher snakes (*Pituophis *catenifer*), rattlesnakes (*Crotalus viridis*), and common kingsnakes (*Lampropeltis getula*), as well as mammals like the striped skunk (*Mephitis mephitis*).

Riparian Woodland

Less than one acre of Riparian woodland is found within the project footprint. Riparian vegetation occurs in association with mesic soils provided by flowing water sources. Additionally, frequent regeneration of vegetation occurs where plants are located within flood channels and scoured with flood flows. Within the project area and Folsom vicinity, riparian vegetation has decreased substantially due to land development; this contributes to its rarity in global and state rankings.

Riparian woodland consists of dominant tree species in the upper canopy layer including the Fremont's cottonwood (*Populus fremontii*), California sycamore (*Platanus racemosa*), and valley oak (*Quercus lobata*). A subcanopy is also present and consists of less dominant trees like the white alder (*Alnus rhombifolia*), and Oregon ash (*Fraxinus latifolia*) (CDFG 2015). There is a typical understory shrub layer consisting of California wild grape (*Vitis californica*), California wild rose (*Rosa californica*), California blackberry (*Rubus ursinus*), blue elderberry (*Sambucus cerulea*), and poison oak (*Toxicodendron diversilobum*); however, in shallower soils or frequently inundated banks, the shrublayer is primarily composed of willows and young trees. Additionally, there is an herbaceous layer consisting of sedges, rushes, and grasses including miner's lettuce (*Claytonia perfoliata*), Douglas sagewort (*Artemisia douglasiana*), poison-hemlock (*Conium maculatum*), and hoary nettle (*Urtica dioica*) (CDFG 2015).

Forage coverage and nesting habitat is of high value in riparian woodland for birds such as ruby-crowned kinglets (*Regulus calendula*), bushtits (*Psaltriparus minimus*), warbling vireos (*Vireo gilvus*), Hutton's vireos (*Vireo huttoni*), Wilson's warblers (*Wilsonia pusilla*), American robins (*Turdus migratorius*), and Bullock's orioles (*Icterus bullockii*). Cottonwood trees in particular, found in the project area's riparian woodland, are used for nesting by several species of owls, woodpeckers, and wrens as well as American kestrels (*Falco sparverius*), northern flickers (*Colaptes auratus*), white-breasted nuthatches (*Sitta carolinensis*), oak titmice (*Baeolophus inornatus*), hoary bats (*Lasiurus cinereus*), western bluebirds (*Sialia mexicana*), as well as western gray squirrels (*Sciurus griseus*) and raccoons (*Procyon lotor*).

Seasonal Wetlands

Seasonal wetlands occur within the project area next to drainages, seeps, springs, and depressions of ponded water. Less than one acre of emergent wetland habitat is present in the potential project footprint (Appendix D). Seasonal wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. Vegetation, typically perennial, is present for most of the growing season in most years (Cowardin et al. 1979). Seasonal wetlands are characterized by non-woody, erect, rooted hydrophytes including sedges, rushes, and cattails but excluding mosses and lichens. For regulatory purposes, wetlands are a subgroup of waters in the United States defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support hydrophytic vegetation, and that under normal circumstances, support a prevalence of vegetation typically adapted for life in saturated conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR Section 328.3; 40 CFR Section 230.3).

A wetland delineation report (USFWS 2014) was produced on the landside of dikes 4, 5, and 6, which identified a total of 0.083 acre of seasonal wetlands in two distinct parts adjacent to Dike 6. Although these wetland features are outside the project area as currently planned, the wetland features are within areas that potentially can be used for staging areas. No wetlands are identified in the staging and construction areas of Dike 4 and Dike 5.

Other wetlands tentatively identified by the Northern Sierra Nevada Foothills Vegetation project within the project area include a fresh emergent wetland of 0.53 acres in size, in a staging area identified directly south of MIAD (Appendix D). This small wetland is shown to drain into a larger wetland basin outside the staging area. Determination of this area has yet to be conducted for wetland status. Saturated soils and wetland species were also found during a site visit to drainage areas of the westernmost staging area of MIAD; these limited areas were not mapped by the Northern Sierra Nevada Foothills Vegetation Project. Seasonal ponded standing water has produced cottonwood and willow growth, along with a few hydrophytes at this site. Willow and cottonwood trees were cut by the Phase 4 JFP contractor, and the remnant stumps with vegetative regrowth are scheduled for relocation to linear wetland drainage adjacent to a downslope housing development. These areas have not yet been formally evaluated for hydric soils and hydrophytic vegetation to make a determination on wetland status. Substantial amounts of wetland and seasonal riparian habitat has been removed from the south Folsom Lake vicinity for dike/dam and residential development.

Urban/Developed Area

Approximately 54 acres of urban and developed areas are identified within the project area and potential project footprint (Appendix C). The project area is found within the southern portion of Folsom Dam Lake, of which a major portion is urbanized and the largest portion of the recent development is residential. Urban and developed areas are intensively used land with the major portions covered in pavement or by structures. This urban community includes residential, commercial, and industrial development.

Parks and other developed areas, outside of the reservoir influence, are dominated by horticultural or ruderal species. Developed areas within the project area include riprap slopes of dams and dikes, roads, trails, or parking lots. Currently, several construction staging and material storage sites are in use by the Folsom Dam modification projects, and they host non-native grasses, ruderal vegetation, or are devoid of vegetation.

Recent dam and dike construction, and structure modification, has contributed to substantial habitat disturbance and removal of riparian wetland and oak woodland habitat to accommodate construction, structures, and material disposal. Dikes and dams are generally devoid of vegetation with concrete, gravel, and compacted dirt surfaces but can include ruderal species such as non-native invasive grasses, including the shortpod mustard (*Hirschfeldia incana*), yellow starthistle (*Centaurea solstitialis*), and tree tobacco (*Nicotiana glauca*). Twenty-nine mature oaks and cottonwoods were identified for removal, along with the loss of seasonal wetland and riparian woodland acreage for dam modification projects in the project area. Remnant habitat remains, primarily in a linear strip between residential areas and dam/dike structures along the project area shoreline. They support avian species and resident wildlife of lower trophic levels that are able to co-exist with urban disturbances.

A large portion of the project area consists of disturbed ground or is devoid of vegetation, with the exception of sparse annual grasses and forbs. Various buildings, dams, water control facilities, and related facilities have been constructed on or near the project area and provide limited or no wildlife habitat. Equipment and structures on active construction sites of the Folsom Dam Modification Project have attracted nesting bird species including Anna's hummingbird (*Calypte anna*), mourning doves (*Zenaida macroura*), house finches (*Carpodacus mexicanus*), cliff swallows (*Petrochelidon pyrrhonota*), and Say's phoebe (*Sayornis saya*); it is feasible that predator avoidance overrides construction disturbance as an attractant to these sites. In addition, bald eagles (*Halieaeetus leucephalus*) and Osprey (*Pandion haliaetus*) have been sighted fishing, foraging, and roosting between open water and blue oak woodland directly over and around active construction areas. Effects of construction disturbance on the bioenergetics of these species have not been assessed. Many species have low tolerance for disturbance and would not utilize habitat near active anthropogenic sites.

The south Folsom Reservoir shoreline has incurred substantial residential and dam/dike development in the last 50 years. Urban and residential development has reduced habitat significantly in the Folsom vicinity and it constitutes marginal habitat, or is no longer considered suitable for wildlife species. Remaining habitat that is constrained by bordering urban development also supports a concentration of dam structures and construction activity along the linear shoreline. Incremental losses of oak, pine, and riparian woodlands and wetlands are at issue for retaining wildlife populations in the project area. Oak and riparian woodland habitat has been fragmented and reduced to a lower level of bioenergetics which does not sustain higher wildlife trophic levels. Urban and current Folsom construction disturbance precludes residential status for many wildlife species, particularly for those species sensitive to anthropomorphic disturbance.

Continuity and connectivity of woodland habitat around the lakefront is currently the most limiting factor for maintaining wildlife populations as development continues to fragment remaining acreages. Remaining oak, pine, and riparian woodlands are heightened in importance and critical to maintaining current wildlife populations. Wildlife populations and diversity are compromised with incremental reduction and fragmentation of habitat acreage. Sufficient habitat acreage to support bioenergetics for larger land-based mammals such as gray foxes (*Urocyon cinereoargenteus*), bobcats (*Lynx rufus*), mountain lions (*Puma concolor*), and coyotes (*Canis latrans*) are much reduced or no longer present. These species may occasionally utilize contiguous, vegetated acreages for travel, cover, and for access to suburban food sources. Wildlife species with a capacity for urban noise and activity, commonly referred to as urban wildlife, are more likely to utilize the fragmented woodlands and ruderal grasslands.

Disturbance factors such as roads, urban noise, construction sites, night lights, and toxic substances are additional contributions of developed areas which have reduced wildlife diversity and numbers. Mortality factors are high for suburban wildlife due to collisions with vehicles and power lines, toxic substances, depredation, noise, disturbance of nests and burrows, predation by dogs and humans, and other factors. Small acreages of remaining habitat can function as mortality sinks where species are attracted by useable habitat attributes but incur mortality due to unexpected anthropogenic factors.

Chaparral

Less than one acre of Chaparral is found within the project area and does not occur within the project footprint. Chaparral is usually found on drier sites with shallow, well drained soils and south-facing slopes. Vegetation is characterized by a dense overstory of woody evergreen shrubs, and understory growth is sparse or non-existent. In the project vicinity, species may include chamise (*Adenostoma fasiculatum*), manzanita (*Arctostaphylos spp.*), toyon (*Heteromeles arbutifolia*), ceanothus (*Ceanothus spp.*), and scattered California scrub oak (*Quercus berberidifolia*).

Lacustrine (Open Water) and Riverine

Lacustrine areas shown upon the Sierra Nevada Foothills map base indicate lake surfaces (open water). Aquatic and emergent vegetation is not found within the project footprint and is limited within the project area which abuts, but does not impede, on open water. Riverine indicates aquatic vegetation within the stream channel as opposed to riparian vegetation on stream bank or flood channels. The project footprint borders over 12 miles (65.756 feet) of lacustrine shoreline. Aquatic vegetation in open water and streams is sparse or not present due to fluctuations in the reservoir and intermittent flows within streambeds. Extreme seasonal water level fluctuations can occur in the reservoir ranging from elevations of 357 feet to 466 feet. A mix of barren area and sparse ruderal species seasonally vegetate the flood zone after reservoir drawdown. Sporadic willows and cottonwoods can be found in the shoreline. The continuum between lacustrine and riverine wetlands and woodlands is the most productive wildlife habitat in the vicinity. Greater wildlife diversity is provided by native ecological areas that support water access, aquatic prey, and mesic forage. Dikes and dams cover much of the lacustrine zone in the project area.

Wildlife

The project area is found within the southern portion of Folsom Dam Lake, of which a major portion is urbanized. The largest portion of recent development in the area is residential. Recent dam and dike construction, and structure modification, has also contributed to substantial habitat disturbance and removal of riparian wetland and oak woodland habitat to accommodate construction, structures and material disposal. Twenty-nine mature oaks and cottonwoods were identified for removal, along with the loss of acres of seasonal wetland and riparian woodland for dam modification projects in the project area. Remnant habitat remains, primarily in a linear strip between residential areas and dam/dike structures along the project area shoreline. They support avian species and resident wildlife of lower trophic levels that are able to co-exist with urban disturbances. Additionally, cliff swallows seasonally nest on the dam and gates.

Vegetative diversity within the project area provides a productive mosaic of habitat edge, cover, water, food-rich sources, and functional structure for wildlife which has likely been a salient element in retaining existing wildlife use of the area. Vegetation transitions as a continuum, such as from oak woodland to grass land, which provides additional habitat diversity.

Oak woodland habitat is the largest woodland acreage affected by the project. Oak in particular provides a highly productive mast food (acorns) utilized by species found in the project area such as mule deer (*Odocoileus hemionus*), wild turkeys (*Meleagris gallopavo*), western grey squirrels (*Sciurus griseus*), western scrubjays (*Aphelocoma californica),* and acorn woodpeckers (*Melanerpes formicivorus*). Verner (1980) reported that thirty bird species are known to include acorns in their diet. Tree cavities in oaks, pines, and particularly cottonwood trees found in the project area's riparian woodland are used for nesting by American kestrels (*Falco sparverius*), several species of woodpeckers, northern flickers (*Colaptes auratus*), white-breasted nuthatches (*Sitta carolinensis*), oak titmice (*Baeolophus inornatus*), western gray squirrels (*Sciurus griseus*), raccoons (*Procyon lotor*), hoary bats (*Lasiurus cinereus*), wrens (*Troglodytidae*), western bluebird (*Sialia mexicana*), and several species of owls. Two dozen breeding bird species have been documented to breed in the oak woodland (Gaines 1977).

The woodland also provides hiding cover, thermal regulation, nesting cavities, and structure for birds and mammals. Proximity to water increases this habitat value and increases food diversity. Dense, contiguous cover can provide connectivity (wildlife corridors), particularly used by larger ranging mammals. Cover forage and nest habitat is of high value in riparian woodland for birds such as ruby-crowned kinglets (*Regulus calendula*), bushtits (*Psaltriparus minimus*), warbling vireos (*Vireo gilvus*), Hutton's vireos (*Vireo huttoni*), Wilson's warblers (*Wilsonia pusilla*), American robins (*Turdus migratorius*), and Bullock's orioles (*Icterus bullockii*).

Most species found in oak and riparian woodlands also utilize annual grass lands. California quail (*Callipepla californica*), wild turkeys, and deer are the most common species observed within the project area grasslands. Raptors utilize expanses of grass lands for primary foraging of rodents such as voles. Raptors observed in the project area include red-tailed hawks (*Buteo jamaicensis*), red-shouldered hawks (*Buteo lineatus*), turkey vultures (*Cathartes aura*), great horned owls (*Bubo virginianus*), and white-tailed kites (*Elanus leucurus*). Also found within the grass lands and water interface are Canada geese (*Branta canadensis*), great egret (*Ardea alba*), house finches (*Carpodacus mexicanus*), spotted towhees (*Piplio maculates*), gopher snakes (*Pituophis catenifer*), rattlesnakes (*Crotalus viridis*), common kingsnakes (*Lampropeltis getula*), and striped skunks (*Mephitis mephitis*).

A large portion of the project area consists of disturbed ground or is devoid of vegetation, with the exception of sparse annual grasses and forbs. Various buildings, dams, water control facilities, and related facilities have been constructed on or near the project area and provide limited or no wildlife habitat, with the exception of cliff swallows (*Petrochelidon pyrrhonota*), who build their mud nests on the surface of structures, such as the dam face and gates. Equipment and structures on active construction sites of the Folsom Dam Modification Project have attracted nesting bird species including Anna's hummingbird (*Calypte anna*), mourning doves (*Zenaida macroura*), house finches (*Carpodacus mexicanus*), , owls and Say's phoebe (*Sayornis saya*). It is feasible that predator avoidance overrides construction disturbance as an attractant to these sites. Bald eagles (*Halieaeetus leucephalus*), osprey (*Pandion haliaetus*) and waterfowl have been sighted fishing, foraging, and roosting between open water and blue oak woodland directly over and around active construction areas of the Folsom Dam Modification Project. Effects of construction disturbance on the bioenergetics of these species have not been assessed. Many species have low tolerances for disturbance and would not utilize habitat near active anthropogenic sites.

The south Folsom Reservoir shoreline has incurred substantial residential and dam/dike development in the last 50 years. Urban and residential development has reduced habitat significantly in the Folsom vicinity and it constitutes marginal habitat, or is no longer considered suitable for wildlife species. Remaining habitat that is constrained by bordering urban development also supports a concentration of dam structures and construction activity along the linear shoreline. Incremental losses of oak, pine, and riparian woodlands and wetlands are at issue for retaining wildlife populations in the project area. Oak and riparian woodland habitat has been fragmented and reduced to a lower level of bioenergetics which does not sustain higher wildlife trophic levels. Urban and current Folsom construction disturbance precludes residential status for many wildlife species, particularly for those species sensitive to anthropomorphic disturbance.

Continuity and connectivity of woodland habitat around the lakefront is currently the most limiting factor for maintaining wildlife populations as development continues to fragment remaining acreages. Remaining oak, pine, and riparian woodlands are heightened in importance and critical to maintaining current wildlife populations. Wildlife populations and diversity are compromised with incremental reduction and fragmentation of habitat acreage. Sufficient habitat acreage to support bioenergetics for larger land based mammals such as gray foxes, bobcats, mountain lions, and coyotes are much reduced or no longer present. These species may occasionally utilize contiguous, vegetated acreages for travel, cover, and for access to suburban food sources. Wildlife species with a capacity for urban noise and activity, commonly referred to as urban wildlife, are more likely to utilize the fragmented woodlands and ruderal grasslands.

Disturbance factors such as roads, urban noise, construction sites, night lights, and toxic substances are additional contributions of developed areas which have reduced wildlife diversity and numbers. Mortality factors are high for suburban wildlife due to collisions with vehicles and power lines, toxic substances, depredation, noise, disturbance of nests and burrows, predation by dogs and humans, and other factors. Small acreages of remaining habitat can function as mortality sinks where species are attracted by useable habitat attributes but incur mortality due to unexpected anthropogenic factors.

3.4.2 Environmental Consequences

This section describes methodology, basis of significance, and effects to existing vegetation and wildlife resources within the project area. Proposed active construction that would potentially cause ground disturbance is referred to as the construction footprint.

Methodology

Assessment of vegetation and habitat was made from aerial photography and from vegetative delineations conducted by the Northern Sierra Nevada Foothills Project (CNPS 2015) as described under Section 3.4.1 above. Geographic Information System (GIS) overlays of the proposed project were used to quantify acreages of affected vegetation (Appendix C). A qualitative field assessment was not conducted on the entirety of the project area, but consisted primarily of vegetation and wildlife assessment over a period of four years in the vicinity of the current JFP Folsom Dam Modification Project, Approach Channel.

Project area vegetation was delineated by the Northern Sierra Nevada Foothill Project (Klein, A., J. Crawford, J. Evens, T. Keeler-Wolf, and D. Hickson 2007). The Dam Raise project footprint was mapped over delineated vegetation groups and alliances by the Corps utilizing the mapping program from the CDFW interactive website (CDFW 2015). Acreages were determined with ESRI ArcMap 10 GIS.

Mapped information provides vegetation alliances and general groupings of vegetation types as assessed from dominant vegetative overstory and understory floristic composition (Sawyer, J.O and T.Keeler Wolf 2009). An alliance is a category of vegetation classification which describes repeating patterns of plants across a landscape (Sawyer and Keeler-Wolfe 2009). Plant species composition defines an alliance, incorporating the effects of local climate, soil, water, disturbance, and other environmental factors (CNPS 2015). Vegetation assessment was conducted on a spatial scale of a minimum of eight acre size parcels (Klein, A., *et al.* 2007). Since habitat groups under eight acres in size were not included, an under estimation of woodland and wetland vegetation acreages occurred due to the fragmented nature in the project area. This size parcel also precluded site-specific identification of floristic composition down to an alliance or association level. Floristic field surveys to determine alliance or associations were not conducted for the Dam Raise project area. As a result, some mapping units are characterized by a group or macro-group. California Annual Grassland represents a grouping of all grass and herb species without a shrub or tree overstory. The macro-group of broad-leaf forest and woodland was mapped to a specific alliance of blue oak (*Quercus douglasii*). An association level was delineated for blue oak–woodland pine (*Quercus sabina*). Additional macro-groups identified and mapped within the project area include Chaparral Shrub, Valley Foothill Riparian, Wetland, Lacustrine (lake), Riverine (river), and Urban (developed) land.

Using vegetation data from the California Department of Fish and Wildlife that was input into ArcGIS allowed for the creation of an interactive vegetation map of Folsom Lake. In GIS, a construction boundary was made around the Lake's perimeter in order to estimate the vegetative areas that had been affected by construction. Using this boundary allowed for the calculation of the area of the original vegetative cover when the dam was built, minus what had been removed by the parking lot areas and urban areas. Next, assumptions were made for what kind of vegetation was removed from the construction of the parking lots and urban areas. The acreage of these areas was found using GIS and allowed for the calculation of the area of each type of vegetation that was removed. Finally, the calculations could be made for original vegetation acreage when the dam was built, the vegetation acreage removed by project construction, and the percentage of total vegetation lost. Original vegetation acreage when the dam was built was calculated by the vegetative areas that exist within the construction boundary now, plus the vegetative acreages that have been removed from the parking lots/staging areas. The project removed vegetation acreage was calculated by adding the vegetation losses expected from phase VI of the JFP to the vegetative area lost from the parking lots/urban areas. Percentage lost was calculated by the removal area divided by the total area.

Basis of Significance

Direct and indirect effects on vegetation and wildlife would be considered significant if the alternatives result in any of the following:

1. Substantial loss, degradation, or fragmentation of any natural communities or wildlife habitat.

2. Substantial reduction in the quality or quantity of important habitat with the result that native wildlife could not live or successfully reproduce in the project area.

3. Interfere substantially with the movement of any native wildlife species (habitat connectivity) or with established native resident or migratory wildlife corridors.

4. Conflict with any local, state or federal policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

5. 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 CWA.

3.4.3 Alternative 1: No Action Alternative

Under Alternative 1, No Action, the proposed construction would not occur. No construction related effects (direct or indirect) to vegetation and wildlife would occur, and conditions in the project area would remain consistent with existing conditions assessed in Section 3.4.2.

3.4.4 Alternative 2: Spillway Tainter Gate Modification and Combination Earthen Raise and Concrete Floodwall

Alternative 2 is proposed to affect a construction footprint of up to up to 50 feet on both sides of Dikes 1 through 8 and MIAD, and remove vegetation and disturb the ground surface at up to thirty-one staging areas (Appendix C). The proposed project extends along the southern Folsom Reservoir shoreline for a distance of over 12 miles. Approximately fifty acres of annual grasslands, five acres of blue oak woodlands and blue oak-wood pine, and less than an acre of valley foothill riparian vegetation and fresh emergent wetland within the project footprint have the potential to be removed as a result of implementing Alternative 2 (Table 4). Smaller vegetation type acreages, however, are understated in size as blocks of vegetation under eight acres were not mapped as distinct units. The majority of the construction footprint acres are intended for use as staging or material storage areas. With the exception of staging areas, the construction of concrete floodwalls on the left wing dam (LWD) and right wing dam (RWD) would not extend past the current dam footprints and would not require an additional removal of vegetation.

The left wing dam and right wing dam surfaces are faced with large diameter rocks and boulders, usually on steep gradients. Direct construction upon the 3.5-foot concrete wall on the wing dams, dikes, and tainter gate installation is not expected to adversely affect wildlife movement because the structure impediments preclude animal travel and use. Disturbance caused by staging and stock pile construction activity, noise, traffic, and night lighting are expected to displace wildlife species through multiple years of construction from year 2017 to 2020. Interference with water access by terrestrial mammals would occur for intermittent periods from years 2017 to 2021. Loss of remaining woodland acres would substantially reduce habitat cover used to access summer and fall water sources by terrestrial wildlife populations. Disturbance from the project is expected to intermittently compromise water access to the shoreline for a period of five years. The duration of construction-created disturbances would be overlapping and continuous throughout Dikes 1 through 8. Project construction would begin at Dikes 7 and 8 shortly after the completion of restoration efforts on the Folsom Dam Approach Channel Project in the vicinity of Dikes 7 and 8. However, if habitat remains intact, displacement would be temporary in nature and would not be considered a significant impact for area wildlife populations.

Due to the fragmented nature of remaining oak, pine, and riparian woodland, Alternative 2 has a disproportionate potential to significantly impact remaining habitat connectivity by the removal of additional woodland. Permanent loss of these small acreages would be significant to local wildlife populations for access, connectivity, breeding, and foraging. Species that would be most impacted by loss of woodland include turkey, bobcats, striped skunks, gray foxes, mule deer, gray squirrels and some rodent species. Resident and migratory birds would lose foraging and breeding areas.

Table 5 shows the approximate loss or conversion of vegetation acres since the Folsom Dam and Dikes were completed within the project area. Wetlands show the greatest habitat loss from the area, while riparian woodland was largely protected in a uniform block south of

Mormon Island Dam. There is added risk of wildlife population loss due to the linear configuration of remaining habitat bordering an urban area; however, more intensive bioenergetics analysis is necessary to quantify incremental or cumulative loss to wildlife populations. With additional habitat decreases of even small or incremental acreage losses in this area, it is expected that remaining species, such as deer and turkey, would be lost as the bioenergetic requirements of individual species exceed the productivity of remaining habitat.

Because remaining habitat is narrow and does not exceed 2,000 feet in width, it is substantially more vulnerable to anthropogenic impact than a configuration supporting greater interior habitat area and wildlife cover. The magnitude of project caused disturbance would be proportionally higher as a result of the linear configuration due to lack of habitat continuity outside the project boundaries for cover, escape, or alternate use. Terrestrial and avian wildlife would need to shift primarily north or south to escape construction activity as they cannot shift into the lake or residential areas bordering residual habitat. As a result, because the habitat configuration is constrained and remaining acres are low, habitat is highly impacted in magnitude by incremental or small acreage losses.

Table 4. Potentially Affected Vegetation of Alternative 2.

Vegetation Type	Acres
Blue Oak Woodland, Blue Oak-Foothill Pine	4.9
Annual Grassland	50.4
Valley Foothill Riparian	0.1
Wetland	0.3
Reservoir/Lacustrine	19.6

Source: Northern Sierra Foothills Vegetation Project-Vegetation Mapping Report. CNPS 2015; CDFG 2015

Table 5. Vegetation Acres and Percentage Affected.

Vegetation Type	Acres Post Dam construction	Acres Removed by Subsequent Projects	Percentage Removed
Blue Oak Woodland	257.83	47.49	18.42%
Blue Oak Woodland/Foothill Pine	276.41	6.02	5.79%
Annual Grassland	492.85	97.53	19.79%
Valley Foothill Riparian	49.81	2.53	5.07%
Wetlands	8.12	3.61	44.48%

Source: Northern Sierra Foothills Vegetation Project-Vegetation Mapping Report. CNPS 2015; CDFG 2015

Indirect adverse impacts to woodland vegetation would include increased erosion, damage to roots of tree by heavy equipment, dust impacts to roadside vegetation, and invasion of exposed substrate by exotic and noxious plant species. These impacts can be partially mitigated to a less than significant level by providing dust control and a buffer for existing vegetation.

Sufficient staging acreage (157 acres) is available over 31 proposed staging areas to provide adequate flexibility to avoid loss of woodland habitat. The majority of proposed staging areas are currently delineated on disturbed and grassland substrates. Five of the staging areas are proposed within the high water line of Folsom Lake for periods of low lake level and would not impact vegetation or habitat. Tree avoidance measures and adjustment of staging area boundaries, to prevent damage or removal to individual trees and woodland boundaries, would substantially reduce impacts to remaining woodland acreage. Incorporation of mitigation measures listed in Section 3.4.5 would reduce the permanent effects of the project to less than significant. These mitigation measures require assessment of alternatives to individual oak, pine, and riparian tree removal. The achievement of no-net-loss of woodland habitat, or less than one quarter acre (or 5 trees) with Section 3.4.5 tree mitigation replacement would constitute a less than significant-action with mitigation.

Annual grassland constitutes a substantially higher acreage within the project area. Disturbance or removal of grassland can be restored/improved within a relatively short time frame due to its annual nature. However, invasive and exotic weed growth occurs rapidly in disturbed areas, and the spread of invasive species such as star thistle can preclude wildlife and human use. Introduction of invasive plants can easily occur by vehicle and construction equipment transport and can cause significant affects to existing habitat. To avoid significant impact to grassland habitat, mitigation measures listed in Section 3.4.5 would be employed. The project area would be returned to pre-existing conditions to the extent practicable at the completion of this project and improved with the use of native flora. Staging areas and other disturbed soil surfaces would be revegetated with native forb and grass species directly after construction activities cease.

Construction associated with raising embankment dams and dikes can temporarily disturb nesting birds in the project area. While some bird species acclimate to construction disturbance, it has also been shown that noise generated by motor vehicles is sufficient to decrease breeding bird fecundity (Rheindt 2003, Reijnen et al. 1995, Reijnen and Foppen 1994, and Ferris 1979). Disturbance by vehicle and pedestrian traffic and machinery would particularly disturb nesting raptors and turkeys in the project area. While some species abandon nests upon being disturbed, others exhibit adaptation to area construction. Certain species of migratory and resident birds [cliff swallows (*Petrochelidon pyrrhonota*), mourning doves (*Zenaida macroura*), Anna's hummingbirds (*Calypte anna*), Say's phoebes (*Sayornis saya*), and house finches (*Carpodacus mexicanus*)] have commonly nested on structures and construction equipment on the Folsom

Dam Modification Project and are expected to continue this behavior on structures and equipment in Alternative 2. Cliff swallows are known to nest on supporting structures for the Tainter gates. Compliance with the Migratory Bird Treaty Act would not constitute a significant issue because nest surveys conducted per Mitigation Section 3.4.5 would require nesting surveys, and nest avoidance and protection, to prevent harm to avian species. In addition, State and USFWS protocols for survey and protection of nesting raptors would be followed for the project. Pre-emptive measures would be conducted continuously by a qualified biologist to prevent birds from nesting on construction equipment and structures undergoing modifications. Environmental protection training would occur for all construction personnel regarding avian nests and environmental protection.

The modification of emergency tainter gates would result in a localized construction footprint (Figure 19) for three years. Construction noise and traffic is expected to disturb and/or displace local wildlife that utilizes oak and pine woodlands and grasslands over the project duration; however, it is expected that local wildlife utilization of the area would return to pre-construction levels post-contsturction.

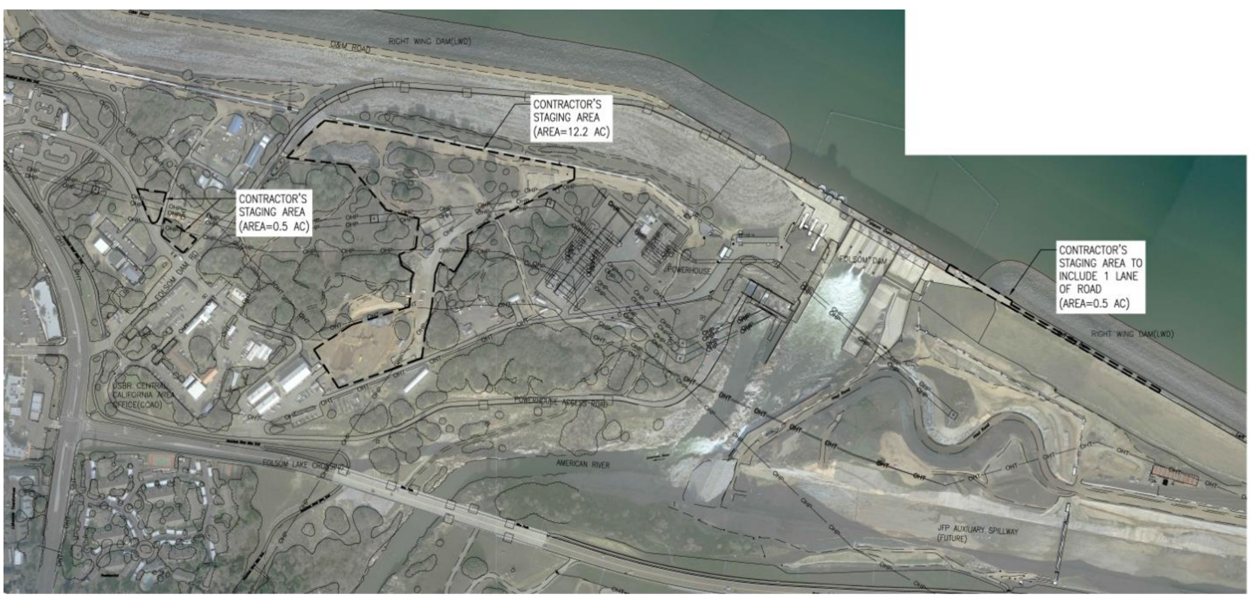

Figure 19. Tainter Gate Replacement Project Area.

Site access to the project area would occur through a Bureau of Reclamation facility on existing paved roads and through the crest of the right wing dam. Staging areas, proposed for the current Bureau of Reclamation work yard, abut the borders of remaining blue oak woodland.

Construction staging areas are proposed primarily for disturbed areas that appear to have formerly supported oak woodland vegetation, but now consist of bare soil or ruderal vegetation.

Up to two acres of oak woodland savannah is included in staging area boundaries within the tainter gate project area; however, this smaller acreage was not included in the Northern Sierra Foothills Project mapping due to limited size and was delineated as urban acreage. Though small in acreage, loss of these trees would contribute disproportionally to the reduction of oak woodland habitat in the project area. Sufficient land area is available for staging and temporary stockpiling in disturbed or open ruderal habitat to avoid removal of additional oaks, and would curtail incremental losses of contiguous oak woodland habitat. Mitigation measures for protecting existing trees would reduce these impacts to less than significant with mitigation. Other construction activity would be conducted in developed and concreted areas of the dam that would not cause impacts upon existing vegetation or habitat.

Alternative 2, Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall project is not is not expected to cause substantial loss, degradation, or fragmentation of any natural communities or wildlife habitat when conducted with mitigation specified in Section 3.4.4. The USFWS has provided a Draft Coordination Act Report (2014) (Appendix E) that specifies recommended oak mitigation measures. Native trees within the unincorporated area of Sacramento County are protected by the County Tree Preservation Ordinance and the Sacramento County General Plan Conservation Element. Compliance with this mitigation and local ordinances would ensure that significant impacts would not occur. Alternative 2 is expected to be less than significant with mitigation when measures specified in Section 3.4.4 are applied. As a result of incorporating these measures, substantial reduction would not occur to the quality or quantity of critical habitat with a result that native wildlife cannot live or successfully reproduce in the project area. Construction disturbance would interfere temporarily but not to a significant magnitude affecting the connectivity of habitat, movement of native wildlife species, established native residents or migratory corridors. Utilization of mitigation measures in Section 3.4.5 are necessary to prevent additional wildlife habitat degradation in the project area.

A wetland delineation conducted by USFWS in 2014 shows 0.083 acres of seasonal wetlands adjacent to Dike 6. Any delineated wetlands in the project area would be fenced and signed for protection from construction activity. USFWS-delineated wetlands within the vicinity of the project area would also be defined and signed for protection in the event a vehicle trespasses from the project area. Alternative 2 is not expected to affect open or other waters of the U.S. as defined by the CWA and its implementing regulations.

Local and State identified natural communities are present in oak and riparian woodland, but with incorporation of mitigation, significant effects are not expected. The project area would be returned to the pre-existing condition to the extent practicable at the completion of this project. Staging areas and other disturbed soil surfaces would be revegetated with native forb and grass species. The implementation of Alternative 2 is not expected to conflict with local policies or ordinances protecting biological resources because Sacramento County tree ordinance and USFWS recommended habitat protections and prescriptions would be observed. There are no applicable Habitat Conservation Plans (HCPs) or National Community Conservation Plans (NCCPs) in the project area. The implementation of Alternative 2 is not expected to conflict with any other approved local, regional, or state habitat conservation plan.

3.4.5 Avoidance, Minimization, and Mitigation Measures

The following avoidance, minimization, and mitigation measures, including recommendations from the USFWS Fish and Wildlife Coordination Act Report for the Folsom Dam Raise Project (February 2015), would be required and conducted by the Corps or project contractor, as appropriate, to reduce significant impacts to a less than significant level.

1. To minimize dust impacts to vegetation, wetlands, and breeding wildlife, dust control measures consistent with SMAQMD fugitive dust control measures would be implemented. Unpaved access roads would be frequently watered with raw water to prevent visible dust.

2. To prevent importation of exotic and invasive plant and animal material, contractors would clean all mud, soil, plant, and animal material from vehicles and equipment before entering the project area. The Corps or its project contractor would conduct inspections to ensure vehicles comply with this measure.

3. Before the project commences, the Corps and the contractors would identify native vegetation and habitat areas to be protected. Detailed pre-construction site drawings would be created identifying vegetated and habitat areas to be avoided, fenced, and signed for protection. These drawings would be accompanied by a narrative detailing the vegetative and wildlife protection plan. No off-road traffic would occur outside of identified staging areas.

4. Disturbance, damage, and interference to plants and wildlife, including their habitat, would be minimized. Areas that are not to be disturbed would be clearly defined by signing, fencing, or other techniques. The contractor would avoid impacts to native trees, shrubs, and aquatic vegetation to the greatest extent possible. Construction would be implemented in a manner to minimize disturbance of such areas.

5. Woody vegetation at all staging areas, borrow sites, and haul routes would be enclosed with protective construction fencing. Where practicable, a buffer would be provided; it would be one and a half times the distance of the dripline. Temporary fencing would also

be used during construction to prevent damage to native trees that are located adjacent to construction areas but can be avoided. Coordination on these areas would occur with a Corps biologist prior to work commencement.

6. Except as identified in the project drawings or plans, no tree or shrub would be removed without prior consultation and examination of alternatives with the contracting officer and a qualified Corps biologist. To minimize tree removal related to construction/staging purposes, all feasible construction or staging alternatives would be exhausted before removal of any oak, pine, or riparian trees occurs. After consultation, any native trees identified for removal would be replaced onsite, at a ratio of 1.2:1 for oak/grey pine woodland, 1/1:1 for riparian woodland in kind, as defined by the USFWS Coordination Act Report requirements (USFWS 2015). Plantings must be managed and monitored for five years until determined to be established and self-sustaining.

7. Any tree or shrub, or part thereof, identified for removal would be removed during the period of November through January (*i.e.* months within the designated non-nesting season for local avian species) with the assistance of a trained arborist as applicable. Any requested exceptions to these dates would be preceded by a survey conducted by a qualified avian biologist to identify any active avian nests. If active nests are found, vegetation would not be removed until any young have fledged.

8. Before and during the nesting season, a qualified biologist would conduct nesting surveys along proposed construction sites, structures within the construction sites (e.g. gate strutures and other parts of the dam subject to modification or disturbance), haul roads, staging areas, and stockpile sites. If nests are found, work activity around the nests would be avoided until the young have fledged. CDFW protocol survey for Sacramento Swainson’s hawks would suffice for most preconstruction nest surveys for raptors. Great horned owls in particular would be surveyed at an earlier date. The following protocol would suffice for pre-construction survey for raptors:

> A focused survey for Swainson’s hawk nests would be conducted by a qualified biologist during the nesting season (February to August 31) to identify active nests within 0.25 mile of the project area. The survey would be conducted for 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 would occur during the active nesting season of February 1 to August 31, or until the young have fledged (as determined by a qualified wildlife 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.

9. Pre-emptive avoidance measures would be conducted before nesting season occurs to prevent nesting on equipment and structures, such as the use of netting on structures to prevent cliff swallow nesting activity. Any discovered nests would be reported to the Corps biologist, and the nest would be avoided until assessment. No active nests would be disturbed so as to cause disturbance, harassment, or nest abandonment.

10. A qualified avian biologist/environmental monitor, approved by the Corps, would be employed up to a full time basis onsite, as needed, to ensure project compliance with the Migratory Bird Treaty Act and other environmental mitigations and protections.

11. The Corps and the project site biologist/monitor would ensure that all construction personnel undergo environmental protection training to be aware of all required environmental protections (bird, wildlife, and vegetation protection) per these mitigations, and by federal and state law. Any vegetation or wildlife habitat issues would be reported directly to the Contracting Officer and Corps biologists.

12. Construction materials likely to lead to entrapment of wildlife would be removed nightly as applicable. Wildlife escape ramps would be installed in construction areas that contain steep-walled holes or trenches. All trash and food-related waste would be placed in self-closing trash containers and removed nightly.

13. Native species specific to the project area would be planted through a revegetation plan with a mitigation and monitoring plan to address revegetation of all disturbed or destroyed vegetation within the project area. The revegetation plan would be implemented immediately following construction in accordance with requirements in the SWPPP and Mitigation, Monitoring, and Reporting Plan. Reseeded grassland areas would be periodically monitored until 85 percent vegetation cover is achieved. The targets will be established by the Corps, and the contractor will implement planting and conduct monitoring to meet those targets for 3 years.

14. All revegetated or disturbed areas would be monitored during the contract warranty period by a qualified biologist for percent coverage and invasive non-native plant species.

15. Assessment would be conducted of any drainage depression or channels that provide hydrological contributions to wetlands. These channels would be maintained to assure continuing drainage into off site wetlands. No entry or disturbance of wetlands would be allowed within the project area or off site, and they would be fenced and signed. Wetlands identified by the Northern Sierra Foothills project at MIAD would be assessed before project commencement, and appropriate protections would be provided.

16. In the event that mitigation is not initiated within a two year period after each phase of project completion, mitigation ratios would increase by 0.5:1 if initiated within two to five years and by 1:1 if mitigation is initiated more than five years after the permanent or temporary impacts occur (USFWS 2012).

17. All BMPs would be strictly followed to prevent spills of toxic substances. Appropriate materials for spill containment and cleanup would be maintained onsite. No staging of vehicles or equipment would occur within 50 feet of the water edge of Folsom Lake to prevent accidental inundation and toxic infiltrations.

18. All restoration would be coordinated with the Bureau of Reclamation, USFWS, and Sacramento County as appropriate.

3.5 Special Status Species

3.5.1 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 Chapter 5.0.

<u>Federal</u>

- Federal Endangered Species Act (16 U.S.C. 1531 et seq.)
- Migratory Bird Treaty Act (16 USC §703-712)

<u>State</u>

- California Endangered Species Act (Fish and Game Code 2050 et seq.)

Existing Conditions

Special-status species are defined as:

- Species that are listed or proposed for listing as threatened or endangered under the ESA (50 CFR 17.12 for listed plants, 50 CFR 17.11 for listed animals, and various notices in the *Federal Register* for proposed species);

- Species that are candidates for future listing as threatened or endangered under the ESA (72 FR 69034, December 6, 2007);

- Species listed or proposed for listing by the State of California as threatened or endangered under the CESA (14 CCR 670.5);

- Species that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines Section 15380);

- Animals that are California species of special concern (California Department of Fish and Game 2008); Remsen 1978);

- California Department of Fish and Game and Point Reyes Bird Observatory 2001 [birds]; Wouldiams 1986 [mammals]; and Jennings and Hayes 1994 [amphibians and reptiles]); and,

- Animals fully protected in California (CFGC 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians].

Federally-listed proposed, candidate, threatened, or endangered species (listed species) and their associated critical habitat were obtained for the Folsom, Rocklin, and Clarksville 7.5 Minute USGS Quadrangles via the USFWS website and the California Natural Diversity Database (CNDDB) (USFWS, CNDDB 2015). The USFWS and CNDDB lists are included in Appendix F. A total of 17 special status species are identified as having the potential to occur within the Folsom, Clarksville, and Rocklin quadrangles. Because there would be no in-water work, special-status fish species are not included and would not be discussed in this document. Table 6 lists the special status species and provides their listing status, basic habitat requirements, and potential to occur in the project area.

Table 6. Special Status Species with Potential to Occur in the Project Area.

Species	Status	Habitat	Potential for Occurrence
Invertebrates			
Conservancy fairy shrimp *Branchinecta conservatio*	FE	Inhabits vernal pools	Unlikely; no known populations in the area. Need to conduct survey prior to construction.
vernal pool fairy shrimp	FT		

Species	Status	Habitat	Potential for Occurrence
Branchinecta lynchi		Endemic to the grasslands of the Central Valley, Central Coast mountains, and South Coast mountains, in rain-filled pools. Inhabit small, clear-water sandstone-depression pools and grassed swales, earth slumps, or basalt-flow depression pools	Unlikely; no known population is the area. Need to conduct survey prior to construction.
valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT	Occurs only in the Central Valley of California, in association with blue elderberry (*Sambucus mexicana*); primarily in riparian woodland and scrub habitat.	Known to occur in the project area. Twenty elderberry shrubs were located within the project area in a 2014 survey.
Amphibians and Reptiles			
California tiger salamander, central population *Ambystoma californiense*	FT	California endemic, a lowland species restricted to the grasslands and lowest foothill regions of Central and Northern California, which is where its breeding habitat (long-lasting rain pools) occurs. During dry-season, uses small mammal burrows as refuge, travelling up to 1.6 kilometers (km).	Unlikely to occur; outside the Spawning range for the species
California red-legged frog *Rana draytonii*	FT, SSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development and must have access to aestivation habitat.	Unlikely to occur due to presence of predator bull frog species and low quality habitat.
Giant garter snake *Thamnophis gigas*	FT	Prefers freshwater marsh and low gradient streams. Has adapted to drainage canals & irrigation ditches. This is the most aquatic of the garter snakes in California.	Unlikely to occur; no suitable habitat is in project area.

Species	Status	Habitat	Potential for Occurrence
Birds			
Bald eagle *Haliaeetus leucocephalus*	SE	Typically found in coniferous forest habitats with large, old growth trees near permanent water sources such as lakes, rivers, or ocean shorelines.	Known to occur in the project area.
California black rail *Laterallus jamaicensis coturniculus*	ST	**I**nhabits tidal marshes and freshwater marshes in the western United States and Mexico. Tend to inhabit the drier portions of wetlands.	Unlikely to occur; no suitable habitat in project area.
Cooper's hawk *Accipiter cooperii*	SSC	Nests in riparian woodland or forest dominated by cottonwoods and willows. Occurs principally as a migrant and summer resident from late March through early October; breeds from April to late July.	Unlikely; no suitable nesting or foraging habitat is present within project area. Could be observed during migration in California.
Swainson's hawk *Buteo swainsoni*	ST	Restricted to portions of the Central Valley and Great Basin regions where suitable nesting and foraging habitat is still available. Requires large, open grasslands with abundant prey in association with suitable nest trees.	Potential to occur in the project area.
tricolored blackbird *Agelaius tricolor*	SE, SSC	Highly colonial species, most numerous in Central Valley and vicinity: largely endemic to California. Requires open water, protected nesting substrate, & foraging area with insect prey within a few kilometers of the colony.	Unlikely to occur; no suitable habitat is in project area.
Plants			
Boggs Lake hedge-hyssop *Gratiola heterosepala*	SE	Can be found in marshes, swamps (lake margins), and vernal pool habitats on clay soils ranging from 10 to 2,375 meters in elevation. Known to occur in Fresno, Lake, Lassen, Madera, Merced, Modoc, Placer, Sacramento, Shasta, Siskiyou, San Joaquin, Solano and Tehama Counties as well as parts of Oregon.	Unlikely to occur; small areas of seasonal wetlands and marshy habitat present within the project area, but not on clay soils.
El Dorado bedstraw *Galium californicum ssp. sierrae*	FE, SR	Only found within El Dorado County. Exists within chaparral, cismontane woodland, lower montane and coniferous forest habitats and gabbroic soils within an elevation range from 100 to 585 meters.	Unlikely to occur in the project area based on the lack of chaparral and coniferous forest.

Species	Status	Habitat	Potential for Occurrence
Layne's ragwort *Packera layneae*	FT	Can be found in Butte, El Dorado, Placer, Tuolumne, and Yuba Counties. Habitat is chaparral or cismontane woodland, located in serpentinite, gabbroic, or rocky soils.	Unlikely to occur in the project area; plant is endemic to the western slopes of the northern Sierra Nevada foothills, but not within the project footprint.
Pine Hill ceanothus *Ceanothus roderickii*	FE, SR	This species grows only on gabbro soils in western El Dorado County, scattered throughout areas of chaparral.	Unlikely to occur; no suitable habitat is in project area.
Pine Hill flannelbush *Fremontodendron decumbens*	FE, SR	Only known from the central portion of western Eldorado County in the vicinity of Pine Hill itself. Habitat includes live oak woodland with a significant shrub component.	Unlikely to occur; no suitable habitat is in project area.
Sacramento Orcutt grass *Orcuttia viscida*	FE, SE	Endemic to Sacramento county. Grows only in vernal pools	Unlikely; no suitable habitat in the project area. Need to conduct survey prior to construction

(FE) Federal Endangered Species (FT) Federal Threatened Species
(SE) State Endangered Species (ST) State Threatened Species
(FP) State Fully Protected (SSC) California Species of Special Concern

Special status species that were not identified as occurring or having habitat in the project area are not discussed further in this document. The following Federally and State listed species are identified as having the potential to occur in the vicinity of the project areas and could be affected by construction activities:

- Valley elderberry longhorn beetle (Federal Threatened)
- Bald eagle (State Endangered)
- Swainson’s hawk (State Threatened)

Valley Elderberry Longhorn Beetle.

The valley elderberry longhorn beetle (VELB) is federally listed as threatened under the ESA. In October of 2012, the USFWS recommended in the Federal Register (78 FR 4812) that the beetle be delisted. After review of updated species information, the recommendation was withdrawn in September of 2014 (79 FR 55879 55917). The range of the beetle extends throughout the Central Valley and associated foothills, from the 3,000-foot-high contour in the east foothills, through the valley floor, to the watershed of the Central Valley in the west foothills. Elderberry shrubs are found in the remaining riparian forests and grasslands of the Central Valley and adjacent foothills. This beetle is often associated with various plant species, such as Freemont’s cottonwood, California sycamore, willow, and oak (USFWS 1999a).

Elderberry shrubs (*Sambucus* sp.) are the host plant for VELB and are a common component of the remaining riparian forests of the Central Valley. Elderberry shrubs are also common in upland habitats. Field surveys have found that adult VELB feed on elderberry foliage, and perhaps flowers, and are present from March through early June. It is during this time that the adults mate. The females lay their eggs, either singularly or in small clusters, in bark crevices or at the junction of stem and trunk or leaf petiole and stem. After hatching, a larva burrows into the stem of the elderberry where it creates a gallery, which it fills with grass and shredded wood. After the larva transforms into an adult beetle, it chews an exit hole and emerges from the elderberry. The life span of VELB ranges from 1 to 2 years. Studies of the spatial distribution of occupied shrubs suggest that the beetle is a poor disperser (USFWS 1999a). No critical habitat has been identified for this species.

During two biological surveys conducted by USACE, USFWS, DWR, and Reclamation staff on April 9th and 19th, 2014, a total of 22 elderberry shrubs were identified within or nearby the project area. Twelve (12) shrubs were located at the Right Wing Dam, three (3) were located at Dike 6, two (2) were located between Dikes 5 and 6, and five (5) were located at Dike 1 (Figure 20).

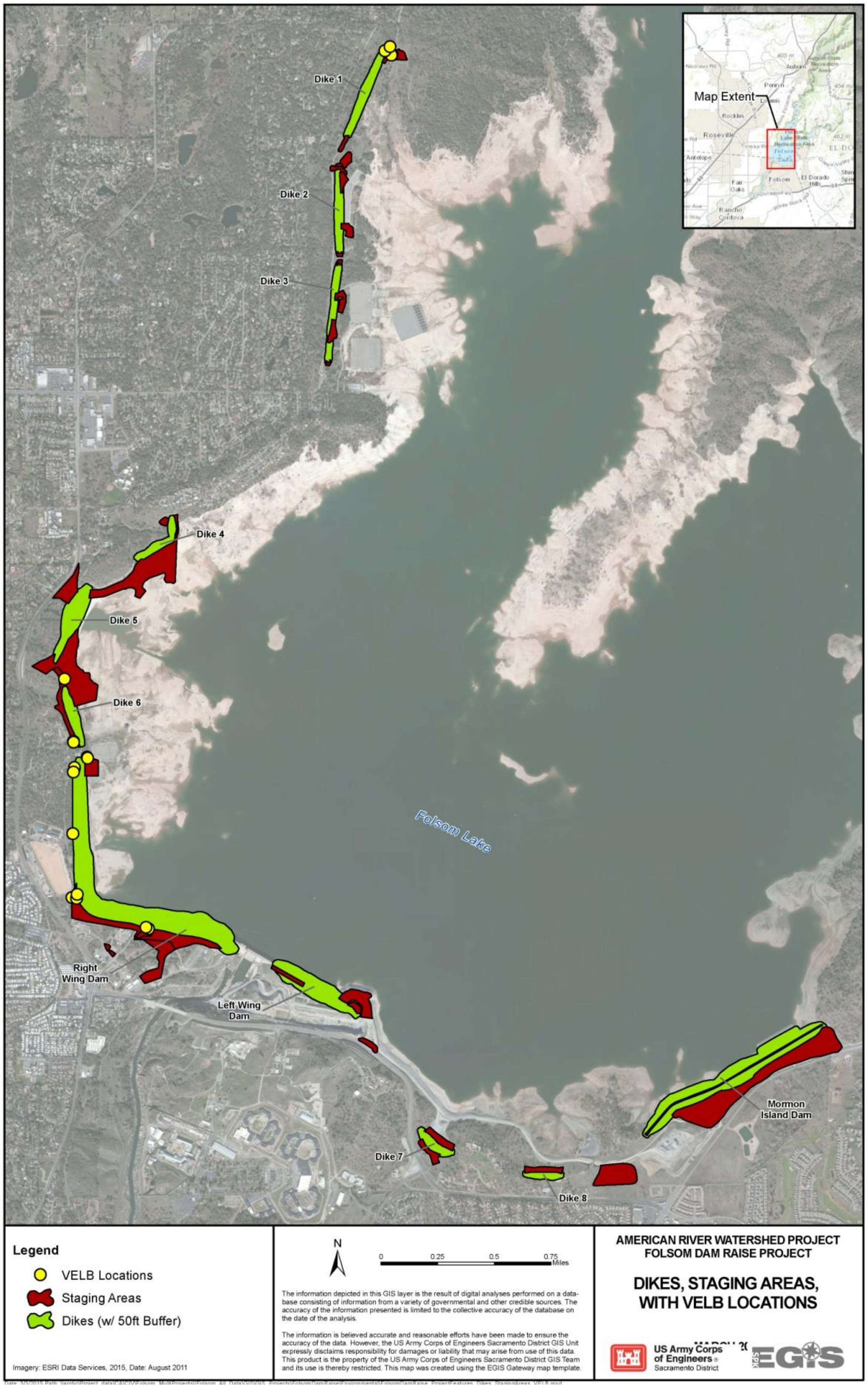

Figure 20. Dikes and Staging Areas for Alternative 2 with Elderberry Shrub (VELB) Locations.

Bald Eagle.

This species is a permanent resident and uncommon winter migrant in California. Breeding is mostly restricted to Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity Counties. About half of the wintering population is in the Klamath Basin. The bald eagle is fairly common as a local winter migrant in a few favored inland waters in Southern California. The largest numbers of bald eagles occur at Big Bear Lake, Cachuma Lake, Lake Matthews, Nacimiento Reservoir, San Antonio Reservoir, and along the Colorado River. Bald eagles are typically found in coniferous forest habitats with large, old growth trees near permanent water sources such as lakes, rivers, or ocean shorelines. This eagle requires large bodies of water with abundant fish and adjacent snags, or other perches for foraging. Bald eagles prey mainly on fish, and occasionally on small mammals or birds, by swooping from a perch or during mid-flight. This eagle also scavenges dead fish and other dead animals. Nests are found in large, old growth or dominant trees, especially ponderosa pine with an open branch-work, usually 50 feet to 200 feet above the ground. It breeds February through July, with peak activity from March to June. Clutch size is usually two. Incubation usually lasts 34 to 36 days (Zeiner et al. 1990a).

The bald eagle is known to occur within the project area and vicinity, and based on the availability of adequate nesting sites and foraging habitat, would continue to utilize habitat within the project area. Bald eagles have over-wintered in the area but there are no reports of successful nest building activities. No critical habitat has been designated for this species.

Swainson's hawk.

Swainson's hawks are protected under the MBTA and are State-listed as threatened. Swainson's hawks inhabit grasslands, sage-steppe plains, and agricultural regions of western North America during the breeding season, and winter in grassland and agricultural regions from central Mexico to southern South America (England et al. 1997). In California, the nesting distribution includes the Sacramento and San Joaquin Valleys, the Great Basin sage-steppe communities and associated agricultural valleys in extreme northeastern California, isolated valleys in the Sierra Nevada in Mono and Inyo Counties, and limited areas of the Mojave Desert region (CDFG 1994).

Since 1980, based on nesting records alone, populations in California appear relatively stable. However, continued agricultural conversion and practices, urban development, and water development have reduced available habitat for Swainson's hawks throughout their range in California; this habitat reduction could potentially result in a long-term declining trend. The status of populations, particularly with respect to juvenile survivorship, remains unclear.

In California, Swainson's hawk habitat generally consists of large, flat, open, undeveloped landscapes that include suitable grassland or agricultural foraging habitat and sparsely distributed trees for nesting. Foraging habitat includes open fields and pastures. Preferred foraging habitats for Swainson's hawk include alfalfa fields, fallow fields, low-growing row or field crops, rice fields during the non-flooded period, and cereal grain crops. Prey species include ground squirrels, California voles, pocket gophers, deer mice, reptiles, and insects (CDFG 2000; England et al. 1997).

Swainson's hawk often nests peripherally to riparian systems, and are known to utilize lone trees or groves of trees in agricultural fields. Valley oak (*Quercus lobata*), Fremont's cottonwood (*Populus fremontii*), walnut (*Juglans nigra*), and large willow (*Salix* spp.) with an average height of about 60 feet are the most commonly used nest trees in the Central Valley. Breeding occurs late March to late August, with peak activity from late May through July. Clutch size is two to four eggs (Zeiner et al. 1990a). This species may use the riparian trees in the project area as nest sites, and they may forage in the uplands.

3.5.2 Environmental Consequences

Methodology

Based on the USFWS list for the quadrangles within the study area (Clarksville, Folsom, and Rocklin), a review of CNDDB occurrences within a 10-mile radius of the study area, and biologist's observations during reconnaissance-level surveys, three special-status wildlife species were identified as having potential to occur within the study area and surrounding region.

Basis of Significance

For this analysis, a direct and indirect effect, based on professional practice and NEPA and CEQA Guidelines to special status species, was considered significant if it met one or more of the following significance criteria:

- Have a substantial adverse effect, either directly or indirectly, on species growth, survival, or reproductive success through habitat modification, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by CDFW or the USFWS;

- Interfere 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;

- Contribute to a substantial reduction or elimination of species diversity or abundance; or

- Have an adverse effect on a species' designated critical habitat, if applicable.

3.5.3 Alternative 1: No Action Alternative

Under the No Action Alternative, the Corps would not participate in the construction of the proposed project. There would be no construction-related effects to existing special status species or critical habitat. The types of special status species and their associated habitats would remain the same. Current dam and dike maintenance, recreation, and public activity would not change. The effects of these activities on special status species and their associated habitat would be the same; however, a PMF flood event may result in the loss of critical habitat, and special status species could be adversely affected.

3.5.4 Alternative 2: Spillway Tainter Gate Modification and Combination Earthen Raise and Concrete Floodwall

A draft Biological Assessment (BA) has been completed and sent to USFWS and NMFS for their review and comment. The Corps would initiate formal consultation with USFWS and NMFS in November 2015.

Valley Elderberry Longhorn Beetle (VELB).

Direct effects to VELB may occur if elderberry shrubs are incidentally damaged by construction personnel or equipment. Impacts may also occur if elderberry shrubs need to be transplanted because they are located in areas that cannot be avoided by construction activities. Potential impacts due to damage or transplantation include direct mortality of beetles and/or disruption of their lifecycle. Indirect effects to VELB could occur when haul trucks are driving in close proximity to elderberry shrubs. This could disturb the beetle due to vibration and dust.

Long-term effects of the project may include reduced viability of elderberry shrubs due to the placement of project area materials. Loss of habitat or species abundance may also occur due to transplantation of elderberry shrubs. Although compensation measures include restoration and creation of habitat, mitigation plantings would likely require five or more years to become large enough to provide supporting habitat. Furthermore, associated riparian habitats may take 25 years or longer to reach their full value. Removal of plants may also fragment remaining habitats, which may make dispersal more difficult. However, there is no designated critical habitat for VELB.

The construction of Alternative 2 would potentially result in both direct and indirect effects to elderberry shrubs, the critical habitat of the VELB. Direct effects would include removal or damage to the shrubs during site preparation and construction activities near the RWD, Dike 6, and Dike 1 (see Figure 16 for exact locations). Indirect effects would include physical vibration and an increase in dust during operation of equipment and trucks during construction activities. These indirect effects would be short-term during construction and are considered less than significant with the implementation of the avoidance and minimization measures discussed below. Direct and indirect effects would be considered potentially significant if they cause adverse effects on elderberry shrubs and/or cause mortality or stress to VELB residing in the shrubs. However, with the implementation of mitigation measures, transplanting of shrubs, mitigation plantings, and creation of habitat, these impacts are considered less than significant and not likely to adversely affect VELB.

Table 7. Folsom Dam Raise Elderberry Shrub Survey Results.

Location	GPS ID	Stem Size @ Ground Level			Lat	Lon
		≥ 1" & ≤ 3"	> 3" & < 5"	≥ 5"		
Right Wing Dam	5	1			38°43.172'	121°10.264'
Right Wing Dam	6	--	--	--	38°43.175'	121°10.264'
Right Wing Dam	7	1			38°43.158'	121°10.269'
Right Wing Dam	8			1	38°42.922'	121°10.275'
Right Wing Dam	9	1			38°42.677'	121°10.282'
Right Wing Dam	10	1			38°42.673'	121°10.260'
Right Wing Dam	11	1			38°42.688'	121°10.257'
Right Wing Dam	12	1			38°42.554'	121°09.909'
Right Wing Dam	13	1			38°42.560'	121°09.920'
Right Wing Dam	14		1		38°42.560'	121°09.920'
Right Wing Dam	15	1			38°43.214'	121°10.201'
Right Wing Dam	16	1			38°43.211'	121°10.199'
Dike 6	17	1			38°43.275'	121°10.268'
Dike 6	18	1		1	38°43.272'	121°10.266'
Dike 6	193	3			38°43.291'	121°10.233'
Between Dike 5 and 6	19		1		38°43.514'	121°10.309'
Between Dike 5 and 6	20		1		38°43.514'	121°10.309'
Dike 1	21	5			38°45.896'	121°08.676'
Dike 1	22				38°45.896'	121°08.677'
Dike 1	23				38°45.894'	121°08.678'
Dike 1	24	1			38°45.911'	121°08.711'
Dike 1	25	1			38°45.926'	121°08.685'

Effects to Bald Eagle.

The bald eagle is known to occur within the general vicinity of the staging areas. However, the staging areas are highly disturbed and do not provide high quality habitat for this species. Replacement of emergency tainter gates would not have a direct or indirect effect on the growth, survival, or reproductive success of the bald eagle. The construction of Alternative 2 would not cause direct mortality, long-term habitat loss, or lowered reproduction success of the bald eagle. No critical habitat has been designated for this species. Although there are oaks present within the CCAO yard, the primary staging area for this alternative, it is currently used as an active maintenance and staging yard for the main dam and is highly disturbed habitat. Because this area is already heavily utilized, it is unlikely that additional staging for Alternative 2 would further disturb any bald eagles in the area. Additionally, due to the disturbed nature of the habitat and mobility of the Bald Eagle, project construction activities would not interfere substantially with the movement Bald Eagles in the vicinity of the project area or affect the population or diversity.

However, prior to construction activities, bald eagle surveys would be conducted within the study area to determine the locations of 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 active nests are found within one-half mile of construction sites, coordination with USFWS and CDFW would occur to determine avoidance and minimization measures, and construction would not be initiated until nestlings are fledged and the bald eagles move out of the project area. Therefore, the effect to bald eagles is considered less than significant.

Effects to Swainson's Hawk.

The Swainson's hawk is known to occur within the general vicinity of the project area. However, there have been no recorded nesting sites above the Nimbus Dam on the American River. In addition, the staging and construction areas for this project are highly disturbed and do not provide high quality habitat for this species. Replacement of emergency tainter gates would not have a direct or indirect effect on the growth, survival, or reproductive success of the Swainson's hawk. The construction of Alternative 2 would not cause direct mortality, long-term habitat loss, or lowered reproduction success of the Swainson's hawk. No critical habitat has been designated for this species. Although there are oaks present within the CCAO yard, the primary staging area for this alternative, it is currently used as an active maintenance and staging yard for the main dam and is a highly disturbed habitat. Because this area is already heavily utilized, it is unlikely that additional staging at Alternative 2 would further disturb any Swainson's hawks in the area. Additionally, due to the disturbed nature of the habitat and mobility of the Bald Eagle, project construction activities would not interfere substantially with the movement Bald Eagles in the vicinity of the project area or affect the population or diversity.

However, prior to construction activities, hawk surveys would be conducted within the study area to determine the locations of 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 active nests are found within one-half mile of construction sites, then coordination with USFWS and CDFW would occur to determine avoidance and minimization measures, and construction would not be initiated until nestlings are fledged and the Swainson's hawks move out of the project area. Therefore, the effect to Swainson's hawk is considered less than significant.

3.5.5 Avoidance, Minimization, and Mitigation Measures

The following measures were proposed by the Corps to avoid, minimize, or mitigate significant effects associated with the Dam Raise Project to less than significant.

Valley Elderberry Longhorn Beetle.

The Corps would compensate for the loss of elderberry shrubs if they are removed. The elderberry shrubs would be transplanted to a USFWS approved location and monitored for 5 years. Compensation would also consist of planting elderberry shrubs and associated native plants at an existing Corps mitigation site in the American River Parkway, or credits would be purchased at a USFWS approved mitigation bank. If the shrubs are not removed, and the proposed Dike 8 disposal area is used, the following measures taken from the USFWS "Conservation Guidelines for the Valley Elderberry Longhorn Beetle, July 1999" would be incorporated into the project to minimize potential take of the VELB:

- A minimum setback of 100 feet from the dripline of all elderberry shrubs would be established, if possible. If the 100 foot minimum buffer zone is not possible, the next minimum distance allowable would be established. These areas would be fenced, flagged, and maintained during construction. When a 100-foot (or wider) buffer is established and maintained around elderberry shrubs, complete avoidance (i.e., no adverse effects) would 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 would be maintained whenever possible.

- Environmental awareness training would be conducted for all workers before they begin work. The training would include status, the need to avoid adversely affecting the elderberry shrub, avoidance areas and measures taken by the workers during construction, and contact information.

- Signs would be placed every 50 feet along the edge of the elderberry buffer zones. The signs would include: "This area is the habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment." The signs should be readable from a distance of 20 feet and would be maintained during construction.

- During construction activities, all areas to be avoided would be fenced and flagged.

- Any damage done to the buffer area would be restored.

- No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant would be used in the buffer areas.

- Trimming of elderberry plants would be subject to mitigation measures.

- Elderberry shrubs that cannot be avoided would be transplanted to an appropriate riparian area at least 100 feet from construction activities.

- If possible, elderberry shrubs would be transplanted during their dormant season (approximately November, after they have lost their leaves, through the first two weeks in February). If transplantation occurs during the growing season, increased mitigation ratios would apply.

- Any areas that receive transplanted elderberry shrubs and elderberry cuttings would be protected in perpetuity.

- The Corps would work to develop off site compensation areas prior to or concurrent with any take of valley elderberry longhorn beetle habitat.

- Management of the area within the project impact zone would include all measures specified in USFWS's conservation guidelines (1999a) related to weed and litter control, fencing, and the placement of signs.

- Monitoring would occur for ten consecutive years or for seven non-consecutive years over a 15-year period. Annual monitoring reports would be submitted to USFWS.

- Offsite areas would be protected in perpetuity and have a funding source for maintenance (endowment).

Impacts to VELB would be considered less than significant with the implementation of the USFWS conservation guidelines for the beetle.

Bald Eagle, Swainson's Hawk, and Special Status Migratory Birds

To avoid and minimize effects to Bald Eagle, Swainson's hawk, and other migratory birds, the Corps would implement the following measures:

- A breeding season survey for nesting birds would be conducted for all trees and shrubs that located within 0.5 miles of construction activities, including grading. Swainson's hawk surveys would be completed in compliance with the CDFW survey guidance (Swainson's hawk Technical Advisory Committee 2000). Other migratory bird nest surveys can be conducted concurrent with the 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, can commence without any further mitigation.

- If active nests are found, the Corps would maintain a 0.5-mile buffer between construction activities and the active nest(s). In addition, a qualified biologist would be present onsite 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 can 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).

Impacts to Bald Eagle and Swainson's hawk would be considered less than significant with the implementation of the measures identified above.

3.6 Air Quality

3.6.1 Environmental Setting

Regulatory Setting

The United States Environmental Protection Agency (USEPA) has established primary and secondary National Ambient Air Quality Standards (NAAQS) under the provisions of the Clean Air Act (CAA). The CAA set emission limits for certain air pollutants from specific sources, set new source performance standards based on best demonstrated technologies, and established national emissions standards for hazardous air pollutants.

The USEPA classifies the air quality within a control region according to whether the region meets or exceeds Federal primary and secondary NAAQS. Primary standards define levels of air quality necessary to protect public health with an adequate margin of safety. Secondary standards define levels of air quality necessary to protect public welfare (i.e., soils, vegetation, and wildlife) from any known or anticipated adverse effects of a pollutant. Federal NAAQS are currently established for seven principal pollutants (known as "criteria pollutants") including carbon monoxide (CO), nitrogen dioxide (NO2), ozone (O3), sulfur dioxide (SO2), lead (Pb), particulate matter equal to or less than 10 micrometers in aerodynamic diameter (PM10), and very fine particulate matter (PM2.5).

Responsibility for attaining and maintaining air quality in California is divided between the California Air Resources Board (ARB) and Regional Air Quality Districts. Areas of control for the regional districts are set by ARB, which divides the State into air basins. These air basins are defined by topography that limits air flow access, or by county boundaries.

The following Federal, State, and local laws, regulations, and policies apply to the resources covered in this Section. Descriptions of the laws and regulations can be found in Section 5.0, Compliance with Environmental Laws and Regulations.

- Federal:
  - Clean Air Act, 42 U.S.C §7401, *et seq.*
  - Federal Tailpipe Emission Standards, 40 CFR Part 88
  - General Conformity Regulation, 40 CFR Parts 5, 51 and 93
  - National Ambient Air Quality Standards, 40 CFR Part 50

- State:
  - Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations
  - California Ambient Air Quality Standards

- California Clean Air Act, Health and Safety Code, Division 26
- Idling Limit Regulation, Title 13, California Code of Regulations

- Local:
  - El Dorado County Air Quality Management District Standards
  - Placer County Air Pollution Control District Standards
  - Sacramento Metropolitan Air Quality Management District Standards

Existing Conditions

The study area for the Dam Raise is located in the Sacramento Valley Air Basin (SVAB), which includes Sacramento County, Placer County, and El Dorado County. Sacramento Metropolitan Air Quality Management District (SMAQMD) is the lead on air quality considerations for all air quality districts for the JFP and Dam Raise projects. Criteria air pollutants relevant to the project were determined based on the existing pollutant conditions in the SVAB. Toxic Air Contaminants (TACs) relevant to the project were determined based on SMAQMD guidance and the project site conditions.

Air Pollutants

Air pollutants relevant to the project and their health effects are discussed below and summarized in Table 8. In addition, sensitive receptors are defined and receptors near the project area are identified.

Table 8. Summary of Air Pollutants of Concern for the Project.

Pollutant Class	Pollutant	Existing Condition
Criteria Pollutants	CO, NO_2, O_3 (precursors: NO_x, ROG), PM10, PM2.5, and SO_2	The SVAB has NAAQS and/or CAAQS non-attainment designations for PM10, PM2.5, and O3. The SVAB is also a maintenance area (formerly non-attainment) for CO. Consequently, PM10, PM2.5, CO, and ozone precursor (ROG and NOx) emissions are the primary criteria pollutants of concern associated with the project.
TACs	DPM and NOA*	Local geology supports the formation of NOA, although no NOA has been located within the project site. The primary DPM sources associated with the project are diesel-powered on-road haul trucks and off-road construction equipment.

*DPM = Diesel Particulate Matter
*NOA = Naturally Occurring Asbestos

Criteria Pollutants: Criteria pollutants include CO, NO_2, O_3, PM10, PM2.5, and SO_2. Ozone 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 (ROGs) and nitrogen oxides (NOx) – in the presence of sunlight and high temperatures.

Toxic Air Contaminants (TAC): A 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." The USEPA uses the term hazardous air pollutants (HAPs) in a similar sense. Controlling toxic air emissions became a National priority with the passage of the Clean Air Act Amendments, whereby Congress mandated that USEPA regulate 188 air toxicants. TACs can be emitted from stationary and 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 been shown to cause cancer, birth defects, damage to brain and nervous system, and respiratory disorders. TACs do not have ambient air quality standards because often no safe levels have been determined. Instead, TAC impacts are evaluated by calculating the health risks associated with a given exposure.

The TACs of interest to this project are diesel particulate matter (DPM) and NOA. The Folsom Dam area has been identified as within an area where local geology supports the formation of NOA, although no NOA has been located within the project site.

Meteorology and Climate

The project is located at the southern end of the Sacramento Valley, which is characterized by hot, dry summers and mild, rainy winters. The surrounding mountains create a barrier to airflow that can trap air pollutants in the valley when meteorological conditions are right and a temperature inversion exists.

Air Quality

Within Sacramento County, on-road motor vehicles are the major source of ROG, CO, and NOx emissions. Other equipment and off-road vehicles contribute substantially to ROG, CO, and NOx emissions. Fugitive dust, generated from construction, roadways, and farming operations, is the major source of PM10 and, to a lesser degree, PM2.5. Residential fuel combustion also substantially contributes to PM2.5 emissions.

Based on 2008 to 2010 monitoring data of CO, O_3, NO_2, SO_2, PM10, and PM2.5 collected at a monitoring station located 11 miles from the project site, CO, NO_2 and SO_2 in

Sacramento County did not exceed the applicable CAAQS and NAAQS, while O3, PM10 and PM2.5 did exceed the CAAQS and/or NAAQS.

Sensitive Receptors

Some locations are considered more sensitive to adverse effects from air pollution than others. These locations are termed sensitive receptors. A sensitive receptor is generally 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). Sensitive land uses and sensitive receptors generally include residents, hospital staff and patients, as well as school teachers and parents.

There are numerous sensitive receptors within 1,000 feet of the project area. Several residences to the west of Vogel Valley Road, Haley Drive, and E Hidden Lakes Drive are within 600 feet of Dikes 1, 2, and 3. Residences on Lake Court, Lakeshore Drive, and Sierra Drive are within 200 feet of Dike 4. Residences to the west of Auburn-Folsom Road are within 1,000 feet of Dike 5, parts of the Right Wing Dam, and just over 1,000 feet from Dike 6. Many residences just off of East Natoma Street are within 1,000 feet of Dikes 7 and 8.

Attainment Status

The General Conformity *de minimis* levels are based on the non-attainment and maintenance classification of the air basin. General conformity thresholds are for ozone precursors. The request for reclassification of the 8-hour ozone non-attainment area from “serious” to “severe” was granted by USEPA on June 1, 2010 and as a result, the GRC *de minimis* thresholds for ozone, VOC, and NOX reduced from 50 tons per year to 25 tons per year.

The Lower SVAB is designated as a “severe” non-attainment for the O3 NAAQS (for the 2008 8-hour O3 standard) and as non-attainment for PM2.5 NAAQS. In 2005, the 1-hour O3 NAAQS (established in 1997) was revoked and is no longer applicable. In 2015, the 8-hour O3 NAAQS was revoked and is no longer applicable. However, USEPA is in the process of reviewing CARB’s request, on behalf of SMAQMD, to formally designate the area as in PM10 attainment. The county is a designated maintenance area for the CO NAAQS. Sacramento County is in non-attainment for the O3, PM2.5, and PM10 CAAQS, and in attainment for all other criteria pollutants (CARB 2015; USEPA 2012a; USEPA 2012b).

Table 9. Criteria Pollutant Attainment Status.

County	Pollutant	National	State
Sacramento	1-hour Ozone	N/A[a]	Severe Non-attainment
	8-hour Ozone	Non-attainment	Severe Non-attainment
	CO	Unclassified/Attainment	Attainment
	PM10	Attainment	Attainment
	PM2.5	Non-attainment	Moderate Non-attainment
	SO_2	Unclassified	Attainment
	NO_2	Unclassified/Attainment	Attainment
	Pb	Unclassified/Attainment	Attainment
El Dorado	1-hour Ozone	N/A[a]	Severe Non-attainment
	8-hour Ozone	Non-attainment	Severe Nonattainment
	CO	Unclassified/Attainment	Unclassified/Attainment
	PM10	Unclassified	Non-attainment
	PM2.5	Moderate Non-attainment	Moderate Non-attainment
	SO_2	Unclassified	Attainment
	NO_2	Unclassified/Attainment	Attainment
	Pb	Unclassified/Attainment	Attainment
Placer	1-hour Ozone	N/A[a]	Severe Non-attainment
	8-hour Ozone	Non-attainment	Severe Non-attainment
	CO	Unclassified/Attainment	Unclassified/Attainment
	PM10	Unclassified	Non-attainment
	PM2.5	Unclassified/Attainment	Moderate Non-attainment
	SO_2	Unclassified	Attainment
	NO_2	Unclassified/Attainment	Attainment
	Pb	Unclassified/Attainment	Attainment

Source: Adapted from: California Air Resources Board 2013; U.S. Environmental Protection Agency 2015.
Notes: N/A = Not Available/Applicable
[a] The EPA revoked the 1-hour ozone standard on June 15, 2005.
[b] The EPA revoked the 8-hour ozone standard on April 6, 2015.

State Implementation Plans

Due to the nonattainment or maintenance area designations for SVAB discussed above, SMAQMD is required to prepare SIPs for O_3, PM10, and PM2.5, and a maintenance plan for CO. The status of these SIPs is summarized below (SMAQMD 2015).

- O_3: A final attainment designation for the 2008 O_3 NAAQS of 0.075 ppm has not been provided by USEPA and an attainment plan has not been prepared.

- PM10: USEPA is in the process of reviewing a maintenance plan and evaluating a CARB request to change the designation to attainment.

- PM2.5: SMAQMD prepared a PM2.5 attainment plan for submission in 2012. A final rule for Determination of Attainment was submitted July 2013 and the rule became final in August 2013.

- CO: A maintenance plan was approved by the USEPA in 2005 and is still applicable.

Air Emission Thresholds for Federal and Local Criteria Pollutants

The Federal standards and local thresholds for short-term construction projects in Sacramento, El Dorado, and Placer Counties are shown in Table 10 below. Local emissions are calculated per county and compared to their thresholds, whereas Federal standards look at the project emissions in total on an annual basis.

Table 10. Air Emission Thresholds for Federal and Local Criteria Pollutants.

Criteria Pollutant	Federal Standard (tons/year)	SMAQMD Threshold	El Dorado County APCD	Placer County APCD
NO_x	25***	85 lbs/day	82 lbs/day	82 lbs/day
CO	100	*23 mg/m^3 1-hour standard; 10 mg/m^3 8-hour standard	*AAQS	*AAQS
CO_2	None	1,100 metric tons/year		
PM_{10}	100	*50 µg/m^3 24-hour standard; 20 µg/m3 Annual Arithmetic Mean; 0 lbs/day *or* 80 lbs/day with BMPs **	*AAQS	82 lbs/day
$PM_{2.5}$	100	*35 µg/m^3 24-hour standard; 12 µg/m3 Annual Arithmetic Mean; 0 lbs/day *or* 82 lbs/day with BMPs **	*AAQS	82 lbs/day
ROG	25***	None	82 lbs/day	82 lbs/day

NO_x = nitrogen oxides	PM_{10} = particulate matter 10 micrometers or less
CO = carbon monoxide	$PM_{2.5}$=particulate matter 2.5 micrometers or less
SO = sulfur oxides	ROG = reactive organic gases

* = default to State standard (see California Ambient Air Quality Standards, Appendix B)
** = 0lbs/day threshold, with the caveate with BMPs standard is 80 lbs/day PM10 and 82 PM2.5
*** = rates for "severe" Federal nonattainment areas [*Federal Register* (40 CFR), 1993]
Source: SMAQMD, 2014

3.6.2 Environmental Consequences

Methodology

The methods for evaluating impacts are intended to satisfy the Federal and State air quality requirements, including the Federal General Conformity Rule, and to disclose effects for NEPA and CEQA.

In coordination with SMAQMD, the Road Construction Emissions Model, Version 7.1.5.1, was used to calculate construction emissions. Daily and totally project emissions were estimated from appropriate emissions factors using the model or USEPA AP-42 guidance, the type of equipment being operated, the level of equipment activity, and the associated construction schedules. The model's estimated criteria pollutants from a variety of constructed-related emission sources including mobile sources (trucks, worker vehicles, etc.), construction equipment, and/or fugitive dust sources. The following construction sources and activities were analyzed for emissions:

- Onsite construction off-road equipment emissions (all criteria pollutants)
- Onsite pickup trucks, onsite haul trucks, and off site haul trucks emissions (all criteria pollutants)
- Offsite worker vehicle emissions (all criteria pollutants)
- Onsite pickup trucks, onsite haul trucks, off site haul truck, and off site worker vehicles entrained fugitive dust emissions for paved and unpaved road entrained dust (PM10 and PM2.5)
- Onsite material storage piles handling and wind erosion (PM10 and PM2.5)
- Onsite excavation (cut/fill) fugitive dust (PM10 and PM2.5)

Borrow and disposal sites have not been identified at this time but are assumed to be located within a 30 mile radius from the project areas. Emissions associated with material borrow activities would fall within SMAQMD.

Basis of Significance

A project would significantly affect air quality if it would:

- Violate any ambient air quality standard;
- Contribute on a long-term basis to any existing or projected air quality violation;
- Expose sensitive receptors (such as schools, residences, or hospitals) to substantial pollutant concentrations; or
- Not conform to applicable Federal and State standards or local thresholds on a long-term basis.

3.6.3 Alternative 1: No Action Alternative

Under the No Action Alternative, the project would not be constructed and there would be no construction-related effects on air quality in the project area. Air quality would continue to be influenced by climatic and geographic conditions, local and regional emissions from vehicles and households, and local commercial and industrial land uses. Air quality is expected to improve in the future based on the stricter standards implemented by CARB and SMAQMD. A possible flood event may temporarily increase the amount of vehicle emissions during flood-fighting activities, as well as increase the amount of vehicle emissions resulting from clean-up activities.

3.6.4 Alternative 2: Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall

Short-term construction emissions were calculated by obtaining an estimated inventory of required construction equipment, the hours of operation, and the horsepower of each piece of equipment for each construction phase. The data was incorporated into the SMAQMD Road Construction Emission Model, Version 7.1.5.1, recommended by SMAQMD. Combustion emissions would result from the use of construction equipment, truck haul trips, and worker vehicle trips to and from the construction site. Exhaust emissions from these sources would include ROG, NOX, and PM10. Exhaust emissions would vary depending on the number and type of equipment, the duration of its use, and the number of construction worker and haul trips to and from the construction site. Combustion emissions from heavy equipment and construction worker commute trips would vary from day to day, and would temporarily contribute incrementally to regional ozone concentrations over the construction period.

Maximum daily emissions (lbs/day) and total construction emissions (tons/year) are estimated for ROG, NOX, PM10, and PM2.5 and GHG CO_2 (Climate Change Section 3.7) to evaluate emissions against SMAQMD, El Dorado, and Placer County thresholds. All emissions from activities associated with the implementation of Alternative 2 are shown in Appendix G and in Tables 11 -14 below, except for emissions related to AAQA, which require dispersion modeling. Dispersion modeling would be conducted with General Conformity.

Table 11. Unmitigated Alternative 2 Daily Emissions Summary (lbs/day).

Activity	Pollutant (lbs/year)				
	ROG	NOx	CO	PM_{10}	$PM_{2.5}$
2017 Total	4212	35911	20498	2184	6396
2018 Total	12917	127826	66674	58032	16692
2019 Total	19188	191599	112601	88171	24929
2020 Total	22370	232658	143426	273874	64210
2021 Total	11326	117998	76752	220022	49202
Project Total	70013	705994	419952	642283	161429
Daily Emissions, unmitigated (lbs/day)	45	453	269	412	103
SMAQMD Thresholds (lbs/day)	N/A	85	N/A	0	0
Totals over Thresholds (lbs/day)	N/A	368	N/A	412	103

*Converted from threshold of 1,100 metric tons/year
** = 0lbs/day threshold, with the caveate with BMPs standard is 80 lbs/day PM10 and 82 lbs/day PM2.5
*** Model results were used for the CEQA effects analysis based on SMAQMD guidance). Total emissions were divided by total number of days in the construction period (1,560) to estimate the daily emissions (lbs/day)

Table 12. Unmitigated Alternative 2 Annual Emissions Summary (tons/year)

Activity	Pollutant (tons/year)					
	ROG	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2
2017 Total	2	13	7	8	2	1,289
2018 Total	5	46	24	2	4	5,366
2019 Total	7	70	41	30	9	9,430
2020 Total	8	85	52	93	22	14,625
2021 Total	4	43	28	75	17	9,212
General Conformity *de minimis* levels	25	25	100	100	100	100

Table 13. Mitigated Alternative 2 Daily Emissions Summary (lbs/year)

Activity	Pollutant (lbs/year)				
	ROG	NOx	CO	PM_{10}	$PM_{2.5}$
2017 Total	1685	7182	8199	983	2878
2018 Total	5167	25565	26670	26114	7511
2019 Total	7675	38320	45040	39677	11218
2020 Total	8948	46532	57371	123243	28894
2021 Total	4530	23600	30701	99010	22141
Project Total	28005	141199	167981	289027	72643
Daily Emissions, mitigated (lbs/day)	18	91	108	185	47
SMAQMD Thresholds (lbs/day)	N/A	85	N/A	80**	82**
Totals over Thresholds (lbs/day)	N/A	6	N/A	105	-35

*Converted from threshold of 1,100 metric tons/year.
** = 0lbs/day threshold, with the caveate with BMPs standard is 80 lbs/day PM10 and 82 lbs/day PM2.5
*** Model results were used for the CEQA effects analysis (based on SMAQMD guidance). Total emissions were divided by total number of days in the construction period (1,560) to estimate the daily emissions (lbs/day).
Source: Mitigation calculated using http://www.airquality.org/ceqa/ceqaguideupdate.shtml

Table 14. Mitigated Alternative 2 Annual emissions Summary (tons/year)

Activity	Pollutant (tons/year)					
	ROG	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2
2017 Total	1	3	3	3	1	516
2018 Total	2	9	10	1	2	2146
2019 Total	3	14	16	13	4	3772
2020 Total	3	17	21	42	10	5850
2021 Total	2	9	11	34	8	3685
General Conformity *de minimis* levels	25	25	100	100	100	100

Construction emissions associated with Alternative 2 would last approximately 5 years. At the time of this analysis, this period begins in 2017 and ends in 2021. Daily emissions are exceeded for NO_x, CO_2, and PM levels in all five years of the project if unmitigated (Appendix G, Tables 11-14). Therefore, construction of the alternative would result in a significant effect if unmitigated. With the implemntations of BMPs, emissions would not be reduced below to below threshold levels, remaining a significant effect.

For the Folsom Dam Raise Project, the entire construction footprint of Dikes 1 through 8, the LWD, RWD, and MIAD, along with the Emergency Spillway, were analyzed under the CAA to determine the worst case scenario for air quality impacts. The analysis conducted determined that the emissions associated with construction of this action would be above the *de minimis* level-emission reductions were incorporated into the project analysis. Based upon preliminary analysis of air quality effects from the proposed action, it was evident that mitigated construction actions would result in exceeding SMAQMD standards for NOx, etc. It is likely that during the Project, sensitive receptors, such as residents within 1,000 feet of construction, will experience short-term increases in emissions of criteria pollutants. However; compliance with the CAA would be accomplished with the completion of a General Conformity Analysis, or with the inclusion in the State Implementation Plan, therefore, impacts to air quality would be less than significant with this mitigation.

General Conformity

The Federal CAA requires Federal agencies to ensure that their actions conform to applicable implementation plans for the achievement and maintenance of the NAAQS for criteria pollutants. To achieve conformity, a Federal action must not contribute to new violations of NAAQS, increase the frequency or severity of existing violations, or delay timely attainment of standards in the area of concern (for example, a state or a smaller air quality region). Federal actions need to demonstrate conformity to any State Implemenation Plan (SIP) of the regional air basin. Each action must be reviewed to determine whether it 1) qualifies for an exemption listed in the General Conformity Rule (GCR), 2) results in emissions that are below the GCR *de minimis* emissions thresholds, or 3) would produce emissions above the GCR *de minimis* thresholds applicable to the specific area.

The proposed action is located in an area with a designated Federal status of severe nonattainment for O_3 (8-hour standard). In addition the State has designated the area as nonattainment for PM_{10} and $PM_{2.5}$. As stated above, the proposed action would not be reduced below the USEPA's general conformity *de minimis* threshold. As a result, the Dam Raise would complete a general conformity determination (GCD) report. While the GCD is being prepared, all mitigation measures, including the ability to mitigate back to zero if thresholds are exceeded, would be required. The report would include project emission estimates in 2017 through the completion of the project in 2021, and would be completed prior to the start of construction in 2017.

3.6.5 Avoidance, Minimization, and Mitigation Measures

Combustion emissions would result from the use of construction equipment, truck haul trips to and from the borrow sites, and worker vehicle trips to and from the construction sites. The contractor would submit a list of vehicles to be used in the construction project for approval by USACE and SMAQMD. In order to achieve the required reductions in emissions, the following BMPs would be followed, in addition to the SMAQMD Guidance for Construction GHG Emissions Reductions (Section 3.7.5) (SMAQMD 2015b).

- Maintain all construction equipment in proper working condition according to manufacturer's specifications. The equipment would be checked by a certified mechanic and determined to be running in proper condition before it is operated.

- Use diesel-fueled equipment manufactured in 2003 or later, or retrofit equipment manufactured prior to 2003 with diesel-oxidation catalysts; use low-emission diesel products, alternative fuels, after-treatment products, and/or other options as they become available.

- Any equipment found to exceed 40 percent opacity (or Ringelmann 2.0) would be repaired immediately, and USACE and SMAQMD would be notified within 48 hours of identification of non-compliant equipment.

- Any remaining emissions over the GCR *de minimis* NO_x threshold would be reduced to zero through the purchase of offsets or other offsite mitigation. Additionally, any remaining emissions over the PM threshold would be reduced to zero through the purchase of offsets or other offsite mitigation. The contractor would be responsible for payment of any required mitigation and administrative fees.

- At least 48 hours prior to the use of heavy-duty, off-road equipment, the contractor would provide SMAQMD with the anticipated construction timeline including start date, and the names and phone numbers of the project manager and onsite foreman. SMAQMD and/or other officials may conduct periodic site inspections to determine compliance (SMAQMD 2015a). SMAQMD's Basic Construction Emissions Control Practices.

Basic Construction Emission Control Practices

The SMAQMD requires construction projects to implement basic construction emission control practices to control fugitive dust and diesel exhaust emissions. 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.

SMAQMD Exhaust Emission Mitigation Measures

SMAQMD recommends that the project implement a set of Enhanced Exhaust Control Practices to further reduce hydrocarbon emissions. The Enhanced Exhaust Control Practices that would be implemented by the contractor during construction include the following:

- Provide a plan for approval by the lead agency and SMAQMD demonstrating that the heavy-duty (50 horsepower [hp] or more) off-road vehicles to be used in the construction project, including owned, leased, and subcontractor vehicles, would achieve a project-wide fleet-average 20 percent NOX reduction and 45 percent particulate reduction compared to the most recent California Air Resources Board (ARB) fleet average. Acceptable options for reducing emissions may include use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, and/or other options as they become available. The SMAQMD's Construction Mitigation Calculator can be used to identify an equipment fleet that achieves this reduction.

- Submit to the lead agency and SMAQMD a comprehensive inventory of all off-road construction equipment, equal to or greater than 50 hp, that would be used an aggregate of 40 or more hours during any portion of the construction project. The inventory would include the horsepower rating, engine model year, and projected hours of use for each piece of equipment. The inventory would be updated and submitted monthly throughout the duration of the project, except that an inventory would not be required for any 30-day period in which no construction activity occurs. At least 48 hours prior to the use of subject heavy-duty, off-road equipment, the contractor would provide SMAQMD with the anticipated construction timeline including start date, and the names and phone numbers of the project manager and onsite foreman. The SMAQMD's Model Equipment List can be used to submit this information.

- 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 (3) minutes in any one (1) hour. Any equipment found to exceed 40 percent opacity (or Ringelmann 2.0) would be repaired immediately. Non-compliant equipment would be documented and a summary provided to the lead agency and SMAQMD monthly. A visual survey of all in-operation equipment would be made at least weekly, and a monthly summary of the visual survey results would be submitted throughout the duration of the project, except that the monthly summary would not be required for any 30-day period in which no construction activity occurs. The monthly summary would include the quantity and type of vehicles surveyed as well as the date of each survey. The SMAQMD and/or other officials may conduct periodic site inspections to determine compliance. Nothing in this section would supersede other SMAQMD or State rules or regulations.

- If at the time of construction SMAQMD has adopted a regulation applicable to construction emissions, compliance with the regulation may completely or partially replace this mitigation. Consultation with the SMAQMD prior to construction would be necessary to make this determination.

SMAQMD Construction Area Particulate Matter Mitigation Measures

If the project's construction contractor determines that the construction activities would actively disturb more than 15 acres per day, then the contractor would be required to conduct PM10 and PM2.5 dispersion modeling. If that modeling shows violations of SMAQMD's PM10 or PM2.5 NAAQS thresholds, then the contractor would be required to implement sufficient mitigation (SMAQMD 2011) to avoid exceeding SMAQMD significance thresholds.

NO_X Mitigations Fee to SMAQMD

As of July 1, 2016, the mitigation fee rate is $18,260 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 of emissions for these mitigation fees are included under the alternative's effects analysis in Appendix G. 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.

3.7 Climate Change

3.7.1 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 Chapter 5.0.

Federal

- Mandatory Greenhouse Gas Reporting Rule

State

- Assembly Bill 32, Global Warming Solutions Act of 2006
- California Clean Air Act of 1998
- Executive Order B-30-15
- Executive Order S-3-05
- Executive Order S-13-08
- Senate Bill 97
- Air Resources Board AB 32 Scoping Plan
- State Regulations on Greenhouse Gases and Climate Change

Local

- El Dorado County Air Quality Management District
- Placer County Air Pollution Control District
- Sacramento County Climate Action Plan
- Sacramento Metropolitan Air Quality Management District

Federal

On February 18, 2010, Council of Environmental Quality (CEQ) released the "Draft Guidance for GHG emissions and Climate Change Impacts" regarding the consideration of

GHGs in NEPA documents for Federal actions. The draft guidelines include a presumptive annual threshold of 25,000 metric tons of carbon dioxide equivalent (CO2e) emissions from a proposed action to trigger a quantitative analysis (CEQ, 2010).

State

On June 1, 2005, Executive Order S-3-05 (E.O. S-3-05) was signed by Governor Arnold Schwarzenegger. "The order established greenhouse gas reduction targets, created the Climate action plan Team, and directed the Secretary of Cal/EPA to coordinate efforts with meeting the targets with the heads of other state agencies. The order also requires the Secretary to report back to the Governor and Legislature biannually on progress toward meeting the GHG targets, GHG impacts to California, and Mitigation and Adaptation Plans." (California Climate Change Portal, 2015)

The following year, the Global Warming Solutions Act of 2006, commonly referred to as Assembly Bill 32 (AB 32), required the California Air Resources Board (CARB) to develop regulations and policies to regulate sources of emissions of GHGs that cause global warming. CARB was directed to create a program that would reduce statewide emissions to 1990 levels by 2020, a reduction of approximately 21.7% below emissions expected under a "business as usual scenario." These reductions were to be met by adopting regulations that maximize feasible technology and are cost effective while improving efficiency in land use sectors (i.e. energy, transportation, waste).

In addition, AB 32 directed CARB to develop a scoping plan to help lay out California's strategy for meeting the goals. This scoping plan was to be updated every 5 years and would be funded through fees collected annually from large emitters of GHGs such as oil refineries, electricity power plants, cement plants, and food processors.

Senate Bill 97 (SB 97) approved by legislature in 2007, was an act relating to the California Environmental Quality Act (CEQA) that addressed GHGs. Specifically, SB 97 required Office of Planning and Research to prepare and develop proposed guidelines addressing the analysis and mitigation of greenhouse gases for the implementation of CEQA by public agencies. The Amendments to the CEQA Guidelines were adopted by the California Natural Resources Agency (formerly Natural Resources Agency) March 18, 2010.

Local

The local air quality districts within the project boundaries oversee air quality standards in their respective areas, and also provide guidance for addressing GHG emissions and mitigation in CEQA documents. While Placer and Eldorado air quality districts have not adopted thresholds of significance for GHGs, SMAQMD has. On October 23, 2014, SMAQMD adopted Resolution 2014-028 that established recommended thresholds for GHGs. Following in November 2014, SMAQMD updated Chapter 6 of SMAQMD's CEQA Guide to Air Quality

Assessment to provide guidance for agencies to specifically deal with GHG emissions, and included SMAQMD's recommended thresholds.

Potential Environmental Effects

Guidance released by CEQ regarding the consideration of GHG's in NEPA documents for Federal actions include a presumptive threshold of 25,000 metric tons of CO2e emissions from a proposed action to trigger a quantitative analysis (CEQ, 2010).

CEQA requires that lead agencies consider the reasonably foreseeable adverse environmental effects of projects they are considering for approval. CEQA requires that the cumulative impacts of GHG, even impacts that are relatively small on a global basis, need to be considered.

Existing Conditions

Warming of the climate system is now considered to be unequivocal (IPCC, 2007). Global average surface temperature has increased approximately 1.33° F over the last 100 years, with the most severe warming occurring in the most recent decades. In the 12 years between 1995 and 2006, 11 years ranked among the warmest years in the instrumental record of global average surface temperature (going back to 1850). Continued warming is projected to increase global average temperature between 2 and 11 °F over the next 100 years (IPCC 2007).

The causes of this warming have been identified as both natural processes and as the result of human actions. Increases in greenhouse gas (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 reflected back into space. The six principal GHGs of concern are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), sulfur hexafluoride (SF6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs).

3.7.2 Environmental Consequences

Methodology

The proposed construction would use large, diesel-fueled construction vehicles during all phases of the project. The partial degrade of dike crowns would result in emissions from bulldozers and graders, as well as emissions from the haul trucks used to dispose of material. The construction of a concrete floodwall would result in emissions from haul trucks and other equipment, as well as the diesel-powered mixers required for the mixing of the cement. Diesel-powered cement mixers, pavers, and haul trucks for borrow materials would be used for the reconstruction of the dike crowns. Trucking material in from borrow sites for an earthen raise would increase the total GHG emissions for this project.

In addition to the construction vehicles, mixers, and haul trucks involved in the actual construction of the project, there would also be GHG emissions from the workforce vehicles. Workers would commute from their homes to the construction site and park in the staging area. Workers are assumed to commute no farther than 20 miles from the construction site based on the availability of housing and the urban setting of the project. During construction, there may be times when large construction vehicles on the roads slow regular traffic, increasing emissions from vehicles that use the roads on a regular basis.

The most recent version of the SMAQMD Road Construction Emissions Model (v. 7.1.5.1) now generates an output for CO_2. The SMAQMD Road Construction Emissions Model 7.1.5.1 (RCEM) was based on knowledgeable individuals from SMAQMD, California Department of Transportation (CalTrans), CARB, and the USEPA. The emissions model was updated by Tetra Tech in 2013 based on the original model prepared by Jones & Stokes (now part of Inner City Fund International [ICF]) and Rimpo and Associates, Inc., and used the 26th edition of Walker's Building Estimator's Reference Book (1999).

The Dam Raise includes five separate construction designs that would each be constructed during a 2 to 4 year duration and span for five consecutive years from 2017-2022. For each construction design, project parameters were directly input into the data section of the model which calculates emissions based on the size of the project area(s), amount of construction equipment, amount of workers required, and the amount of fill (i.e. soil, concrete, rock) to be transported per construction period (i.e. grubbing/land clearing, grading/excavation, drainage utilities/sub-grading, and paving). The RCEM creates default values based on the project parameters, and these values change to reflect the percentage, or amount of time each piece of equipment would be used during each construction phase.

Basis of Significance

It is unlikely that any single project by itself would have a significant impact on climate change. 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).

SMAQMD developed recommended thresholds to allow review and assessment of about 90% of the projects in the district. For construction-only projects, the annual threshold is 1,100 Metric Tons CO_2 equivalents of per year (CO2e MT/year).

The proposed project could result in a significant impact if it generates GHG emissions:

(1) either directly or indirectly that may have a significant cumulative impact on the environment;

(2) that would conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases, including the State goal of reducing greenhouse gas emissions in California to 1990 levels by 2020, as set forth by the timetable established in AB 32, California Global Warming Solutions Act of 2006.

If a project's emissions exceed the thresholds of significance, then the project emissions may have a cumulatively considerable contribution to a significant environmental impact. If this were to occur, then all feasible mitigation would be implemented.

3.7.3 Alternative 1: No Action Alternative

Under the No Action Alternative, the project would not be constructed and there would be no construction-related effects on climate change. Locally generated emissions, including levee operations and maintenance, would continue. However, a flood associated with a PMF event may result in large amounts of GHG emissions during flood-fighting activities, as well as large amounts of emissions resulting from clean-up activities and the repair and/or replacement of flood damaged housing, commercial and industrial properties, and public infrastructure.

3.7.4 Alternative 2: Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall

Construction emissions associated with Alternative 2 would last approximately 4-5 years. At the time of this analysis, this period begins in 2017 and ends in 2021. In the SMAQMD, construction-related emissions under this action would exceed yearly emission thresholds for CO2 by approximately 172 metric tons in 2017, 3,870 metric tons in 2018, 7,557 metric tons in 2019, and 7,359 metric tons in 2021. Based on the estimated emissions, SMAQMD's GHG 1,100 MT CO2e threshold will be exceeded on an annual basis.

Table 15. Alternative 2 CO_2 Emissions in Tons and Metric Tons/Construction Project.

	2017	2018	2019	2020	2021
Tainter Gate	1,289.30	1,289.50	1,289.40	1,289.00	
Work Package 1 Earthen Embankment Raise		4,076.60	4,073.80		
Work Package 2 Earthen Embankment Raise (Excluding LWD and RWD)				4,647.30	4,636.40
Work Package 2 Concrete Floodwall for LWD and RWD				4,625.60	4,575.70
Work Package 3 Earthen Embankment Raise			4,067.00	4,063.20	
Total	1,289.30	5,366.10	9,430.20	14,625.10	9,212.10
SMAQMD Threshold of Significance	1,100	1,100	1,100	1,100	1,100
Amount Over Threshold of Significance (tons)	189.30	4,266.10	8,330.20	13,525.10	8,112.10
Amount Over Threshold of Significance (metric tons)	172	3,870	7,557	12,270	7,359

3.7.5 Avoidance, Minimization, and Mitigation Measures

The District provides recommended measures for reducing GHG emissions from construction activities. These recommended measures are best management practices and can be found further below in this section. In addition to implementation of BMPs, a GHG Mitigation plan would be implemented. The GHG mitigation plan would consist of feasible mitigation measures in which one mitigation measure or a multitude of mitigation measures can be implemented to reduce impacts to less than significant. To be considered less than significant, mitigation measures would need to reduce emissions to SMAQMD's threshold of significance of 1,100 MTCO2e on an annual basis. SMAQMD provides an example of potential mitigation methods, and feasible mitigation measures are discussed in more detail in the avoidance, minimization, and mitigation measures section (2014 SMAQMD):

- Measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision in which the plan or program provides specific requirements that would avoid or substantially lessen the potential impacts of the project;

- Offsite measures, including offsets, to mitigate a project's emissions;

- Measures that sequester greenhouse gases; and

- In the case of the adoption of a plan, such as a general plan, long range development plan, or GHG reduction plan, mitigation may include the identification of specific measures that may be implemented on a project by-project basis. A mitigation plan would be developed for the use of the Dam Raise Project by SMAQMD.

While the project won't necessarily sequester GHG emissions, the project would prevent extra carbon productions. Project emissions are short-term construction emissions, and the project is expected to have long-term benefits from the prevention of extra carbon production from the demolition, repair, and reconstruction of flood induced infrastructure losses associated with a catastrophic flood event. The short-term construction emissions are expected to be less than significant when averaged over the life span of the project and compared to the carbon production prevented from catastrophic flooding. In addition, BMPs would be incorporated in the design of the work and implemented by the contractor.

The Council on Environmental Quality (CEQ) released its Revised Draft Guidance for GHG Emissions and Climate Change Impacts in 2014. This guidance supersedes the 2010 guidance. The revised guidance includes a presumptive annual threshold of 25,000 MT of CO2e emissions from a proposed action to trigger a quantitative analysis. Unlike the 2010 draft guidance, the revised draft guidance applies to all proposed Federal agency actions, including land and resource management actions. This DSEIS/SEIR is a joint document and required under CEQA to fully analyze, quantify, and mitigate GHG impacts, and therefore is compliant with all NEPA requirements.

BMPs and the standard construction avoidance, minimization, and mitigation measures as recommended in the SMAQMD's "Guidance for Construction GHG Emissions Reductions" would be implemented to further reduce GHG emissions. In addition to implementing BMPs, the State would monitor emissions and implement all feasible mitigation measures. The following measures that could be implemented by the Contractor, the Corps, and/or the State will reduce GHG emissions levels back to less than significant and less than cumulatively considerable:

- Minimize the idling time of construction equipment to no more than 3 minutes, or shut equipment off when not in use;

- Maintain all construction equipment in proper working condition;

- Encourage carpools, shuttle vans, and/or alternative modes of transportation for construction worker commutes;

- Use locally sourced or recycled materials for construction materials as much as practicable;

- Develop a plan to efficiently use water for adequate dust control; and

- Implement a GHG reduction Plan. Feasible mitigation measures within the plan would be implemented if GHG emissions exceed 1,100 metric tons CO2e/year. These measures could include:

    - Purchase of low carbon fuel

    - Purchase of CO2 offsets to mitigate GHG emissions to less than 1,100 metric tons CO2e/year. Potential offsets could be purchased from the following sources:
        - AB 32 U.S. Forest and Urban Forest Project Resources
        - AB 32 Livestock Projects
        - AB 32 Ozone Depleting Substances Projects
        - AB 32 Urban Forest Projects
        - Other-California Based Offsets
        - United States Based Offsets
        - International Offsets (e.g., clean development mechanisms)

    - Funding incentive programs from SMAQMD or supplementing existing programs such as Sacramento Emergency Clean Air Transportation (SECAT) program to obtain GHG reductions

    - Use of low carbon concrete if economically feasible and engineering feasible

Although construction of the alternative would result in a significant short-term increase in CO2, this effect would be temporary. The long-term operations and maintenance of the project sites would remain the same with or without the project; therefore, the project would not increase emissions due to operations and maintenance. Long-term emissions would be the same with or without the project; maintenance emissions would be the same, and the cutoff wall itself has no net long-term emissions. This project does not conflict with any Statewide or local goals with regard to reduction of GHG. Any emissions exceeding SMAQMD thresholds will be reduced to less than significant; therefore, there would be no significant effects on climate change.

3.8 Aesthetics and Visual Resources

3.8.1 Environmental Setting

Regulatory Setting

There are no Federal or State laws regulating visual resources.

Existing Conditions

Folsom Reservoir is a significant visual feature in the regional landscape. The lake and shoreline contrast sharply with the nearby rolling, wooded foothills. Visual quality is highest in winter and spring when reservoir levels are high. As summer progresses, reservoir drawdown typically exposes a ring of bare soil along the shoreline, negatively affecting visual quality. Major viewer groups are the residents of nearby areas and recreationists using the reservoir and shoreline.

Downstream of Dikes 1 through 6 contains views of grasslands, oak woodlands, and wetlands. Several unimproved recreation trails are visible in the area. Auburn-Folsom Road is visible in some of these locations. The existing trail on top of Dikes 1 through 6 has views of Folsom Reservoir and the shoreline.

The areas surrounding Dikes 7 and 8 are similar to that of Dikes 1 through 6, only with some visibility from Folsom Lake Crossing and E. Natoma Street.

The LWD and RWD have little viewshed from any residential areas. Construction is ongoing near the LWD and spillway, where equipment and vehicles are visible throughout the week.

MIAD is currently under construction for ongoing USBR Dam Safety projects. Construction equipment and vehicles are visible throughout the week. Construction should be completed by December 2015. After construction, the construction zones would be hydroseeded, providing grassy and herbaceous plant growth within the viewshed.

3.8.2 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.

3.8.3 Alternative 1: No Action Alternative

Under the No Action Alternative, the Corps would not participate in construction of the proposed project and the visual resources around Folsom Reservoir would remain undisturbed. Dikes and dams would not be modified, and construction work, outside of routine maintenance and projects that are already underway or planned, would not contribute to any change in visual quality within the study area.

3.8.4 Alternative 2: Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall

During the four year construction period of the emergency tainter gates, visual resources near the gates and dam structure itself may temporarily be impaired. However, at the time of this analysis, staging would be at the CCAO area yard, which is not a publically accessible or visible area. Therefore, construction-related effects on aesthetics and visual resources are considered less than significant because construction is temporary and existing views would not be obstructed.

The 3.5-foot raise of the dikes and dams, and other construction activities, may temporarily impair visual resources during each 2-year construction period of the various work packages. Increased construction traffic on Auburn-Folsom Road would affect views of the area from several homes across the street and may be visible by recreation users on the trails. The traffic light and/or flagmen and turning lanes, as well as construction vehicles, would be visible at certain times of the day. There may also be flashing lights to the north and south of the new traffic light to warn drivers of stopped traffic.

The existing trail on top of Dikes 4, 5, and 6 has views of Folsom Reservoir and the shoreline. During construction, recreationists would not have access to the trail on top of the dikes and would need to utilize the trail detour, which would not have views of the reservoir because of its location on the downstream side of the dikes. The trail detour would instead provide views of natural areas such as grasslands, oak woodland, and other habitats. Several unimproved recreation trails are visible in the area. The downstream side of Dike 5 contains mostly grasslands that extend to Auburn-Folsom Road. Existing trails cross through the proposed staging area at Dike 5. Auburn-Folsom Road is visible from the trails on the downstream side of Dike 5. Because the trail detour would be temporary and would still provide views of natural landscapes, no substantial adverse effects are expected to visual resources.

Raising the dams and dikes would not significantly affect the visual character of the FLSRA. Modifications to dikes and dams around Folsom Reservoir would occur in phases, limiting the extent of construction affecting viewsheds at any one time. The relatively small changes in the heights of these large linear features would not significantly alter the quality of views around the reservoir. Construction-related effects on visual resources near existing wing dams and dikes are considered less than significant because construction would be short in duration, the area disturbed would be relatively small, modifications would be limited to existing linear features, and existing views would not be obstructed.

There would be a temporary degradation of aesthetics/visual resources during construction, with an extended slight degradation of aesthetics/visual resources due to the removal of the Dike 7 Office Complex after the area is no longer used as a staging area.

However, with the removal of the Dike 7 Office Complex pavement and the subsequent restoration of habitat to the area, there would be long-term improvement of aesthetics/visual resources following project completion. Aesthetic impacts of this action were previously addressed in the 2012 SEIS/EIR and assessed in the 2016 Phase V SEA/EIR.

3.8.5 Avoidance, Minimization, and Mitigation Measures

- Modifications to dikes and dams around Folsom Reservoir would occur in phases, limiting the extent of construction affecting viewsheds at any one time.
- Measures would be incorporated into the project design to minimize effects on riparian vegetation and ensure use of appropriate erosion control methods, thereby lessening the visual effects of vegetation loss.
- Staging areas would be located throughout the project area on previously disturbed areas and their use would not constitute a substantial change from existing visual resource conditions.

3.9 Traffic and Circulation

3.9.1 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 Chapter 5.0.

<u>Federal</u>

- Title 23 of the Code of Federal Regulations (CFR)
- Title 23 of the U.S. Code (USC)

<u>State</u>

- California Streets and Highways Code

<u>Regional and Local</u>

The Folsom Dam Raise Project study area includes roadways in the following jurisdictions:

- Counties – Sacramento, Placer and El Dorado (limited).
- Communities – Cities of Folsom, Roseville, and Community of Granite Bay.

The Sacramento Area Council of Governments (SACOG) serves as the area Metropolitan Planning Organization (MPO) for the region. Local municipalities determine their own criteria for streets and roads while the California Department of Transportation (Caltrans) oversees State highways.

Existing Conditions

This section describes the environmental setting as it pertains to transportation and circulation. Any incremental transportation impacts associated with implementation of the project are limited to the proposed construction years. The proposed project is expected to be under construction during calendar years 2017 through 2021. Therefore, the analysis years include all construction years from the project startup in 2016 to project completion in 2020, as well as the 2016 baseline conditions required by CEQA.

Folsom Dam is located in the City of Folsom (City) north of US Highway 50. Figure 21 shows the project vicinity map in context to the regional circulation system. The roadways within the study area of this DSEIS/SEIR are located within Sacramento County, Placer County, and to a limited extent, El Dorado County. Roadways under Caltrans' jurisdiction are also adjacent to the project area. Access points to the proposed work sites are restricted to the western and southern regions of Folsom Reservoir. Direct access to the project area is disseminated throughout the proposed project area. The figures in Appendix B show the proposed access points for the project area. Onsite haul routes are not discussed since they are not considered part of the public roadway system.

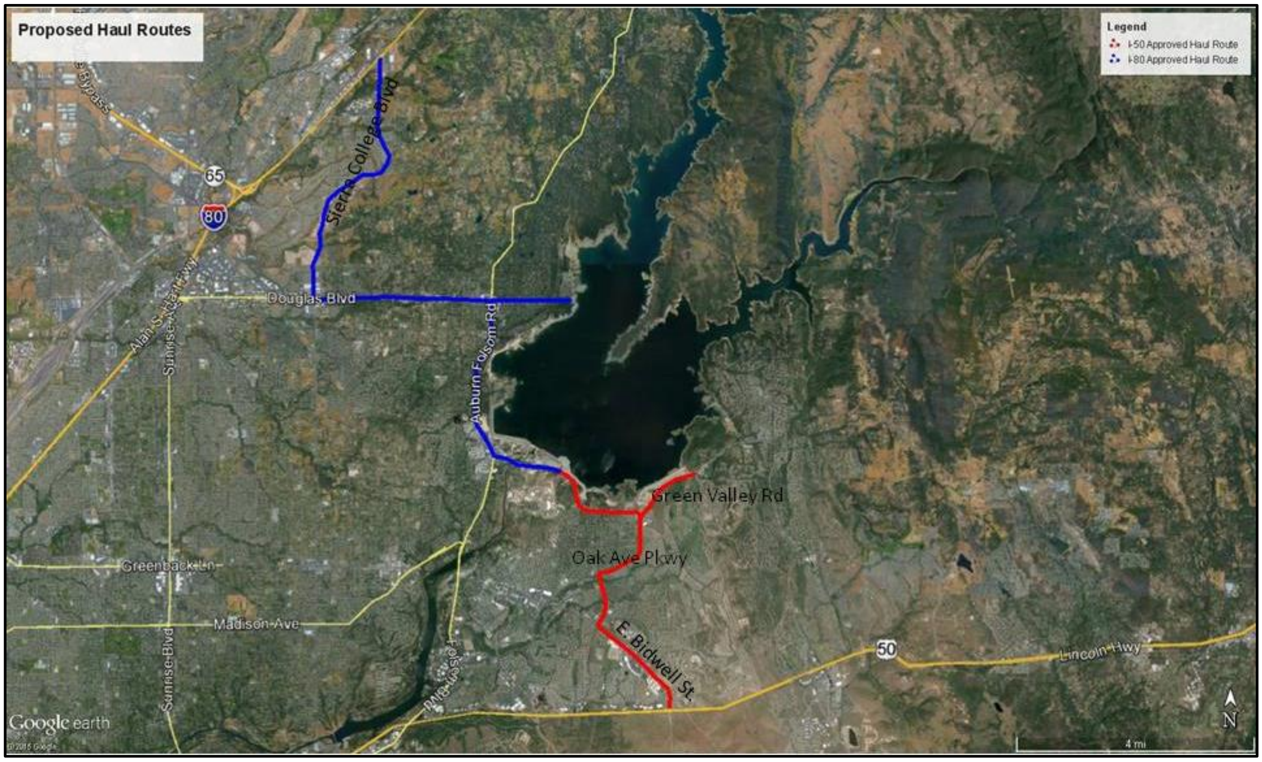

Figure 21. Proposed Folsom Dam Raise Project Haul Roads Vicinity Map.

The roadway network adjacent to the construction site is well-developed with multiple access patterns. There are two basic categories of traffic accessing the site, 1) daily workers and staff, and 2) material deliveries and hauling operations due to construction activities. It is assumed daily workers would commute locally via the adjacent roadway network, or use Highway 80 and Highway 50 to gain access to the site.

The area is considered to be primarily a suburban, low-density development to the east of Sacramento. Transportation facilities and services include interstate and State highways, local roads and streets, and local transit including local bus service and a light rail line from the City of Folsom to downtown Sacramento. A number of bicycle paths/routes accompany major roads. In addition, commuter bus services are provided by counties and cities within the area.

Functional Classification

Sacramento, Placer, and El Dorado Counties use a roadway classification system for long-range planning and programming. Roadways are classified based on the linkages they provide and their function, both of which reflect importance to the land use pattern, travelers, and general welfare. The functional classification system recognizes differences in roadway function and standards between urban/suburban and rural areas. The following paragraphs define 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. In some cases, onramps and off-ramps are metered during peak-hours 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., freeways, arterials, and expressways).

- **Local Streets:** These facilities are two-lane streets that provide local access and service. They include residential, commercial, industrial, and rural roads.

<u>Level of Service</u>

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. A measure called "Level of Service" (LOS) is used to characterize traffic conditions. LOS is a measure of quality of operational conditions within a traffic stream based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six LOS from A (best) to F (worst), define each type of transportation facility (Table 16).

Table 16. Regulatory Criteria for Roadways and Intersections.

Level of Service (LOS)	Description of traffic conditions
A	Conditions of free flow; speed is controlled by the driver's desires, speed limits, or roadway conditions.
B	Conditions of stable flow; operating speeds beginning to be restricted; little or no restrictions on maneuverability from other vehicles.
C	Conditions of stable flow; speeds and maneuverability more closely restricted; occasional backups behind left-turning vehicles at intersections.
D	Conditions approach unstable flow; tolerable speeds can be maintained but temporary restrictions may cause extensive delays; little freedom to maneuver; comfort and convenience low; at intersection, some motorists, especially those making left turns, may wait through more than one or more signal changes.
E	Conditions approach capacity; unstable flow with stoppages of momentary duration; maneuverability severely limited
F	Forced flow conditions; stoppages for long periods; low operating speeds.

LOS thresholds are based on daily volumes, number of lanes, and facility type. These definitions and metrics are general transportation industry standards found in the Highway Capacity Manual (HCM), the American Association of State Highway and Transportation Officials (AASHTO) and the Institute of Transportation Engineers (ITE) guidelines and nomenclature. Table 17 (Roadway Functional Classification Thresholds) shows the relationship of LOS threshold for various roadway functional classifications.

Table 17. Roadway Functional Classification Thresholds.

Functional Class	Code	LOS Capacity Threshold (Total vehicles per day in both directions)				
		A	B	C	D	E
2-Lane Collector	2C	-	-	5,700	9,000	9,800
Minor 2-Lane Highway	MI2	900	2,000	6,800	14,100	17,400
Major 2-Lane Highway	MA2	1,200	2,900	7,900	16,000	20,500
4-Lane, Multilane Highway	MH4	10,700	17,600	25,300	32,800	36,500
2-Lane Arterial	2A	-	-	9,700	17,600	18,700
4-Lane Arterial, Undivided	4AU	-	-	17,500	27,400	28,900
4-Lane Arterial, Divided	4AD	-	-	19,200	35,400	37,400
6-Lane Arterial, Divided	6AD	-	-	27,100	53,200	56,000
8-Lane Arterial, Divided	8AD	-	-	37,200	71,100	74,700
2-Lane Arterial, moderate access control[1]	2AMD	10,800	12,600	14,400	16,200	18,000
4-Lane Arterial, moderate access control[1]	4AMD	21,600	25,200	28,800	32,400	36,000
6-Lane Arterial, moderate access control[1]	6AMD	32,400	37,800	43,200	48,600	54,000
4-Lane Arterial, high access control[1]	4AHD	24,000	28,000	32,000	36,000	40,000
6-Lane Arterial, high access control[1]	6AHD	36,000	42,000	48,000	54,000	60,000
4-Lane Freeway[2]	4F	22,200	40,200	57,600	71,400	80,200
4-Lane Freeway with Auxiliary Lanes[2]	4FA	28,200	51,000	72,800	89,800	100,700
6-Lane Freeway[2]	6F	33,300	60,300	86,400	107,100	120,300
6-Lane Freeway with Auxiliary Lanes[2]	6FA	42,300	76,500	109,200	134,700	151,050

Source: Transportation Research Board 2000
Notes:
(1) Used to analyze roadways within County of Sacramento. LOS Capacity Thresholds from Traffic Impact Analysis Guidelines, County of Sacramento, July 2004
(2) Includes mixed flow lanes only. HOV lanes and volumes are excluded from the analysis because a review of existing HOV counts and forecasts showed the HOV lanes to be operating under capacity.

The City of Folsom General Plan (1995) establishes LOS C as the minimum acceptable threshold for City roadways. The Sacramento County General Plan (2011) establishes LOS D as the minimum acceptable threshold for rural roadways, and LOS E for urban roadways. All of the Sacramento County roadways in the transportation study area are urban roadways. The Placer County General Plan (1994) establishes LOS C on rural, urban, and suburban roadways except within one-half mile of state highways where the standard is LOS D. The El Dorado County General Plan establishes LOS F as the acceptable threshold for county roads. The Community of Granite Bay establishes an LOS C (except for intersections along Auburn-Folsom Road south of Douglas Boulevard, and along Douglas Boulevard west of Auburn-Folsom Road where the standard is LOS E). The standards generally apply to projects that would create a permanent increase in traffic.

Freeways

There are two prominent freeways with the study area:

- Interstate 80 (I-80): I-80 is an east-west route but predominantly runs north-south within the study area. The study area for I-80 extends from Eureka Road to Sierra College

Boulevard. I-80 consists of six lanes, divided by barriers, within the analysis area with acceleration/deceleration lanes at the interchanges.

- U.S. Highway 50: The study area for Highway 50 runs from Hazel Avenue to El Dorado Hills Boulevard in a predominantly east-west direction. Highway 50 consists of four lanes with two carpool lanes, divided by barriers, within the analysis area with acceleration/deceleration lanes at the interchanges.

Bridges

The following bridges play a prominent role and serve as key linkages to the community within the project study area:

- Folsom Historic Truss Bridge: After its reopening to the public in 2000, the historic truss bridge is currently used as a recreational pedestrian and bicycle bridge. Its colorful history reflects the City's long dependence and appreciation for provided service since the 1800s.

- Rainbow Bridge (Greenback Lane): Directly below and south of Historic Truss Bridge, the Rainbow Bridge provides a more robust two-lane crossing that can handle cars and heavy vehicles. Although supplanted by wider bridges to the north and south, this attractive bridge with characteristic arches serves as a key signature symbol for Folsom.

- Lake Natoma Crossing Bridge: Completed in 1999, the Lake Natoma Crossing connects Folsom-Auburn Road from the north to Folsom Boulevard to the south. This has brought enormous relief to the community which endured long delays and congestion using Rainbow Bridge and the Folsom Dam Road when it was open to the public.

- Folsom Lake Crossing Bridge: Officially opened on March 29, 2009, the Folsom Lake Crossing Bridge is a modern concrete segmental bridge proving two travel lanes in each direction with Class 1 & 2 bicycle facilities. Situated below the Folsom Dam, this new bridge was constructed under the auspices of the Folsom Dam Raise Project, which is a component of the American River Watershed Long-Term Project.

Arterials, Collectors, and Local Roads by Jurisdiction

Table 18 below shows the roadway segments analyzed in each county. Project area roadways range from two to six lanes and have speed limits from 35 to 55 miles per hour. The project area roads provide access to the industrial and residential uses in the vicinity of the project.

Table 18. Roadway Segments.

Sacramento County	Functional Class	Capacity (LOS C/D/E)	Year 2015 Traffic Volumes	
			Traffic Volumes[2]	LOS
Folsom-Auburn Road – Folsom Lake Crossing to Greenback Lane	4AD	37,400	39,330	**F**
Folsom Boulevard – Greenback Lane to Iron Point Rd	4AD	37,400	45,603	**F**
Greenback Lane/Riley St – Natoma Street to Folsom Boulevard/Folsom Auburn Road	2A	18,700	56,590	**F**
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	29,075	D
East Natoma Street – Cimmaron Cir to Folsom Lake Crossing	4AU	28,900	20,027	D
East Natoma Street – Folsom Lake Crossing to Green Valley Rd	4AU	28,900	32,694	**F**
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	26,783	C
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	47,413	D
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	23,525	D
U.S. 50 – Hazel Ave to Folsom Blvd	4FA	89,800	140,914	**F**
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	119,439	**F**
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	98,808	**F**
Folsom Lake Crossing Bridge	4AHD	40,000	31,850	C
I-80 – Douglas Blvd to Greenback Ln	6F	107,100	197,630	**F**
I-80 – south of Greenback Ln	6F	107,100	205,662	**F**
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	48,499	**F**
Douglas Blvd – Folsom-Auburn to Folsom Lake (To account for use of Park Drive)	4AU	14.500	7,900	A
Folsom-Auburn Road – Douglas Blvd to Lake Crossing	4AD	37,400	48,620	**F**
I-80 – north of Douglas Blvd	6F	107,100	197,630	**F**
U.S. 50 - Sacramento - El Dorado County Line1	4F	71,400	93,636	**F**
Greenvalley Road – East Natoma Street - Sophia Parkway	**4AU**	28,900	**38,609**	**F**

Source: Transportation Research Board 2000
Note: Year 2011 traffic volumes from the Folsom DS/FDR traffic analysis – calculated from 2010 ADT (Average Daily Traffic) with an annual 2% growth rate.
(1) Data obtained from Caltrans Traffic Data Branch – calculated from 2010 ADTs with an annual 2% growth rate.
(2) Data obtained from Folsom Dam Safety and Flood Damage Reduction Final EIS/EIR – calculated from 2007 ADTs with an annual 2% growth rate.

Bicycle and Pedestrian Facilities

Pedestrian facilities generally include sidewalks, crosswalks, curb ramps, pedestrian signals, and streetscape/landscape amenities (i.e., benches, tree-lined buffers, planters, bulb-outs, street lighting, etc.). There are existing bicycle lanes on several roadways in the vicinity of the proposed project. A Class II bicycle facility is an on-road, striped bicycle lane, and a Class III bicycle facility is an on-road, signed bicycle route.

Class II Bicycle Facilities

- *Douglas Boulevard* - Bicycle lanes are provided intermittently east of Eureka Road.

- *Auburn-Folsom Road/Folsom Boulevard* - Bicycle lanes are provided in the City of Folsom north of Greenback Lane/Riley Street and south of Sutter Street.

- *Natoma Street* - Bicycle lanes are provided from Folsom Boulevard to east of Mill Street, and between Prison Road and Ranch Drive. The City of Folsom Bikeway Master Plan proposes to connect these two segments so the bicycle lanes would eventually run continuously between Folsom Boulevard and Green Valley Road.

- *Green Valley Road* - Bicycle lanes are provided from north of Natoma Street to the Sacramento County line. The Bikeway Master Plan proposes to connect these bicycle lanes with existing lanes on Blue Ravine Road south of Natoma Street.

Class III Bicycle Facilities

- *Auburn-Folsom Road* - There is a bicycle route between the Sacramento County line and Douglas Boulevard.

Transit Service

Public transportation within the proposed project vicinity is provided via bus and light rail service. Bus service within the City of Folsom, the City of Roseville, Sacramento County, and Placer County is primarily provided by Folsom Stage Line, Roseville Transit, Sacramento Regional Transit, and Placer County Transit, while light rail transit is provided by Sacramento Regional Transit.

3.9.2 Environmental Consequences

Methodology

Traffic effects associated with the project were evaluated in two ways: (1) regarding average daily traffic, and (2) in terms of specific time periods during the day (*i.e.*, hourly basis, as needed). The analysis is based on the following criteria:

- The construction schedule would be up to 10 hrs a day, up to 6 days per week.
- Material hauling activity would occur within normal work hours, from 7am to 7pm.
- Equipment hauling activity would occur during normal work hours, from 7am to 7pm.

All material necessary for each alternative would be obtained from an established borrow site within 30 miles of the proposed project site. As specific borrow locations are not known at this time, subsequent CEQA and NEPA documentation may be necessary to evaluate the impacts associated with material hauling. However, haul trucks would use existing county and city designed haul truck routes and approved and established haul routes described in this document.

Haul trucks and staff vehicles are expected to access the site via one of two predetermined, approved haul routes, one from I-80 and one from Highway 50 (Figures 19 and 20). For Alternative 2, the proposed route is originating from I-80, proceeding south to Sierra College Boulevard, east on Douglas Boulevard following Douglas Blvd into the project site. The route originating from Highway 50 would be via East Bidwell Street, Oak Avenue, Blue Ravine Road, to East Natoma Street, to Folsom Lake Crossing and vice-versa (for Alternative 2). The aforementioned project haul routes are consistent with city and county designated truck routes. Additionally, no trucks are allowed to use Auburn-Folsom Road north of Douglas Boulevard.

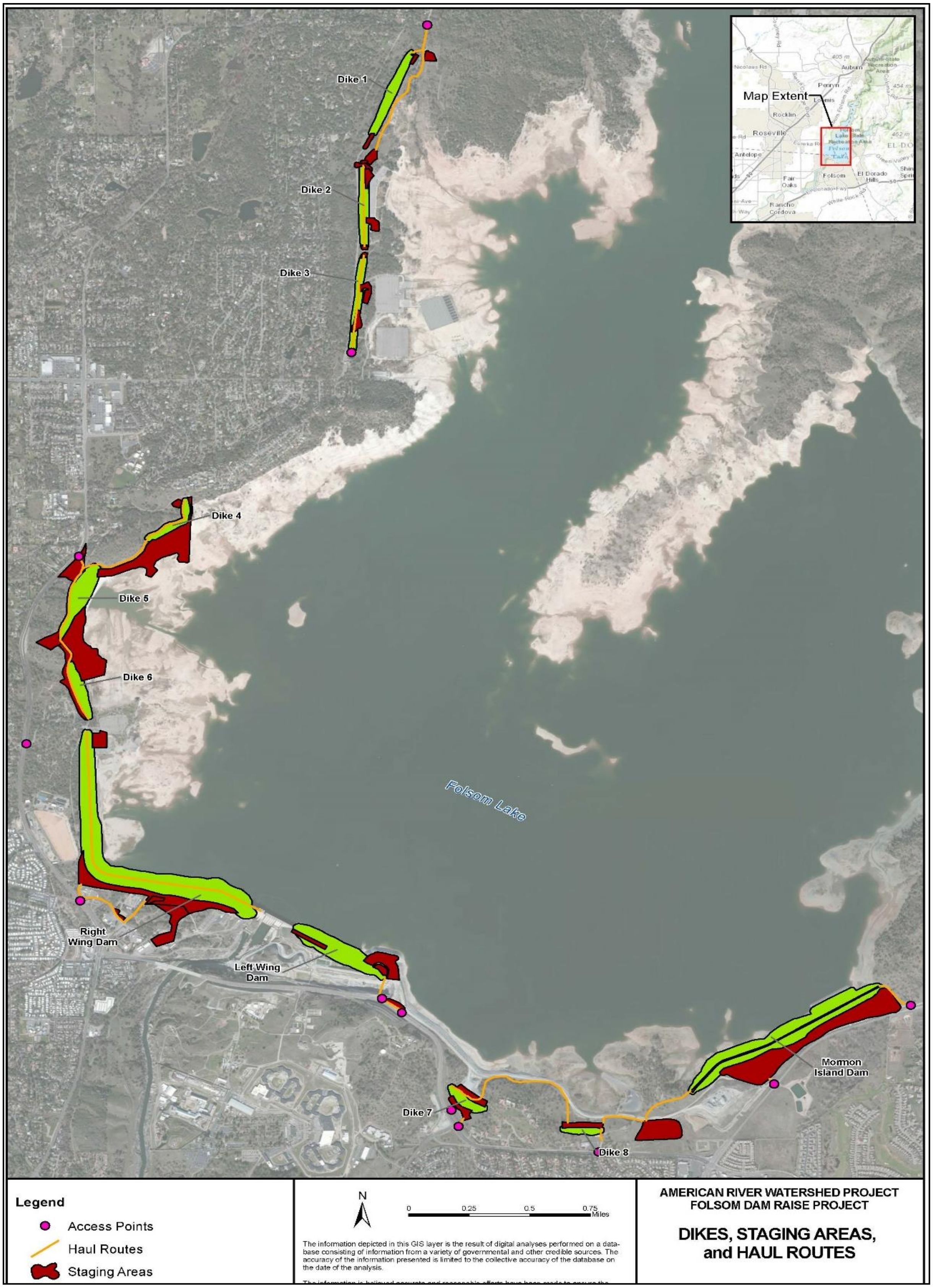

Figure 22. Folsom Dam Raise Project Proposed Staging Areas and Haul Roads.

To account for the large percentage of heavy trucks associated with typical construction projects, the Institute of Transportation Engineers recommends a threshold level of 50 or more new peak-direction trips during the peak hours. Therefore, an alternative would cause an increase in traffic that is substantial in relation to the existing traffic load and capacity, and result in a significant impact related to traffic, if it would result in 50 or more new truck trips during the morning or evening peak hours.

Basis of Significance

Adverse effects on traffic and circulation are considered significant if an alternative would result in any of the following:

- Substantially increase traffic in relation to existing traffic load and capacity of the roadway system;
- Substantially disrupt the flow and/or travel time of traffic;
- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities;
- Result in inadequate emergency access;
- Reduce supply of parking spaces sufficiently to increase demand above supply;
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in a safety risk; or
- Substantially increase hazards due to design feature (e.g. sharp curves or dangerous intersection) or incompatible uses.

3.9.3 Alternative 1: No Action Alternative

Under the No Action Alternative, the Corps would not participate in construction of the proposed alternatives; therefore, the project would not create additional traffic during construction around the proposed project area. The existing roadway network, types of traffic, and circulation patterns is expected to increase traffic by 2% each year.

3.9.4 Alternative 2: Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall

The existing access into the construction site for the emergency spillway modification portion of Alternative 2 is via the intersection along Folsom-Auburn Road and Folsom Dam Road, or from Folsom Lake Crossing. Access from the first point allows vehicular access to RWD; however, this access is restricted to limited use. Access from the second point, off Folsom Lake Crossing and across the LWD, would be the primary access to the dam for the tainter gate refinements. Table 19 details direct access roads for each proposed project feature.

Table 19. Spillway Modification Access Routes.

Direct access Route	Access Area	Facility/Structure
Auburn-Folsom Rd	Beal's Point	Tainter Gate Refinements
Folsom Dam Road, Folsom Lake Crossing	Main Concrete Dam	Tainter Gate Refinements

One lane would be open to traffic across the main Folsom Dam structure at all times during the construction period; however, the traffic lane would not need to be continuous across the dam so long as a vehicle (auto/pickup) can navigate from one side to the other. Coordination with USBR on use of the Main Dam road is ongoing on this subject.

Truck trips would involve hauling materials through residential areas; however, proposed routes are on designated haul roads. Additionally, proposed haul routes occur in the vicinity of schools throughout the project area. When possible, construction schedules would avoid routes that impact schools during the school year.

Vehicle trips to Folsom Dam from the surrounding area would increase slightly as a result of labor force trips and haul truck trips. It is anticipated that 67 haul truck trips would be required over the duration of construction, beginning calendar year 2016 and lasting approximately four (4) years. Approximately 54 workers are estimated to commute to and from the project six (6) days a week, resulting in a total of 134,784 worker commuter trips over the duration of construction, beginning calendar year 2016 and lasting approximately 4 years (Table 20). Therefore, 134,851 total truck trips are associated with the tainter gate aspect of Alternative 2.

Transportation and circulation effects resulting from this action are temporary in nature and would not result in permanent traffic increases to the surrounding area. The action would not create 50 or more new truck trips during peak travel hours (7AM to 8AM and 5PM to 6PM), as workers would be arriving and leaving onsite between 7am and 7pm. Employee commuter trips and haul truck trips would not result in a deterioration of existing LOS values, nor substantially disrupt the flow and/or travel time of traffic on public roadways or on Highways 50 and 80. Labor force trips and haul truck trips would not conflict with adopted plans or policies that effect public transit, bicycle, or pedestrian facilities, nor would it conflict with emergency access. Therefore, this portion of Alternative 2 would result in less than significant impacts on transportation and circulation resources.

To access Dikes 1 through 3, construction vehicles could access the project area at the Granite Point entrance. This impact to residential areas is temporary and less than significant. The traffic patterns in and around the project area would not change as a result of construction of the dam raise project.

Table 20. Hauling and Worker Truck Trips for Spillway Modification Portion of Alternative 2.

Component	Total Hauling Truck Trips	Total Worker Commuting Truck Trips	Total Truck Trips
Alternative 2: Replacement of Emergency Tainter Gates	67	134,784	134,851

Direct access routes to the construction sites for the 3.5-foot raise of the Dikes, wing dams, and MIAD is via Douglas Boulevard, Auburn-Folsom Road, Folsom Dam Road, E. Natoma Street, and Green Valley Road (Table 21). Access from these points also allows vehicular access to the primary staging areas.

Table 21. Access Routes for the 3.5-Foot Dam Raise Portion of Alternative 2.

Direct Access Route	Access Area	Facility/Structure
Douglas Boulevard	Granite Bay	Dikes, 1, 2, and 3
Auburn-Folsom Rd	Beal’s Point	RWD
Auburn-Folsom Rd	Unnamed road between Bell Drive and Country Ct	Dikes 4, 5, and 6
Folsom Dam Road, Folsom Lake Crossing	Main Concrete Dam	LWD, RWD
E Natoma Street	Folsom Point	LWD, Dikes 7, 8, MIAD
Green Valley Road	MIAD	MIAD

Construction of this portion of Alternative 2 would have temporary direct effects on the traffic and circulation in the project area. Traffic generated by the proposed action would result in growth in two categories: (1) labor force accessing the project site on a daily basis, and (2) truck trips due to the import of material and equipment for the earthen raise. New trips have been determined by calculating the number of trips generated by the quantity of materials and equipment deliveries required for the project construction, as well as trips generated by construction labor forces. Construction labor force is estimated as round-trips per day, while haul truck trip is estimated as total trips over the construction duration of each Work Package (approximately 2 years). Table 22 illustrates these values. The traffic numbers developed are maximum amounts of traffic volumes based on anticipated work schedules and activities.

Direct access to the proposed work site would vary by project feature/Work Package and are detailed in Table 21 above. It is anticipated that these roads would be used by workers accessing LWD, RWD, MIAD and Dikes 1 through 7. Figure 22 illustrates the routes that are proposed to be used for providing equipment, workers, and materials for the alternatives. Staging areas are on Reclamation's work yard just south of the RWD and site access is off Folsom-Auburn Road through Reclamation's Central California Area Office (CCAO), both of which are not public accessible roads.

A paved road for vehicles exists on the crest of Dikes 1 through 3 and would need to be closed during construction of the earthen raise (approximately 2 years); therefore, a detour road would be constructed to maintain public access to the park roadway system. Public vehicle access is not permitted on the crests of Dikes 4 through 8, or the RWD and LWD.

It is estimated that approximately 15,620 truck trips would be necessary for material and equipment hauling for this alternative during construction (2017 – 2020). Approximately 27 workers are estimated to commute to and from the project 6 days a week for a total of 624 days in the project lifetime, adding up to 101,088 worker commuter trips. Therefore, 116,709 total trips are associated with this alternative.

Table 22. Total Truck Trips for the 3.5-Foot Dam Raise portion of Alternative 2.

Component	Total Hauling Truck Trips (20cy per truck)	Total Worker Commuting Truck Trips	Total Truck Trips
WP1 Earthen Embankment Dikes 4-6	3,121	33,696	36,817
WP 2 Earthen Embankment dikes 7, 8, and MIAD, Concrete wall for LWD and RWD	9,731	33,696	43,427
WP3 Earthen Embankment	2,768	33,696	36,464
Total	15,621	101,088	116,709

The increased traffic associated with construction will not eliminate any known emergency access routes and will not affect emergency access. Construction workers would park in designated locations and would not reduce the supply of parking spaces. Air traffic patterns would not be affected, design features do not include any changes to traffic design, and no increase in hazards would occur. However, the implementation of this portion of Alternative 2 would substantially increase traffic in relation to existing traffic load and capacity of the roadway system and has the potential to substantially disrupt the flow and/or travel time of traffic. Therefore, potential traffic effects resulting from this action would be significant and unavoidable.

3.9.5 Avoidance, Minimization, and Mitigation Measures

The effects are identified as significant and unavoidable, however, the following measures would be implemented to avoid or minimize any effects, as well as ensure public safety on area roadways:

- The construction contractor would be required to prepare a traffic management plan, outlining proposed routes to be approved by the appropriate agencies, and implement the plan prior to initiation of construction.

- High collision intersections would be identified by the appropriate local entity, and avoided if possible.

- Construction and haul drivers would be informed and trained on the various types of haul routes, and areas that are more sensitive (e.g., high level of residential or education centers, or narrow roadways).

- The construction contractor would develop and use signs to inform the public of the haul routes, route changes, detours, and planned road closures to minimize traffic congestion and ensure public safety.

3.10 Noise

3.10.1 Environmental Setting

Regulatory Setting

- City of Folsom Noise Ordinance
- Noise Control Act of 1972, as amended (42 U.S.C. 4901 et seq.)

Existing Conditions

Federal and state governments provide guidelines for construction noise in regards to worker protection and, for this project, traffic noise. The proposed project is located in the vicinity of four convergent jurisdictions: the City of Folsom, Sacramento County, Placer County, and El Dorado County. Construction noise from the project may impact noise sensitive receptors in each of these four jurisdictions. These noise sensitive receptors consist of both human receptors and wildlife receptors. There are no established criteria available for the wildlife species known to occur in the project area. Many regulatory agencies recommend using 60 dBA Leq hourly levels as the threshold for determining significant impacts for sensitive bird species at the edge of suitable habitat.

The City of Folsom's noise standards would be applied to this project because it is the closest jurisdiction with the most restrictive noise ordinance. The local noise standards for Sacramento County, Placer County and El Dorado County can be found in Appendix H. Compliance with the City of Folsom standards would assure compliance with all other local noise standards. The noise ordinance standards for the City of Folsom are listed in Table 23, and are based on the L50 metric as the baseline criterion level.

Table 23. City of Folsom Noise Ordinance.*

			Noise Levels Not To Be Exceeded In Residential Zone**	
Exterior Noise Standards	**Maximum Time of Exposure**	**Noise Metric**	**7 am to 10 pm (daytime)**	**10 pm to 7 am (nighttime)**
	30 Minutes/Hour	L_{50}	50 dBA	45 dBA
	15 Minutes/Hour	L_{25}	55 dBA	50 dBA
	5 Minutes/Hour	$L_{8.3}$	60 dBA	55 dBA
	1 Minute/Hour	$L_{1.7}$	65 dBA	60 dBA
	Any period of time	L_{max}	70 dBA	65 dBA
Interior Noise Standards				
	5 Minutes/Hour	$L_{8.3}$	45 dBA	35 dBA
	1 Minute/Hour	$L_{1.7}$	50 dBA	40 dBA
	Any period of time	L_{max}	55 dBA	45 dBA

*Construction Noise Exemption Times: 7:00 a.m. – 6:00 p.m. Weekdays, 8:00 a.m. – 5:00 p.m. Weekends
**5 dBA reduction for impact noise during non-exempt times SOURCE: City of Folsom, CA Municipal Code. Chapter 8.42

Construction noise is exempt from these standards during the periods of 7:00 a.m. to 6:00 p.m. on weekdays and 8:00 a.m. to 5:00 p.m. on weekends. If construction occurs outside of these periods, measures would be required to comply with exterior and interior noise limits at residential receptors. In the event that the measured ambient noise level exceeds the applicable noise level standard, the applicable standard would be adjusted so as to equal the ambient noise level. For impulse noise (such as impact pile driving or blasting), the limits are reduced by 5 dBA in the noise ordinance.

Background sound levels for residential areas are typically in the range of 40–60 dBA. This analysis assumed an average background noise level of 50 dBA. However, ongoing construction projects, such as the auxiliary spillway construction and current MIAD work would have an impact on this ambient noise level for the tainter gate work, Dikes 7 and 8, MIAD, and the LWD and RWD. For the most part, the ambient noise for Dikes 1 through 6 would typically be in the range of 40-60 dBA.

3.10.2 Environmental Consequences

Methodology

Noise effects were evaluated for each construction site by comparing the expected project-generated construction noise levels with existing noise levels while taking into account the locations of sensitive receptors, and the noise criteria and standards set forth in applicable laws and regulations. A reasonable worst-case assumption is that the three loudest pieces of equipment would operate simultaneously and continuously over at least a one-hour period. Because the average background noise level in residential areas is estimated to be 50 dBA, a construction-related increase in noise to levels above 60 dBA would represent a significant effect.

Construction noise may potentially impact five jurisdictions (City of Folsom, Granite Bay, and unincorporated areas of Sacramento, El Dorado, and Placer Counties). These jurisdictions either have non-transportation noise standards based on time of day and land use sensitivity, or provide exemptions for construction as long as those activities occur during the daytime. Residential areas are considered the most noise-sensitive land use and have the strictest noise standards.

Table 24. Non-Transportation Noise Standards in the Relevant Jurisdictions.

Local Government Non-Transportation Standards (dBA)						
Noise Element Jurisdiction/ Land Use Category	**Maximum Allowable Exterior Noise Levels**					
	Daytime (7am-7pm)		**Evening (7pm-10pm)**		**Nighttime (10pm-7am)**	
Sacramento County	Hourly		Hourly		Hourly	
	L_{50}	L_{max}	L_{50}	L_{max}	L_{50}	L_{max}
Residential Areas	50	70	50	70	45	65
City of Folsom [3,4]	Hourly L_{eq}				Hourly L_{eq}	
	50				45	
El Dorado County [1]	Hourly		Hourly		Hourly	
	L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
Residential Areas (Community Areas)	55	75	50	65	45	60
Residential Areas (Rural Regions)	50	60	45	55	40	50
Commercial Areas (Community Areas)	70	90	65	75	65	75
Commercial Areas (Rural Regions)	65	75	60	70	60	70
Open Space, Natural Resource (Rural Regions)	65	75	60	70	60	70
Placer County[2] including Granite Bay Community			L_{dn}			
Residential			50			
Resident Areas adjacent to Industrial			60			
General Commercial			70			
Heavy Commercial/Industrial Park			75			
Recreation and Forestry			70			
All land uses interior allowable noise level			45			

Notes

[1]Non-transportation construction noise standards

[2]Single event impulsive noise levels produced by blasting shall not exceed a peak linear overpressure of 122 dB, or a C-weighted Sound Exposure Level (SEL) of 98 dBC. The cumulative noise level from blasting shall not exceed 60 dB LCdn or CNELC on any given day.

[3]Construction noise is exempt from the City of Folsom Noise Element provided that construction does not take place before 7 a.m. or after 6 p.m. during weekdays and before 8 a.m. or after 5 p.m. on weekends.

[4]Based on cumulative 30 minutes in any one-hour time period.

Sources

County of Sacramento General Plan Noise Element (December 1993, amended 1998)

City of Folsom Municipal Code, Chapter 8.42 Noise Control

El Dorado County General Plan, Public Health, Safety and Noise Element (July 2004)

Placer County General Plan Update, Section 9 Noise (August 1994)

Granite Bay Community Plan Noise Element (Amended 1996)

Construction activity noise levels at and near the project areas would fluctuate depending on the particular type, number, and duration of uses of various pieces of construction equipment. Construction-related material haul trips would raise ambient noise levels along haul routes, depending on the number of haul trips made and types of vehicles used. In addition, certain types of construction equipment generate impulsive noises (such as pile driving or blasting), which can be particularly annoying. Table 25 shows typical noise levels during different construction stages. Table 26 shows typical noise levels produced by various types of construction equipment.

Table 25. Typical Construction Noise Levels.

Construction Phase	Noise Level (dBA, Leq)[a]
Ground Clearing	84
Excavation	89
Foundations	78
Erection	85
Finishing	89

[a] Average noise levels correspond to a distance of 50 feet from the noisiest piece of equipment associated with a given phase of construction and 200 feet from the rest of the equipment associated with that phase.
Source: EPA, 1971.

Table 26. Noise Emission Levels Typical for Construction Equipment.

Equipment	Typical Noise Level (dBA) 50 feet from Source
Backhoe	80
Bulldozer	85
Compressor	81
Generator	75
Grader	85
Jackhammer	90
Loader	85
Roller	75
Scraper	89
Truck	88

Source: Federal Highway Administration 1995 and Reagan and Grant 1977.

A reasonable worst-case assumption is that the three loudest pieces of equipment would operate simultaneously and continuously over at least a one-hour period. The combined sound level of three of the loudest pieces of equipment listed in Table 26 (jackhammer, scraper, and truck) is 94 dBA measured at 50 feet from the source. Table 27, which assumes this combined source level, summarizes predicted noise levels at various distances from an active construction site. The data shown in the table indicates that the 60 dBA threshold would be exceeded up to 2,000 feet from the point the noise is generated. These estimations of noise levels take into account distance attenuation, attenuation from molecular absorption, and anomalous excess attenuation (Hoover 1996).

Table 27. Estimated Construction Noise in the Project Area.

Distance Attenuation	
Distance to Receptor (feet)	**Sound Level at Receptor (dBA)**
50	94
100	88
200	82
400	73
600	72
800	69
1000	66
1500	62
2000	59
2500	56
3000	53
4000	49
5280	45
7500	38

*This calculation assumes simultaneous operation of one jackhammer, one truck, and one scraper.

The results in Table 27 above indicate the potential for residences within about 2,000 feet of active construction sites to be exposed to substantial increases in noise, assuming a background sound level of 50 dBA.

Basis of Significance

Adverse effects on noise and vibration are considered significant if an alternative would result in any of the following:

- Exposure to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Substantial (10 dB or greater) long-term increase in ambient noise levels in the project vicinity above levels existing without the project;
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project; or,
- Exposure of sensitive receptors or structures to groundborne vibration.

3.10.3 Alternative 1: No Action Alternative

Under the No Action Alternative, the Corps would not participate in the proposed project. As a result, there would be no construction-related effects to the acoustic environment, including the generation of groundborne vibration. The noise levels in the study area would remain consistent with the existing ambient noise levels present under current conditions. Sources of noise and noise levels would continue to be determined by local activities, development, and natural sounds.

3.10.4 Alternative 2: Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall

The nearest noise receptors to Folsom Dam are the Reclamation (USBR) offices on the north side of the dam. The closest USBR office is approximately 1,000 feet away from the main dam (Figure 23). The replacement of the emergency tainter gates is expected to result in an increase in ambient noise levels at the USBR's and DPR's offices because of the close proximity of the proposed roadway to these buildings. Additionally, a portion of the Folsom State Prison complex just across Folsom Lake Crossing road is within 2,000 feet of the main concrete dam. Because this area is immediately adjacent to a main road, the ambient noise level in the background would be higher than 60 dBA. Therefore, temporary noise effects associated with raising and modifying Folsom Dam would be considered less than significant as the distance between noise sources and potential receptors is large enough to attenuate noise.

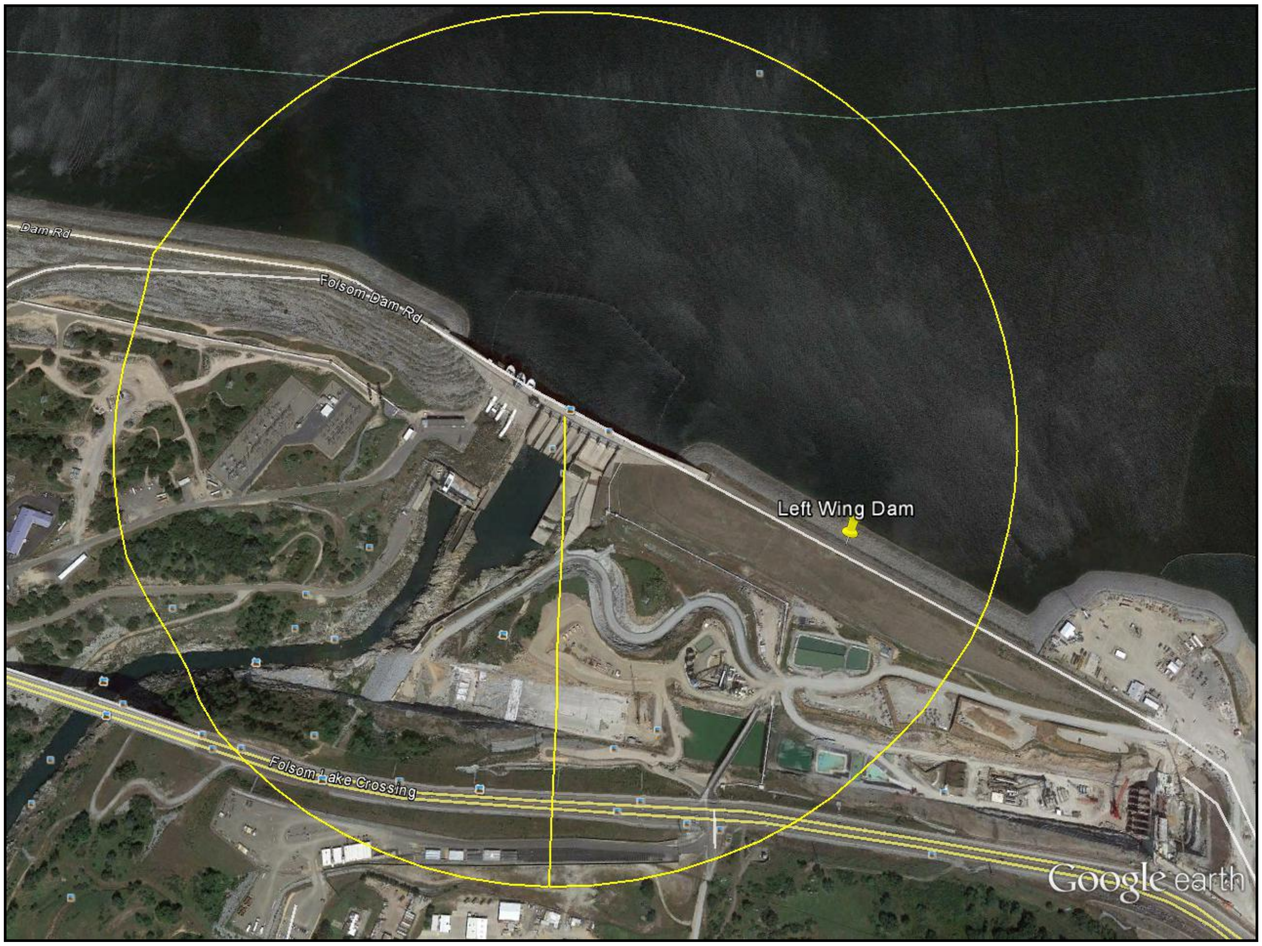

Figure 23. 2,000 Foot Buffer around Folsom Main Dam.

There are several sites where sensitive noise receptors are located near the proposed construction areas for this portion of Alternative 2. Operation of heavy equipment over the maximum construction duration (2 years for each work package, as previously described), within 2,000 feet of sensitive receptors, would result in a substantial increase in the ambient noise level exceeding the estimated background level of 50 dBA.

Dike 1. Residences to the northwest of Vogel Valley Road are within 500 to 600 feet of Dike 1. Residences on Christian Lane are less than 900 feet away from Dike 1. Additionally, numerous residences near the confluence of Boulder Road and Twin Rocks Road are within 2,000 feet of Dike 1 (Figure 24).

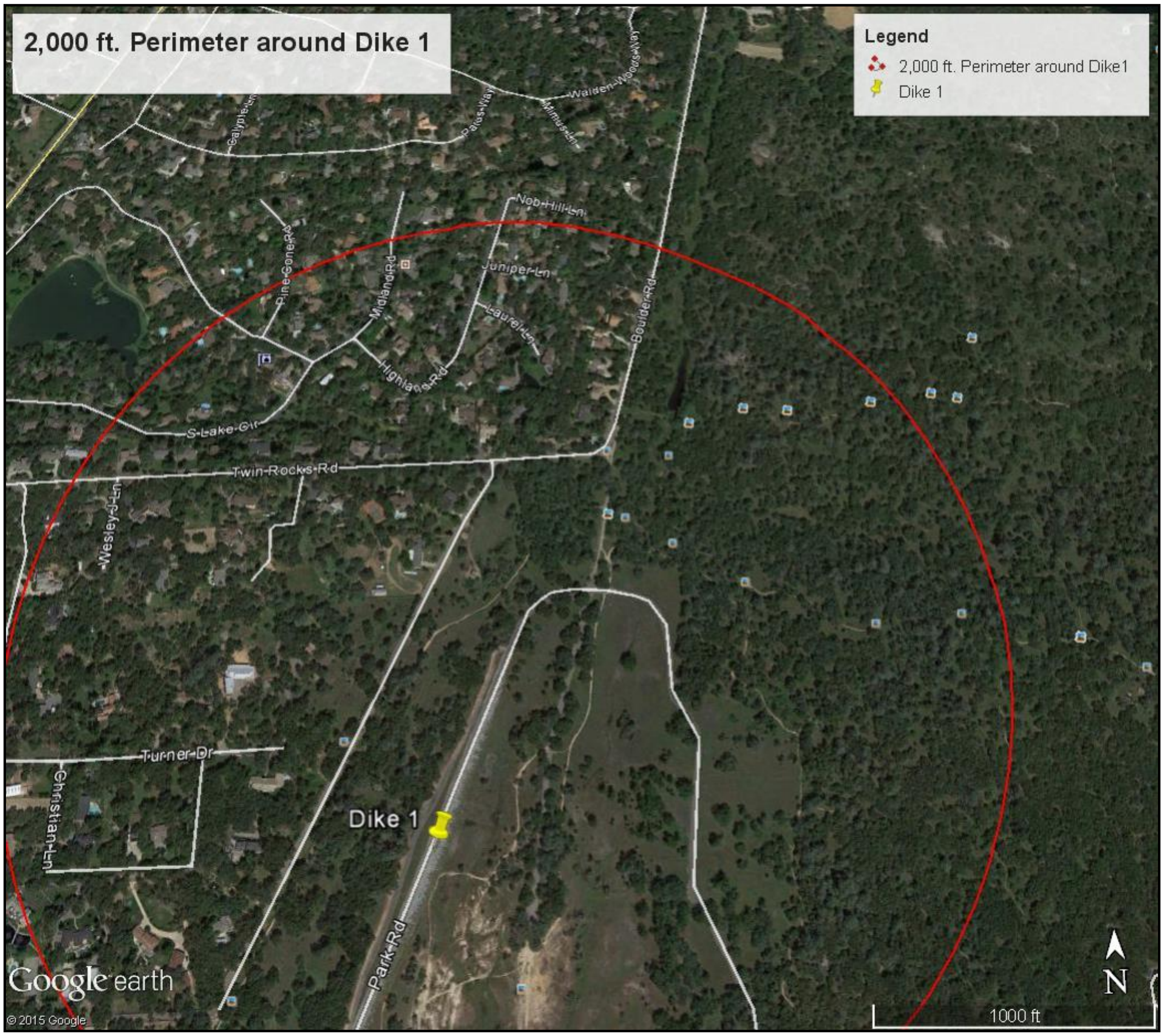

Figure 24. 2,000 Foot Buffer around Dike 1.

Dike 2. The Granite Bay Activity Center is within approximately 600 feet of Dike 2. Numerous residences along Haley Drive are within 1,000 feet of Dike 2. Parts of the beach and the parking lot for the boat launch are within 2,000 feet of the dike as well (Figure 25).

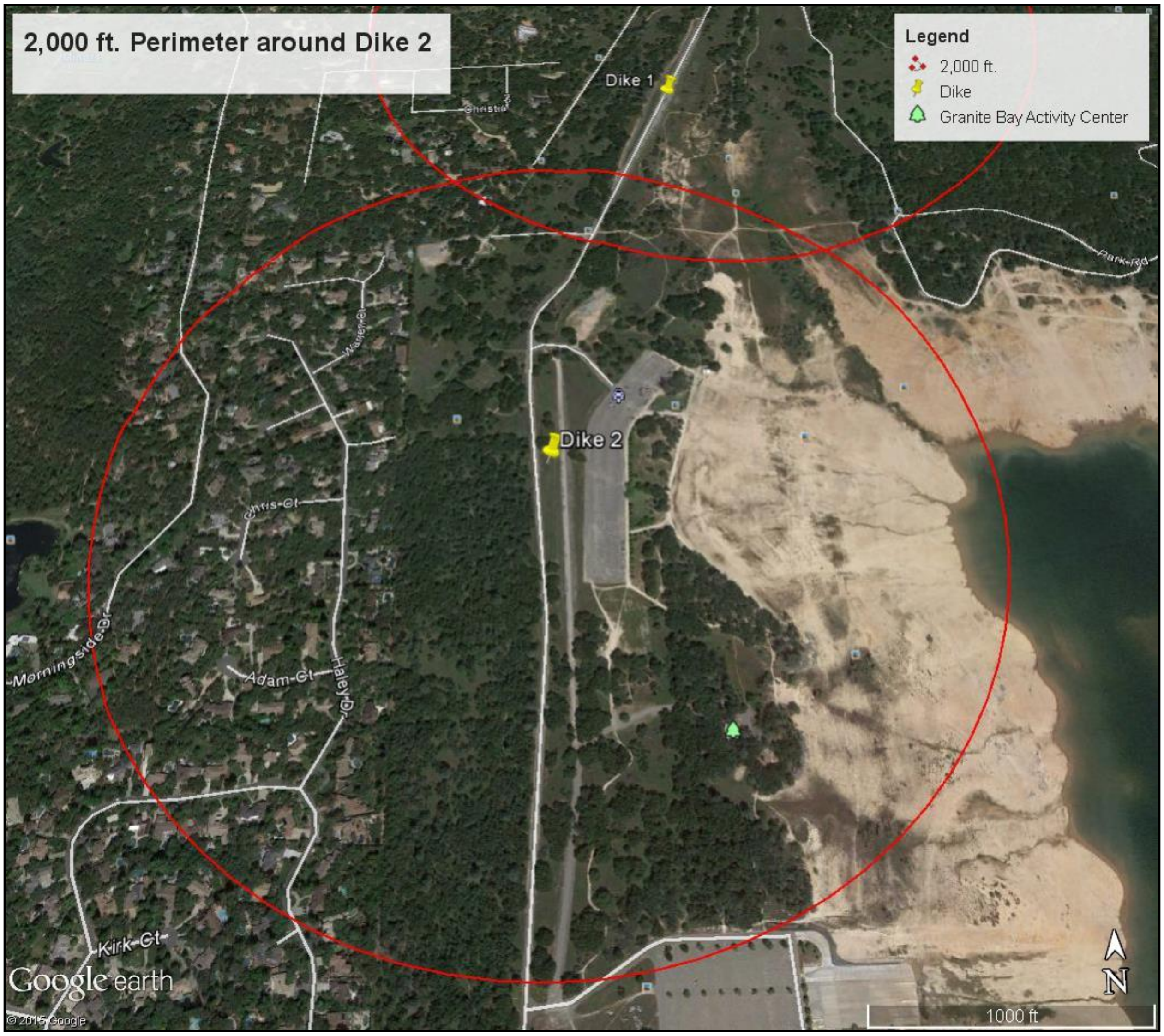

Figure 25. 2,000 Foot Noise Buffer around Dike 2.

Dike 3. The Granite Bay Activity Center is approximately 600 feet of the dike. Residences along East Hidden Lakes Drive and Haley Drive are within 1,000 feet of Dike 3. Residents on Kirk Court, Michael Court, and Jon Way are less than 2,000 feet from Dike 2. Parts of the boat launch and beach area are within 2,000 feet of Dike 3 (Figure 26).

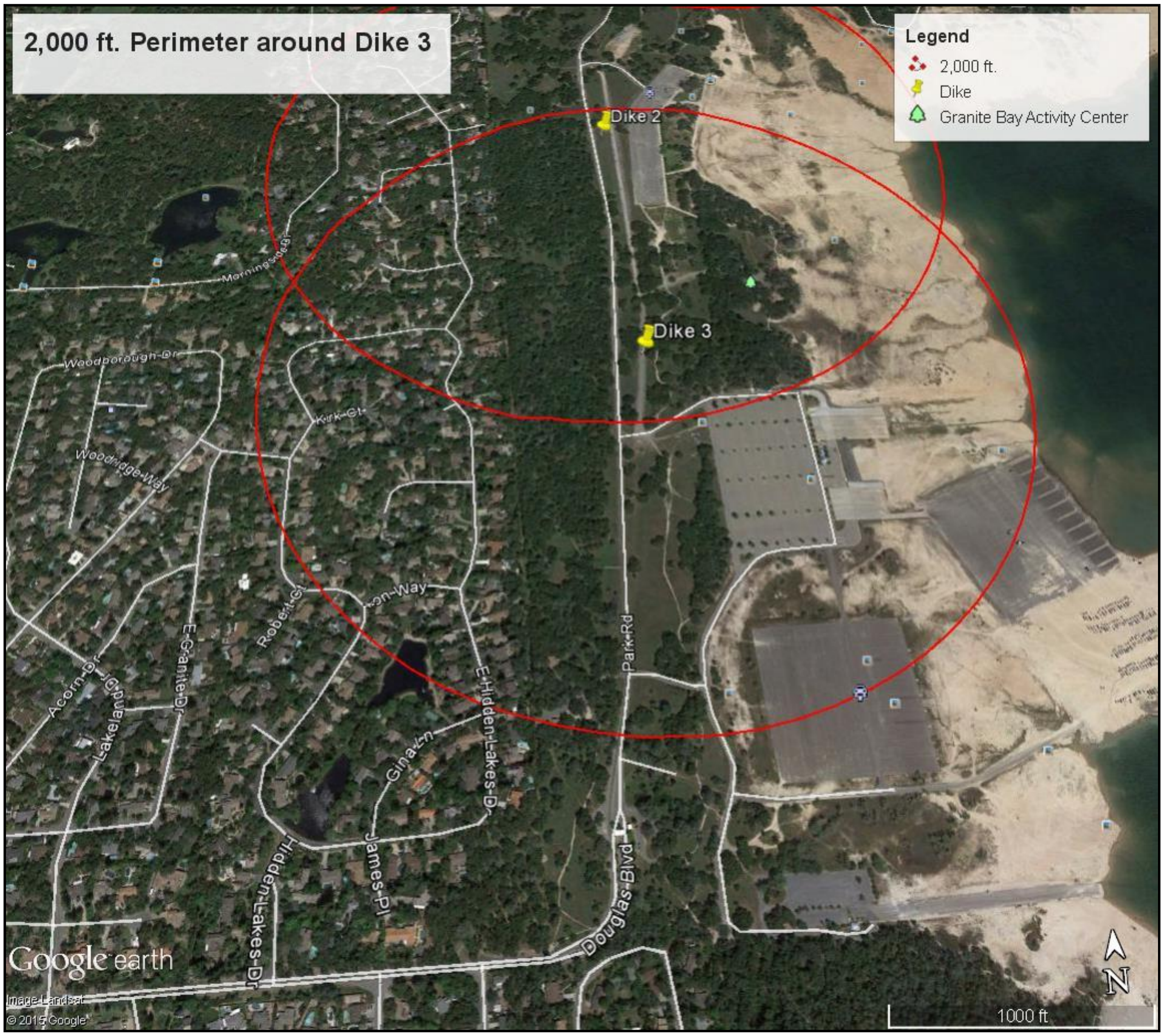

Figure 26. 2,000 Foot Noise Buffer around Dike 3.

Dike 4. Residences to the north of Dike 4 near the intersection of Lake Court and Sierra Drive are within 300 feet of Dike 4. Some residences on Lakeshore Drive are within 700 feet of Dike 4. Residences near the intersection of Bronson Drive and Hill Road are within 800 feet of Dike 4. Sections of multi-use trails are within 300 feet of the dike (Figure 27).

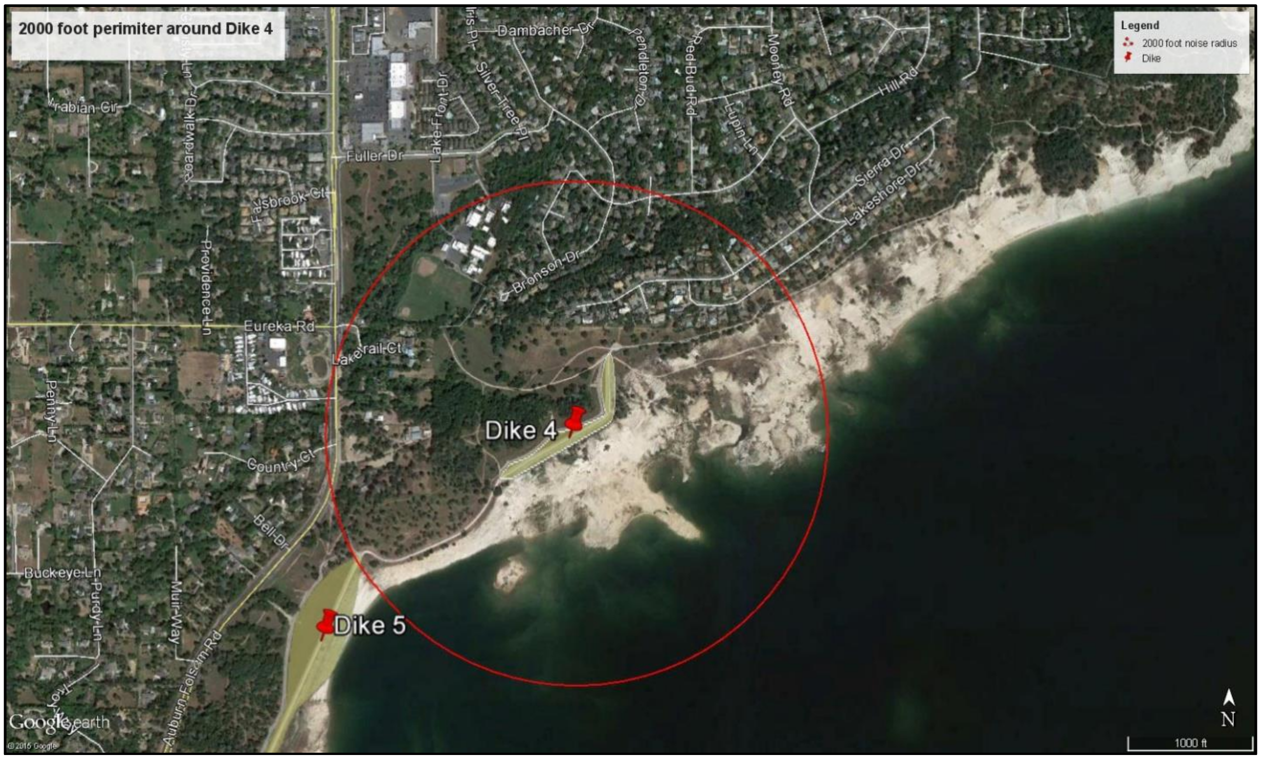

Figure 27. 2,000 Foot Noise Buffer around Dike 4.

Dike 5. There are a number of residences to the west of Auburn-Folsom Road on the southwestern perimeter of the reservoir near Granite Bay, located within 600 to 1,200 feet of Dike 5. Multi-use trails are located within 200 feet of the dike. Various sections of beach are located 200 to 500 feet from Dike 5 (Figure 28).

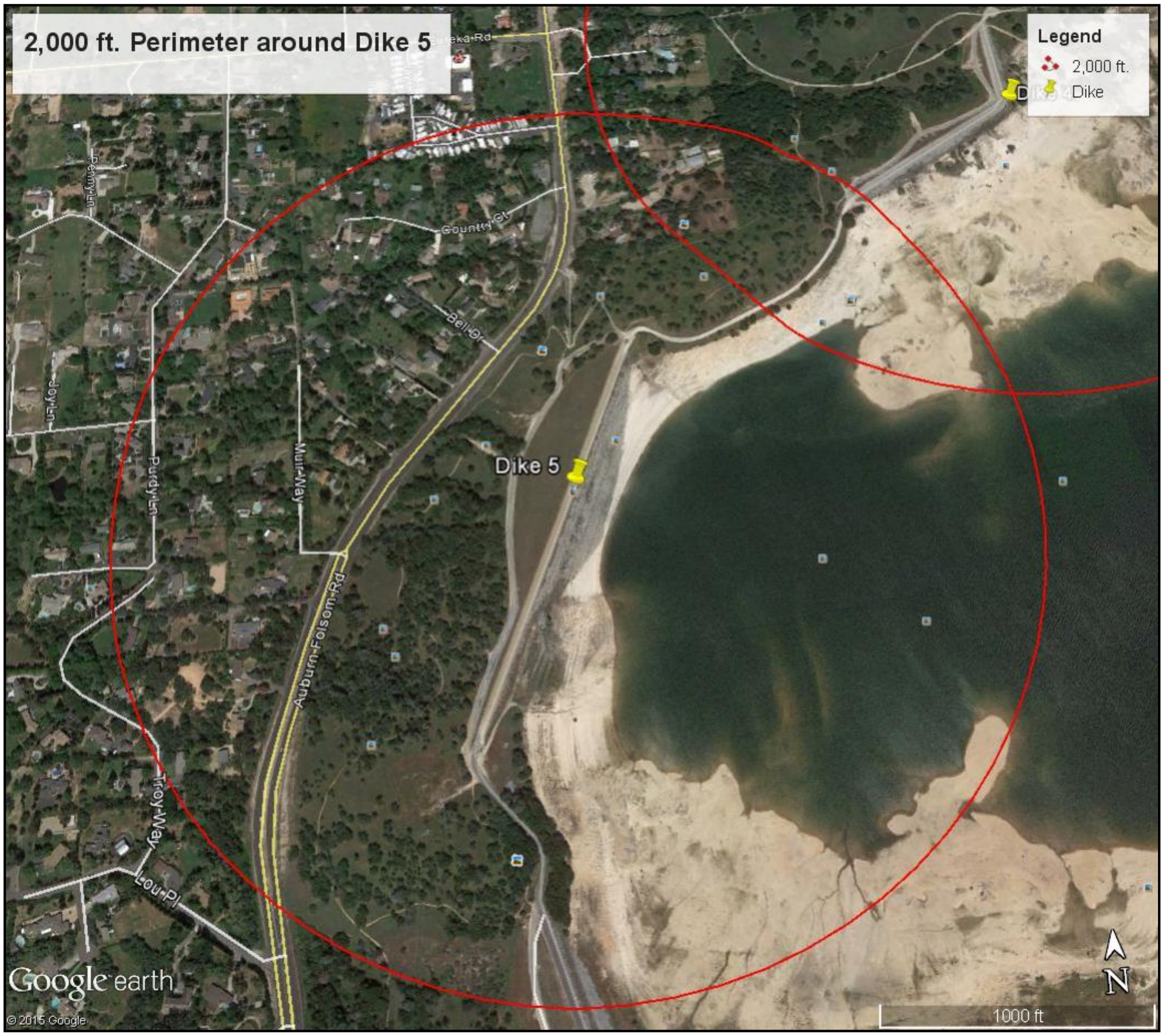

Figure 28. 2,000 Foot Noise Buffer around Dike 5.

Dike 6. Campsites are located within 300 feet of Dike 6 (Figure 28), and multiuse trails are within 500 feet.

Figure 29. 2,000 Foot Noise Buffer around Dike 6.

Right Wing Dam and Left Wing Dam. The access to Beal's Point parking lot is less than 100 feet north of the RWD. Portions of the American River Bike Trail run nearly parallel to the RWD. There are a few residences within 1,000 feet of the RWD, but none within the same distance of the LWD (Figures 29 and 30).

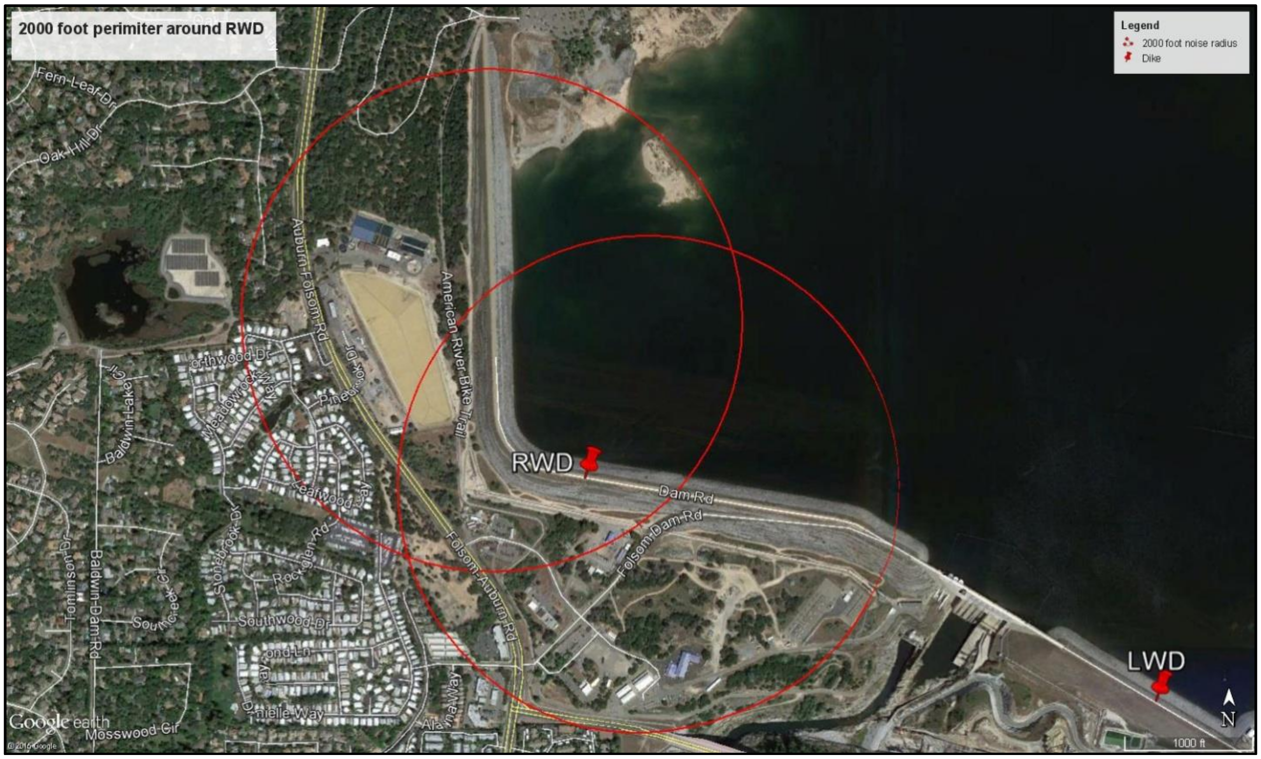

Figure 30. 2,000 Foot Noise Buffer around the Right Wing Dam.

*Two buffers were used in assessment due to size of the Right Wing Dam.

Figure 31. 2,000 Foot Noise Buffer around the Left Wing Dam.

Dike 7, Dike 8, and MIAD. On the southeastern perimeter of the reservoir, some residences are located within 400 feet of Dikes 7 and 8 (Figure 32). The closest residences to MIAD are located approximately 1,200 feet away off Green Valley Road (Figure 33). Construction in these areas could cause a substantial, temporary increase in the ambient noise level and expose sensitive receptors to noise levels that exceed standards established by local noise ordinances.

Figure 32. 2,000 Foot Noise Buffer around Dikes 7 and 8.

Figure 33. 2,000 Foot Noise Buffer around the Mormon Island Auxiliary Dam (MIAD).
*Two buffers were used in assessment due to size of the Mormon Island Auxiliary Dam.

Residences in other areas around the perimeter of Folsom Lake are located far enough away from construction areas to attenuate construction-related noise to an acceptable level. It is not anticipated that construction-related noise would create a significant adverse effect on recreation facilities located at Granite Bay and Beal's Point.

Vibration associated with construction activities would be short-term and due to the distance of structures and sensitive receptors, and would not be significant. Other sensitive receptors that could be affected by this increase include residents, wildlife, and recreationists. Sensitive receptors would experience noise from construction vehicle motors and construction activities. Because the increase in vibration would be short-term and intermittent, the impact would be less than significant.

Temporary noise effects associated with the construction of this alternative are considered significant because of the close proximity of portions of the dikes to some residential areas. Implementation of mitigation measures listed below would reduce this effect, but not to a less than significant level.

3.10.5 Avoidance, Minimization, and Mitigation Measures

The following measures would be implemented to reduce the effects of the noise to less than significant:

- Construction noise would be limited in accordance with the City of Folsom, Sacramento County, and Placer County Noise Ordinance exemption for construction.

- Construction equipment noise would be minimized during project construction by muffling and shielding intakes and exhaust on construction equipment (per the manufacturer's specifications), and by shrouding or shielding impact tools.

- All equipment, haul trucks, and worker vehicles would be turned off when not in use for more than 30 minutes.

- Equipment warm up areas, water tanks, and equipment storage areas should be located as far from existing residences as is feasible.

- Provide written notice of construction activities within 2,000 feet of residences or other sensitive receptors. Written notice provided to potentially-affected residences should identify the type, duration, and frequency of construction activities. Notification materials would also identify a mechanism to register complaints if construction noise levels are overly intrusive or if construction occurs outside specified hours.

- Residences and businesses would be notified about the type and schedule of construction at least two weeks prior to mobilization.

- The contractor would measure surface velocity waves caused by equipment and monitor vibration up to a threshold value established and approved in writing by USACE. There would be no vibration exceeding 0.2 inch per second.

Public meetings would be scheduled with affected residents to ensure they are informed of the project schedule and its potential effects. Due to the temporary nature of the construction and the proposed avoidance, minimization, and mitigation measures, impacts would be less than significant.

3.11 Water Quality

Water quality analysis covers the conventional pollutants. For this analysis, conventional pollutants analyzed are:

- pH
- Turbidity
- Total dissolved solids (TDS)
- Dissolved oxygen
- Nutrients, including total organic carbon (TOC), nitrogen, and phosphorus
- Trace elements, including arsenic, cadmium, chromium, copper, lead, nickel, and zinc

Groundwater quality was not analyzed for this report because of the lack of hydraulic connectivity between the dikes, emergency spillway, and the Folsom Reservoir. Previous studies (*e.g.* Sherer 2006) indicate that the data collected throughout the downstream foundation areas indicate that there is no connection between the reservoir and local groundwater levels.

The area of analysis for this section is the aquatic body of Folsom Lake, particularly surface waters within the area of the lake along the dikes, the main dam, and the emergency spillway.

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 are discussed in Chapter 5.0.

<u>Federal</u>

- Clean Water Act (CWA) (33 USC §1251 *et seq.*)
- National Pollutant Discharge Elimination System (33 USC §1342)

<u>State</u>

- California Water Code
- Local Water Quality Regulations
- 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 every three years. The most recent update was completed in October 2011. The 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 Folsom Dam Raise project is located within the Central Valley's RWQCB's jurisdiction and is subject to the Basin Plan.

Snowmelt and precipitation from the upper American River Watershed discharges water into Folsom Lake. In general, runoff from the relatively undeveloped watershed is of high quality and rarely exceeds the State of California's water quality objectives (Reclamation Dam Safety SEIS, 2008). The following beneficial uses have been defined by the Central Valley Regional Water Quality Control Board (CVRWQCB) for Folsom Lake: municipal and domestic water supply; irrigation; industrial power; water contact and non-contact recreation; warm and cold freshwater habitat; warm freshwater spawning habitat; and wildlife habitat, along with potential beneficial uses for industrial service supply. Water quality within Folsom Lake and Lake Natoma is generally acceptable to meet the beneficial uses currently designated for these water bodies.

Although groundwater is not a major resource in the vicinity of Folsom Lake, small amounts of groundwater are typically found in granitic fissures and cracks. Because fractured aquifer systems are typically low yielding, surface water sources are primarily used for drinking water or irrigation water sources rather than wells.

The CVRWQCB standards are listed in Table 28. The water quality values measured within Folsom Reservoir from 1992 to 1998 are presented in Table 29. All the data was collected over a six-year period from 1992 to 1998; 104 samples were taken for both pH and turbidity; 47 samples were taken for TOC; 101 samples were taken for electric conductivity (Larry Walker Associates, 1999).

Table 28. Central Valley Regional Water Quality Control Board Water Quality Standards.

Water Quality Parameter	Objective
Bacteria	100 MPN/100 ml
Total Dissolved Solids	100 mg/l
Dissolved Oxygen	7.0 mg/l for cold water habitat
	5.0 mg/l for warm water habitat
Turbidity	10 NTU
pH	6.5 to 8.5

Note: MPN is the Most Probably Number

Table 29. Water Quality Parameters Sampled at Folsom Reservoir – 1992 to 1998.

Water Quality Parameter	Minimum	Maximum	Average
pH (standard units)	5.82	8.46	7.09
Turbidity (mg/L)	1	68	1.2
DO (mg/L)	6.1	13.6	10.3
TOC (mg/L)	2	3.5	N/A
Nitrogen (mg/L)	N/A	N/A	N/A
Phosphorus (mg/L)	N/A	N/A	N/A
Electric Conductivity (µS/cm)	18.5	123	52.2

Table 30 presents water quality values within Folsom Reservoir from 2001 to 2005. The nitrogen, phosphorus, and TDS data were collected over a 13-month period from February 2001 to February 2002; five (5) samples were taken for each of these parameters. The TOC data were collected on June 11, 2003; six (6) samples were taken. The pH, electric conductivity, DO, and turbidity data were collected on June 28, 2005; a total of 47 samples were taken (Reclamation 2005, MWH 2003, Wallace, Roberts and Todd et. al. 2003).

Table 30. Water Quality Parameters Sampled at Folsom Reservoir – 2001 to 2005.

Water Quality Parameter	Minimum	Maximum	Average
pH (standard units)	6.6	8.23	6.94
Turbidity (NTU)	1	126.9	8.4
DO (mg/L)	4.95	7.93	6.88
TOC (mg/L)	1.5	1.8	1.6
Nitrogen (mg/L)	<0.050	0.11	0.062
Total Phosphorus (mg/L)	<0.010	<0.050	0.0212
TDS (mg/L)	39	44	41.8
Electric Conductivity (µS/cm)	32.5	61.6	46.2

Fecal coliform bacteria levels within Folsom Reservoir are presented in Table 31. The values for Granite Bay and Beal's Point represent data collected over a five-month period (May 2003 to September 2003); 19 samples were taken at each location. The values for Folsom Dam represent data collected over a 13-month period from February 2001 to February 2002; 5 samples were taken (Reclamation 2003; Wallace, et al. 2003).

Table 31. Folsom Reservoir Coliform Sampling – 2001 to 2003, Fecal Coliform Concentrations (MPN/100mL).

Site	Minimum	Maximum	Geometric Mean
Granite Bay	2	300	9
Beal's Point	2	900	18
Folsom Dam	2	30	12.2

3.11.2 Environmental Consequences

Methodology

Effects on water quality that could result from construction activities were qualitatively evaluated based on the construction practices and materials to be used, the location and duration of the activities, and the potential for water-quality or beneficial-use degradation of project waterways (Table 32). Standard pollution prevention measures, including erosion and sediment control measures, good housekeeping, proper control of non-stormwater discharges, and hazardous spill prevention and response measures, would be implemented as part of the project design.

Table 32. Summary of Potentially Significant Water Quality Effects.

Threshold	Rational for Evaluating Potential Effects
Fecal Coliform Bacteria	Effects not likely since potential bacteria sources are not associated with the project
pH	Any release of concrete wash water without treatment or approved BMPs
DO	Discharges with chemical or biochemical oxygen demand, low DO
Oil and Grease	No visible sheen or adverse effects due to the use of heavy equipment
Turbidity	Discharges with high turbidity
Nutrients	Discharges with high turbidity

Basis of Significance

For this analysis, an effect pertaining to surface and ground water 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 1500 *et seq*.):

- Violate water quality standards or waste discharge requirements;
- Substantially degrade water quality; and
- Alter regional or local flows resulting in substantial increases in erosion or sedimentation.

3.11.3 Alternative 1: No Action Alternative

Under this alternative, water resources or quality would not be affected by construction in the project area. The surface and groundwater conditions would continue to be affected by contaminants through runoff. Extreme flooding events could wash siltation and contaminants into the water system, and if emergency work became necessary to prevent dike failure, measures required for the protection of water quality might not be used.

3.11.4 Alternative 2: Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall

An assessment was conducted by USBR on the Folsom Dam temperature shutters (2001). It was concluded that lead paint should be assumed present in all underlying primer on the structure. Some of the work on the tainter gates would be done over water and there is the potential for lead paint to enter surface water downstream of the dam. Stop logs would be installed on the waterside of the tainter gates to hold back the water. This, along with the implementation of best management practices and the mitigation measures listed below, assumes that direct effects to water quality for the rehabilitation of the spillway would be less than significant.

This action would neither increase the occurrence of impervious surfaces such as parking lots or buildings, nor change the existing land uses such that hydromodification would occur. Existing drainage infrastructure (function and capacity) would not be altered from the 3.5-foot raise of the dikes, wing dams, and MIAD. Overall, the drainage patterns would not be substantially altered; therefore the direct and indirect affect to local drainage would be less than significant. Implementation of the Stormwater Pollution Prevention Plan (SWPPP) would ensure that there is no exceedance of the capacity of stormwater drainage infrastructure, and therefore effects to the infrastructure (dikes, etc.) would be less than significant with mitigation.

Project activities, such as drilling, excavation, hauling, and fill placement may disturb or mobilize sediments, which have the potential to affect total suspended solids, pH, turbidity, and dissolved oxygen.

Installation of the dike raises and the concrete floodwalls, and use of the identified staging areas, could have short-term direct impacts on water quality from ground-disturbing activities. Exposed soil on the dikes could potentially erode as a result of significant runoff events, causing increased turbidity in local waters. In addition, debris and inadvertent spills of fuels, oils, or concrete mix materials from construction equipment, in work areas, or in the staging areas could be a source of contamination into adjacent waterways.

Run-off could result from excavation activities with potentially higher concentrations of total dissolved solids, both direct and indirectly. Should run-off reach the reservoir, there is a potential to create turbidity and introduce associated contaminants to the receiving waters.

The contractor would be required to obtain an NPDES Construction Storm Water Permit from the CVRWQCB because the project would disturb more than one acre of land. Across the entire construction site, debris, soil, or oil and fuel spills could temporarily adversely affect the water quality of Folsom Lake. The construction storm water permit pertains to the prevention of increased turbidity of adjacent waterways as a result of site erosion and sedimentation, as well as debris, soil, fuel, and oil spill prevention. The contractor would be required to design and implement a SWPPP prior to initiating construction activities, and to implement standard BMPs. There is also a potential for fugitive dust and construction runoff to enter waterways due to soil excavation, equipment use, cutoff wall construction, and movement of trucks in the project areas and along the haul routes. However, frequent watering of haul routes, proper coverage and control of material stock piles, and installation of BMPs would help to prevent such pollution impacts.

By obtaining NPDES permits and the implementation of BMPs, water quality standards or waste discharge requirements associated with earth moving activities would be met; therefore impacts would be less than significant.

3.11.5 Avoidance, Minimization, and Mitigation Measures

The contractor would be required to obtain a National Pollutant Discharge Elimination System (NPDES) permit from the Regional Water Quality Control Board (RWQCB), Central Valley Region. As part of the permit, the contractor would be required to prepare a SWPPP and a SPCP prior to initiating construction activities, identifying BMPs to be used for avoidance or minimization of any adverse effects during construction to surface waters.

Pollution prevention measures should be incorporated into all final design and construction plans. The pollution prevention measures would include erosion and sediment control measures, and measures for non-stormwater discharges (i.e., construction dewatering and appropriate spill prevention and containment measures). Measures would be implemented to avoid accidental spills and sediment dispersal during barging of borrow materials. Construction contractor(s) would be required to obtain coverage under the NPDES General Storm Water Permit for Construction Activities from the State Water Resources Control Board (SWRCB), and obtain any applicable waste discharge requirements. Work under NPDES jurisdiction requires the preparation of a SWPPP. The SWPPP would describe the proposed construction activities and pollution prevention measures that should be implemented to prevent discharge of pollutants. The SWPPP would also include a description of inspection and monitoring activities that shall be conducted. Construction and post-construction monitoring should be conducted to ensure that all pollution prevention efforts are performed as described in the SWPPP. The SWPPP should be amended in the event modifications to the pollution prevention measures become necessary.

The following BMPs would be incorporated into the project:

- Implement appropriate measures, such as straw wattles and silt fencing, to prevent debris, soil, rock, or other material from entering the water.

- Use a water truck or other appropriate measures to control dust on haul roads, construction areas, and stockpiles.

- Properly dispose of oil or other liquids.

- Fuel and maintain vehicles in a specified area that is designed to capture spills. This area cannot be near any ditch, stream, or other body of water or feature that may convey runoff to a nearby body of water.

- Fuels and hazardous materials would not be stored on the site, unless in a specified area that is designated to capture spills.

- Inspect and maintain vehicles and equipment to prevent the dripping of oil or other fluids.

- If rain is forecast during construction, inspect erosion/sedimentation prior to rains and implement additional measures as needed.

- Maintain sediment and erosion control measures during construction. Inspect the control measures before, during, and after a rain event.

- Train construction workers in storm water pollution prevention practices.

- Revegetate disturbed areas in a timely manner to control erosion.

In accordance with 29 CFR 1926.62 Lead and 8 CCR 1532.1 Lead, for all construction jobs where lead is present the following is required:

- Housekeeping. Lead dust on surfaces, especially in eating areas, must be controlled by HEPA vacuuming, wet cleanup, or other effective methods.

- Hand and face washing. Workers must have washing facilities with soap and clean water.

- Training. Workers must receive training on lead hazards and how to protect themselves.

- A written compliance program to assure control of hazardous lead exposures.

- Employers must assess the amounts of lead breathed by workers. This is usually done by employee breathing-zone air sampling. Air sampling results are used to determine if clean areas for eating and clothing change, showers, full worker training, and medical monitoring with routine blood testing for lead and zinc protoporphyrin (ZPP) is necessary, as well as the type of respirator that must be worn for protection.

3.12 Cultural Resources

The following section addresses cultural resources impacts that could result from implementation of one of the proposed alternatives for the Folsom Dam Raise Project. "Cultural resources" describe several different types of properties: prehistoric and historic archeological 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 archeological 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. Archeological sites dating to the time when these initial Native American-European contacts occurred are referred to as protohistoric. Historic archeological 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.

3.12.1 Environmental Setting

Regulatory Setting

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

- Assembly Bill 52 (AB52)

Existing Conditions

For purposes of complying with Section 106 of the NHPA, a Federal agency would make a determination of the Area of Potential Effects (APE) for the project or undertaking. The APE is defined as “the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character of 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 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 aesthetic characteristics of landscapes or features, or even access to a historic property.

The APE for the Folsom Dam Raise Project includes all areas of ground disturbance, staging areas, and modifications to manmade structures (Folsom Dam, Dikes 1 through 8, MIAD, LWD, and RWD). The existing conditions, records and literature search, and inventory and evaluation of cultural resources cover the APE for the Folsom Dam Raise Project.

Prehistoric Cultural Context

Since the Folsom Dam Raise Project area lies within two specific cultural areas, both the Lower Sacramento Valley and the Northern Sierra slope regions, the context below summarizes the distinct cultural chronologies for each of these regions.

Lower Sacramento Valley

Prehistorically, the Lower Sacramento Valley has been subjected to archeological interest since the last decade of the nineteenth century, culminating with early avocational archeologists establishing a temporal schedule for this region, referred to as the Central California Taxonomic System (CCTS) (Nilsson and Smith 2006; Moratto 1984). The CCTS is organized into three very broad divisions, the Early, Middle, and Late Horizon. This broad classification has largely fallen out of use, mostly due to obscured gradual changes throughout time, ignored diversity in the archeological record, and ignored smaller spheres of culture within the Central Valley (Waechter and Mikesell 1994). For these reasons, the cultural history discussion would concentrate on the pattern-aspect theme, presented by Frederickson (1973), in an effort to take into account cultural variation between sub-regions as well as material culture and behavior.

Windmiller Pattern (4,500-3,000 B.P.)

This pattern exemplifies the earliest occupation in the Sacramento Valley and encompasses aspects ascribed to the Early Horizon of the CCTS. This pattern is characterized by the exploitation of both game and plant resources and acquisition of utility goods, as well as ornamental and ceremonial objects, many of which were apparently obtained as finished items as opposed to raw materials (Moratto 1984). In regards to settlement practices, the Windmiller pattern suggests that populations may have established winter villages in the valley, with summer exploitation of the foothill zones. Within the archeological record, the Windmiller pattern is characterized by extended burials with westerly orientation as well as the presence of grave goods, which has been utilized to identify social stratification within the Windmiller peoples.

Berkeley Pattern (3,500-1,500 B.P)

The Windmiller Pattern gives way to the Berkeley Pattern in the Sacramento Valley, marking a transitional shift as opposed to a sudden and total replacement of the culture that proceeded. This pattern corresponds with the Middle Horizon of the CCTS and is represented by an increased dependence on acorn milling, evidenced by an increase in mortars and pestles within the archeological record for the Berkeley people. Cultural material includes the occurrence of an extensive bone tool kit, unique flintworking techniques, and certain types of shell beads and pendants within Berkeley pattern sites. Burial practices of Berkeley peoples included interring their dead in flexed positions with variable burial orientation. There has also been evidence of cremation practices within the Berkeley Pattern as well as a decrease in the numbers and variation of grave goods.

Augustine Pattern (1,500 B.P. to Contact Period)

The Augustine Pattern, assigned to the Late Horizon, is distinguished by intensive fishing, hunting and gathering, and reflects local innovation in technology and the integration of new developments with traits from the previous Berkeley Pattern. Settlement patterns exhibit highly stratified populations, indicated by the increased variation in mortuary practices and types of grave furnishings (Bennyhoff and Fredrickson 1994). Exhibited within the archeological collection is evidence for extensive trade networks, connecting the interior to the coast (Nilsson and Smith 2006). Archeologically, the Augustine Pattern is characterized by baked clay items, the introduction of the bow and arrow which replaced the dart and atlatl as the favored hunting implement, and the presence of side-notched, serrated arrow points. In the archeological record, evidence of the Augustine Pattern is also displayed in the distinctive *Olivella* shell bead types, clamshell disc beads, stone tubular pipes, and flat bottomed mortars.

Northern Sierra

Many researchers working within the project area have chosen to refer to the Central Valley sequence, specifically as it relates to work performed adjacent to Folsom Reservoir, when discussing chronologies. In 1952, archeological investigations were performed by the University of California at Berkeley, and it was through this research that Heizer and Elsasser (1953) developed two archeological cultures separated in time and space; the Martis Complex and the Kings Beach Complex.

Martis Complex (4,000-1,500 B.P.)

The Martis Complex, centered in the Martis Valley, represents the earliest occupation of the north-central Sierran foothills and mountains. The dates of the complex is determined by both obsidian hydration measurements and radiocarbon dates (Elsasser and Gortner 1991). The Martis Complex is characterized by an artifact assemblage dominated by local lithic materials consisting of basalt as opposed to obsidian tool production. Other cultural material indicative of this complex includes large, roughly shaped projectile point, and “boatstones” or atlatl weights (use of atlatl and dart). Plant processing tools such as the mano and millingstones for seed milling, bowl mortar and cylindrical pestle, are displayed in the artifact assemblages. Based upon the large numbers of projectile points and milling equipment discovered in the archeological record, there was an apparent economic emphasis on hunting and seeding (Moratto 1984). Elsasser and Gortner also note the frequent association of Martis assemblages with petroglyphs of the “Central Sierra Abstract Style” and suggest that these locations may represent high-elevation summer hunting camps (Waechter and Mikesell 1994).

Kings Beach Complex (1,500 B.P. to Contact Period)

The Kings Beach Complex, named after a site on the north shore of Lake Tahoe, was distinguished by flaked obsidian and chert tool stones over basalt resources. The archeological assemblages of Kings Beach are characterized by sparse artifact scatters overlying deeper Martis settlements (Elston et al 1977). The Complex employed the use of small projectile points, hunting technology based upon the bow and arrow, bedrock mortars, and cobble pestles. Although hunting played a role in Kings Beach subsistence patterns, fishing and gathering strategies are thought to have constituted the main focus of site use. This is indicated by the site locations situated at the mouths and confluence of streams within the Lake Tahoe region. Researchers have ascribed this complex to the ethnographic Washoe after 1,000 B.P. (Heizer and Elsasser 1953). The results of the work originally performed by Heizer and Elsasser dated the Kings Beach Complex to no earlier than 1000 years B.P, leaving a substantial chronological gap between the two complexes. Due to the work by W. Davis and R. Elston in the Lake Tahoe region, their efforts proved successful in finding evidence for a transitional phase between both the Martis and Kings Beach Complexes (Elston 1977).

Ethnographic Background

Ethnographic Overview

The Folsom Dam Raise Project APE is located within the territorial boundaries of the ethnographic Nisenan. The Nisenan, often referred to as the Southern Maidu in anthropological literature, are classified as the southern linguistic group of the Maidu tribe, and together with Maidu and Konkow, form a subgroup of the California Penutian linguistic family (Wilson and Towne 1978). The Nisenan linguistic group is further subdivided based on dialect into Northern Hill Nisenan, inhabiting the Yuba River drainage; Southern Hill Nisenan, living along the American River; and Valley Nisenan, occupying a portion of the Sacramento River Valley between the American and Feather Rivers (Beal's 1933; Kroeber 1925, 1929).

Prior to Euroamerican contact, Nisenan territory extended west into the Sacramento Valley to encompass the lower Feather River drainage, north to include the Yuba River watershed, south comprising the whole of the Bear and American River drainages and the upper reaches of the Cosumnes River, and east to the crest of the Sierra Nevada (Wilson and Towne 1978).

The information in this section is derived from a variety of sources, including: Bennyhoff (1977); Beal's (1933); Gifford (1927); Kroeber (1925, 1929); Littlejohn (1928); and, Wilson and Towne (1978). Additional resources on Nisenan and Miwok ethnography include: Faye (1923); Levy (1978); Powers (1976); and, Schulz and Ritter (1972). The following is a brief synthesis focusing on selected traits of Valley Nisenan ethnography that may manifest archaeologically.

Habitation Patterns

The Nisenan were organized by tribelet, each tribelet being composed of several large, semi-autonomous villages that accepted the leadership of the headman of a specific village. Headmen acted as advisors for major decision making, communal hunts, and ceremonies. Wilson and Towne (1978) identify three Valley Nisenan tribelet centers in the Sacramento Valley: at the mouth of the American River (present-day Sacramento); at the mouth of the Bear River; and, at the confluence of the Yuba and Feather rivers near present-day Marysville.

Nisenan villages varied greatly in size, ranging from three to seven houses up to 40 to 50 houses, with the largest valley villages inhabited by more than 500 people (Littlejohn 1928). Villages in the lower valleys tended to be located along low rises and mounds adjacent to streams and rivers.

Nisenan built structures, including semi-permanent houses, which were generally conical, measuring 10 to 15 feet in diameter and covered with tule mats, grasses, or earth. Smaller, temporary wikiup-like shelters, made of upright poles and cloaked in brush, were used in the warm seasons while hunting and gathering (Curtis 1924; Kroeber 1925). Other structures commonly associated with village sites include semi-subterranean dance houses, acorn granaries, and sweathouses (Wilson and Towne 1978). Each Nisenan tribelet controlled the natural resources within a bounded tract of land (Littlejohn 1928). These boundaries were often indicated by piles of stones (Littlejohn 1928). Beal's (1933) estimated that Nisenan tribelet territory averaged approximately 100 square miles.

Subsistence

The basic subsistence strategy of the Nisenan was seasonally mobile hunting and gathering. Acorns from the California Black Oak, the primary staple, were gathered in the fall and stored in granaries for use during the rest of the year. Other plant resources included seeds, buckeye, wild onion, wild sweet potato, Indian potato, wild garlic, wild carrot, many varieties of berries and fruit, grasses, herbs, and rushes. During the warmer months, people moved to mountainous areas to hunt and collect food resources particular to higher elevations.

Communal hunting drives were undertaken to obtain deer, quail, rabbits, and grasshoppers. Game was prepared by roasting, baking, or drying. Mountain lions and bobcats were hunted for their skins as well as their meat, and bears were hunted ceremonially in the winter when their hides were at their best condition (Wilson and Towne 1978). Runs of salmon in the spring and fall provided a regular supply of fish, while other fish, such as suckers, pike, whitefish, and trout were caught with hooks, harpoons, nets, weirs, snares, fish traps, or by using fish poisons such as soaproot. Birds were trapped with nooses or large nets, or shot with bow and arrow (Wilson and Towne 1978).

Many wild plants may also have been "managed" by prescribed burning that removed underbrush and encouraged growth of edible grasses, seed-producing plants, and other useful plant resources such as basketry materials (Blackburn and Anderson 1993). The use of fire for environmental modification and as an aid in hunting is frequently mentioned in ethnographic literature relating to the Nisenan. Littlejohn (1928) noted that the lower foothills in the valley oak zone were thickly covered with vegetation that was annually burned by the Nisenan to remove and limit its growth while encouraging the growth of oaks and the harvest of acorns. The annual fires destroyed seedlings but did not harm established oak trees. Beal's (1933) also noted that the Nisenan regularly burned the land, primarily for the purpose of driving game.

Technology and Trade

Stone technology included flaked stone knives, projectile points, and other tools made from obsidian, basalt, and silicates. Ground stone tools included club heads, pipes, charms, and mortars and pestles made from local coarser-grained rocks (Beal's 1933; Wilson and Towne 1978). Shells and beads manufactured from bone, shell, and minerals, such as magnesite, were used for ornamentation. Wood and bone were used for a variety of tools and weapons, including bows, arrow shafts and points, fishhooks, looped stirring sticks, flat-bladed mush paddles, pipes, and hide preparation tools. Cordage was made from plant material and was used to construct fishing nets as well as braided and twined tumplines.

Baskets were used for a variety of tasks, including storing, cooking, serving, and processing foods. Basketry items consisted of burden baskets, traps, cradles, hats, cages, seed beaters, and winnowing trays. Basket manufacturing techniques included both twining and coiling, and baskets were decorated with a variety of designs and materials. Other woven artifacts included tule matting and netting made of milkweed, sage fibers, or wild hemp. In the Sacramento Valley, the Nisenan used tule balsa rafts and log canoes (Kroeber 1929) for fishing, and used the boats extensively for travel among the major river villages.

Trade and exchange networks were established with neighboring groups for food and other items, both practical and ornamental, which were not available within Nisenan territory. Clamshell disk beads, used as a mode of currency, were acquired from Patwin and other outside sources. Obsidian was highly valued and imported. Nisenan informants stated that obsidian only came from a place to the north, outside of Nisenan territory (Littlejohn 1928). Abundant archaeological evidence suggests that the vast majority of obsidian in southern Nisenan territory is derived from either Bodie Hills to the east, or Napa Valley to the west. Nisenan commodities traded to neighboring groups included salmon, deer, and acorns (Davis 1961).

Intergroup Relations

Nisenan and Miwok peoples frequently interacted as trading partners, at ceremonial gatherings, and in armed conflict primarily due to perceived territorial encroachment. The ethnographic literature, particularly in reference to the Nisenan, reports rather regular hostilities between Hill and Valley Nisenan, and Nisenan and Sierra Miwok (cf., Littlejohn 1928; Beal's 1933). Most interactions between the two ethnographic groups, however, appear to have been civil, friendly in nature, and characterized by considerable intermarriage.

Ethnohistory

Initial contact with Euroamericans in the eighteenth century had little effect on the Nisenan. The earliest contacts were Spanish exploratory expeditions in the Central Valley led by José Canizares and Gabriel Moraga, followed in the 1820s by American and Hudson's Bay Company trappers. Introduced diseases, against which they had no natural immunities, were the single greatest cause of death among California Native Americans after Euroamerican contact.

The great epidemic of 1833 (probably malaria) devastated the Valley Nisenan population by as much as 75 percent, in some instances wiping out entire villages.

Captain John Sutter settled in Nisenan territory in 1839. Word of James Marshall's 1848 discovery of gold near the Nisenan settlement of Culloma (Coloma) soon triggered an influx of thousands of fortune seekers in Hill Nisenan territory (Wilson and Towne 1978). From the 1870s until the 1890s, the Nisenan experienced a cultural and religious resurgence with the Ghost Dance revival of 1870. Originating with the Paiute, the basic tenets included the end of the world and/or return of the dead, return of the world to Native Americans, and the destruction of White People (Bean and Vane 1978:670). Native American "rancherias" were established by the federal government in the Maidu area between 1906 and 1937. Today, the majority of the estimated 2,500 Maiduan peoples (including persons descended from Nisenan, Konkow, and Maidu groups) live within the traditional territory inhabited at historic contact by their ancestors.

Historic Context

The following Historic Context section is taken from the "Cultural Resources Literature Search, Inventory, and National Register Evaluations for the Folsom Dam Safety and Flood Damage Reduction EIS/EIR, El Dorado, Placer, and Sacramento Counties, California" report completed by Pacific Legacy, Inc. (Bartoy 2007).

Exploration into the interior of present day California began in 1808 with an expedition led by the Spanish explorer Gabriel Moraga, looking for potential sites for new missions (Thompson and West 1880). The British, working for the Hudson's Bay Company based out of Fort Vancouver on the Columbia River, entered the region from the north via the Siskiyou Trail in the late 1800s (Dillon 1975). The Americans, led by Jedidiah Strong Smith in 1826, followed an overland route (Hurtado 1888:39-42). Smith led a small band of men across the Sacramento Valley in 1827, searching for a pass across the Sierra Nevada and camping at a site that is now part of the City of Folsom.

Fur Trappers were followed by military expeditions in the 1840s, charged with exploring the region in advance of American westward expansion. A detachment of the Wilkes expedition, led by Lt. George Foster Emmons, traveled from the Columbia River to Sacramento in 1841. John Charles Frémont led the Army Corps of Topographical Engineers into present day California in two separate expeditions in the 1840s.

The area surrounding Folsom Lake was first settled by Euro Americans following the discovery of gold at Coloma in 1848. This discovery led to an influx of miners who sought rich placer deposits along the American River and its tributaries. As new deposits were discovered, towns and camps were established near the discoveries and these quickly developed into communities to provide for needs of the expanding population. These communities included Mormon Island, Goose Flat, Alabama Bar, Sailor's Bar, Negro Hill, Salmon Falls, McDowell Hill, Beal's Bar, Condemned Bar, Doton's Bar, Long Bar, Horseshoe Bar, and Rattlesnake Bar (Hoover et al. 1966:300; Peak and Associates 1990:5; Waechter and Mikesell 1994:11-12).

Mormon Island, site of California's second important gold discovery, was one of the most prominent of these early communities. The camp was originally established on a gravel bar at the confluence of the North and South Forks of the American River. The settlement was located on a branch of the Coloma Road, the first route into the region which connected Sutter's Fort in Sacramento to his sawmill in Coloma. "By 1853, the camp had some 2,500 inhabitants and had three dry goods stores, five general merchandise stores, two blacksmith's shops, a bakery, saloons, hotels, schools, a post office, and express offices for both Wells Fargo & Company and Adams & Company" (Waechter and Mikesell 1994:12). As with the majority of the communities formed by miners, Mormon Island went into decline as nearby gold deposits were exhausted. By the 1880s, the population had dwindled to 20 and no residents were present when the town site was inundated by the Folsom Reservoir (Waechter and Mikesell 1994).

As hard rock and hydraulic mining replaced placer mining in the 1850s, the need for large amounts of water led to the construction of numerous dams, ditches, and flumes throughout the region. The largest and most prominent of these endeavors were undertaken by two joint stock companies: the Natomas Water and Mining Company, and the American River Ditch Company. Although several smaller companies were involved in the creation of water conveyance systems in the region, such as the Salmon Falls Water and Mining Company who constructed the Clark-Eastman Ditch, and the Negro Hill Ditch Company who constructed the Negro Hill Ditch, these operations were overshadowed by the large scale projects of the Natoma Water and Mining Company and the later American River Ditch Company.

First founded by A.P. Catlin in 1851 and later acquired by H.G. Livermore in 1862, the Natomas Water and Mining Company completed its first water conveyance from near Salmon Falls on the South Fork of the American River, to Granite City (Folsom) in 1854. That same year, several shareholders organized the American River Ditch Company to complete a similar project along the North Fork of the American River. Following the company's acquisition by Livermore in 1862, the company became increasingly interested in water development for industry as well as for logging. The Natomas Water and Mining Company spawned two additional entities under Livermore, the Folsom Water and Power Company, which promoted water-powered industry, and the American River Land and Lumber Company, which controlled the timber-related activities (Waechter and Mikesell 1994:10). As part of this move to water power and logging, the original Folsom Dam was completed in 1893.

Although mining continued in importance through the second half of the nineteenth century, the depletion of gold deposits led to an increased investment in other activities, most significantly agriculture. Initially developed for mining, the series of ditches and flumes throughout the area around Folsom Lake provided the necessary water to provide for the agricultural productivity of the region. In response to the switch from mining to agriculture, the Natoma Water and Mining Company as well as the American River Ditch Company organized several new companies, including the Natomas Vineyards Company and the North Fork Ditch Company. In the twentieth century, through a series of reorganizations and sales, the Natomas Water and Mining Company became simply the Natomas Company while the American River Ditch Company became the San Juan Suburban Water District (Waechter and Mikesell 1994).

As the twentieth century progressed, agriculture replaced mining as the dominant industry in the region. The ample supply of water and the rich soils of the area provided for the cultivation of grain, hay, wine grapes, oranges, and other fruits (Peak and Associates 1990:9). Although a small community existed at Salmon Falls, none of the numerous mining communities still existed in the area. By the early 1950s when the federal government acquired the land to create the present Folsom Reservoir, few people inhabited the region.

Folsom Dam was completed in 1956 and consists of a concrete dam flanked by earth wing dams and dikes, with a total length of approximately nine miles. The reservoir created by the dam has approximately 10,000 surface acres of water when full, and approximately 75 miles of shoreline. The reservoir extends approximately 15 miles up the North Fork and 11 miles up the South Fork of the American River. The Folsom Dam is part of the Central Valley Project, which includes a vast network of dams, reservoirs, canals, power plants, and pumping plants throughout California's Central Valley.

Records and Literature Search

An extensive records search of the APE was conducted at the California Historical Resources Information System, North Central Information Center, California State University, Sacramento, in December 2011. The Corps examined previously completed archeological survey and excavation reports, existing site records, and local and regional overviews within and adjacent to the Folsom Reservoir. All or portions of the APE have been surveyed in previous investigations, all consisting of various levels of intensity. In 2007, Pacific Legacy, Inc. (Bartoy et al) performed a cultural resource literature search, inventory, and NRHP evaluation in relation to proposed safety and flood control measures undertaken at Folsom Dam that covered much of the APE. The study area for the 2007 cultural resource inventory consisted of the footprints of Dike 1 through Dike 8, RWD, the area below LWD, and MIAD and is contained within the current APE. Also included in the survey were areas in which the contractor could potentially stage any equipment or materials. Both the records search and survey performed by Pacific Legacy, Inc. concluded with a finding of four cultural resources within the APE for that project, one of which was previously documented (Folsom Dam [CA-SAC-937H]), two that were newly identified (CA-SAC-944H and CA-SAC-945H), and the recordation of the Folsom Dam Dikes (CA-SAC-1103H).

Previously Documented Sites

Folsom Dam (CA-SAC-937H) was deemed eligible for listing on the NRHP (Corps 2006) under Criterion A with a period of significance of 1948 to 1956. Folsom Dam played an integral role in flood control, resulting in significant flood damage reduction for areas downstream, specifically the City of Sacramento. The dam was found not eligible under Criterions B, C, and D. CA-SAC-937H is currently in the process of being listed by Reclamation as a contributing element of the Central Valley Project Multiple Property Listing. Similar to CA-SAC-937H, Folsom Lake Dikes (CA-SAC-1103H), which includes Dikes 1 through 8 and MIAD, has been previously determined by Reclamation as eligible for listing in the NRHP under Criterion A.

Site CA-SAC-944H is located within the APE, within the proposed staging area for Dike 5. This site was originally documented by Reclamation (Welch 2005a) and has since been revisited by archeologists with Pacific Legacy, Inc. in 2006 (Bartoy, *et al*.) and 2007 (Jones) to assess eligibility for listing in the NRHP. The site is an early 20th century trash scatter with a four-walled concrete box structure appearing to serve as a water conveyance function in association with the San Juan Water District. The property was not found to meet any of the criteria for eligibility in its 2007 evaluation (Bartoy, *et al*. 2007a).

Another site located within the Dike 5 Staging area, Site CA-SAC-945H, is a water conveyance system likely constructed in the early 20th century. The site was first recorded by Reclamation (Welch 2005b) and has been revisited by Pacific Legacy, Inc. (Bartoy, *et al*. 2006b) as part of intensive survey and inventory efforts, then again to evaluate the property for listing in the NRHP (Bartoy, *et al*. 2007). Characteristics of the conveyance system included six trapezoidal supports, a concrete intake, and the extant remains of an earthen ditch. The property was not found to meet any of the criteria for eligibility in its 2007 evaluation (Bartoy, *et al*. 2007a).

Field Survey Results

After a thorough review of the records and literature available, Corps personnel conducted cultural resource surveys for the presence of cultural resources within the APE. Large portions of the APE had been previously investigated for the presence of cultural material. Subsurface testing was conducted within reaches of the APE where ground visibility was less than sufficient. Much of the areas within the APE were severely disturbed by construction activities associated with the construction of the reservoir. Historic photographs showed ground-disturbing activities involving heavy grading, road building, staging activities, vegetation removal and a batch plan operation had formally occurred in a majority of the APE (Corps 2004a). The cultural resource survey covered a total of 570 acres. No previously unknown cultural resources were identified during the cultural resource surveys. Existing cultural resources Folsom Dam (CA-SAC-937H), CA-SAC-944H, CA-SAC-945H, and Folsom Dam Dikes (CA-SAC-1103H) are the only known cultural resources within the current APE.

3.12.2 Methodology and Basis of Significance

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

- Specific changes in the characteristics of historic properties in the study area.
- The temporary or permanent nature of changes to historic properties and the visual 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.

Basis of Significance

Any adverse effects on cultural resources that are listed or eligible for listing in the NRHP are considered to be significant. Effects are considered to be adverse if they alter, directly or indirectly, any of the characteristics of a cultural resource that qualify that resource for the NRHP so that the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association is diminished.

In California, effects to a historic resource or unique archaeological resource are considered to be adverse if they materially impair the significance of a historical or archaeological resource.

3.12.3 Alternative 1: No Action Alternative

Under the No Action Alternative, the Federal government would not implement the emergency spillway gate modifications or the 3.5-foot raise, and, therefore, would not cause any additional effects to cultural resources. The conditions in the project area would remain consistent with current conditions. If a great enough flood event, or PMF, were to occur, the gates and dam would be at risk for failure, threatening the levee system downstream with a surge of flow beyond the current 160,000 cfs levee capacity and affecting the dam as a historic property. 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 failure in the system and the severity of the storm. As a result, a precise determination of adverse effect and the significance of the effect is not possible and cannot be made. Because of this uncertainty, this potential effect is considered too speculative for meaningful consideration. Additionally, without a Federal undertaking, under the No Action Alternative there would not be a lead Federal agency required to take into account the effects of a proposed undertaking on historic properties. No further action would be required by the Corps.

3.12.4 Alternative 2: Spillway Tainter Gate Modification and Combination Earthen Raise/Concrete Floodwall

The effects of the emergency spillway gate modification and 3.5-foot raise would result in no adverse effects to historic properties located within the APE for the project. There are four previously recorded sites within the APE. CA-SAC-944H is an early 20th century trash scatter and water conveyance structure associated with the San Juan Water District and was determined not eligible for listing in the NRHP in 2007. CA-SAC-945H is an early 20th century water conveyance system and was determined not eligible for listing in the NRHP in 2007. Reclamation submitted these determinations to SHPO, who concurred on July 5, 2007. No further evaluation or consideration of either CA-SAC-944H or CA-SAC-945H is required.

Folsom Dam, including the RWD and LWD (CA-SAC-937H) has been previously determined by the Corps as eligible for listing in the NRHP under Criterion A. SHPO concurred with this determination on June 26, 2006. Folsom Lake Dikes (CA-SAC-1103H), which includes Dikes 1 through 8 and MIAD, has been previously determined by Reclamation as eligible for listing in the NRHP under Criterion A. SHPO concurred with this determination on November 7, 2007. Any federal undertaking is required to determine if the action will result in an alteration, directly or indirectly, to any of the characteristics of these historic properties that qualify them for inclusion in the NRHP.

In accordance with 36 CFR § 800.5 (b) *Finding of no adverse effect,* the construction of the spillway tainter gate modification and combination earthen raise/concrete floodwall would result in no adverse effects to historic properties within the APE. Folsom Dam would undergo physical changes due to the spillway tainter gate modification. Refinements include additional strengthening features to the existing tainter gates and a new "top seal" bulkhead that will prevent overtopping of the spillway gates during a major flood event. These modifications constitute no adverse effect to the qualities that make Folsom Dam eligible for inclusion in the NRHP. Folsom Dam is eligible for inclusion in the NRHP under Criterion A, and the proposed spillway tainter gate modification will have no effect on the capacity of the dam to portray the broad patterns of our history. The proposed modifications, in fact, are designed to enhance the important function of this structure for the purposes of flood control, hydropower, and irrigation.

The RWD and LWD, which are a part of Folsom Dam, and Folsom Lake Dikes, would undergo physical changes due to the earthen raise and concrete floodwall construction. The appearance of Folsom Lake Dikes would be slightly altered by raising the height of the dikes by 3.5-feet and by changing the slopes of the dikes and crest widths to conform to Corps' standards while maintaining Reclamation's requirements for security and maintenance. Materials used for fill would be similar to the existing composition of the earthen dikes, and existing riprap would be reprocessed for use on the raised dike. These modifications constitute no adverse effect to the qualities that make Folsom Lake Dikes eligible for inclusion in the NRHP. Folsom Lake Dikes are eligible for inclusion in the NRHP under Criterion A, and the proposed earthen raise will have no adverse effect on the capacity of the dikes to portray the broad patterns of our history. The proposed modifications, in fact, are designed to enhance the important function of these structures for the purposes of flood control, hydropower, and irrigation.

The appearance of the RWD and LWD would be slightly altered by constructing a reinforced 3.5-foot concrete flood wall that would tie into the main dam, the new control structure, and the existing terrain. This would require excavating a portion of the dam or dike crest to place the footing and to replace the embankment fill. The flood wall would be constructed using cast-in-place, reinforced concrete. The construction of the flood wall constitutes no adverse effect to the qualities that make the RWD and LWD, as part of Folsom Dam, eligible for inclusion in the NRHP. Folsom Dam is eligible for inclusion in the NRHP under Criterion A, and the proposed flood wall will have no adverse effect on the capacity of the dam to portray the broad patterns of our history. The proposed modifications, in fact, are designed to enhance the important function of these structures for the purposes of flood control, hydropower, and irrigation.

The APE for the project also includes areas of ground disturbance, including staging areas, haul routes, recreation trails, and geotechnical borings. The vertical depth of disturbance caused by grading the existing ground for use, and in those areas where the footprint of Dikes 1, 2, 3, 7, and 8, will be expanded. The Corps has assumed potential disturbance of up to 3 feet within the APE where there are not currently built environment resources (Folsom Dam and Folsom Lake Dikes). Observations during the 2015 cultural resources surveys of the APE concluded that much of the areas within the APE were severely disturbed by construction activities associated with the construction of the reservoir. Shovel test pits conducted in areas exhibiting limited ground disturbance did not reveal the presence of any historic properties. As a result, the Corps has determined there will be no adverse effects to historic properties for the project.

3.12.5 Avoidance, Minimization, and Mitigation Measures

Folsom Dam (CA-SAC-937H) and Folsom Lake Dikes (CA-SAC-1103H) are the only known historic properties within the APE that could be potentially affected by the proposed project. Consultation with potentially interested Native Americans did not result in the identification of potential historic properties significant to tribes within the APE, although tribes have indicated that Folsom Lake and the surrounding area are sensitive for sites and locations of importance to them. The Corps' *Finding of no adverse effect* pursuant to 36 CFR § 800.5 (b) will be sent to SHPO for comment and concurrence. Based on these identification and evaluation efforts, there will be no adverse effects to historic properties and no mitigation, avoidance, or minimization measures will be required.

However, if archeological deposits or other potential historic properties are found during project activities, work would be stopped pursuant to 36 CFR § 800.13(b), *Discoveries without prior planning*, to determine the significance of the find and, if necessary, complete appropriate discovery procedures.

CHAPTER 4.0 - CUMULATIVE IMPACTS, GROWTH-INDUCING IMPACTS, AND OTHER REQUIREMENTS

NEPA and CEQA require the consideration of cumulative effects of the proposed action, combined with the effects of the projects. NEPA defines a cumulative effect as an effect on the environment that results from the incremental effects of an action when combined with other past, present, and reasonably foreseeable future actions, regardless of the agency (Federal or non-Federal) or person undertaking such other actions (40 CFR 1508.7). The CEQA Guidelines (CERES 2007) define cumulative effects as "two or more individuals effects, which, when considered together, compound or increase other environmental impacts" (Section 15355).

4.1 Methodology

The cumulative effects analysis determines the combined effect of the proposed project and other closely related, reasonably foreseeable projects. Cumulative effects were evaluated by identifying projects in and around the Folsom Dam vicinity that could have significant, adverse, or beneficial effects. These potential effects are compared to the potential adverse and beneficial effects of the proposed alternative to determine the type, length, and magnitude of potential cumulative effects. Mitigation of significant cumulative effects could be accomplished by rescheduling actions of proposed projects and adopting different technologies to meet compliances. Significance of cumulative effects is determined by meeting Federal and State mandates and specified criteria identified in this document for affect resources.

4.2 Geographic Scope

The geographic area that could be affected by project effects varies depending on the type of environmental resource being considered. An example is air and water resources as they extend beyond the confines of the project footprint; effects on these mediums would not necessarily be confined to the project area. When the effects of the project are considered in combination with those of other past, present, and future projects to identify cumulative effects, the other projects that are considered may also vary depending on the type of environmental effects being assessed. The following are the general geographic areas associated with the different resources addressed in the analysis:

- Air Quality: the air basin under the jurisdiction of SMAQMD as air quality lead.
- Climate Change: the air basin under the Jurisdiction of SMAQMD as air quality lead.
- Water Quality: Folsom Lake

- Fisheries: Folsom Lake
- Aesthetics and Visual Resources: the FLSRA and surrounding neighborhoods in the City of Folsom
- Recreation: the FLSRA
- Traffic and Circulation: the roadways in the project region where traffic generated by multiple projects would interact with the public on a cumulative basis.
- Noise: the area under the jurisdiction of the City of Folsom and Sacramento County.
- Cultural Resources: the APE, as described in Section 3.12, Cultural Resources.

4.3 Past, Present, and Reasonably Foreseeable Future Projects

The projects with the potential to contribute to cumulative effects during construction and operation of the Approach Channel Project are briefly described below. Each of these projects is, or has been, required by Federal, state, and/or local agencies to avoid, minimize, and/or mitigate any significant adverse effects on environmental resources to less than significant, when possible. Those effects that cannot be reduced to less than significant are likely to have a greater cumulative effect. Sequencing and timing of construction for the projects would also affect the cumulative effects.

4.3.1 Folsom Joint Federal Project Activities

Due to the fact that the Join Federal Project (JFP) is a multi-phased, accelerated effort, overlapping construction efforts would occur adjacent to and in the vicinity of the project area throughout the course of construction of the Folsom Dam Raise Project. The concurrent activities onsite include both the various aspects of the Approach Channel work upstream of the control structure, as well as other phases of the JFP to be constructed by both the Corps and USBR. The Folsom Dam Raise Project construction would be calendar years 2017 through 2020. Other activities associated with the Folsom JFP are discussed below.

Phase 1 of Folsom JFP Auxiliary Spillway

Winter 2007 to Sept 2008 included the initiation of the spillway excavation and construction of MIAD haul road, as well as installation of filter material in the top 20 ft of the LWD and RWD. This Phase 1 work was completed under USBR contract as part of JFP project.

Pier Tendon Installation, Spillway Pier Wraps, and Braces and 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 is covered under the 2007 FEIS/EIR.

Folsom Dam Modification Project 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 would 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. These sites and facilities are connected by an internal project haul road. Criteria pollutant emissions from the Approach Channel Project and the downstream project would be less than significant for ROG, CO, SO_2, and $PM_{2.5}$, and less than significant with mitigation for PM_{10}. NO_x exceeds the GCR *de minimis* threshold but would be addressed by inclusion in the State Implementation Plan, which would provide compliance with the GCR of the Federal Clean Air Act. The supplemental FEIS/EIR was released for public review in December 2012.

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 is covered under the 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.

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 would be complete approximately Fall 2014. Concrete lining of the spillway chute and stilling basin would be conducted by the Corps as the final phase of the JFP. These actions would be constructed from approximately Summer 2013 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 (Corps 2010).

Dike 1 Modification Project

Winter 2014 to Spring 2015. The Dike 1 Modification is a portion of the Folsom Dam Safety Project that was approved in 2005 to address seepage exiting from downstream of Dike 1. Reclamation concluded that the seepage is likely occurring through the foundation and is being collected by the downstream horizontal blanket drain and exiting onto the ground surface at the toe. Modifications to Dike 1 include constructing a downstream overlay with sand chimney filter and toe drain to prevent internal erosion under flood loading conditions.

4.3.2 Folsom Dam Water Control Manual Update

The Water Control Manual Update is being completed in conjunction with the JFP by the Corps, USBR, CVFPB, and SAFCA. The Water Control Manual Update for Folsom Dam would develop, evaluate, and recommend changes to the flood control operations at Folsom Dam that would further reduce flood risks to the Sacramento area. Operational changes may be necessary to fully realize the flood risk reduction benefits of the following:

- The additional operational capabilities created by the auxiliary spillway.
- The use of improved forecasts from the National Weather Service.

Further, the Water Control Manual Update would 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 potential for improved releases for fish flows, and possibly increased flexibility of water storage during drought periods. The study would result in a Corps decision document and would be followed by a water control manual implementing the recommendations of the Study. It should be recognized that the initial water control manual would implement the recommendation of the study but would not include the capabilities to be provided by the Dam Raise and additional Common Features project improvements until such time as these projects have been completed.

4.3.3 Other Projects

Dike 4, 5, and 6 Repairs, USBR Dam Safety

Summer 2009 to October 2010. To address seepage concerns due to static and hydrologic loadings 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 is covered under the 2007 Folsom Dam Safety and Flood Damage Reduction Project EIS/EIR (2007 EIS/EIR).

Mormon Island Auxiliary Dam Modification Project

The project has been underway from Summer 2010 to December 2015. USBR released the Draft EIS/EIR for the MIAD Modification Project in December 2009. Four action alternatives were analyzed in the MIAD Draft Supplemental EIS/EIR. The preferred MIAD action alternative of jet grouting selected in the FEIS/EIR was determined to be neither technically nor economically feasible. The preferred alternatives addressed 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 methods of excavation. In addition, the alternative in the Final 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.

Johnny Cash Folsom Prison Blues (Folsom Lake) Trail: Historic Truss Bridge to Green Valley Road Segment

This project is planned to provide approximately 2.5 miles of Class I bike trail from the Historic Truss Bridge to Green Valley Road. A majority of the trail alignment would be within the Folsom Prison property. The project is broken into three major segments consisting of:

- Phase 1 – Folsom Lake Crossing bike/pedestrian overcrossing to the Hancock Drive intersection (currently under construction).
- Phase 2 – Folsom Prison entry road to Rodeo Park (existing trail end).
- Phase 3 – Hancock Drive intersection to the Folsom Prison entry road.
- Phase 4 – Folsom Lake Crossing bike/Pedestrian overcrossing to the El Dorado County Line

Incorporation of a separated grade crossing at the new Folsom Lake Crossing/East Natoma Street realignment was included within the new bridge crossing construction. Construction began in 2011, with continued work expected through the early years of the Folsom Dam Raise project.

Widening of Green Valley Road

Green Valley Road runs between both the City of Folsom and El Dorado County. Both agencies have proposed projects to widen Green Valley Road from two to four lanes. The El Dorado County Green Valley Road widening project from the county line to Francisco Drive was constructed prior to 2009, with environmental mitigation to be completed from 2009 to 2012 (El Dorado County 2010). The City of Folsom plans to widen Green Valley Road; however, the ongoing construction of the Bureau's MIAD Modification Project limits their ability to conduct the road widening project. There is currently an environmental compliance documentation but no construction schedule for the project within the City of Folsom. The project could take four years to construct.

El Dorado 50 – HOV Lanes

California Department of Transportation would construct bus-carpool (HOV) lanes in the eastbound and westbound directions by widening U.S. Highway 50 from approximately El Dorado Hills Boulevard to just west of Greenstone Road. The project would ultimately extend the current HOV lane system to provide approximately 23 continuous miles of eastbound and westbound HOV lanes between Sacramento and El Dorado counties. The project also includes bridge modification, lighting improvements, and new asphalt overlay. The project would be constructed in three phases: Phase 1 would extend the current HOV lanes from their existing terminus west of El Dorado Hills Boulevard, to west of Bass Lake Road with construction started in fall 2008 and completion scheduled for fall 2011; Phase 2 would extend the lands from west of Bass Lake Road to approximately Ponderosa Road with construction targeted to begin in Summer 2013 and completion in Fall 2015; Phase 3, currently on hold pending determination of funding source, would extend the lands from Ponderosa Road to Greenstone Road (Caltrans 2012).

Hazel Avenue Improvement Project

Sacramento Department of Transportation completed Phase 1 of the Hazel Avenue Improvement Project. The primary portion of Phase 1 involved the widening of Hazel Avenue from four to six lanes over the American River Bridge from U.S. 50 to Curragh Downs Drive. Construction was completed in 2010. Phase 2 of the Hazel Avenue Projects includes widening Hazel Avenue from four to six lanes from Curragh Downs Drive to Madison Avenue. This phase would also include traffic signal modification at Curragh Downs Drive, Winding Way, La Serena Drive, the fire station at Roediger Lane, and a new signal at Phoenix Avenue. Construction of Phase 2 is targeted to begin in 2015 with completion in 2017.

4.4 Cumulative Effects

This section discusses the potential cumulative effects of the Folsom Dam Raise Project 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, that resource is not addressed.

Resources include recreation, vegetation and wildlife, special status species, water quality, air quality, climate change, aesthetics and visual resources, traffic and circulation, noise, and cultural resources.

4.4.1 Air Quality

The Folsom Dam Raise Project's construction period (2017-2021) would overlap with other JFP construction activities, including the Approach Channel Project (2012-2017) and the control structure, chute, and stilling basin projects (2010-2016). These other activities are considered to be a codependent project subject to evaluation for the General Conformity Rule by the USEPA.

Other concurrent projects are considered discrete projects outside the consideration of the general conformity ruling for the Folsom Dam Raise Project. Long-term emissions associated with the completion of the JFP would be analyzed in associated environmental documents, such as the Folsom Dam Modification Project Approach Channel Supplemental EIS/EIR and the 2007 Folsom Dam Safety and Flood Damage Reduction Project EIS/EIR. However, it is anticipated that any long-term emissions associated with operations of the auxiliary spillway would be below State and Federal thresholds and would not significantly contribute to the overall cumulative impacts.

Combined JFP Analysis

This section discusses the quantitative analysis of the cumulative short-term air quality effects of the Folsom Dam Raise Project alternatives in combination with the other features of the JFP. Qualitative discussions of the cumulative effects of the Approach Channel Project and the other projects identified in Section 4.3 are also included. Prior cumulative air quality effects from the 2007 EIS/EIR did not address the Folsom Dam Raise Project alternatives and other regional projects in depth. Air emission models, project elements, the NOx *de minimis* threshold, and resulting calculated emissions differed substantially between the 2007 EIS/EIR and the current JFP project.

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 less than significant. With the exception of the Folsom Dam Water Control Manual 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.

It is likely that the Dam Raise Project would be constructing at the same time as the Folsom Dam Modification Project Approach Channel and the post-construction restoration. It would be necessary to ensure that the projects are not constructing sites in close proximity to one another at the same time. However, on a regional level, these projects would still contribute to a significant cumulative effect and coordination with the SMAQMD and USBR would need to occur prior to construction to reduce these effects.

4.4.2 Climate Change

It is unlikely that any single project by itself would 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, has 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 would 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.

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 reporting requirements for GHG emissions. However, with the implementation of mitigation measures, which would be required for each of these projects, it is possible that the effects could be reduced to less than significant.

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. As a result, the related projects could combine to reduce long-term potential GHG emissions in the Sacramento region. As a result, the overall cumulative GHG emissions from these projects are considered to be less than significant.

4.4.3 Aesthetics and Visual Resources

Cumulative impacts to aesthetics and visual resources are primarily related to other construction projects that have already occurred or could occur in the future within the vicinity of the study area and result in loss of visual quality both during and after construction. There would be some overlap with the construction of other projects as mentioned above (*e.g.* Folsom Dam Modification Project Approach Channel). Concurrent construction of the Folsom Dam Raise Project would result in short-term cumulative effects in the visual resources in the project area. Additional vegetation clearing, earth moving, construction equipment, and stockpile from the projects could contribute to a larger, temporary overall visual impact. However, cumulative effects are expected to be less than significant because Folsom Lake's southern shoreline is of low visual quality and other large man-made features (such as the main dam) are already well established in the landscape.

4.4.4 Water Quality

Water quality to be affected within the actual construction area. Construction activities such as rock placement, clearing and grubbing, and slope realignment 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 American River Common Features and the Folsom Dam Modification Project Approach Channel, could be under construction during the same timeframe as the Folsom Dam Raise 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 would be required to meet the Basin Plan objectives. These projects, however, would culminate in long-term beneficial impacts for flood damage reduction and dam safety. There are no anticipated long-term water quality affects with the implementation of multiple projects.

4.4.5 Recreation

Cumulative impacts to recreation were primarily related 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. At the time of this analysis, some projects have the potential to increase recreational access on a long-term basis (*e.g.* Johnny Cash Folsom Prison Blues (Folsom Lake) Trail), and some have the potential to have short-term impacts (*e.g.* Folsom Dam Modification Project Approach Channel). The Johnny Cash Folsom Prison Blues (Folsom Lake) Trail would increase bicycle and pedestrian access from the Historic Truss Bridge to Green

Valley. Future construction of the bike trail has the potential to have a significant, long-term positive effect upon recreation and public access to the FLSRA.

The Mormon Island Auxiliary Dam Modification is currently being constructed and is schedule to be completed in December of 2015. This project would produce short-term impacts to recreation. The Folsom Dam Modification Project Approach Channel started in 2013 and is going to continue through 2017, therefore the construction periods of these projects and the Folsom Dam Raise Project would overlap. The Approach Channel would impact water-based activities during the construction period. The trails atop MIAD and the associated parking lots would be closed to the public during construction due to potential public safety hazards at the construction site. Visitors would need to park at Brown's Ravine or find alternate parking areas. While these projects would have a cumulative effect on recreation, the Folsom Dam Raise Project would only temporarily impact land-based activities, whereas the Approach Channel construction would impact water-based activities. Because the projects affect different recreation activities, and the Folsom Dam Raise Project and MIAD Modification Project impacts would be temporary, it is not expected that visitation would be substantially reduced and cumulative effects are considered less than significant.

4.4.6 Vegetation and Wildlife

Implementation of the Folsom Dam Raise Project has the potential to remove large amounts of vegetation within the project area. The Folsom JFP, the MIAD Modification Project, and the Folsom Dam Modification Project Approach Channel Project would also require the removal of habitat within the Folsom area. These affects, along with the historical decline of vegetation due to urbanization, would result in significant cumulative effects.

The avoidance, minimization, and mitigation measures would be implemented in accordance with the recommendations of the Coordination Act Report for the Dam Raise Project. Additionally, all the projects would include avoidance, minimization, and mitigation measures. However, potential adverse effects on biological resources would remain significant due to the amount of habitat being removed to construct these projects and the time lapse before 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 vegetation and wildlife would be less than significant, but the temporary loss of vegetation along the levees would be significant. There is no designated critical habitat for VELB in the project area.

4.4.7 Sensitive Species

Potential cumulative impacts from the combination of these projects to each of the listed species included in this consultation are below. During preconstruction engineering and design, the Corps designs would avoid impacts to special status species, where possible, or otherwise minimize effects to each of these species.

Valley Elderberry Longhorn Beetle

Concurrent construction of multiple projects over the next 10 to 15 years within the Sacramento 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 each past, current, and potential future project footprints at Folsom Lake would be transplanted to areas in close proximately to the current locations as needed and required by USFWS. Additionally, compensation would be located within the vicinity of impacted shrubs. Transplanting of shrubs and planting of seedlings and native plant species 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 of the beetle. The transplanting of shrubs and compensation within the same area as the potential impacts would result in effects to the beetle but not result in permanent jeopardy to the Valley Elderberry Longhorn Beetle.

Bald Eagle

Concurrent construction of multiple projects over the next 10 to 15 years within the Sacramento area would not likely cause any impacts to the bald eagle. The Folsom Dam Project area for the Folsom Dam Raise and many other concurrent projects (e.g. the Approach Channel and the MIAD Modification Project) are all highly disturbed areas and do not provide quality habitat for the eagle. No critical habitat has been designated for this species and the proposed project would not have a direct or indirect effect on the growth, survival, or reproductive success of the bald eagle. There would be no cumulative effects caused by the Folsom Dam Raise project.

Swainson's Hawk

Concurrent construction of multiple projects within the Folsom Lake area would not likely cause any impacts to the Swainson's hawk. The Swainson's hawk is known to occur in the vicinity Folsom Dam and Reservoir, thus could be a concern for many of the projects in the area. However, there have been no recorded nesting sites above the Nimbus Dam on the American River. In addition, the staging and construction areas for this project and others in progress, or areas planned for the future, are highly disturbed and do not provide high quality habitat for this species. No critical habitat has been designated for this species, and the proposed project would not have a direct or indirect effect on the growth, survival, or reproductive success of the Swainson's hawk. There would be no cumulative effects caused by the Folsom Dam Raise project.

4.4.8 Traffic and Circulation

There are several short-term projects that have the potential to effect traffic. The Hazel Avenue Improvement Project, the widening of Green Valley Road, and the Folsom Bridge Project are completed projects that have benefited traffic volumes. There is potential for future projects in the vicinity of Folsom Lake to affect traffic, and some would be constructed concurrently with the proposed action. The Approach Channel and the MIAD Modification Projects, both in progress, have had some temporarily increased traffic levels from the transport of materials and the labor force's shift work. Construction of the proposed project would temporarily increase traffic on some local, regional roadways.

While there would be a cumulative effect of the concurrent projects impacts on freeways and other regional roadways, these roadways are designed to handle increased traffic loads and the effect would be less than significant. There is enough distance in time between other local projects that impacts to local roadways would not create a significant cumulative effect. With the implementation of avoidance and minimization measures, the project is not expected to result in a cumulatively considerable increase of traffic and be less than significant. This is pending final routes being identified and analyzed, and would be included in a subsequent environmental document, if needed.

4.4.9 Noise

There is the potential for future construction activities in the vicinity of the Folsom Dam and Reservoir to be constructed concurrently with the proposed action and other concurrent projects. This project and other local projects would result in temporarily increased levels of ambient noise in the study area. Simultaneous construction of projects would increase noise levels from the onsite construction and the transport of materials. However, the effects would be limited to the people in the immediate proximity to the construction sites and none of the local projects are in close enough proximity to the various proposed construction sites to create a cumulative effect. If there are any projects constructing within audible distance from one another, the USACE and BOR teams for these projects would coordinate to ensure that both projects are not constructing at the same time. With this coordination, there would be no cumulative effects due to noise in the study area.

4.4.10 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 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. For this project, the Corps has determined there will be no adverse effects to historic properties. Federal undertakings are required to avoid, minimize, and/or mitigate any significant adverse effects on cultural resources. At the time of this analysis, there are several ground disturbing construction projects anticipated that could result in adverse effects to historic properties that have not yet been identified as part of those projects. As a result, the cumulative overall impact to non-renewable cultural resources is possible, as well as significant and unavoidable. Individual projects would implement separate mitigation measures that would address the effects caused by these projects. Although mitigation would minimize these impacts, there is still a possible significant cumulative effect to cultural resources.

4.5 Growth Inducing Impacts

NEPA and CEQA both require a discussion on 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 employments) 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 study area, growth and development are controlled by the local governments of the City of Folsom, and Sacramento, El Dorado, and Placer Counties. Consistent with California law, each of these local governments has adopted a general plan and each general plan provides an overall framework for growth and development within the jurisdiction of each local government. Local, regional, and national economic conditions also directly affect growth and development.

The alternatives currently being considered for the Folsom Dam Raise Project would not contribute directly to population or economic growth as no additional housing or businesses would be built. However, the overall Folsom Dam Safety and Flood Damage Reduction Project (including the JFP and other aspects of the Folsom Dam project) would generate additional economic benefits during construction and would contribute to greater flood risk management for the Sacramento area once complete. The potential for any growth-inducing effects associated with the overall JFP were analyzed under the 2007 FEIS/EIR (USBR 2007).

The Folsom Dam Raise Project is of a limited scope and would not promote or contribute to any regional economic or population growth. Any future local growth would be consistent with the local general plans, as described above.

4.6 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 effects on the environment that cannot be avoided if the project is implemented." Chapter 2 provides a detailed analysis of all potentially significant environmental impacts of the Folsom Dam Raise 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 above. If a specific impact cannot be reduced to less than significant level, it is considered a significant and unavoidable impact.

The Folsom Dam Raise would have the following significant and unavoidable environmental effects (direct, indirect, and/or cumulative):

- Traffic on public roadways;
- Some loss of vegetation and wildlife habitat along the dikes;
- Potential loss/removal of elderberry shrubs;
- Noise
- Temporary closure of recreation facilities including bike and walking trails during construction;

4.7 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 environmental 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, increased air emissions, ambient noise level, and dust, yet are not expected to alter the long-term productivity of the natural environment. Project implementation would also result in long-term effects, including changes in visual resources, however minimal.

Project implementation would contribute to long-term productivity of the environment by improving the dike system and the spillway gates that maintain flood protection to the downstream area by reducing the overall flood risk.

The long-term beneficial effects of the project would outweigh its potentially significant short-term impacts to the environment.

4.8 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 a permanent loss of the 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 the project construction and maintenance, including the following:

- Construction materials, including such resources as soil and rocks;

- Land and water area committed to new/expanded projects facilities; and

- Energy expended in the form of electricity, gasoline, diesel fuel, and oil for equipment and transportation vehicles that would be needed for project construction, operation, and maintenance.

The use of these nonrenewable resources is expected to account for only a small portion of the region's resources and would not affect the availability of these resources for other needs within the region. Construction activities would not result in inefficient use of energy or natural resources.

As described throughout this DSEIS/SEIR, without implementation of the Folsom Dam Raise Project, the reduction of flood risk benefits would remain. While a precise quantification of impacts associated with flood risk reduction is not possible, there is a potential for a variety of impacts. Flooding and the resulting emergency and reconstruction efforts could expend more energy, overall, than with construction of the Folsom Dam Raise 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 during a flood event 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 repair and/or 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.

CHAPTER 5.0 - COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

This chapter summarizes the environmental laws and regulations that apply to the Folsom Dam Raise Project and describes the status of compliance with those laws and regulations. The project would not only comply with the Federal environmental laws and regulations, but would comply with all state, regional, and local laws, regulations, and ordinances.

5.1 Federal Laws, Regulations, and Policies

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

Partial compliance. The Federal 1970 Clean Air Act (CAA) authorized the establishment of national health-based air quality standards, and also set deadlines for their attainment. The Federal Clean Air Act Amendments of 1990 (1990 CAA) made major changes in deadlines for attaining National Ambient Air Quality Standards (NAAQS). State and local agencies, within areas that exceed the NAAQS, are required to develop state implementation plans (SIPs) to show how they would 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, SO2, PM10, PM2.5, and Pb.

Pursuant to CAA Section 176(c) requirements, USEPA promulgated the General Conformity Rule which applies to the most federal actions, including the Folsom Dam Raise Project. The General Conformity Rule is used to determine if Federal actions meet the requirements of the CAA and applicable SIPs 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 would 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 Folsom Dam Raise Project, the entire construction footprint of Dikes 1 through 8, the LWD, RWD, and MIAD, along with the Emergency Spillway, were analyzed under the CAA. For this footprint, emissions associated with the dike raises, the concrete floodwalls, and the emergency spillway modifications construction equipment were analyzed to determine the worst case scenario for air quality impacts. The analysis conducted determined that the emissions associated with construction of this action would be above the *de minimis* level. These emission reductions were incorporated into the project analysis. Even with implementation of mitigation measures identified in Section 3.6, emissions would not be reduced below the USEPA's general conformity *de minimis* threshold. Based upon preliminary analysis of air quality effects from the proposed action, it was evident that mitigated construction actions would result in exceeding SMAQMD standards for NOx, and CO_2. Compliance with the CAA would be accomplished with the completion of a General Conformity Analysis, or with the inclusion in the State Implementation Plan.

Federal Sustainability in the Next Decade, Executive Order 13693, March 19, 2015

Full Compliance. Signed on March 15, 2015, Federal agencies are directed to promote building energy conservation, efficiency, and management, and reduce energy use by vehicle fleets. Federal agencies shall also reduce greenhouse gas emissions and increase water efficiency in industrial, landscape, agricultural and potable water uses. Specific percentage goals by year are established. The Corps is requiring lower emission producing equipment for use in construction.

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

Partial Compliance. The potential effects of the proposed project on water quality have been evaluated and are discussed in Section 3.11. Prior to construction, the contractor would prepare and implement a Stormwater Pollution Protection Plan (SWPPP). The SWPPP would help identify the sources of sediment and other pollutants, and establish BMPs for storm water and non-storm water source control and pollutant control. Additionally, compliance with the CWA would be accomplished by obtaining certification through the CVRWQCB and internally through the Corps. As part of the permits, contractors would be required to implement best management practices to avoid and minimize any adverse effects of construction on surface waters. The following National Pollutant Discharge Elimination System (NPDES) permits would be obtained:

1. Storm Water Permit: NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities.

2. Industrial Storm Water Permit: NPDES General Permit for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities.

3. Limited Threat Discharge Permit: NPDES Permit for Limited Threat Discharges of Treated/Untreated Groundwater to Surface Water.

Once the work is completed, the contract would submit a Notice of Termination in order to terminate coverage by the NPDES permit. As there is currently no in-water disposal areas, 404(b)(1) would not be necessary. However, if project changes allow for the need of lakeside disposal areas, a 404(b)(1) would be completed by the Corps.

Clean-fuel Vehicle Tailpipe Emission Standards for Light-Duty Vehicles and Light-duty Trucks (40 CFR 88.104-94)

Full compliance. A light-duty vehicle or light-duty truck will be considered as a TLEV, LEV, ULEV, or ZEV if it meets the applicable requirements of the emission standards. Vehicles for the project would meet the standards as defined by 40 CFR 88.104-94.

Endangered Species Act of 1973, as amended (16 U.S.C. 1531. et seq.)

Partial Compliance. A list of the threatened and endangered species that have the potential to occur in the Folsom area was obtained USFWS on January 21, 2015. Based on the analysis contained in this document, the Corps has determined that the project has the potential to affect the Federally-listed Valley Elderberry Longhorn Beetle if the work on Dikes 1, 5, 6, and the Right Wing Dam are to be done. If the proposed work is to move forward, the Corps would initiate consultation with USFWS under Section 7(a) of the Endangered Species Act to assess the impacts to VELB and determine appropriate mitigation measures. Either USFWS consultation and/or receipt of a Biological Opinion or letter of concurrence, or the decision to eliminate this work, would constitute full compliance with this law. There are no additional potential effects to Federally-listed species beyond the VELB and elderberry shrubs in the mentioned locations.

Executive Order 11988: Flood Plain Management

Full Compliance. The objective of this E.O. is to avoid, to the extent possible, any long term and short-term adverse effects associated with the occupancy and modification of the base floodplain (1% annual event), and to avoid direct and indirect support of development in the base floodplain wherever there is a practicable alternative. While the proposed project reduces flood risk to the population in the study area, it also removes an obstacle to growth for portions of the study area that are slated for redevelopment and are within the base floodplain. The Dam Raise, in combination with other area flood risk reduction projects, protects the existing urban population of the greater Sacramento area. Modifying existing structures such as the Folsom

Facility was determined to be the only practicable alternative to address the specific dam safety and flood management issues at Folsom. There is no practicable alternative that does not indirectly induce development in the flood plain by removing flood risk as an obstacle to growth, therefore the project is in compliance with the E.O.

Executive Order 11990: Protection of Wetlands

Full Compliance. Executive Order 11990, signed May 24, 1977, directs all Federal agencies to refrain from assisting in or giving financial support to projects that encroach on publicly or privately owned wetlands. It further requires that Federal agencies support a policy to minimize the destruction, loss, or degradation of wetlands. A project that encroaches on wetlands may not be undertaken unless the agency has determined that 1) there are no practicable alternatives to such construction, 2) the project includes all practicable measures to minimize harm to wetlands that would be affected by the project, and 3) the effect would be minor.

During a 2014 survey, less than 1 acre of seasonal wetland habitat was identified adjacent to the project area to the west of Dike 6. No other wetlands were identified throughout the rest of the project area during this survey. These wetlands would not be directly impacted by any project activities. There is the potential for fugitive dust to affect the wetlands; however, dust suppression measures would be implemented throughout project construction. With the implementation of the dust suppression measures listed in Section 3.4, there would be no adverse effects to wetlands in the vicinity of the project area.

Executive Order 12989, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.

Full Compliance. This Executive Order 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 proposed construction project is located on public lands and is not located near any minority or low income communities. The benefits of the Dam Raise would extend to all areas of the greater Sacramento area; therefore it would not provide disproportionate burdens, benefits, or effects to any minority or low income populations and is in compliance with this Executive Order.

Executive Order 13112: Invasive Species

Full Compliance. Executive Order 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 Executive Order 13112 and to prevent the introduction and spread of invasive species (National Invasive Species Council 2008). Executive Order 13112 requires consideration of invasive species in NEPA analyses, including their identification and distribution, their potential effects, and measures to prevent or eradicate them.

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

Full Compliance. There are no designated prime or unique farmlands within the project area; therefore there would be no adverse effects to farmland and the project is in compliance with this Act.

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

Partial Compliance. Federal agencies undertaking water projects are required to fully consider recommendations made by the USFWS in the provided Coordination Act Report (CAR) or Planning Aid Letter associated with the project. USFWS and CDFG have participated in evaluating the proposed project, and USFWS has prepared a preliminary draft CAR which accompanies this document (Appendix E). Inclusion of the final CAR and consideration of USFWS recommendations would accomplish full compliance with this law

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

Full Compliance. The Migratory Bird Treaty Act implements various treaties and conventions between the United States, Canada, Japan, Mexico, and Russian, providing protection for migratory birds as defined in 16 U.S.C. 715j. The proposed action is located in an ongoing construction area, which has been active since 2008. There is potential nesting habitat located in the woodland (oak) habitat scattered throughout the project footprint. The project is in a very urbanized area 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 site. If breeding birds are found in the area, a protective buffer would be delineated and USFWS and CDFG would be consulted for further actions.

National Environmental Policy Act of 1969, as amended (42 U.S. C. 4321, et seq.)

Partial Compliance. NEPA applies to all Federal agencies and most of the activities they manage, regulate, or fund that affect the environment. This act requires full disclosure of the environmental effects, alternatives, potential mitigation, and environmental compliance procedures of proposed actions NEPA requires the preparation of an appropriate document to ensure that Federal agencies accomplish the law's purposes. This draft DSEIS/SEIR constitutes partial compliance with NEPA. Full compliance would be achieved when the final SEIS/EIR is filed with USEPA and the Corps issues a Record of Decision.

Noise Control Act of 1972, as amended (42 U.S.C. 4901 et seq.)

Full Compliance. Inadequately controlled noise presents a growing danger to the health and welfare of the Nation's population, particularly in urban areas. The major sources of noise include transportation vehicles and equipment, machinery, appliances, and other products in commerce. The Noise Control Act of 1972 establishes a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. The Act also serves to (1) establish a means for effective coordination of Federal research and activities in noise control; (2) authorize the establishment of Federal noise emission standards for products distributed in commerce; and (3) provide information to the public respecting the noise emission and noise reduction characteristics of such products.

While primary responsibility for control of noise rests with State and local governments, Federal action is essential to deal with major noise sources in commerce, control of which requires national uniformity of treatment. EPA is directed by Congress to coordinate the programs of all Federal agencies relating to noise research and noise control.

Title 23 of the U.S. Code (USC)

Federal statutes specify the procedures that the U.S. Department of Transportation must follow in setting policy regarding the placement of utility facilities within the rights-of-way of roadways that received Federal funding. These roadways include expressways, most State highways, and certain local roads. In addition, 23 USC 116 requires State highway agencies to ensure proper maintenance of highway facilities, which implies adequate control over non-highway facilities such as utility facilities. Finally, 23 USC 123 specifies when Federal funds can be used to pay for the costs of relocating utility facilities in connection with highway construction projects.

Title 23 of the Code of Federal Regulations (CFR)

Federal Highway Administration (FHWA) regulations require that each state develop its own policy regarding the accommodation of utility facilities within the rights-of-way of such roads. After FHWA has approved a state’s policy, the State can approve any proposed utility installation without referral to FHWA, unless utility installation does not conform to the policy.

Federal regulations do not dictate specific levels of operation or minimum delays, however, which are primarily established by local jurisdiction.

National Historic Preservation Act of 1966, as amended (16 U.S.C. 470)

Partial Compliance. Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to take into account the effects of a proposed undertaking on properties that have been determined to be eligible for, or included in, the National Register of Historic Places (NRHP). If cultural resource(s) have been identified during a survey, 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 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, the Corps has determined that in accordance with 36 CFR § 800.5 (b) *Finding of no adverse effect*, the construction of the spillway tainter gate modification and combination earthen raise/concrete floodwall would result in no adverse effects to historic properties within the APE.

SHPO Consultation

In a letter dated March 3, 2015, the Corps initiated consultation with SHPO, informing SHPO of the proposed project and asking for comments on and concurrence with the determination of the APE, and comments on the proposed efforts to identify historic properties within the APE. In an email dated March 6, 2015, SHPO responded that they would wait to comment until the Corps submitted a document that fully addresses the identification efforts and results. The cultural resources survey report documenting the identification and evaluation efforts, as well the *Finding of no adverse effect* pursuant to 36 CFR § 800.5 (b), will be sent to SHPO requesting their concurrence with the Corps' determinations. Correspondence with SHPO is included in Appendix I.

American Indian Consultation

As part of the Section 106 process, the Corps is required to identify Native American Tribes that attach cultural affiliation to historic properties that may be affected by the proposed undertaking (36 CFR Part 800.3(f)(2). As part of 36 CFR Part 800.4(a)(4), the Corps has consulted with and is presently consulting with the Wilton Rancheria, the Tsi-Akim Maidu of the Taylorsville Rancheria, the Shingle Springs Band of Miwok Indians, and the United Auburn Indian Community of the Auburn Rancheria in an effort to identify sites of religious and cultural significance that may be affected by the proposed undertaking. A detailed consultation log is included in Appendix I. If historic properties are identified during this consultation process, and if the proposed undertaking results in adverse effects to the identified historic properties, then the Corps will work with appropriate Native American Tribes and SHPO to mitigate adverse effects to those resources.

Compliance with Section 106

In accordance with 36 CFR § 800, the implementing regulations of Section 106 of NHPA, the Corps has determined that the project will result in no adverse effects to historic properties. The Corps has consulted with interested parties, SHPO, and Native American tribes and individuals in the Section 106 compliance process. The Corps will submit the finding of no adverse effects to historic properties to SHPO for concurrence, after which the Corps will be in compliance with Section 106.

Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 et seq.)

Full compliance. In the unlikely event that human remains are encountered, all activities in the vicinity of the discovery will cease immediately and a Reclamation official will be contacted immediately. The Reclamation official will ensure the appropriate officials are contacted, including contacting Reclamation's Regional Law Enforcement Officer. If the remains are skeletal, the Reclamation official will immediately notify Reclamation's Regional

Archaeologist. Information regarding the discovery, including contents and location, will be kept confidential and relayed only to responsible officials. Human remains will be treated with respect, will not be disturbed, and must be protected as necessary to lessen further exposure or impacts. Photographs will not be taken and no postings on social media is permitted. Ongoing activities in the vicinity of the discovery will not proceed until Reclamation provides authorization to proceed.

Reclamation will be responsible for identification of skeletal human remains as Native American. Inadvertent and unpermitted discoveries of Native American human remains and Native American funerary objects, sacred objects, and objects of cultural patrimony discovered on Federal land are subject to the Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. 3001 et seq.) and the implementing regulations at 43 CFR Part 10. Reclamation is responsible for compliance with NAGPRA and for conducting tribal consultations. Under NAGPRA, the discovery and location of human remains is confidential and will not be shared with anyone, especially the press or social media, who is not a designated official.

5.2 State of California Laws, Regulations, and Policies

Alquist-Priolo Earthquake Fault Zoning Act

Full compliance. The Alquist-Priolo Earthquake Fault Zoning Act (California PRC Sections 2621-2630 was passed by the California Legislature in 1972 to mitigate the hazard of surface faulting to structures. The Act's main purpose is to prevent the construction of buildings used for human occupancy on the surface tract 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. The Folsom Dam Raise Project does not contain any Alquist-Priolo Earthquake Fault Zones.

Assembly Bill 52

In September of 2014, the California Legislature passed Assembly Bill (AB) 52, which added provisions to the Public Resources Code regarding the evaluation of impacts on tribal cultural resources under CEQA, and consultation requirements with California Native American tribes. In particular, AB 52 now requires lead agencies to analyze project impacts on "tribal cultural resources," separately from archaeological resources (PRC § 21074; 21083.09). The Bill defines "tribal cultural resources" in a new section of the PRC Section 21074. AB 52 also requires lead agencies to engage in additional consultation procedures with respect to California Native American tribes (PRC § 21080.3.1, 21080.3.2, 21082.3). Finally, AB 52 requires the

Office of Planning and Research to update Appendix G of the CEQA Guidelines by July 1, 2016 to provide sample questions regarding impacts to tribal cultural resources (PRC § 21083.09). No tribal cultural resources have been identified within the Folsom Dam Raise Project.

Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations

Full Compliance. As required by the California EPA Air Resources Board, Section 93105 Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations requires compliance on any work done in any portion in a geographic ultramafic rock unit, any portion of the area to be disturbed has naturally-occurring asbestos, serpentine, or ultramafic rock as determined by the owner / operator, or the Air Pollution Control Officer (APCO); or naturally-occurring asbestos, serpentine, or ultramafic rock is discovered by the owner / operator, a registered geologist, or the APCO in the area to be disturbed after the start of any construction, grading, quarrying, or surface mining operation. The Folsom Dam Project would be in compliance with the implementation of dust control best management practices, as defined by Section 93105 (CARB 2016).

California Clean Air Act

Partial Compliance. The California Clean Air Act was signed into law in 1988 and, for the first time, clearly spelled out in statute California's air quality goals, planning mechanisms, regulatory strategies, and standards of progress. The California Clean Air Act provides the State with comprehensive framework for air quality planning regulation. Prior to passage of the Act, Federal law contained the only comprehensive planning framework.

The California Clean Air Act requires attainment of state ambient air quality standards by the earliest practicable date. For air districts in violation of the state ozone, carbon monoxide, sulfur dioxide, or nitrogen dioxide standards, attainment plans were required by July 1991. CARB is responsible for the development, implementation, and enforcement of California's motor vehicle pollution control program, GHG statewide emission estimates and goals, and development and enforcement of GHG emission reduction rules. A summary of the major California GHG regulations that would affect the project's GHG emissions are presented in Section 3.7. 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 3.7. As a result, full compliance with this Act is expected with coordination with SMAQMD and preconstruction permitting.

California Endangered Species Act

Partial Compliance. This Act requires the non-Federal partner to consider the potential adverse effects to State-listed species. As a joint NEPA/CEQA document, this DSEIS/SEIR has considered the potential effects to State-listed species, as discussed in Section 3.5. There is the potential for the Folsom Dam Raise Project to impact the state-listed bald eagle and Swainson's hawk, but only if nests are present at the construction sites. The Corps has been coordinating with CDFW regarding potential impacts to State-listed species. Prior to construction of any site, the Corps and the State would conduct preconstruction surveys to determine the presence of nests at construction sites. If nests are present, coordination with CDFW would occur to determine any mitigation or minimization measures that would need to be implemented. The project would be in full compliance with this Act once these surveys are conducted and coordination has occurred.

California Environmental Quality Act

Partial Compliance. CEQA requires that State and local agencies identify the significant environmental impacts of their actions, and avoid or mitigate those impacts when feasible. The CEQA amendments of December 30, 2009 specifically require lead agencies to address GHG emissions in determining the significance of environmental effects caused by a project, and to consider feasible means to mitigate the significant effects of GHG emissions (California Natural Resources Agency 2012). The CVFPB, as the non-Federal partner, would 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 would consider certifying the final EIR and adopting its findings. Certification of the final EIR by the CVFPB would provide full compliance with CEQA.

California Seismic Hazards Mapping Act

Full Compliance. The California Seismic Hazards Mapping Act of 1990 (California Public Resources Code [PRC] Sections 2690-2699.6) addresses seismic hazards other than surface rupture, such as liquefaction and induced landslides. The Seismic Hazards Mapping Act specifies that the lead agency for a project may withhold development permits until geologic or soils investigations are conducted for specific sites, and mitigation measures are incorporated into plans to reduce hazards associated with seismicity and unstable soils. The project area is within the Foothills Fault System, which is located in the metamorphic belt. No active faults have been mapped within the project area by the California Geological Survey or U.S. Geological Survey. The closest fault is a Quaternary (younger than 1,600,000 years) is just over 8 miles to the northwest. As a result, there would be no significant effects on the project due to seismicity and the Folsom Dam Raise Project is in full compliance with this Act.

California Water Code

Partial Compliance. The Folsom Dam Raise Project is located within the jurisdiction of the Central Valley RWQCB, within the greater Sacramento Valley watershed. The preparation and adoptions of water quality control plans, or Basin Plans, and statewide plans, is the responsibility of the SWRCB according to State law and 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, Basins Plans consist of a designation or establishment for the waters within a specific 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 3.11. Compliance with the California Water Code would be accomplished by obtaining certifications from the Central Valley RWQCB for Section 401 and, if applicable, Section 404 review internally by the Corps.

Porter-Cologne Water Quality Control Act

Partial Compliance. The Porter-Cologne Water Quality Control Act of 1970 established the SWRCB and 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 regulate 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 adherence to water quality objectives to protect those uses. The potential effects of the proposed project on water quality have been evaluated and are discussed in Section 3.11. 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.

California Streets and Highways Code

The California Streets and Highways Code authorize the California Department of Transportation (Caltrans) to control encroachment within the State highway right-of-way. Encroachments allow temporary or permanent use of a highway right-of-way by a utility, a public entity, or a private party.

CHAPTER 6.0 - COORDINATION AND REVIEW OF DRAFT EIS/EIR

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 would be conducted for this project, and which satisfy NEPA and CEQA requirements for public scoping and agency consultation and coordination. Additionally, Native American consultation activities are described.

6.1 Public Involvement Under NEPA and CEQA

The lead agencies are implementing a comprehensive public participation program to fully inform and engage potentially affected agencies, stakeholders, and communities. This section describes public involvement to date and future steps to be taken with the public.

6.2 Public Interest

Two public scoping meetings with identical formats and materials for the Folsom Dam Raise Project were held from 5:00 p.m. to 7:00 p.m. on Wednesday, February 19, 2014 at the Folsom Community Center, and on Monday, February 24, 2014 at the Sacramento Library Galleria. The meetings were advertised in February 2014 in the Sacramento Bee and the Folsom Telegraph. Mail and e-mail announcements were also sent to stakeholders and other interested parties. In addition, a Notice of Intent was filed with the Federal Register on February 6, 2014.

When the draft SEIS/SEIR is completed, it will be released and a public meeting scheduled during the public review period.

6.3 Native American Consultation

As part of the Section 106 process, the Corps is required to identify Native American Tribes that attach cultural affiliation to historic properties that may be affected by the proposed undertaking (36 CFR Part 800.3(f)(2). As part of the 36 CFR Part 800.4(a)(4), the Corps has consulted with and is presently consulting with the Wilton Rancheria, the Tsi-Akim Maidu of the Taylorsville Rancheria, the Shingle Springs Band of Miwok Indians, and the United Auburn Indian Community of the Auburn Rancheria in an effort to identify sites of religious and cultural significance in the APE that may be affected by the proposed undertaking. A detailed consultation log is included in Appendix I. If historic properties are identified during this consultation process, and if the proposed undertaking results in adverse effects to the identified historic properties, then the Corps will work with appropriate Native American Tribes and SHPO to mitigate adverse effects to those resources.

The provisions of AB 52 only apply to projects that have a notice of preparation filed on or after July 1, 2015, and therefore the Bill's requirements are not applicable to the proposed Project (the NOP was filed February 17 2014 SCH# 2006022091). Although AB 52 requirements were not in place at the time of the NOP, Tribal coordination noted above and documented in Appendix I, occurred and is substantially consistent with the intent of AB52 for this project.

6.4 Consultation with Other Federal, State, and Local Agencies

A complete list of Agencies is located in Appendix J.

6.5 List of Recipients

A complete list of recipients is located in Appendix J.

6.5.1 Elected Officials and Representatives

A complete list of recipients is located in Appendix J.

6.5.2 Government Departments and Agencies

U.S. Government Agencies

- Council on Environmental Quality
- Federal Emergency Management Agency
- U.S. Bureau of Reclamation
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- Western Area Power Administration

State of California Agencies

- Assembly Committee on Water, Parks, and Wildlife
- California Air Resources Board

- California Department of Conservation
- California Department of Corrections and Rehabilitation
- California Department of Fish and Wildlife
- California Department of Parks and Recreation
- California Department of Water Resources
- Central Valley Flood Protection Board
- Central Valley Regional Water Quality Control Board
- Governor's Office of an Emergency Services
- Native American Heritage Commission
- Senate Committee on Natural Resources
- State Clearinghouse
- State Lands Commission
- State Office of Historic Preservation
- State Water Resources Control Board

Regional, County, and City Agencies

- City of Folsom
- El Dorado County
- Placer County
- Sacramento Area Flood Control Agency
- Sacramento County
- Sacramento Metropolitan Air Quality Management District

CHAPTER 7.0 - LIST OF PREPARERS

U.S. Army Corps of Engineers

- Lisa Aley, Environmental Manager
- Mariah Brumbaugh, Senior Environmental Manager
- Kristine Des Champs, Civil Engineer
- Katie Charan, Senior Project Manager
- Brian Luke, Senior Environmental Manger
- Melissa Montag, Historian
- Jane Rinck, Cultural, Recreation, Social Assessment Section Chief
- Sara Ross Arrouzet, Senior Environmental Manager

California Department of Water Resources

- Vincent Heim, Environmental Scientist
- Cory Koger, Senior Environmental Scientist (Supervisor)
- Erin Brehmer, Environmental Scientist

Central Valley Flood Protection Board, CA Department of Water Resources

- Ruth Darling, Senior Environmental Scientist (Specialist)

CHAPTER 8.0 - REFERENCES

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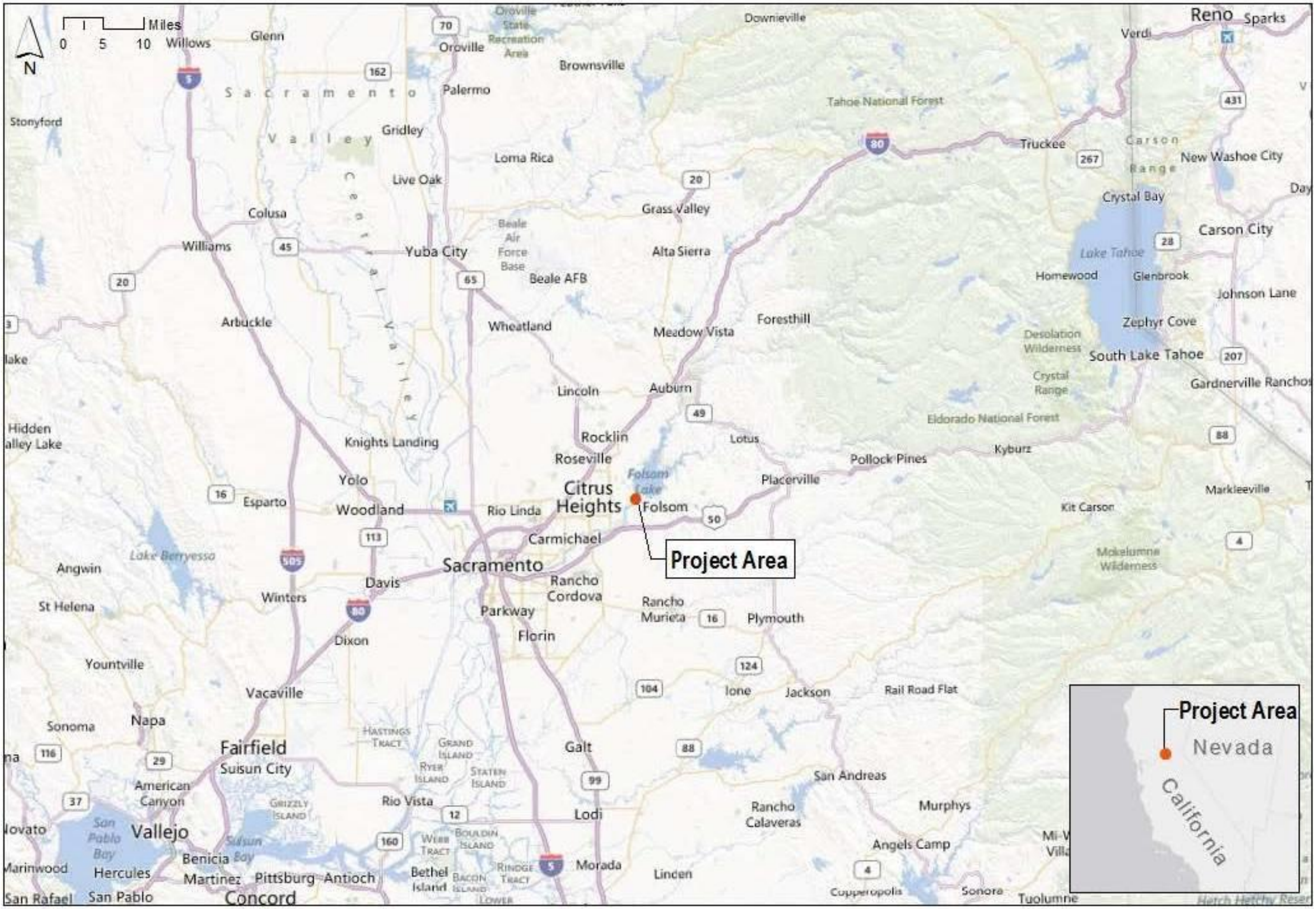
APPENDIX A

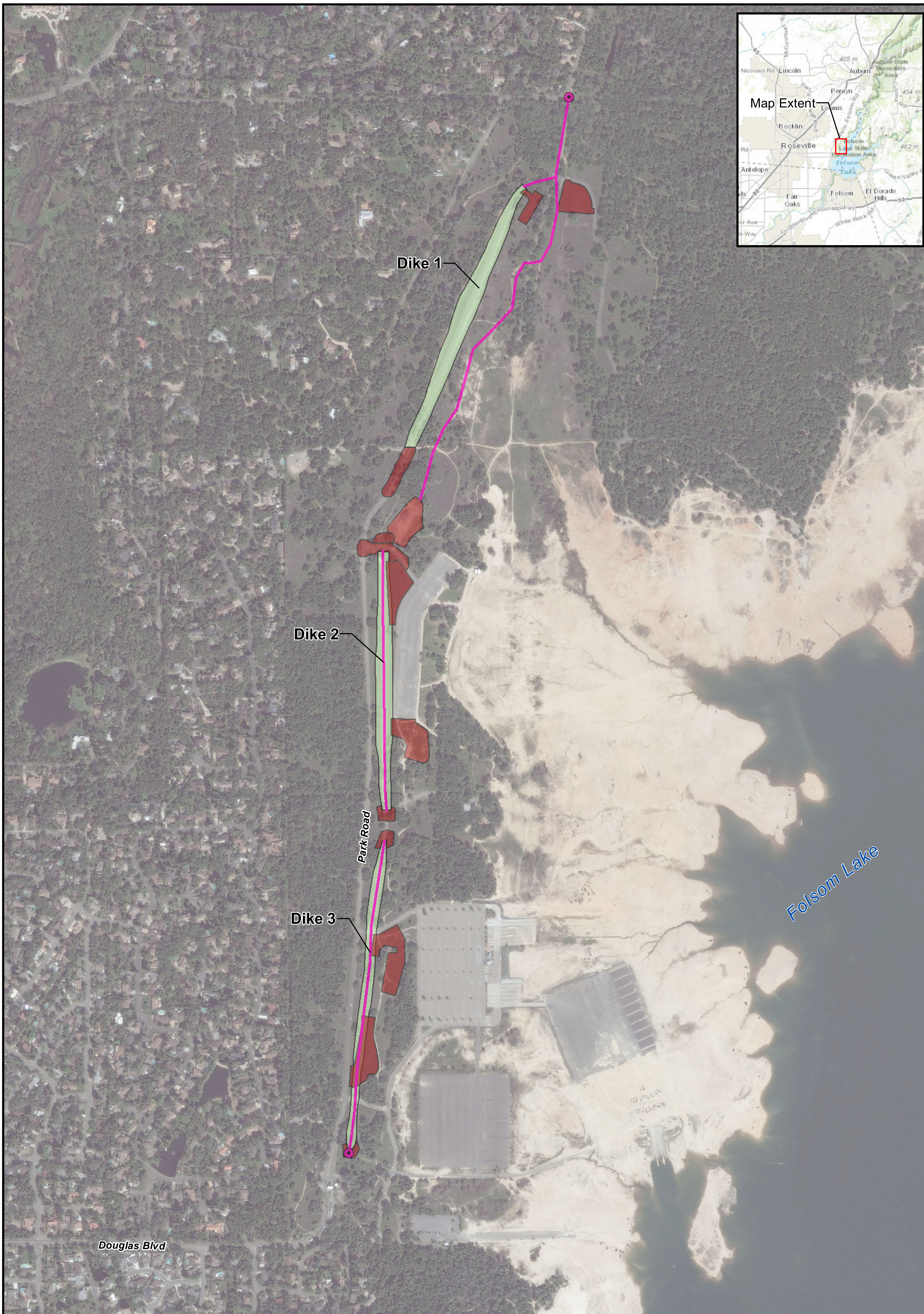
PROJECT LOCATION MAPS



Miles
0 5 10
N
Project Area
Project Area
Nevada
California
Sacramento
Citrus Heights
Folsom
Folsom Lake
Reno
Sparks
Carson City
Lake Tahoe
South Lake Tahoe
Tahoe National Forest
Eldorado National Forest
Sacramento Valley
Vallejo
Fairfield
Concord

APPENDIX B

PROJECT STAGING AREA MAPS



Legend

- Access Point
- HaulRoutes
- Staging Area
- Dikes

Imagery Source: World View 2 .4m, March 23, 2014

N

0 700 1,400 Feet

The information depicted in this GIS layer is the result of digital analyses performed on a database consisting of information from a variety of governmental and other credible sources. The accuracy of the information presented is limited to the collective accuracy of the database on the date of the analysis.

The information is believed accurate and reasonable efforts have been made to ensure the accuracy of the data. However, the US Army Corps of Engineers Sacramento District GIS Unit expressly disclaims responsibility for damages or liability that may arise from use of this data. This product is the property of the US Army Corps of Engineers Sacramento District GIS Team and its use is thereby restricted. This map was created using the EGIS Gateway map template.

AMERICAN RIVER WATERSHED PROJECT
FOLSOM DAM RAISE PROJECT

STAGING AREAS FOR DIKES 1-3

JUNE 2014

US Army Corps of Engineers® Sacramento District

SPK EGIS

Date: 6/16/2014 Path: \\arctic\Project_data\CA\CIV\Folsom_MultiProjects\Folsom_All_Data\GIS\GIS_Projects\FolsomDamRaise\FolsomDamRaise_ProjectFeatures_Dikes1-3.mxd

Legend

- Access Point
- HaulRoutes
- Staging Area
- Dikes

Imagery Source: World View 2 .4m, March 23, 2014

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The information depicted in this GIS layer is the result of digital analyses performed on a data-base consisting of information from a variety of governmental and other credible sources. The accuracy of the information presented is limited to the collective accuracy of the database on the date of the analysis.

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AMERICAN RIVER WATERSHED PROJECT
FOLSOM DAM RAISE PROJECT

STAGING AREAS FOR DIKES 4-6 and RW

JUNE 2014

US Army Corps of Engineers®
Sacramento District

SPK EGIS

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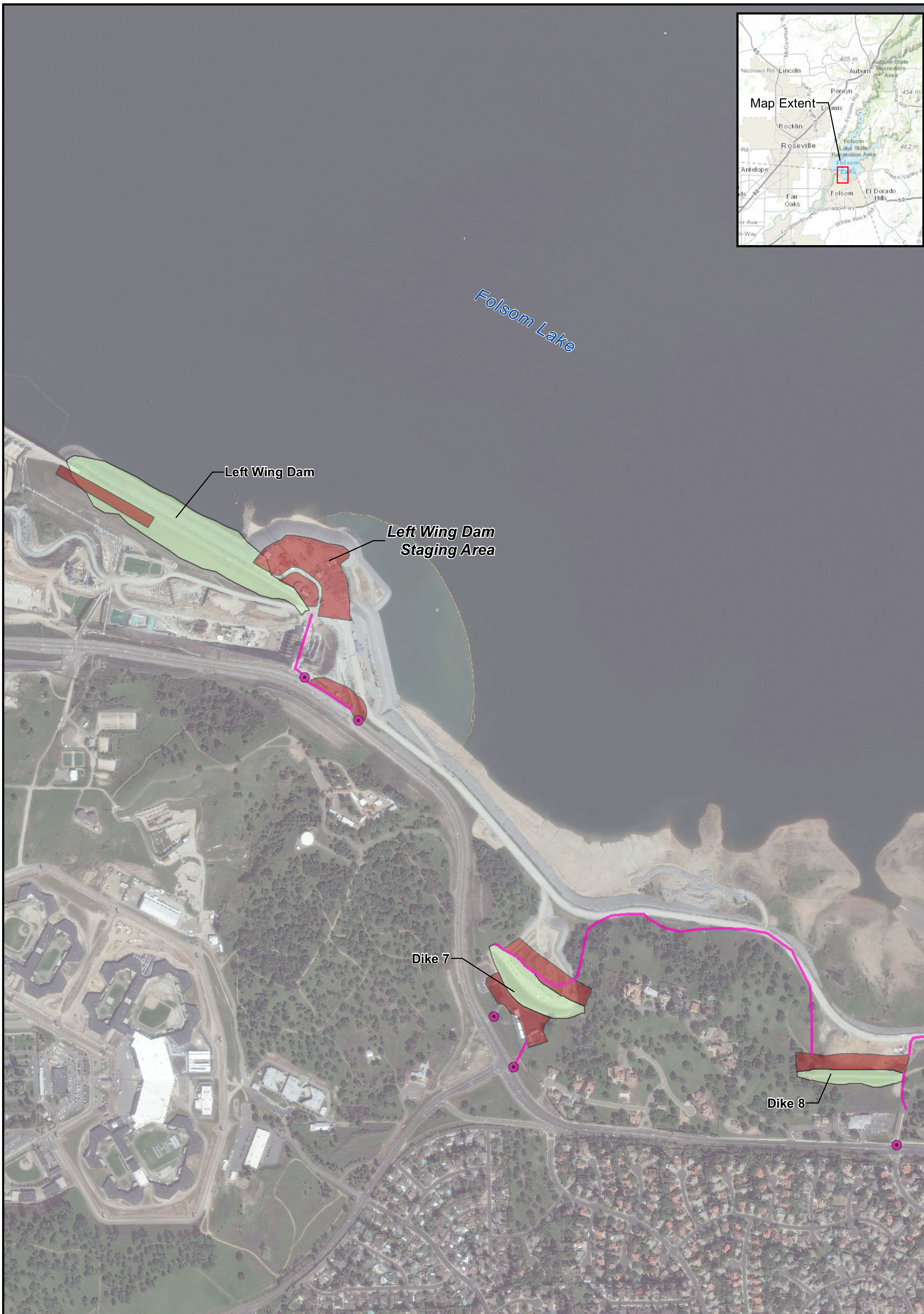

Legend

- Access Point
- HaulRoutes
- Staging Area
- Dikes

Imagery Source: World View 2 .4m, March 23, 2014

N

0 700 1,400 Feet

The information depicted in this GIS layer is the result of digital analyses performed on a database consisting of information from a variety of governmental and other credible sources. The accuracy of the information presented is limited to the collective accuracy of the database on the date of the analysis.

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AMERICAN RIVER WATERSHED PROJECT
FOLSOM DAM RAISE PROJECT

STAGING AREAS FOR DIKES 7, 8 and LW

JUNE 2014

US Army Corps of Engineers®
Sacramento District

SPK EGIS

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Legend

- Access Point
- HaulRoutes
- Staging Area
- Dikes

Imagery Source: World View 2 .4m, March 23, 2014

N

0 700 1,400 Feet

The information depicted in this GIS layer is the result of digital analyses performed on a database consisting of information from a variety of governmental and other credible sources. The accuracy of the information presented is limited to the collective accuracy of the database on the date of the analysis.

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AMERICAN RIVER WATERSHED PROJECT
FOLSOM DAM RAISE PROJECT

STAGING AREAS FOR MIAD

JUNE 2014

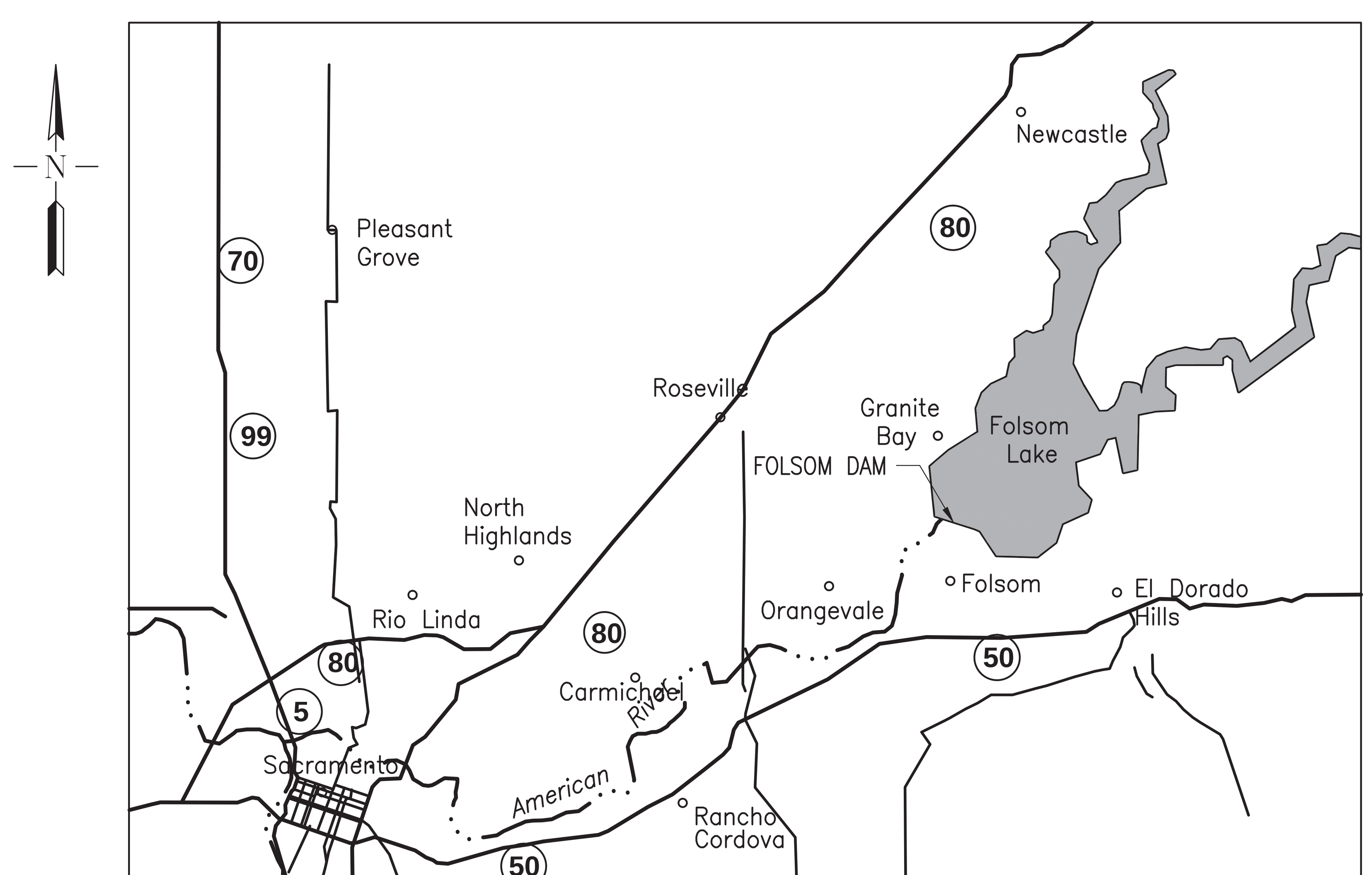
US Army Corps of Engineers®
Sacramento District

SPK EGIS

Date: 6/16/2014 Path: \\ARCTIC\Project_data\CA\CIV\Folsom_MultiProjects\!Folsom_All_Data\GIS\GIS_Projects\FolsomDamRaise\FolsomDamRaise_ProjectFeatures_MIAD.mxd

PLAN VIEW – SITE MAP

SCALE: 1"=200'



VICINITY MAP

NOT TO SCALE

PROJECT LOCATION MAP

NOT TO SCALE

CENTRAL VALLEY PROJECT–CALIFORNIA
AMERICAN RIVER DIVISION – FOLSOM UNIT
DESIGNED U.S. ARMY CORPS OF ENGINEERS
RECEIVED BY
BUREAU OF RECLAMATION, GROUP MANAGER

US Army Corps of Engineers
Sacramento District

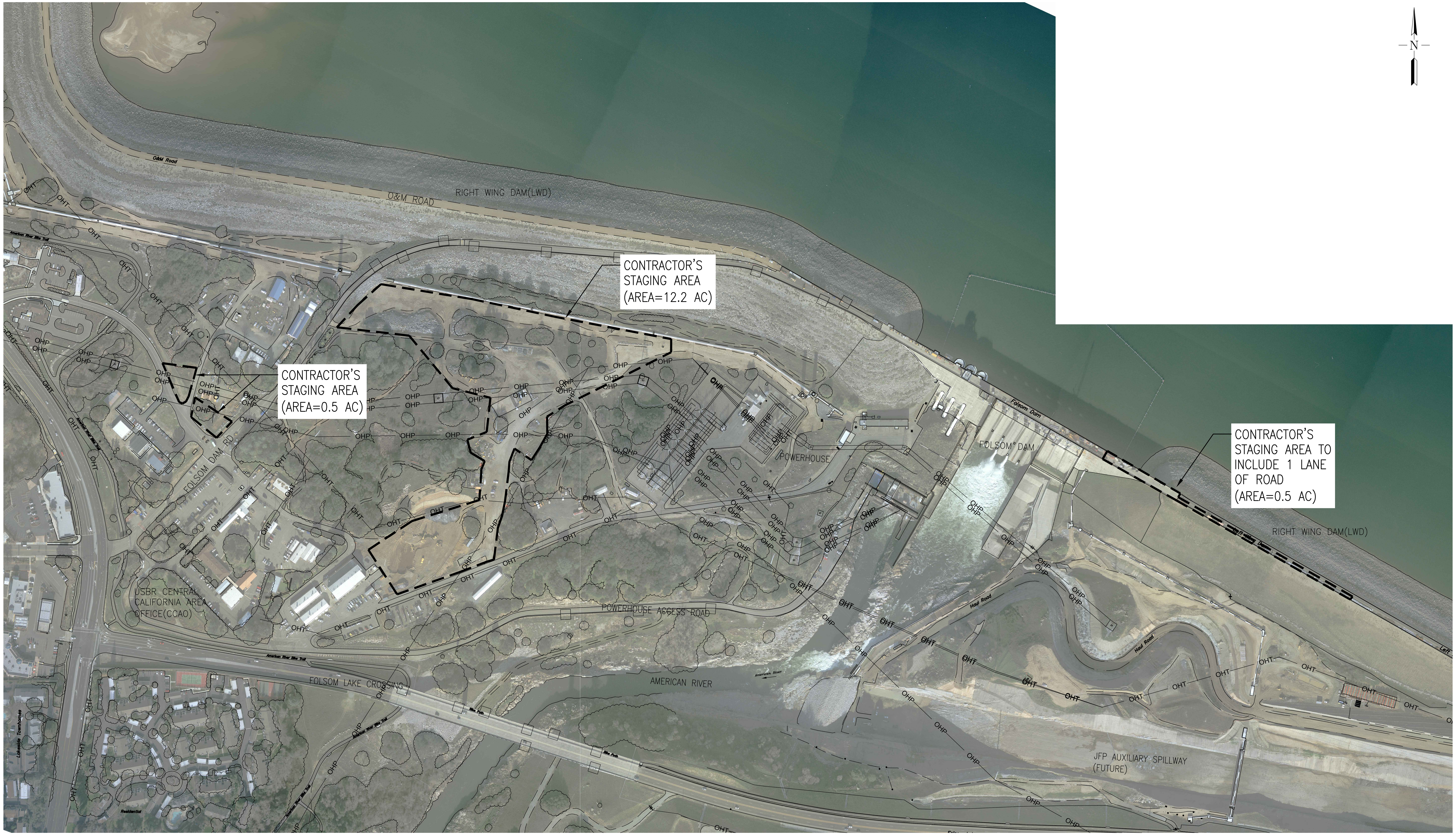
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

SACRAMENTO DISTRICT
IN-HOUSE DESIGN
1325 'J' STREET
SACRAMENTO, CA 95814-2922

Dwn by: R. CONN
Spec No.: XXXX
Design file no: XXX-XX-XXXX
File name: G-004
Plot date: 2/7/14

AMERICAN RIVER WATERSHED — CALIFORNIA
FOLSOM DAM RAISE
TAINTER GATE MODIFICATION
LOCATION, VICINITY & SITE MAPS

Sheet reference number:
G-004



GENERAL NOTES

1. ACCESS FROM THE LEFT WING DAM IS PROHIBITED
2. CONTRACTOR'S STAGING AREA SHOWN IS AN APPROXIMATE. THE FINAL SIZE, LOCATION, AND ACCESS TO THE STAGING AREA SHALL BE COORDINATED WITH USBR AND APPROVED BY THE CONTRACTING OFFICER PRIOR TO COMMENCEMENT OF CONSTRUCTION.
3. AERIAL PHOTO SHOWN ON THIS SHEET IS ONLY FOR GENERAL INFORMATION OF LOCATION AND SURROUNDINGS OF THE PROJECT SITE.
4. SEE SPEC SECTION 01 14 00 FOR ADDITIONAL INFORMATION ON WORK RESTRICTIONS.

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

65% SUBMITTAL
PRELIMINARY XX/XX/2014

CENTRAL VALLEY PROJECT–CALIFORNIA
AMERICAN RIVER DIVISION – FOLSOM UNIT
DESIGNED ______
RECEIVED BY ______
BUREAU OF RECLAMATION, GROUP MANAGER

US Army Corps of Engineers
Sacramento District

Symbol | Description | Date | Approved

Designed by: | Dwn by: | Spec No.: XXXX | Date: | Rev.
Reviewed by: | Design file no: AM1-XX-XXXX | Drawing Code: 65% DESIGN SUBMITTAL
Submitted by: | File name: XREF-BORDER | Plot date: 06/20/2014 | Dwg scale:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

AMERICAN RIVER WATERSHED CALIFORNIA
FOLSOM DAM RAISE
TAINTER GATE MODIFICATION
STAGING & ACCESS PLAN

Sheet reference number:
G-005

USBR FILE NO. 485-D-XXXX

LAST UPDATE: 3-Jul-14 PLOT DATE: 3-Jul-14
LAST UPDATED BY: L2EDDBP9
L2EDDBP9 Jul 03, 2014 – 9:03am
C:\Users\L2EDDBP9\appdata\local\temp\AcPublish_10072\G-005_65%.dwg
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APPENDIX C

GIS MAPPING OF VEGETATION HABITAT

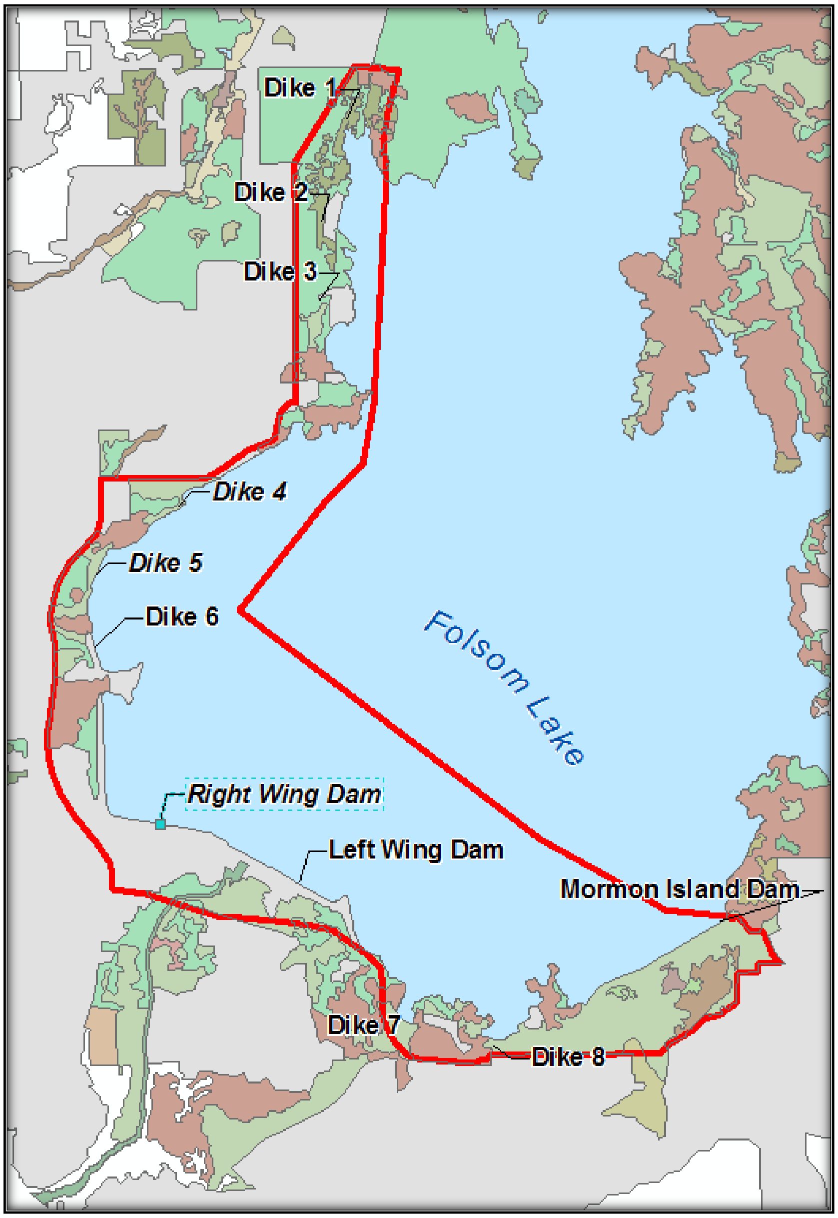
Dike 1
Dike 2
Dike 3
Dike 4
Dike 5
Dike 6
Folsom Lake
Right Wing Dam
Left Wing Dam
Mormon Island Dam
Dike 7
Dike 8

Table 1

Current Vegetation Within Boundary	
Vegetation	**Acreage**
Annual Grassland	442.13
Blue Oak Woodland	214.61
Blue Oak Woodland/Foothill Pine	260.39
Wetlands	7.03
Valley Foothill Riparian	47.29

Table 2

Vegetation Removed	
Vegetation	**Acreage**
Annual Grassland	97.53
Blue Oak Woodland	47.49
Blue Oak Woodland/Foothill Pine	16.02
Wetlands	3.61
Valley Foothill Riparian	2.53

Table 3: Results

Vegetation	**Original Veg. When Dam was Built**	**Project Removed Veg.**	**Percentage Lost**
Annual Grassland	492.85	97.53	19.79%
Blue Oak Woodland	257.83	47.49	18.42%
Blue Oak Woodland/Foothill Pine	276.41	16.02	5.79%
Wetlands	8.12	3.61	44.48%
Valley Foothill Riparian	49.81	2.53	5.07%

APPENDIX D

WETLAND DELINEATION MAP

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-CPA-0010-1

JUL 10 2014

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

Subject: Wetland Delineation Report for the Dikes 4-6 project area of the American River Watershed Investigation – Folsom Dam Raise Project, Placer County, California

Dear Ms. Kirchner:

The U.S. Fish and Wildlife Service's Wetland Delineation Report for the Dikes 4-6 project area of the American River Watershed Investigation – Folsom Dam Raise Project is attached. We are providing this report for the U. S. Army Corps of Engineers (Corps) to include in the Corp's environmental documents currently being prepared for the Folsom Dam Raise Project.

Thank you for providing the opportunity to contribute to your planning process. If you have any questions or comments, please contact either Harry Kahler at (916) 414-6612 or Mark Littlefield at (916) 414-6520.

Sincerely,

Daniel Welsh
Acting Field Supervisor

Enclosure

cc:
Brian Luke, COE, Sacramento, California

American River Watershed Investigation – Folsom Dam Raise Project
Wetland Delineation Report for Dikes 4-6, Folsom Lake, California

Prepared for:
United States Army Corp of Engineers
1325 J Street, 10th Floor
Sacramento, California

Prepared by:
United States Department of the Interior
U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
Sacramento, California

July 2014

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Summary

On behalf of the U.S. Army Corps of Engineers (Corps), the U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office (Service) has conducted a delineation of waters of the United States (wetland delineation) for the proposed American River Watershed Investigation, Folsom Dam Raise Project (Folsom Dam Raise) in Granite Bay, Placer County, California. The project site involves Dikes 4-6, north of the right wing dam of Folsom Dam. This delineation identifies the type and extent of "navigable waters," "wetlands," and "other waters" that occur within or adjacent to the 69.9-acre, Dikes 4-6 project area. A total of 0.083 acre of seasonal wetlands in two distinct parts was delineated adjacent to the Dike 4-6 project area. The Dikes 4-6 project area, as currently proposed, would include Folsom Lake when the lake is at its maximum pool elevation, normally about 466 feet above sea level. The wetland delineation reported herein discusses two areas identified as wetlands; both in the vicinity of Dike 6. No wetlands were identified in the staging and construction areas of Dike 4 and Dike 5.

The delineation of waters of the United States, including wetlands, is subject to verification by the Corps. The Service advises all parties to treat the information contained herein as preliminary until the Corps provides written verification of the boundaries of its jurisdiction.

Introduction

The Corps regulates impacts to waters of the United States under the jurisdictional authority of Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act of 1972 (33 U.S.C. 403; 33 U.S.C. 1344). Jurisdictional waters of the United States include all navigable waters, interstate waters, their tributaries, and adjacent wetlands (Environmental Laboratory 1987).

The purpose of this report is to describe the extent and type of jurisdictional wetlands present within, or nearby, a portion of the proposed Folsom Dam Raise study area that fall under the jurisdiction of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Accordingly, this report addresses all identified potential jurisdictional waters of the United States, including wetlands, for the proposed project in the vicinity of Dikes 4-6. Data and conclusions contained in this report are based on information gathered in the field, the 1987 *U.S. Army Corps of Engineers Wetland Delineation Manual*, the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (U.S. Army Corps of Engineers 2008), and Federal regulations governing waters of the United States.

a) Definitions and Criteria

Navigable Waters of the United States. Generally, waters of the United States are subject to the ebb and flow of the tide shoreward to the mean high water mark, and/or are presently used, or have been used in the past, or may be susceptible to use transport interstate or foreign commerce (33 CFR §329).

Other waters of the United States. As used in this report, this term refers to features determined to be waters of the United States by the Corps, and includes unvegetated waterways and water bodies with a defined bed and bank and an ordinary high water mark, such as drainages, creeks, rivers, and lakes. Other waters of the United States typically lack hydrophytic vegetation and may also lack hydric soils (33 CFR §328.3).

Wetlands. For regulatory purposes, wetlands are a subgroup of waters of the United States defined as areas that are inundated, or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR §328.3; 40 CFR §230.3).

Study Area Location

a) **Project Location**: The study area is located along the west boundary of Folsom Lake along Dikes 4 – 6 in Granite Bay, Placer County, California. The study area is located within the Folsom 7.5-minute U.S. Geological Survey quadrangle. Dike 5 lies between Dikes 4 and 6 at latitude 38° 43' 44.3" and longitude 121° 10' 15.8," which in Universal Transverse Mercator (UTM) Zone 10 coordinates is northing 4288289 and easting 658979.

b) **Acreage**: The Dikes 4-6 project area of the Folsom Dam Raise Project encompasses about 69.9 acres (Figure 1). Folsom Lake usually operates at pool elevations between 425 and 466 feet above sea level. The operational normal maximum pool elevation is 466 feet. Other adjacent areas with suitability as potential staging areas also were analyzed for wetlands and comprise about 35 acres. In total we analyzed an area of about 105 acres.

c) **Proximity to Major Highways and other roads**: Folsom-Auburn Road passes from Folsom through Granite Bay, northward to Auburn and within 300 feet to the west of the project area by Dike 5 (Figure 1). At the south end of Dike 6, the entrance to the Beals Point State Recreation Area crosses from Auburn-Folsom Road to a parking area for the recreation facility on the waterside.

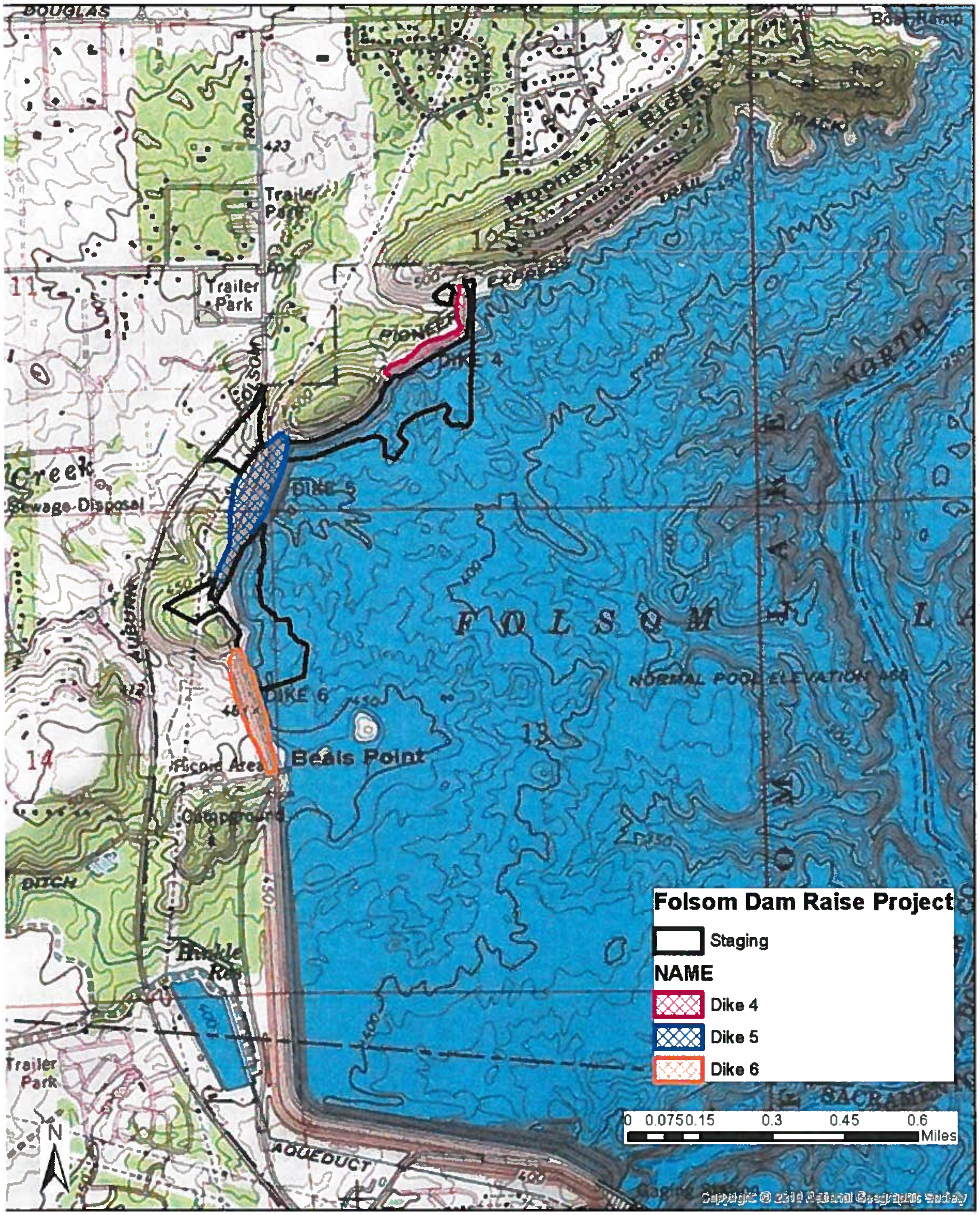
d) **USGS Hydrologic Unit**: The Dikes 4-6 mark the boundary between the North Fork American, California USGS Hydrologic Map Unit (Number 18020128) on the lakeside, and the Lower American, California USGS Hydrologic Map Unit (Number 18020111) to the landside.

Environmental Setting

a) **Current/Recent Land Use**: An access road runs north from the Beals Point Road north across the crowns of Dikes 4, 5, and 6. From the Beals Point Road northward, across the crown of Dike 6, to the southern end of Dike 5 is paved with asphalt. Otherwise the access roads are gravel.

The Beals Point State Recreation Area lies at the south end of Dike 6. A large, asphalt parking area, restrooms, and other recreational facilities are on the waterside, east of the south end of Dike 6. When the pool of the lake is at design level, most of the waterside

Figure 1. Dikes 4-6 project area, Granite Bay, Placer County, California. The outlined areas represent the dikes and potential staging areas.



of the Dikes 4-6 project area is submerged. A camping area occupies about 11.5 acres adjacent to the landside of Dike 6, just north of the Beals Point entrance road. A private, equestrian boarding facility is located on the east side of Auburn-Folsom Road, to the landside of Dike 4. Multipurpose trails for non-motorized use line the landside area north from the campground by Dike 6 to the equestrian facility by Dike 4 and beyond.

b) **Site Elevation**: The crowns of the dikes have an elevation of about 483 feet above mean sea level. The lowest area of the Dikes 4-6 project area lies to the landside of Dike 5, where the elevation is about 380 feet above mean sea level.

c) **Climate**: The climate is typically Mediterranean, with cool, wet winters and hot, dry summers. Annual precipitation recorded at Folsom Dam averages 23.92 inches, of which 20.48 inches fall from October through March (Western Regional Climate Center 2014). Water years 2012 and 2013 were dry years, and 2014 continues the drought trend (California Department of Water Resources 2014). The annual maximum air temperature for Folsom is 75.4°F, ranging from an average in July of 97.0 °F to 54.3 °F in January (Western Regional Climate Center 2014).

d) **Site Topography/Landscape**: The City of Folsom is located south of Folsom Dam, while Granite Bay is located along the western shores of the lake. The Dikes 4-6 project area is situated within the suburban landscape, with the dikes designed to keep lake waters from the lower lying areas to the west. The immediate area contains rolling hills and the dikes are among the highest points on the landscape.

e) **Hydrology/Hydrologic Features/Hydrologic Connectivity**: The dikes contain Folsom Lake to the east. The San Juan Water District facility, containing Hunkle Reservoir, lies directly south of the Dikes 4-6 project area, adjacent to the right wing dam of Folsom Dam. From Hunkle Reservoir, an open ditch flows westward about 0.25 mile, under Auburn-Folsom Road to Baldwin Reservoir. Groundwater drainage from each of the dikes collects to form the headwaters of Linda Creek. Linda Creek flows in a northwesterly direction toward the City of Roseville and into Dry Creek, which in turn flows into the Natomas East Main Drainage Canal and eventually the Sacramento River.

f) **Soils**: Appendix A contains a soil survey map for the Dikes 4-6 project area. The soils of the study area are predominantly Andregg coarse sandy loam (Soil Survey Staff 2014). However, much of the area directly occupied by the dikes appears to be Xerothents as well. The Dikes 4-6 project area also occupies areas of the Ink-Exchequer complex (Soil Survey Staff 2014).

Andregg Soils – Andregg soils occur on the project site on 2 to 50 percent slopes. This moderately deep, well-drained soil is located on foothill locations. Parent material for these soils is granitic. Slopes are complex and can be rocky. Typically surface layers are grayish-brown coarse sandy loam about 15 inches thick. Sub-soils are pale brown and very pale brown coarse sandy loam about 14 inches thick.

Inks Soils – Inks soils occur on the project site on 2 to 30 percent slopes. This shallow, well-drained cobbly soil is located on long, broad volcanic ridges and side slopes. Parent material for these soils is andesitic conglomerate. Inclusions of Exchequer soil may be present. Typically surface layers are yellowish brown cobbly loam about 5 inches thick. The sub-soils are brown very cobbly clay loam about 13 inches thick.

Xerothent Soils – Xerothent soils, or cut and fill areas, occur throughout the project site. This well-drained material consists of mechanically removed and mixed soil in which horizons are no longer discernable. Surface runoff is very rapid and the hazard for erosion is moderate. Permeability and available water capacity is variable.

g) **Plant communities**: Three major natural plant community cover-types were identified in the project area: valley oak woodland, riparian woodland, and annual grassland. Also, much of the land on the waterside of the dikes is bare ground that would be covered in standing water when not in drought years. These land cover-types include jurisdictional wetlands and other waters of the United States, as well as non-jurisdictional upland habitat.

Valley oak woodland – The valley oak woodland habitat is best developed on deep, well-drained alluvial soils, usually in valley bottoms. Most large, healthy valley oaks are probably rooted in permanent water supplies. These woodlands are dominated by valley oak, with black walnut, interior live oak, boxelder, and blue oak as common associates. Oak woodlands with little or no grazing tend to develop a bird-disseminated understory cover, which is best developed along natural drainage areas. Poison oak, blue elderberry, California buckeye, toyon, California coffeeberry, and California blackberry are common understory species. Ground cover includes wild oats, brome, barley, ryegrass, and needle-grass.

Verner (1980) reported that 30 bird species, known to use oak habitats in California, include acorns in their diet. Gaines (1977) reported two dozen breeding bird species in the habitat, including: California quail, plain titmouse, scrub jay, spotted towhee, Bewick's wren, bushtit, willow flycatcher, and acorn woodpecker. Western gray and fox squirrels, as well as mule deer, are common mammals that use the food and shelter of the habitat.

Riparian woodland – Riparian woodland is found on the waterside of the dikes within the study area. The upper canopy is dominated by several species including Fremont cottonwood, box elder, white alder, Chinese tallow, sycamore, valley oak, live oak, Goodding's willow, and other willow species. The lower shrub canopy is dense and thicket-like, with dominant species including California buckeye, California rose, blackberry, blue elderberry, poison oak, and shrub-like forms of the various willow species. The herbaceous understory ranges from very developed to sparse depending on the amount of light filtering through the upper canopies, but typically includes various grasses, sedges, and rushes.

Transition to non-riparian habitat types is usually abrupt and related to water and soil saturation. Shrubby willow thickets can last 15-20 years before becoming overtopped by cottonwoods. Wildlife guilds of the riparian woodlands are generally the same as those of valley oak woodlands.

Annual grassland – Annual grasslands occur on both the landside and waterside of the dikes. Grassland composition and structure is largely dependent on weather patterns and vegetation management (i.e., mowing). Generally, germination occurs in the fall and growth remains low in stature until temperatures rise in the spring. In areas of light grazing, dead plant material accumulates over the summer months, whereas heavy spring grazing favors the growth of summer-annual forbs. No grazing occurs in the Dikes 4-6 project area. In general, annual grassland habitat occurs mostly on flat plains to gently rolling foothills.

The dominant species of the annual grasslands are introduced grasses, including wild oats soft chess, Italian rye grass, ripgut brome, red brome, wild barley, and foxtail fescue. Common forbs include broadleaf filaree, redstem filaree, turkey mullein, true clovers, bur clover, and popcorn flower. In moist or lightly grazed areas perennial grasses also are found, including purple needlegrass and Idaho fescue. Species composition is mainly dependent on seasonal and annual fluctuations in precipitation levels.

Reptiles of annual grasslands include the western fence lizard, mountain garter snake, and northern Pacific rattlesnake (Basey and Sinclear 1980). Typical mammals include the black-tailed jackrabbit, California ground squirrel, Botta's pocket gopher, western harvest mouse, California vole, badger, and coyote (White et al. 1980). Breeding birds may include the short-eared owl, horned lark, and western meadowlark (Verner et al. 1980). Foraging birds include the turkey vulture, northern harrier, American kestrel, black-shouldered kite, and prairie falcon. Areas with annual grassland vegetation in the project area are dominated by a mixture of annual grasses and herbaceous, nonnative or ruderal, weedy species. This cover-type generally occurs on dike slopes and in areas subject to periodic disturbance. Ruderal areas are common along the edge of agricultural fields and on the faces of dikes.

Delineation Methods and References

a) **Review of aerial imagery:** Prior to making field observations, aerial imagery was reviewed to assess the study area for potential wetland acreage.

b) **Date of Field Observations:** The field observations for this delineation occurred on June 10, 2014. All observations were made by Service biologists Mark Littlefield, Harry Kahler, and Amber Aguilera. Completed Wetland Data Forms – Arid West Region are provided in Appendix B.

c) **Wetland Vegetation Indicator Status Reference**: Taxonomic nomenclature for plant species is in accordance with the *Jepson Manual* (Hickman 1993), wetland indicator status for plant species was determined using *National List of Plant Species That Occur in Wetlands: California (Region 0)* (Reed 1988), and the "Dominance Test" and "Prevalence Index" were applied to determine plant dominance (U.S. Army Corps of Engineers 2008).

d) **Hydric Soil Method of Determination Followed**: A soil pit to a depth of up to 12 inches was dug within each suspected wetland feature. Soils were examined in order to assess field indicators of hydric soils. Positive indicators of hydric soils were observed in the field in accordance with the criteria outlined in Field Indicators of Hydric Soils in the United States (Hurt 2006) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (U.S. Army Corps of Engineers 2008). The color of the soils was determined using a Munsell® soil color chart.

e) **Wetland Hydrology Method of Determination Followed**: Presence of primary and secondary wetland hydrology indicators were documented for each suspected wetland feature. These include inundation, saturation within the upper 12 inches of the soil profile, water marks, drift lines, sediment deposits, surface soil cracks, oxidized rhizospheres along living roots, presence of reduced iron, hydrogen sulfide odor, biotic crust, salt crust, and drainage patterns in wetlands.

f) **Wetland Mapping**: All sample points and wetland polygon boundaries were recorded using a Garmin Global Positioning System (GPS) unit capable of sub-meter accuracy (NAD 83 projection, UTM Zone 10). The data was then overlaid onto a site-specific topographic map and aerial National Agriculture Imagery Program images from 2012.

Delineation Results and Discussion

Two areas were identified as wetlands in our analyses of the Dikes 4-6 project area. The two wetland features were identified on the landside of Dike 6 (Figure 2). Although each wetland feature is outside the Dikes 4-6 project area as currently planned, the wetland features are within areas that potentially could be used as staging areas if the project is modified.

Wetland WM012 occupies a highly disturbed area near the landside toe of Dike 6. Although many non-native and upland plant species are present, indicators showed the presence of hydrophytic vegetation. A strong sulfur odor and redox features indicated a wetland soil. Also, the ground at the wetland WM012 site is saturated and shows drainage patterns. Wetland WM013 also is on the landside toe of Dike 6. Hydrophytic vegetation indicators, the gleyed soils with a sulfurous odor, and the presence of surface water indicate the site is a wetland.

After examining aerial imagery and ground truthing, we took soil sample points within areas where wetland species were readily visible within the vegetation strata. Plant species were noted and the percentage of absolute cover and dominant species were determined throughout the vegetation community. Species that could not be identified in the field were collected and identified by experts in the Sacramento Fish and Wildlife Office. The wetland indicator status for each plant species across all vegetation strata were recorded on data forms found in Appendix A.

Soil surveys were conducted in two areas where ocular estimations of plant communities indicated a potential for the area to meet the wetland definition. Vegetation data collected on a site on the waterside of Dike 6 indicated wetland status (Figure 3). The soils within that area consisted of a thin loamy layer (about 6-10 inches) above granite, with no mottling. However, roots along willow branches, about 10 feet above ground level, indicated the site was within the high water mark of normal pool flooding of Folsom Lake. No other hydrology indicators were present. At another site by Dike 5 the vegetation data collected indicated a prevalence and dominance of upland species (Figure 4). Furthermore, the soils were sandy and demonstrated no wetland characteristics. A drainage area flows nearby, but it is outside the current project boundary and is not likely to be included in any future staging plans. No potential wetland areas were identified in or adjacent to project boundaries near Dike 4.

The Dikes 4-6 project area contains portions of Folsom Lake when the pool elevation is at its operational maximum pool elevation of 466 feet. No waters of the United States were identified with the Dikes 4-6 project area, yet other waters (Folsom Lake) lie on the waterside of the dikes. The WM014 site is about 0.50 acre, yet would be covered by water when the lake is at the operational maximum pool elevation of 466 feet. Table 1 provides an acreage summary of waters of the United States.

Table 1. Acreage Summary of Waters of the United States, Dikes 4-6 project area, Granite Bay, Placer County, California.

WATERS OF THE UNITED STATES		
WETLANDS	**ACREAGE**	**LINEAR FEET**
Wetland WM012	0.067	N/A
Wetland WM013	0.016	N/A
Total Wetlands	0.083	N/A
OTHER WATERS	**ACREAGE**	**LINEAR FEET**
Folsom Lake*	58.243	5422
TOTAL WATERS OF THE UNITED STATES	58.326	5422

* The Dikes 4-6 project area includes only a portion of Folsom Lake. The WM014 acreage is not included within the Waters of the United States because it would be covered by water when the lake is at the operational maximum pool elevation.

Figure 2. Wetlands WM012 and WM013, adjacent to Dike 6, Dike 4-6 project area, Granite Bay, Placer County, California.

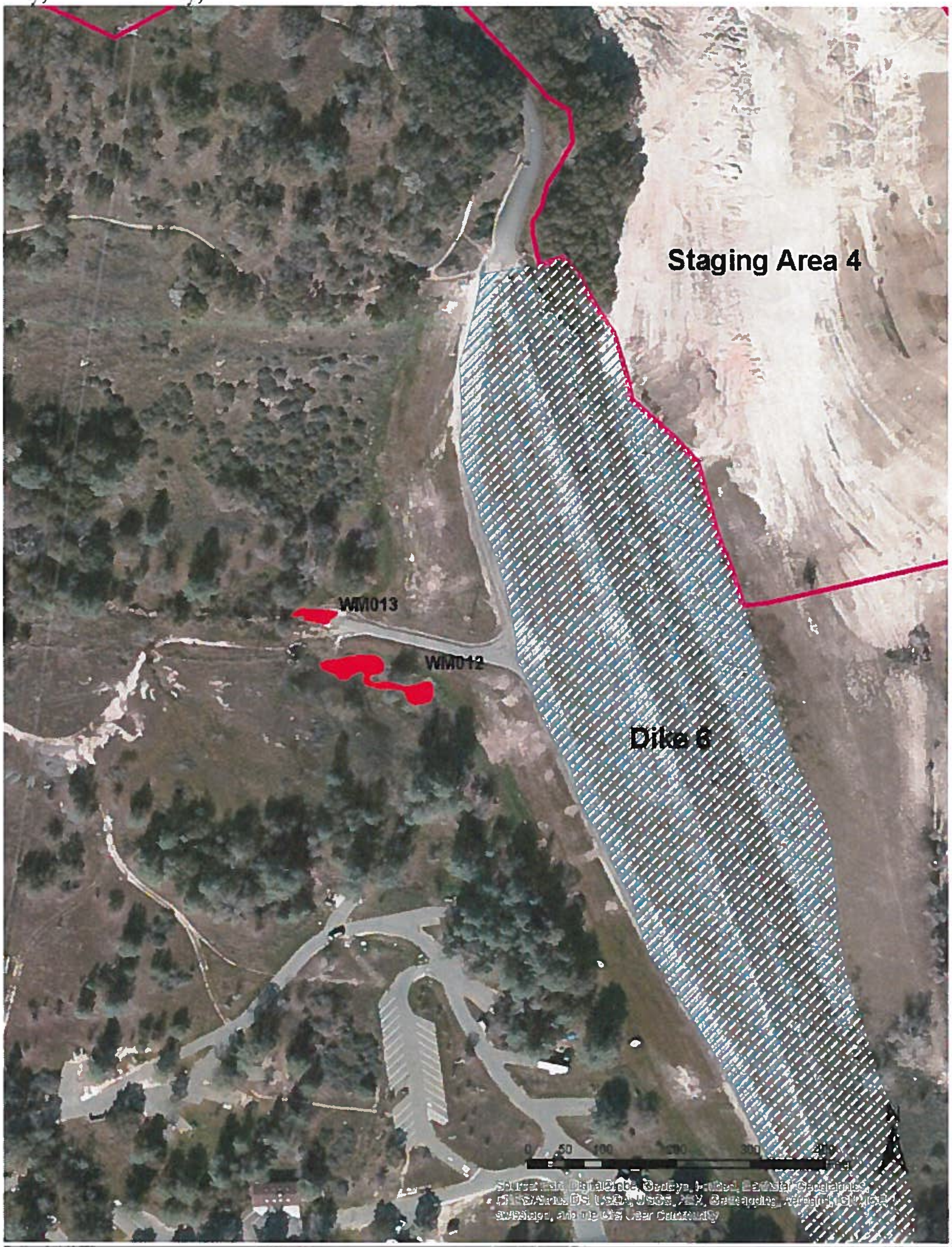


Figure 3. Area of wetland vegetation within the normal high water pool elevation of Folsom Lake, Granite Bay, Placer County, California. The site (WM014) was found to be non-wetland.

Figure 4. A data collection site (WM015) by Dike 5 that was found to be non-wetland, Granite Bay, Placer County, California.

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APPENDIX A

Natural Resources Conservation Service
Soil Survey Map
Folsom Dikes 4-6 Project

Map Scale: 1:5,770 if printed on B portrait (11" x 17") sheet.

0 50 100 200 300 Meters

0 250 500 1000 1500 Feet

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Placer County, California, Western Part
Survey Area Data: Version 6, Dec 13, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 3, 2010—Apr 29, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Placer County, California, Western Part (CA620)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
106	Andregg coarse sandy loam, 2 to 9 percent slopes	4.2	6.0%
109	Andregg coarse sandy loam, rocky, 2 to 15 percent slopes	0.2	0.3%
110	Andregg coarse sandy loam, rocky, 15 to 30 percent slopes	7.4	10.7%
111	Andregg coarse sandy loam, rocky, 30 to 50 percent slopes	0.1	0.2%
152	Inks cobbly loam, 2 to 30 percent slopes	3.3	4.8%
196	Xerorthents, cut and fill areas	12.4	17.8%
198	Water	37.3	53.4%
DAM	Dams	4.8	6.9%
Totals for Area of Interest		**69.9**	**100.0%**

APPENDIX B

Wetland Determination Data Forms
Arid West Region

Acreage: 0.060171

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Folsom Dike 6 City/County: Placer Sampling Date: 6/10/14

Applicant/Owner: ______ State: CA Sampling Point: WM012

Investigator(s): AA, ML, HK, JA Section, Township, Range: ______

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): ______ Slope (%): ______

Subregion (LRR): ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: 152 - NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ______
Hydric Soil Present?	Yes ✓	No ______
Wetland Hydrology Present?	Yes ✓	No ______

Is the Sampled Area within a Wetland? Yes ✓ No ______

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pine Pinus sabiniana	5		UPL
2. Oak Quercus lobata	10		FACU
3.			
4.			
Bare Ground — Total Cover:	1%		
Sapling/Shrub Stratum			
1. Spurge	1%		
2. Dandelion	1%		
3. Tallows	1%		
4. Vetch Vicia sativa	2%		FACU
5. Briza media	1%		FAC
Silverhair grass Aira caryophyllea — Total Cover:	3%	✓	FACU
Herb Stratum			
1. Monkeyflower Mimulus spp.	1%		OBL
2. Pacific Iris Iris hartwegii	15%	✓	FACU
3. Eleocharis palustris	2%	✓	OBL
4. Italian Rye grass Lolium perenne	5%	✓	FAC
5. Polygonum elongatus	5%	✓	OBL
6. Cattails Typha latifolia	5%	✓	OBL
7. plantago	2%		
8. Soft Chess Bromus hordeaceus	3%		FACU
Blackberry Rubus discolor — Total Cover:	2%		FACW
~~Woody Vine Stratum~~			
1. Pink unknown	5%		
2. Rumex crispus	1%		FAC
Nut sedge Cyperus spp. ~~Total Cover~~	4%		FAC
Gnaphalium (Slender cud weed) stramineum	5%		FACW

% Bare Ground in Herb Stratum ______ % Cover of Biotic Crust ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	13	x 1 =	13
FACW species	7	x 2 =	14
FAC species	7	x 3 =	21
FACU species	23	x 4 =	92
UPL species	0	x 5 =	0
Column Totals	50 (A)		140 (B)

Prevalence Index = B/A = 2.8

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

? Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ______

Remarks:

Site has been mowed recently, highly disturbed

SOIL

Sampling Point: ___________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
12	10YR 3/3	50	10YR 5/8	50			Sandy	Graded

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- __ Histosol (A1)
- __ Histic Epipedon (A2)
- __ Black Histic (A3)
- ✓ Hydrogen Sulfide (A4)
- __ Stratified Layers (A5) **(LRR C)**
- __ 1 cm Muck (A9) **(LRR D)**
- __ Depleted Below Dark Surface (A11)
- __ Thick Dark Surface (A12)
- __ Sandy Mucky Mineral (S1)
- __ Sandy Gleyed Matrix (S4)
- ✓ Sandy Redox (S5)
- __ Stripped Matrix (S6)
- __ Loamy Mucky Mineral (F1)
- __ Loamy Gleyed Matrix (F2)
- __ Depleted Matrix (F3)
- __ Redox Dark Surface (F6)
- __ Depleted Dark Surface (F7)
- __ Redox Depressions (F8)
- __ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- __ 1 cm Muck (A9) **(LRR C)**
- __ 2 cm Muck (A10) **(LRR B)**
- __ Reduced Vertic (F18)
- __ Red Parent Material (TF2)
- __ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___________

Depth (inches): ___________

Hydric Soil Present? Yes ✓ No ______

Remarks:
Strong sulfur smell Iron streaking
Soil is disturbed, graded

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- __ Surface Water (A1)
- __ High Water Table (A2)
- ✓ Saturation (A3)
- __ Water Marks (B1) **(Nonriverine)**
- __ Sediment Deposits (B2) **(Nonriverine)**
- __ Drift Deposits (B3) **(Nonriverine)**
- __ Surface Soil Cracks (B6)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Water-Stained Leaves (B9)
- __ Salt Crust (B11)
- __ Biotic Crust (B12)
- __ Aquatic Invertebrates (B13)
- __ Hydrogen Sulfide Odor (C1)
- __ Oxidized Rhizospheres along Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Recent Iron Reduction in Plowed Soils (C6)
- __ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- __ Water Marks (B1) **(Riverine)**
- __ Sediment Deposits (B2) **(Riverine)**
- __ Drift Deposits (B3) **(Riverine)**
- ✓ Drainage Patterns (B10)
- __ Dry-Season Water Table (C2)
- __ Thin Muck Surface (C7)
- __ Crayfish Burrows (C8)
- __ Saturation Visible on Aerial Imagery (C9)
- __ Shallow Aquitard (D3)
- __ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ______ Depth (inches): ___________

Water Table Present? Yes ______ No ______ Depth (inches): ___________

Saturation Present? (includes capillary fringe) Yes ______ No ______ Depth (inches): ___________

Wetland Hydrology Present? Yes ✓ No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
Photo: 126-131 GPS VW011

Remarks:

Acreage: 0.0162

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Folsom Dike 6 City/County: Granite Bay / Placer Sampling Date: 6/10/14

Applicant/Owner: ______ State: CA Sampling Point: WM013

Investigator(s): AA JA HK ML Section, Township, Range: ______

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): ______ Slope (%): ______

Subregion (LRR): ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: 106 NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophylic Vegetation Present?	Yes ✓ No ______	Is the Sampled Area within a Wetland? Yes ✓ No ______
Hydric Soil Present?	Yes ✓ No ______	
Wetland Hydrology Present?	Yes ✓ No ______	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Willow Salix goodingii	10	✓	FACW
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1.			
2. Cattail Typha latifolia	80%	✓	OBL
3. Rabbits foot Polypogon elongatus	1%		OBL
4. Bare ground	19%		
5.			
6.			
7.			
8.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum ______ % Cover of Biotic Crust ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	81	x 1 = 81
FACW species	10	x 2 = 20
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	91 (A)	101 (B)

Prevalence Index = B/A = .9

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ______

Remarks:

SOIL

Sampling Point: ___________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
12	2.5YR 3/0	100						gley

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- __ Histosol (A1)
- __ Histic Epipedon (A2)
- __ Black Histic (A3)
- ✓ Hydrogen Sulfide (A4)
- __ Stratified Layers (A5) (**LRR C**)
- __ 1 cm Muck (A9) (**LRR D**)
- __ Depleted Below Dark Surface (A11)
- __ Thick Dark Surface (A12)
- __ Sandy Mucky Mineral (S1)
- ✓ Sandy Gleyed Matrix (S4)
- __ Sandy Redox (S5)
- __ Stripped Matrix (S6)
- __ Loamy Mucky Mineral (F1)
- __ Loamy Gleyed Matrix (F2)
- __ Depleted Matrix (F3)
- __ Redox Dark Surface (F6)
- __ Depleted Dark Surface (F7)
- __ Redox Depressions (F8)
- __ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- __ 1 cm Muck (A9) (**LRR C**)
- __ 2 cm Muck (A10) (**LRR B**)
- __ Reduced Vertic (F18)
- __ Red Parent Material (TF2)
- __ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___________

Depth (inches): ___________

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ✓ Surface Water (A1)
- __ High Water Table (A2)
- ✓ Saturation (A3)
- __ Water Marks (B1) (**Nonriverine**)
- __ Sediment Deposits (B2) (**Nonriverine**)
- __ Drift Deposits (B3) (**Nonriverine**)
- __ Surface Soil Cracks (B6)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Water-Stained Leaves (B9)
- __ Salt Crust (B11)
- __ Biotic Crust (B12)
- __ Aquatic Invertebrates (B13)
- __ Hydrogen Sulfide Odor (C1)
- __ Oxidized Rhizospheres along Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Recent Iron Reduction in Plowed Soils (C6)
- ✓ Other (Explain in Remarks) *

Secondary Indicators (2 or more required)

- __ Water Marks (B1) (**Riverine**)
- __ Sediment Deposits (B2) (**Riverine**)
- __ Drift Deposits (B3) (**Riverine**)
- __ Drainage Patterns (B10)
- __ Dry-Season Water Table (C2)
- __ Thin Muck Surface (C7)
- __ Crayfish Burrows (C8)
- __ Saturation Visible on Aerial Imagery (C9)
- __ Shallow Aquitard (D3)
- __ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 1-2

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 1-2

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

GPS: VW012 Photos: 132-135

Remarks:

Non-veg. wetland. Drainage from Dike *Algae

Immediately downstream of pipe [illegible]

acreage: 0.505342

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Folsom Dike #6 City/County: Placer Sampling Date: 6/10/14

Applicant/Owner: Aguilera Kohler Littlefield State: ______ Sampling Point: WM014 (VW013)

Investigator(s): ~Photos 136-140 Section, Township, Range: ______

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): ______ Slope (%): ______

Subregion (LRR): ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ______	Is the Sampled Area within a Wetland? Yes ______ No X
Hydric Soil Present?	Yes X No ______	
Wetland Hydrology Present?	Yes ______ No X	

Remarks:

Not a wetland ↑

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Black willow ~~Salix goodingii~~	30	✓	FACW
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. Plum Prunus spp.	T		NI*
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. Eleocharis palustris	60	✓	OBL
2. Aira caryophylla	2		FACU
3. Cocklebur Xanthium spp	2		FAC+
4. Phyla nodiflora	30	✓	FACW
5. Briza minor	2		FAC
6. Solidago spp.	5		?
7. Lotus corniculatus	T		FAC
8.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum ______ % Cover of Biotic Crust ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	60	x 1 = 60
FACW species	60	x 2 = 120
FAC species	5	x 3 = 15
FACU species	2	x 4 = 8
UPL species	1	x 5 = 5
Column Totals:	128 (A)	208 (B)

Prevalence Index = B/A = 1.62

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No ______

Remarks:

Soils thin. Lots of organic matter, roots

SOIL

Sampling Point: WM 014

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
4	10YR 4/3	100						No mottling, streaking thin soil on granite

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ No ___

Remarks: A horizon loamy 1-2 inches below loamy

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Evidence of flooding. Roots high (10 feet?) on willow branches. within lake pool.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Folsom Dike #5 City/County: Placer Sampling Date: 6/10/14

Applicant/Owner: Andrew State: ______ Sampling Point: WM015

Investigator(s): Aguilera, Kohler, Littlefield Section, Township, Range: ______

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): ______ Slope (%): ______

Subregion (LRR): ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ______	No X
Hydric Soil Present?	Yes ______	No X
Wetland Hydrology Present?	Yes ______	No X
Is the Sampled Area within a Wetland?	Yes ______	No X

Remarks: Pictures 146-149

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4. Bromus hordeaceus	1		FACU
5. Centaurea solstitialis	40	✓	UPL
Total Cover:			
Herb Stratum			
1. slender wheatgrass Agropyron spp.	1		NI*
2. Lolium perenne	15	✓	FAC
3. Epilobium [illegible]	2		UPL
4. Foxtail Alopecurus spp.	1		–
5. Vetch Vicia sativa	15	✓	FACU
6. Rumex crispus	5		FAC
7. Clover sp.	2		–
8. yellow mustard (Sisy[illegible])	T		FACU
Total Cover:			
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum ______ % Cover of Biotic Crust ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 = 0
FACW species		x 2 = 0
FAC species	20	x 3 = 60
FACU species	17	x 4 = 68
UPL species	42	x 5 = 210
Column Totals:	79 (A)	338 (B)

Prevalence Index = B/A = 4.27

Hydrophytic Vegetation Indicators:

– Dominance Test is >50%

– Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ______ No X

Remarks:

SOIL

Sampling Point: ____________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ______________________

Depth (inches): ______________________

Hydric Soil Present? Yes ______ No ✓

Remarks:

Sandy soils no wetland characteristics

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ____________

Water Table Present? Yes ______ No X Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ____________

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Dike #4 - Waterside City/County: Placer Sampling Date: 6/10/11

Applicant/Owner: ____ State: ____ Sampling Point: ____

Investigator(s): Aguilera, Andrieux, Kahler, Littlefield Section, Township, Range: ____

Landform (hillslope, terrace, etc.): ____ Local relief (concave, convex, none): ____ Slope (%): ____

Subregion (LRR): ____ Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: ____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophylic Vegetation Present? Yes ____ No ____	Is the Sampled Area within a Wetland? Yes ____ No ____	
Hydric Soil Present? Yes ____ No ____		
Wetland Hydrology Present? Yes ____ No ____		

Remarks:
Photos → 150-159 - No Wetlands

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: ____________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Stratified Layers (A5) (**LRR C**)
__ 1 cm Muck (A9) (**LRR D**)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

__ 1 cm Muck (A9) (**LRR C**)
__ 2 cm Muck (A10) (**LRR B**)
__ Reduced Vertic (F18)
__ Red Parent Material (TF2)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ______________________

Depth (inches): ______________________

Hydric Soil Present? Yes ______ No ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1) (**Nonriverine**)
__ Sediment Deposits (B2) (**Nonriverine**)
__ Drift Deposits (B3) (**Nonriverine**)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Water-Stained Leaves (B9)
__ Salt Crust (B11)
__ Biotic Crust (B12)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Plowed Soils (C6)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water Marks (B1) (**Riverine**)
__ Sediment Deposits (B2) (**Riverine**)
__ Drift Deposits (B3) (**Riverine**)
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Thin Muck Surface (C7)
__ Crayfish Burrows (C8)
__ Saturation Visible on Aerial Imagery (C9)
__ Shallow Aquitard (D3)
__ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): ____________

Water Table Present? Yes _____ No _____ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): ____________

Wetland Hydrology Present? Yes ______ No ______

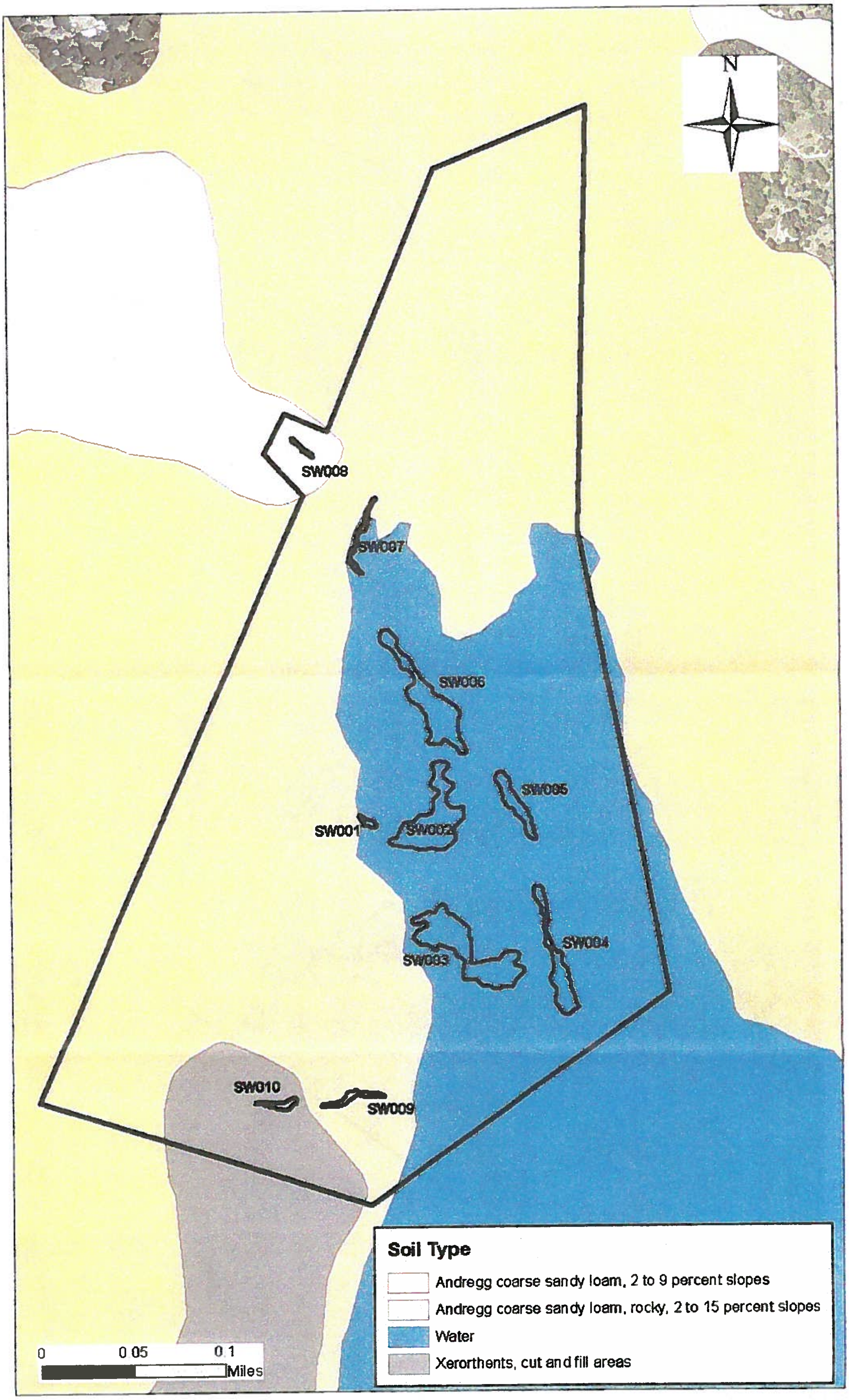
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Study Area

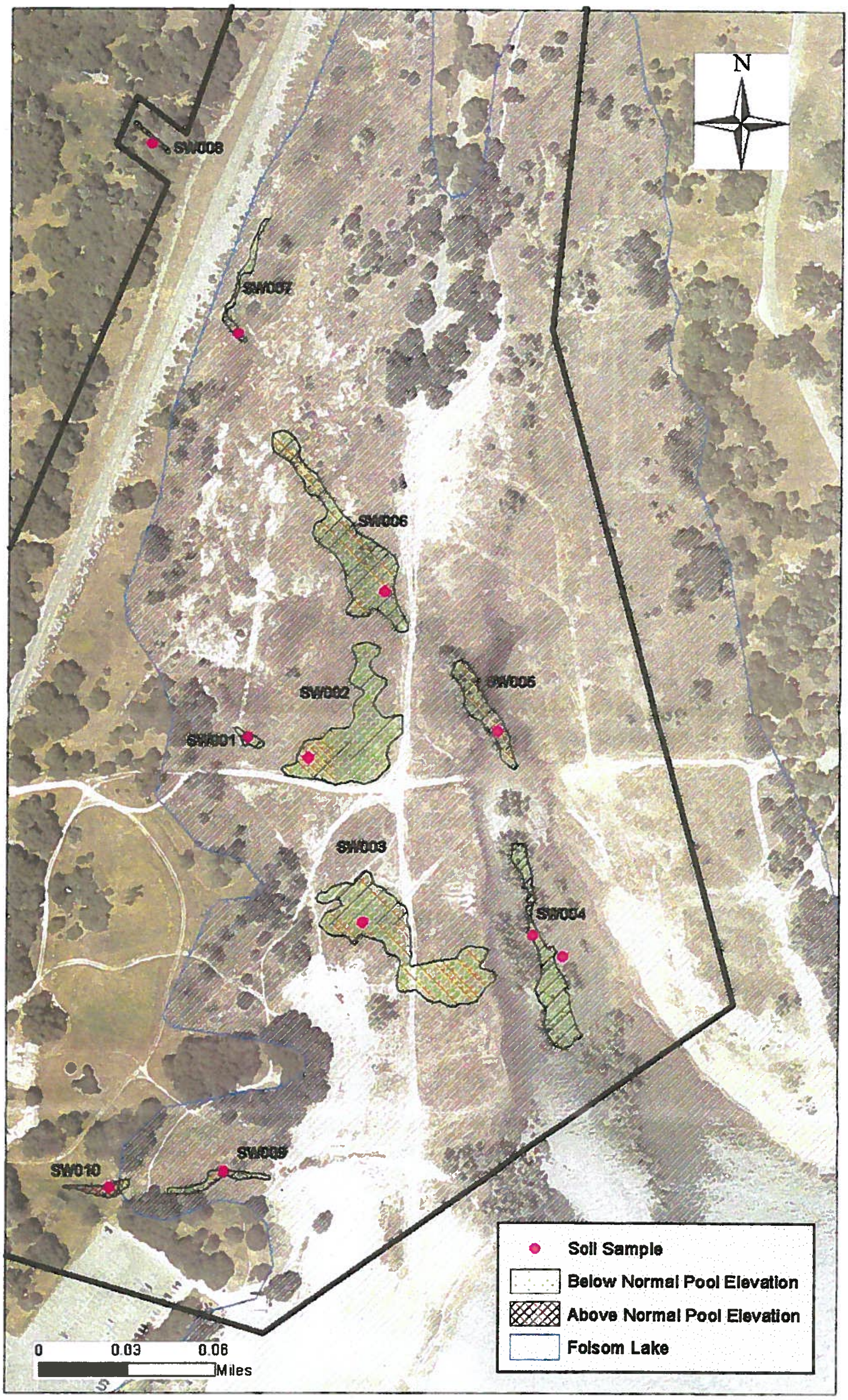

N
SW008
SW007
SW006
SW005
SW001
SW002
SW003
SW004
SW010
SW009
0
0.05
0.1
Miles

Soil Types



N
SW008
SW007
SW006
SW005
SW001
SW002
SW004
SW003
SW010
SW009
0
0.05
0.1
Miles
Soil Type
Andregg coarse sandy loam, 2 to 9 percent slopes
Andregg coarse sandy loam, rocky, 2 to 15 percent slopes
Water
Xerorthents, cut and fill areas

Jurisdictional Wetlands and Other Waters of the U.S. near Dike 1



SW001 - SW006

N
SW006
SW002
SW005
SW001
SW004
SW003
Soil Sample
Below Normal Pool Elevation
Above Normal Pool Elevation
Folsom Lake
0
0.03
0.06
Miles

SW007 and SW008

Appendix E

USFWS 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:
FF08ESMF00-
2014-CPA-0010

APR 2 0 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 supplemental coordination under the Fish and Wildlife Coordination Act (FWCA) for the Folsom Dam Raise Project, in Sacramento, El Dorado, and Placer Counties, California. This letter transmits the U.S. Fish and Wildlife Service's (Service) draft supplemental FWCA report for the proposed project (enclosed). By copy of this letter, we are requesting the agencies listed below to provide any review comments to the Service so that they can be incorporated into a final report for inclusion in the Corps' environmental documents.

If you have any questions regarding this report on the proposed project, please contact Amber Aguilera, Fish and Wildlife Biologist, or Doug Weinrich, Assistant Field Supervisor at (916) 414-6600.

Sincerely,

Jennifer M. Norris
Field Supervisor

Enclosure

cc:
Lisa Aley, COE, Sacramento, CA
Howard Brown, NOAA Fisheries, Sacramento, CA
Tina Bartlett, CDFW, Rancho Cordova, CA

DRAFT SUPPLEMENTAL FISH AND WILDLIFE COORDINATION ACT REPORT FOR THE FOLSOM DAM RAISE PROJECT

FEBRUARY 2015

BACKGROUND

Folsom Dam and its associated facilities (collectively referred to as the Folsom Facility) are located 23 miles northeast of Sacramento, near the City of Folsom, California. The Folsom Facility impounds waters from the north and south forks of the American River and was constructed to provide flood damage reduction, water supply, and hydropower. The Folsom Facility is made up of the main concrete dam, the right and left wing dams, Mormon Island Auxiliary Dam (MIAD), and 8 dikes that collectively impound 1,010,000 acre-feet (AF) of water at a reservoir water surface elevation of 466 feet. The concrete dam and earthen wing dams serve to impound water associated with the main stem of the American River. MIAD serves to dam water within a historic river channel, while the earthen dikes serve to contain water at low areas in the topography during periods when the reservoir is full or nearly full.

The Folsom Dam Safety/Flood Damage Reduction Project (FDS/FDR Project), also referred to as the Folsom Dam Modification Project or the Folsom Joint Federal Project, is a cooperative effort among the U.S. Army Corps of Engineers (Corps), the U.S. Bureau of Reclamation (Reclamation), the State of California Central Valley Flood Protection Board, and the Sacramento Area Flood Protection Agency. The FDS/FDR Project includes measures to remedy dam safety issues associated with seismic, static, and hydrologic concerns, and to provide increased flood damage protection by increasing the flood storage capacity and/or pool release mechanisms of the Folsom Facility. The potential effects of the Folsom FDS/FDR Project on environmental resources were evaluated in the 2007 Final Environmental Impact Statement/Environmental Impact Report (FEIS/EIR) and 2007 Fish and Wildlife Coordination Act (FWCA) Report. The evaluation in the 2007 FEIS/EIR and 2007 FWCA report were based on technical studies and the level of project design available at the time.

Portions of the FDS/FDR Project have been constructed or are currently in construction. This includes construction of a new auxiliary spillway to address dam safety and flood damage reduction concerns related to the discharge of flood waters from Folsom Dam, the replacement of three existing emergency spillway gates at the main dam, modifications to the main dam and 6 of the 11 earthen structures to address seismic and static concerns, security improvements, and development of an updated water control manual for Folsom Dam.

The Folsom Dam Raise Project is an element of the FDS/FDR Project that would increase the flood storage capacity by increasing the height of Dikes 1 through 8, the left and right wing dams, and MIAD by 3.5 feet. These facilities would be raised utilizing either an earthen embankment raise or a reinforced concrete flood wall. Dikes 1 through 8 and MIAD would be raised using earthen engineered fill material similar to the existing dike and auxiliary dam composition, and a reinforced 3.5 foot concrete floodwall would be constructed on the left and right wing dams. In addition, the main spillway and emergency spillway gates would be modified to improve flow capacity. This supplemental FWCA report only addresses the work specific to raising the associated facilities of Folsom Dam by 3.5 feet and the modification of the main spillway and emergency spillway gates.

PROJECT DESCRIPTION

The Folsom Dam Raise Project includes increasing the height of Dikes 1through 8, the left and right wing auxiliary dams, and MIAD by 3.5 feet by means of an earthen embankment raise or a reinforced concrete flood wall. Raising the associated facilities by 3.5 feet would provide an increased surcharge storage capacity which would require modification of the main spillway and emergency spillway gates. Modification of the gates include adding top seal bulk heads to the tainter gates, raising the hoist motors and gate lifting mechanisms, and reinforcing the support struts on the gates.

Dikes 1 through 8 and MIAD would be raised using an engineered fill material similar to the existing composition of the earthen dikes that would allow the proper amount of seepage and pore pressure to be maintained through the interface between the old and new material. The slopes and crest widths would conform to Corps standards while maintaining Reclamations requirements for security and maintenance.

The Corps would also construct a reinforced concrete flood wall on the left and right wing dams that would tie into the main dam, the new control structure, and the existing terrain. Construction of the flood wall would involve excavating a small portion of the top of each earthen structure to receive the base for the wall, constructing forms to receive cement, pouring the cement, removing the forms for the next construction length, and replacing the embankment fill along with a drainage element to control pore pressures (Figure 1 in Appendix A).

The haul routes for the project predominantly use existing service routes along the immediate toes of the existing embankments and/or are in-reservoir (Figures 2-6 in Appendix A). The identified routes avoid surveyed cultural resource sites, incorporate public safety measures, and provide temporary alternate public access detours at major recreation area access points. Staging areas for all eight dikes, both wing dams, and MIAD are identified on Figures 2-6 in Appendix A.

The purpose of the project is the reduction of flood risk. The 3.5 foot raise increases the flood risk reduction capability of Folsom Dam and Lake by allowing better use of the existing surcharge storage capacity. The addition of the top seal bulkheads over the service and emergency gates would allow Reclamation to pass the probable maximum flood event without over-topping the gates while utilizing the additional surcharge storage space.

BIOLOGICAL RESOURCES

Existing Conditions

Existing conditions are those conditions which exist in the project area at the time of the impact analysis.

Vegetation

Surrounding Folsom Lake and Upstream
The area surrounding Folsom Lake supports a mix of habitat types, dominated by blue oak-grey pine woodland. The lower foothill area near Folsom Dam contains large areas of oak woodland,

with scattered blue and interior live oaks. Small areas of chaparral extend to the reservoir's upper edge, particularly along the south fork of the American River. Annual grassland areas are interspersed throughout the area, and human-disturbed habitats occur around recreation facilities. Relatively small areas of riparian habitats can be found along tributaries to the reservoir and within seep areas. Willow stands and individual trees have become established within some areas of the reservoir pool.

Vegetation at MIAD consists mainly of annual grasses with a small portion of oak woodland and occasional freshwater marsh wetlands at the base of MIAD along Green Valley Road. MIAD was constructed to dam water within an historic river channel, creating several perennial wetlands on the landside, in addition to a wetland preserve (Mormon Island Preserve) that is run by the California Department of Parks and Recreation. The major vegetation communities identified in this area in 2008 were cattail emergent wetland and cottonwood/willow riparian woodland.

Lower American River

The lower American River, although highly modified from conditions of 150 years ago, supports a diverse and highly valuable area for biological resources. The 23-mile-long reach of the American River Parkway downstream of Folsom Dam encompasses about 4,000 acres, the majority of which are in a State designated floodway and contains large areas of annual grasslands, riparian forest and scrub-shrub, oak-woodlands, bare sand and gravel, and surface waters of the river and its associated sloughs and dredge ponds (Service 2003).

Fish

Folsom Lake and Upstream

When full, Folsom Lake encompasses about 10,000 surface acres of water and 75 miles of shoreline, extending about 15 miles up the north fork and 10.5 miles up the south fork of the American River. It supports a "two stage" fishery; warm water species such as bass (largemouth, smallmouth, spotted), sunfish (redear, bluegill) and crappie (white, black) in the upper portion of the water column, and trout and landlocked salmon (kokanee and Chinook) in deeper portions of the water column. Various catfish and bullhead species can also be found near the bottom of the lake in shallower waters. Fish habitat is present within the inundation zone in the form of young willow dominated riparian habitat which grows during extended periods of drought. Both warm and cold water fisheries tend to benefit from increased peak spring water storage since it results in better cold water reserves for the salmonids and increased spawning and rearing habitat for warm water fish (Service 2001). Sport fishing is an economically important and popular recreational activity at Folsom Lake.

Sediment associated with the Folsom Facility may contain mercury from historic mining operations and metals from historic activities or geology in the American River drainage (Reclamation 2006). Most of the mercury in water, soil, sediments, or plants and animals is in the form of inorganic mercury salts and organic forms of mercury (e.g., methylmercury). Mercury cycles in the environment as a result of natural and human activities and can accumulate most efficiently in the aquatic food web. Predatory species at the top of the food web generally have higher mercury concentrations. Nearly all of the mercury that accumulates in fish tissue is methylmercury (EPA 2006).

Lower American River
The lower American River supports a diverse and abundant fish community; altogether, at least 41 species of fish are known to inhabit the river (Service 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 (Service 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 (Service 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. The anadromous fish trap count for steelhead at the Nimbus Hatchery was 3,371 adults during the 2012/2013 season (CDFW 2015). 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 (Service 1994).

Wildlife

Surrounding Folsom Lake and Upstream
The area surrounding Folsom Lake supports an animal community characteristic of the lower Sierra Nevada western slope. Although the range of elevation is small, habitats are diverse, in part because the reservoir extends about 20 miles into the Sierra Nevada foothills, from gentle hills near the dam to steep-walled canyons along the forks of the American River. More than 50 species of mammals live in these areas (Service 1986). Common species include mule deer, striped skunk, black-tailed jackrabbit, brush rabbit, raccoon, California ground squirrel, and a diverse assemblage of small mammals, including mice, voles, and pocket gophers. Less common mammals include river otters, mountain lions, badgers, and bobcats. Birds typical of oak-dominated habitats include acorn woodpeckers, scrub jays, ash-throated flycatchers, and California quail. Oaks provide acorns, a nutrient-rich and important food source for mule deer, acorn woodpecker, northern flicker, Nuttall's woodpecker, white-breasted nuthatch, and scrub jay. In addition to a diverse community of small passerine birds, other birds such as woodpeckers, California quail, introduced wild turkeys, Canada geese, and various birds of prey are fairly common near the reservoir. The presence of year-round water provides habitat for many water-associated species such as wood duck, common merganser, mallard, black phoebe, greater yellowlegs, and belted kingfisher. The Mormon Island Preserve also provides a perennial wetland for many species including pond turtles.

Areas dominated by annual grassland provide foraging habitat and cover for California ground squirrel, pocket gopher, turkey vulture, coyote, western fence lizard, western rattlesnake, western kingbird, and western meadowlark. Grassland areas are important to many foraging raptors. Red-tailed hawk, golden eagle, ferruginous hawk, rough-legged hawk, American kestrel, and prairie falcon all spend time in the area for wintering and/or breeding.

Lower American River
The lower American River corridor provides a mosaic of riparian, riverine, grassland, and oak woodland habitat. These diverse habitats support a corresponding diversity of wildlife.

The lower American River provides feeding, resting, and/or nesting habitat for many bird species, many of which require the aquatic areas of the river and backwaters, or the riparian vegetation of the ecosystem. Riparian areas are known to support a species-rich songbird community (Gaines 1977), and the lower American River also provides habitat for many raptors, including Swainson's hawks, red-shouldered hawks, Cooper's hawks, and great-horned owls, all of which require or are closely associated with riparian vegetation. Bald eagles, which are more common around Folsom Lake, occasionally use the lower river, which provides roosting and foraging habitat. Waterfowl, particularly mallards and Canada geese, also use the area extensively.

More than 50 species of mammals have been recorded for the area (Service 1986). Common species include beaver, black-tailed jackrabbit, striped skunk, Virginia opossum, raccoon, California ground squirrel, gophers, and many small rodents and insectivores including voles, moles, shrews, deer mice, and pocket gophers. Uncommon species include mule deer, and several carnivores, such as badger, long-tailed weasel, river otter, gray fox, coyote, bobcat, and mink.

Reptile species of the lower American River include common kingsnake, Gilbert and western skinks, southern alligator lizard, western fence lizard, gopher snake, and several garter snakes. Common amphibians include Pacific treefrog, California newt, California slender salamander, western toad, and the introduced bullfrog.

Relatively little is known about invertebrates of the lower American River, but elderberry plants are fairly common in areas, and provide habitat for the endangered valley elderberry longhorn beetle.

FUTURE CONDITIONS WITHOUT THE PROJECT
(No Action Alternative)

Future without-project conditions are those conditions expected to occur over the life of the project if the project were not implemented.

Under the without-project condition, the Corps would not implement the 3.5 foot raise of Dikes 1-8, the left and right wing dams, and MIAD, and the emergency spillway gate modifications would not be implemented. Consequently, improved flood risk management benefits would not occur.

Vegetation

Surrounding Folsom Lake and Upstream
Without-project conditions for the project area are not expected to change significantly from the existing conditions over the life of the project.

Lower American River
Under without-project conditions, vegetation in and along the lower American River would continue to undergo changes typically associated with a riparian system, but constrained and limited by the adjacent levee system, upstream dams, and regulated flow releases. Regeneration of riparian species,

particularly cottonwood and willows, would slowly decline, as continued lateral erosion, net downstream sediment movement, and increased amount of higher terrace areas, exposed to less frequent flooding, develop as a result of increased channel stability. These processes have resulted from the construction of Folsom Dam and channel modifications along the lower American River (Service 1991).

Sediment deposition needed for the establishment of these riparian species would continue to be limited by upstream impoundments. Forest complexes would be dominated by species adapted to relatively low water needs. Riparian species would gradually mature then die out, giving way to more drought-tolerant plant species such as ash, box elder, and valley and live oaks. Vegetation would continue to be affected by its location in a major metropolitan area. Associated impacts include vandalism, burning, and mowing for firebreaks, among the more common human disturbances. Some younger riparian vegetation that currently exists would continue to develop over time into mature riparian woodland habitat.

Fish

Folsom Lake and Upstream
Without-project conditions for the project area are not expected to change significantly from the existing condition over the life of the project.

Lower American River
Conditions for fish in the lower American River are likely to change in the future without the project. However, the way in which conditions change is difficult to predict. With continued implementation of the Anadromous Fish Restoration Program of the Central Valley Project Improvement Act (Service 1995), conditions in the lower American River are expected to improve for fishery resources.

Other variables would determine the way in which flows are managed on the lower American River; including meeting the needs of downstream water quality standards, existing and renewed water contracts, and any additional new water contract quantities.

Wildlife

Surrounding Folsom Lake and Upstream
Without-project conditions for the project area are not expected to change significantly from the existing condition over the life of the project.

Lower American River
The types of wildlife species found in the area would likely change somewhat along the lower American River under without-project conditions, due primarily to the changes in vegetation described above and overall habitat abundance and diversity. Species which would decrease in number are those that prefer tree species such as cottonwood and willow for perching, foraging, and/or nesting (Service 1991a), as these plant species would likely decrease over time. Such wildlife species include birds such as woodpeckers, flickers, wrens, and raptors, and other avian species that use these riparian areas to meet their life requirements. Alternatively, species that prefer more arid habitat, such as oak woodland, would increase over time.

FUTURE CONDITIONS WITH THE PROJECT

Future with-project conditions are those conditions expected to occur over the life of the project if the project were implemented.

Construction Impacts

Vegetation

Folsom Lake

Four cover-types: oak/grey pine woodland, riparian woodland, seasonal wetland, and annual grassland would be directly impacted by construction of the Folsom Dam Raise Project. The impact acreage for the oak/grey pine woodland, riparian woodland, and seasonal wetland cover-types for the project are shown in Table 1.

Table 1. Summary of cover-types and impacted acres for the construction of the Folsom Dam Raise Project, Sacramento, El Dorado, and Placer Counties, California

Cover-Type Impacted	Impacted Acres[1]
Oak/grey pine woodland	4.9
Riparian Woodland	0.05
Seasonal Wetland	0.32
Total	**5.27**

Construction impacts include a 50 foot construction area from the landside toe. Impacts to seasonal wetlands from raising MIAD may occur from changes in water quality or the discontinued/muted flow of water from Folsom Lake into/out of the wetlands.

Impacts to annual grassland would be minimized by seeding all impacted areas with native grasses as soon as construction activities are complete in that specific area. It was anticipated that the work would be phased, so the annual grassland areas would not all be disturbed at the same time. In addition, the impacts to other disturbed lands can be minimized by replanting with native annual grasses, when possible.

Lower American River

No change in the existing conditions for vegetation in the lower American River is anticipated because the project's construction impacts would be focused on the flood control space within the reservoir, on the main dam for spillway gate modifications, and lands adjacent to the existing reservoir. At the current time, neither Reclamation nor the Corps has the authority to deviate from

1 Note: The impact acreages calculated for construction of the project were provided by the Corps using aerial imagery and the Northern Sierra Nevada Foothills Vegetation Project: Vegetation Mapping Report (CDFW 2011).

the current water control manual, thus operations of the dam would remain the same until an updated water control manual for Folsom Dam is completed.

Fish

Lower American River
No change in fish species numbers or species composition in the lower American River is anticipated to occur from construction of the project. However, the lower American River has been designated as impaired under the Clean Water Act, section 303(d) for methylmercury and Lake Natoma has health advisories for mercury in fish. Efforts should be made to minimize suspension of sediments, if any, during project construction.

Wildlife

Lower American River
No change in wildlife species numbers or species composition is expected to occur along the lower American River as a result of construction of the project.

Operational Impacts

Folsom Lake
In 2001, the Corps proposed enlargement of the existing Folsom Dam outlets as part of the authorization under the American River Watershed Investigation Folsom Dam Modification Project, which directed the Corps to change the variable flood storage space at Folsom Lake from the current interim operation of 400,000 - 670,000 AF to a 400,000 - 600,000 AF permanent variable flood space operation once the Folsom Dam Modification Project had been implemented. This change would increase the level of flood protection by enabling operators to balance outflows with inflow early in the storm hydrograph, and attain a maximum discharge of 115,000 cubic feet per second (cfs) through the enlarged outlets for a 10-year or larger event. At that time the Service analyzed the impact of the revised Folsom Dam Modification Project to the cold water pool, gravel movement, and seed dispersal. The Service completed a FWCA report for the American River Watershed Investigation Folsom Dam Modification Project in 2001 (Service 2001).

When the Folsom DS/FDR project is completed, Folsom Dam would have four methods of discharging flows from the reservoir: three power penstocks, eight flood control outlets, tainter/radial spillway gates set near the main spillway crest (five service and three emergency), and six submerged tainter gates in the new auxiliary spillway. To ensure adequate tailwater, the three emergency spillway gates may not be used unless the total outflow from the dam exceeds 240,000 cfs. This restriction makes the emergency gates unusable for normal flood control purposes and limits the use of the gates to dam safety outflows (Reclamation 2006a).

Lower American River
Implementation of the project would be identical to the without-project condition up to inflows of around 300,000 cfs, or about the 140 year event. Between the 140 year event (0.7% probability of occurrence) and about the 200 year event (0.5% probability of occurrence), the raise would maintain outflows at not more than 115,000 cfs, while the without-project conditions would be uncontrolled, resulting in very high outflows of 180,000-315,000 cfs.

The Corps and Reclamation, along with other agencies and water groups, are in the process of developing an updated water control manual for Folsom Dam that incorporates the flood risk reduction benefits of the American River Watershed Investigation Common Features Project and the new auxiliary spillway. The updated water control manual is scheduled to be implemented after the completion of the new auxiliary spillway and would be updated again to incorporate the flood control benefits of the Folsom Dam Raise Project. The development of the updated water control manual is a collaborative process with the appropriate level of environmental analysis, public, agency and stakeholder coordination, and appropriate NEPA/CEQA documentation. If an updated water control manual is not developed, Folsom Dam would be operated under the existing operating criteria. Under this scenario, the same amount of water would be released with and without the project.

Vegetation

Folsom Lake

The enlargement of Folsom Lake through a raise would allow for additional flood surge storage capacity, on a temporary basis, and not for increasing the storage capacity of the reservoir. About 813.7 acres would be affected by raising Folsom Dam 3.5 feet. Some of these lands are already developed or contain otherwise disturbed habitat, that provide little or no value for wildlife species, and some support vegetation that is tolerant of flooding. Table 2 summarizes the acreage of each cover-type which provides value for wildlife that is expected to receive inundation over the life of the project. Inundation effects around Folsom Lake would occur in large part by the frequency, timing, and duration of flooding. Inundation impacts are shown for the 3.5 foot raise operating under the current water control manual/dam operations.

Table 2. Preliminary summary of cover-types and impacted acres for the inundation of Folsom Lake as part of the Folsom Dam Raise Project, Sacramento, El Dorado, and Placer Counties, California

Cover-Type Impacted by Inundation	Impacted Acres
Oak/grey pine woodland	781.5
Chaparral	32.2
Total	**813.7**

Studies to date indicate that predicting the effects of inundation on vegetation is not straightforward. Raising Folsom Dam would have the potential for two significant impacts on vegetation:
(1) changes in vegetation composition caused by inundation affecting survival and reproduction of vegetation in the zone between current and proposed maximum reservoir levels; and (2) effects of inundation on soil erosion and slippage, especially on steep slopes as are found along the upper reservoir and the forks of the American River.

The vegetation types exposed to flooding are not, in general, highly tolerant of prolonged flooding. With the exception of riparian and riverine habitats, natural flooding does not occur in the areas which would be flooded by raising Folsom Dam. Studies of the effects of inundation on blue oaks (1975 *in* Service 1980; MWA-JSA 1994) have found that blue oaks can survive some flooding, but may be sensitive to periods of inundation of as little as 7 days. It is not clear from these studies, however, at what time of year flooding occurred, and the ability of vegetation to tolerate inundation depends on the time of year. For example, deciduous trees, such as oaks, tend to be much more sensitive to flooding during their period of active growth (i.e., in the spring), while winter-dormant plants appear to be more tolerant of flooding (Service 1980). Folsom Lake can be expected to fill during a spring flood event, when oaks are actively growing. The absence of blue oaks within the inundation zone of Folsom Lake and other foothill impoundments indicates that blue oaks cannot tolerate the flooding regime that exists there. Further, evergreen species, including grey pines and live oaks, occur commonly around the reservoir above current pool elevations, and tend to be more sensitive to inundation than deciduous trees such as blue oaks (MWA-JSA 1994).

The other factor which could affect vegetation is erosion (slippage) of the saturated soil in the new inundation area during a flood event as the water is drawn down or from wind driven wave wash during a major storm event. Slopes within the Folsom Lake area are generally between 5 and 25% (Corps 2001). Slopes in the Mooney Ridge area in the northwestern corner of the reservoir and the shoreline just west of the South Fork of the American River exceed 30% (Corps 2001). It is likely that during a major flood event some, or all, of the soil on steep slopes would experience some erosion. The extent of erosion and its effect on vegetation would be difficult to predict.

Assuming a worst-case scenario that over the life of the project all of the existing vegetation in the inundation zone would be lost, a mitigation need was developed for each cover-type using the 2007 HEP results. Statistically, there is a relatively small chance of complete inundation coupled with total loss of vegetation. However, it is reasonable to expect some impacts, especially at the lower zones due to the potential for more frequent inundation, over the life of the project.

Given the uncertainties on effects of inundation on vegetation and soil erosion, the 2007 HEP Team decided to recommend that a monitoring and adaptive management program be developed to monitor vegetation around the reservoir over the life of the project. Existing conditions would be managed and updated at 10-year, or some other predetermined interval. After major flood events (those which encroach above the existing maximum flood pool elevation), vegetation would be surveyed and damages attributable to inundation would be mitigated as deemed appropriate using best management practices at the time.

Lower American River

Dikes 1-8, MIAD, and both wing dams of Folsom Dam would be raised 3.5 feet with the project, which would allow for additional space within Folsom Lake to detain flood flows. Meanwhile, outflows would remain, to the extent possible, within the 115,000 cfs objective capacity of the downstream channel. The additional 3.5 feet of freeboard would reduce peak flows, while increasing the duration of flows, relative to existing conditions. The project would also modify the main and emergency spillway gates to allow for improved flow capacity. The moderated flows may reduce erosive energy compared to existing conditions, and could have a cumulative or indirect effect on carryover storage.

Fish

Folsom Lake

Impacts from the rise and fall of reservoir levels could result in fish becoming stranded in isolated water bodies or on land, particularly if in-reservoir construction, borrow, stockpiling, disposal areas, and haul roads are not properly re-contoured to allow complete drainage as reservoir levels fall.

Lower American River

No long-term operational effects for fish species are anticipated.

Wildlife

Folsom Lake

No operational effects for wildlife species are anticipated, provided there is no accelerated erosion associated with the new inundation zone.

Lower American River

No long-term operational effects for wildlife species area anticipated.

Endangered Species

Based on a search of the Clarksville, Folsom, Pilot Hill, and Rocklin USGS quadrangle maps there are several listed species which could occur within or near the project area. The species under the jurisdiction of the Service which may be affected by the project include the valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, and California red-legged frog. The other species (anadromous fish) are under the jurisdiction of National Marine Fisheries Service (NOAA Fisheries). The complete list is included in Appendix C, as well as a summary of Federal agencies responsibilities under the Endangered Species Act of 1973, as amended.

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[2] which utilize each habitat or cover-type are then selected for Resource Category analysis. Selection of evaluation species can be based on several rationale, 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 Fish and Wildlife 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 would 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 would 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, rectification of measures, measures to reduce or eliminate impacts over time, and compensation.

Seven fish and/or wildlife habitats were identified in the project area which had potential for impacts from the project: oak/grey pine woodland, riparian woodland, chaparral, seasonal wetland, annual grassland, lacustrine, and other. The resource categories, evaluation species, and mitigation planning goal for the habitats impacted by the project are summarized in Table 3.

<u>Oak/grey pine woodland</u>

Oak/grey pine woodland is usually dominated by a blue oak overstory, with grey pines interspersed at low density among the oaks. Other trees associated with this habitat type are California buckeye,

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2 Note: Evaluation species used for Resource Category determinations may or may not be the same evaluation species used in a HEP application, if one is conducted.

which occurs as scattered individuals or small clumps, and interior live oak. On more mesic sites, such as north-facing slopes along the South Fork near Salmon Falls, live oaks and California black oaks replace blue oaks as the dominant oak. Understory shrubs such as manzanita, toyon, and shrubby oaks are often present, though typically at low densities, relative to tree cover.

Oak woodland also occurs widely in the project area, particularly along the lower American River, and at lower foothill elevations, near Folsom Dam. Typical oak woodland is characterized by a fairly open canopy layer with 20-70% cover of blue and live oaks, and a grassy ground cover. A woody understory may be present, but is typically sparse where present.

The canopy of blue oaks is typically 30 to 50 feet tall, and varies from about 30-80% canopy closure (Barbour 1988), with open areas containing shrubs and grasses. The understory is primarily annual grasses and forbs. Most existing stands of this type are in mature stages, with oaks to heights of up to 50 feet. Mature grey pines typically rise above the oaks, to heights of up to 75 to 100 feet. The long-term survival of this habitat type has been an issue of concern, because oak regeneration has been minimal for over 100 years (Holland 1976). Many factors have been implicated as causes for low recruitment of oaks, including browsing of seedlings, consumption of acorn crops by livestock and native wildlife, changes in fire dynamics, and possibly climatic changes and competition with introduced annual grasses (Barbour 1988; Verner 1988). Blue oak woodland provides high-quality wildlife habitat for a rich assemblage of species. In the western Sierra Nevada, 29 species of amphibians and reptiles, 79 species of birds, and 22 species of mammals find mature stages of this habitat suitable or optimum for breeding, where other, special habitat requirements are met (Verner and Boss 1980).

Non-native annual grasses form an understory in most of the study area, and the transition from woodland to savanna is not clearly demarcated, but rather part of a continuum from closed canopy woodland to open, treeless grasslands. As a result, habitat types can grade imperceptibly from one to another. Where trees are absent, the habitat is designated as annual grassland. Because scattered oaks provide food, cover, and nesting habitat unavailable in grasslands, we treated oak savanna as a component of oak woodland.

The evaluation species selected for the oak/grey pine woodland are acorn woodpecker, turkey, and breeding birds. 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 consumptive and non-consumptive human uses (i.e., hunting and bird watching). Based on the high value of oak woodlands to the evaluation species, and their declining abundance, the Service has determined oak/grey pine 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."

Table 3. Resource categories, evaluation species, and mitigation planning goal for the habitats possibly impacted by the proposed Folsom Dam Raise Project, Sacramento, El Dorado, and Placer Counties, California.

COVER-TYPE	EVALUATION SPECIES	RESOURCE CATEGORY	MITIGATION GOAL
Oak/Grey Pine Woodland	Acorn woodpecker, turkey, Mule deer	2	No net loss of in-kind habitat value or acreage.
Riparian Woodland	Belted kingfisher, Raptor guild	2	No net loss of in-kind habitat value or acreage.
Chaparral	Breeding birds	3	No net loss of habitat value while minimizing loss of in-kind habitat value.
Seasonal Wetland	Marsh wren, red-winged blackbird, great blue heron	2	No net loss of in-kind habitat value or acreage.
Annual grassland	Raptor guild, ground foraging birds	3	No net loss of habitat value while minimizing loss of in-kind habitat value.
Open Water	Sport fish	4	Minimize loss of habitat value
Other	None	4	Minimize loss of habitat value

Riparian Woodland

Riparian woodlands occur extensively along the lower American River, and in patches along perennial and intermittent streams and rivers flowing into Folsom Lake. Two forms of riparian habitat occur in the study area: riparian forest, dominated by large trees and riparian scrub-shrub, consisting mostly of low shrubs. Scrub-shrub habitat occurs in more frequently disturbed areas (e.g., by flood-scouring or human activities), and as a stage in regeneration of riparian forest following disturbance. The two forms are often interspersed (e.g., a clump of cottonwoods in an area of scrub shrub), and are treated together in this report, as the existing data is inadequate to separate them. Trees characteristic of this habitat in the study area include cottonwoods, arborescent willows, and oaks; understory plants include wild grape, blackberries, poison oak, willows, and elderberry. Scrub-shrub habitat is frequently dominated by willows, and often contains other shrubby riparian species and immature trees listed above. Small areas of emergent wetlands, characterized by cattails, occur along the lower American River and may occur in riparian areas upstream of Folsom Dam.

Riparian forests were formerly widespread in the region, but have been severely reduced by agricultural development, flood control measures (including channel modifications and vegetation removal), and decreased stream flows resulting from diversions and dams upstream. The riparian forest along the lower American River is California's largest urban riparian area (County of

Sacramento 2011) and is managed through the policies set forth in the Parkway Plan (County of Sacramento 2008), which has been adopted into the county general plan.

Riparian vegetation provides feeding, nesting, and shelter habitat for many species which use the riparian zone and surrounding lands. Vegetation which overhangs or protrudes into the water also provides fish with cover, rearing, and food resources. Riparian habitat supports a species-rich assemblage of breeding birds and provides food and cover to migratory birds. Because of its linear distribution and the extensive edge which that provides, the value of riparian areas to wildlife typically far exceeds the value of an equally-sized block of non-riparian woody habitat. Belted kingfishers, and raptors (including red-shouldered hawk, osprey, and American kestrel) were chosen to evaluate the riparian woodland because these species are all predators, playing a key role in the community ecology of the area. In addition, the evaluation species have a non-consumptive human use (e.g., bird watching) and are migratory birds, for which the Service has management responsibility under the Migratory Bird Treaty Act.

Riparian habitat is of generally high value to the evaluation species and is scarce in the project area and general eco-region. Therefore, the Service has determined riparian 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."

Chaparral

Chaparral occurs in patches around Folsom Lake, along the south arm of Folsom Lake, and along the North and South Forks of the American River. Chaparral has a dense overstory of woody evergreen shrubs, and is usually found on drier sites, e.g., on southwest-facing slopes, and on shallow soils. Chaparral in the study area is often dominated by chamise, with manzanita, ceanothus, toyon, and shrubby oaks. Understory growth tends to be sparse and is mostly annual grasses with a few forbs. Chaparral plants are notable for their high tolerance to drought, ability of seeds and/or plants to survive fire, and their high value as watershed cover (Service 1991). Chaparral provides food resources, shelter, and breeding sites to many wildlife species. For example, chaparral on the western slope of the Sierra Nevada provides suitable or optimal nesting or breeding habitat for about 90 avian species, 10 amphibians, 18 reptiles, and 41 mammals (Verner and Boss 1980).

The evaluation species selected for chaparral habitat are breeding birds because they are important to the overall chaparral ecology as predators, prey, and seed dispersers. In addition, they were chosen because of the Service's responsibility for their protection and management under the Migratory Bird Treaty Act and they provide non-consumptive human use (e.g., bird watching, bird song). Chaparral habitat is a native habitat of generally high value to the evaluation species and is moderately scarce in the project area, but fairly abundant in the eco-region. Therefore, the Service has determined chaparral habitats which would be affected by the project should be placed in Resource Category 3, with an associated mitigation planning goal of "no net loss of habitat value while minimizing loss of in-kind habitat value."

Seasonal Wetland

Seasonal wetlands occur in small patches near seeps and springs, and in drainages entering Folsom Lake. Seasonal wetlands in the project area are characterized by non-woody emergent vegetation, including cattails, rushes, and sedges. Two marsh-nesting passerine birds, the marsh wren and red-winged blackbird, as well as the great blue heron, were chosen to evaluate the seasonal wetlands. The marsh wren and red-winged blackbird are passerine species which nest and feed in emergent wetlands and could therefore be present in any occurrences of this cover type which may be found in the project area. Great blue herons forage extensively in wetlands on aquatic vertebrates. All three evaluation species have a non-consumptive human use (e.g., bird watching, bird song) and are migratory birds for which the Service has management responsibility under the Migratory Bird Treaty Act.

In the project vicinity, and in the eco-region in general, seasonal wetlands are relatively scarce and would be of high value to the evaluation species. Therefore, the Service designates the seasonal wetland cover-type in the project area as Resource Category 2, with an associated mitigation planning goal of "no net loss of in-kind habitat value."

Annual Grassland

Annual grasslands differ from woodland by lacking dominant tree cover and it appears that much of the treeless grassland found within the study area is a result of tree loss due to human activities. Perennial grass species once dominated native grasslands, but introduced annual species have largely displaced native perennial and annual grasses. Typical annual grass species are foxtail, brome, wild oats, and Italian ryegrass; native perennial grasses include needlegrasses, California onion grass, and fescue. Grassland areas provide habitat for granivorous birds such as the western meadowlark, California quail, sparrows, and finches, and for small mammals such as voles and pocket gophers. These areas provide important foraging habitat for breeding raptors, including red-tailed hawks, American kestrels, and great horned owls. It also provides habitat for wintering raptors. Lastly, waterfowl, notably Canada geese, graze or green vegetation in the grasslands adjacent to Folsom Lake.

The evaluation species selected for the annual grassland cover-type are the raptor guild and passerine ground-foraging birds. The raptor guild was chosen because as a predator, raptors play a key role in the community ecology of the project area. Both evaluation species were selected because of the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and their overall high non-consumptive value to humans (e.g., birdwatching). While the values of this habitat vary according with season and grazing intensity, much of the grassland habitat in the project area provides medium to high value foraging habitat for diverse assemblages of birds of prey and ground-foraging passerine birds. Furthermore, the value of these habitats is often enhanced by their continuity with other adjacent habitats, such as wooded areas, cliffs, and ponds which provide nest and shelter sites. Grassland habitat within the project area is relatively abundant. 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."

Open Water

The evaluation species chosen for the open water cover-type are freshwater sport fish. The open water habitat is comprised of Folsom Lake. This evaluation species was chosen because of their consumptive and recreational value to humans and their importance as a prey item for many species of raptors and wading birds. This area has been highly impacted by recreational activities and contains mostly non-native sport fish. Therefore, the Service designates the open water cover-type as Resource Category 4. Our associated mitigation planning goal for these areas is "minimize loss of in-kind value."

Other

Other habitat includes disturbed areas such as parking lots, roads, and boat ramps. Evaluation species were not chosen for this cover-type because use by wildlife is minimal. In view of the extremely low habitat value for most wildlife species provided by these areas, the Service designates any highly disturbed habitats meeting the other habitat definition that would be impacted by the project as Resource Category 4, with a mitigation planning goal of "minimize loss of habitat value."

A habitat assessment using Habitat Evaluation Procedures (HEP) was completed in February 2007 to develop the compensatory mitigation acreage for the oak/grey pine woodland, riparian woodland, and seasonal wetland cover-types, and is included in Appendix B. The team evaluating the updated project proposal determined the 2007 HEP results were still valid as habitat attributes (tree height, crown cover, percent shrub cover, tree diameter at breast height, tree composition, etc.) have not changed significantly. Based on the results of the 2007 HEP, compensation ratios are: 1.2:1 for oak/grey pine woodland; 1.1:1 for riparian woodland; and 4:1 for seasonal wetland. The impact and compensation acreage for the oak/grey pine woodland, riparian woodland, and seasonal wetland cover-types for construction of the project are summarized in Table 4. The impact and compensation acreage for the oak/grey pine woodland and chaparral cover-types under the worst case scenario of complete inundation and loss of all vegetation within the inundation zone of the reservoir due to the project are summarized in Table 5.

Table 4. Summary of cover-types, impacted acres, and compensation recommended for the construction of the Folsom Dam Raise Project, Sacramento, El Dorado, and Placer Counties, California

Cover-Type Impacted	Impacted Acres: Compensation Acres Needed
Oak/grey pine woodland	4.9 : 5.9
Riparian Woodland	0.05 : 0.06
Seasonal Wetland	0.32 : 1.3
Total	**5.27 : 7.26**

Table 5. Preliminary summary of cover-types, impacted acres, and compensation recommended for the inundation of Folsom Lake as part of the Folsom Dam Raise Project, Sacramento, El Dorado, and Placer Counties, California

Cover-Type Impacted by Inundation	Impacted Acres: Compensation Acres Needed
Oak/grey pine woodland	781.5 : 939.4
Chaparral	32.2 : 34.1
Total	**813.7 : 973.5**

Our recommended mitigation plans are based on the fundamental assumption that in-kind compensatory mitigation, namely creation or restoration of the desired habitats, will succeed in replacing the habitat functions, values, and acreage lost with project implementation.

To provide assurance that any implemented compensatory mitigation measures will achieve their intended objective of replacing lost habitat values, detailed, long-term mitigation monitoring and remedial-action plans must be incorporated into the project design. These plans should include planting design, monitoring methods, specific success criteria, and remedial measures in the event of failure in meeting success criteria. The Service would be willing to participate in monitoring of construction activities, and development and implementation of the mitigation and monitoring programs.

The results and recommendations in the discussion that follows are for compensatory mitigation of impacts due to implementation of the project. They do not supersede our primary recommendation for impact avoidance, as discussed previously in this report. The results and mitigation recommendations are based on the 2007 HEP analyses (Appendix B) which include: field surveys, review of aerial photographs, data collection, review of the literature, and discussions with plant ecologists and other experts familiar with the project area and its ecological processes. These plans were selected based on what the Service views as most appropriate for replacing habitat values that would be lost with the project. They are conceptual in nature, with management goals outlines in each cover-type impact section below. Mitigation site selection should be based on this conceptual framework, and designed to coincide as much as possible with the construction plans in order to minimize project costs. Adverse construction impacts at a proposed mitigation site, such as the removal of topsoil in borrow areas could, however, reduce or negate the suitability of the site for revegetation efforts. In addition, numerous site-specific factors could affect a site's suitability for restoration or creation. Therefore, any proposed mitigation site selection should be considered preliminary until such time as complete evaluation of a site is completed (i.e., evaluations of soil condition, surface hydrology, groundwater depth, and conditions in regard to salinity, alkalinity or toxins).

The 2007 HEP evaluation of conceptual mitigation sites is based upon the assumption that woody vegetation would be allowed to grow to maximum plant and canopy densities. These areas would not be disced or burned as part of any operation and maintenance plans, so predicted habitat values would be gained by this management plan. For the 2007 HEP analyses, we assumed that these areas would be free from human disturbance. If alternative areas would be used for mitigation that have greater exposure to human disturbance, the 2007 HEP analysis would need to be reviewed.

Construction Impact Mitigation Sites

The following tables (Tables 6-9) summarize the actions proposed at each hypothetical mitigation site used to complete the 2007 HEP analyses. Additional information is contained in the HEP report (Appendix B).

Table 6. Oak/Grey Pine Woodland Mitigation Site Development Criteria, Folsom Dam Raise Project, Sacramento, El Dorado, and Placer Counties, California

Oak/Grey Pine Woodland
·Acquire land. ·Site is currently annual grassland. ·Provide access and maintenance roads. ·Plant native cover crop (seed). ·Construct site specific irrigation system. ·Plant 400 trees per acre using 4"x4"x14" tree plots. ·Plant 90% oak tree species (blue and live oak); 10% grey pine. ·Provide watering, weeding, non-native and invasive species control. ·Provide pest control as needed. ·Provide general maintenance and cleanup of site in perpetuity. ·Monitor plantings for 3 years and take remedial actions as needed to ensure plant establishment and overall success of the mitigation effort. ·Prepare and submit monitoring reports to the Service for 3 years. ·Develop an Operations and Maintenance Manual.

Table 7. Riparian Woodland Mitigation Site Development Criteria, Folsom Dam Raise Project, Sacramento, El Dorado, and Placer Counties, California

Riparian Woodland
·Acquire land. ·Site is currently annual grassland. ·Provide access and maintenance roads. ·Complete earthwork to facilitate seasonal natural flooding. ·Construct irrigation system. ·Plant overstory comprised of oaks, willows, and cottonwood trees using 4"x4"x14" tree pots at density of 200/acre. ·Plant understory comprised of wild rose and wild grape at a density of 200/acre. ·Plant native cover crop (seed). ·Provide watering, weeding, non-native and invasive species control. ·Provide pest control as needed. ·Provide general maintenance and cleanup of site in perpetuity. ·Monitor plantings for 3 years and take remedial actions as needed to ensure plant establishment and overall success of the mitigation effort. ·Prepare and submit monitoring reports to the Service for 3 years. ·Develop an Operations and Maintenance Manual.

Table 8. Seasonal Wetland Mitigation Site Development Criteria, Folsom Dam Raise Project, Sacramento, El Dorado, and Placer Counties, California

Seasonal Wetland
·Acquire land. ·Site is currently annual grassland. ·Provide access and maintenance roads. ·Construct wetland so that 40% of the area has water 4-9 inches deep in summer. ·Plant native cover crop on area disturbed from construction area. ·Plant appropriate wetland species. ·Provide weeding, non-native and invasive species control. ·Provide irrigation, pest control and monitoring reports for a minimum of 3 years or until the vegetation is self-sustaining. ·Provide general maintenance and cleanup of site in perpetuity. ·Develop an Operations and Maintenance Manual.

Table 9. Chaparral Mitigation Site Development Criteria, Folsom Dam Raise Project, Sacramento, El Dorado, and Placer Counties, California

Chaparral
·Acquire land. ·Site is currently annual grassland. ·Provide access and maintenance roads. ·Complete earthwork to facilitate seasonal natural flooding. ·Construct irrigation system. ·Plant chaparral species. ·Plant native cover crop (seed). ·Provide watering, weeding, non-native and invasive species control. ·Provide general maintenance and cleanup of site in perpetuity. ·Monitor plantings for 3 years and take remedial actions as needed to ensure plant establishment and overall success of the mitigation effort. ·Prepare and submit monitoring reports to the Service for 3 years. ·Develop an Operations and Maintenance Manual.

Operation Impact Mitigation Sites (Folsom Lake)

Since there are uncertainties on the effects inundation on vegetation and soil erosion and relatively small chances for a major flood event, it is recommended that a monitoring and adaptive management program be developed to monitor vegetation around the reservoir over the life of the project. Baseline conditions would be established and updated at intervals (10 years). After major flood events (those that encroach above the current maximum flood pool elevation of 466 feet), vegetation would be surveyed and damages attributable to inundation would be mitigated as deemed appropriate using best management practices at the time (replanting on-site would be the first priority). However, because the maximum pool could be lower than under the existing conditions, potential impacts to vegetation and wildlife from inundation resulting from extreme hydrologic events may be less with the project than under existing conditions.

RECOMMENDATIONS

The recommendations contained within this section constitute what the Service believes, from a fish and wildlife resource perspective and consistent with our Mitigation Policy, to be the best present recommendations for the project. As additional project information is developed these recommendations may be further refined.

The Service recommends that the Corps implement the following:

1. Avoid impacts to oak/grey pine woodland, riparian woodland, and seasonal wetlands adjacent to, but outside of, construction areas through use of construction fencing.

2. Avoid impacts to woody vegetation at all staging areas, borrow sites, and haul routes by enclosing them with construction fencing.

3. Avoid impacts to water quality at Lake Natoma and Folsom Lake when loading, unloading, and transporting materials to be used for the project by taking appropriate measures to prevent soil, fuel, oil, lubricants, etc. from entering into these waters.

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

5. Avoid impacts to migratory birds nesting in trees or on the ground along the access routes and adjacent to the proposed repair sites. Impacts can be avoided 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 the 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 nesting in trees.

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.

6. Minimize impacts to wildlife from by selection materials least likely to lead to entrapment.

7. Minimize impacts to annual grassland habitat and other disturbed areas, by re-seeding all disturbed areas with appropriate native species as construction elements are completed.

8. Minimize project impacts by reseeding all disturbed areas at the completion of construction with forbs and grasses.

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

10. Compensate for the loss of 4.9 acres of oak/grey pine woodland habitat by developing 5.9 acres of oak/grey pine woodland habitat at a site jointly selected with the Service.

11. Compensate for the loss of 0.05 acre of riparian woodland habitat by developing 0.06 acre of riparian woodland habitat at a site jointly selected with the Service.

12. Compensate for the loss of 0.32 acre of seasonal wetland habitat by developing 1.3 acres of seasonal wetland habitat at a site jointly selected with the Service.

13. Develop a monitoring and adaptive management program to monitor vegetation around the reservoir over the life of the project. Baseline conditions would be established and updated at intervals (10 years). After major flood events (those that encroach above the existing maximum flood pool elevation), vegetation would be surveyed and damages attributable to inundation would be mitigated as deemed appropriate using best management practices at the time. Implementation of the monitoring and adaptive management program should be budgeted in advance.

14. Develop operation and maintenance manuals for all mitigation sites developed for this project. Coordinate with the Service on the development of these manuals.

15. Contact the NOAA Fisheries for possible effects of the project on federally-listed species under their jurisdiction.

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

17. Re-survey the construction and staging areas, borrow sites, and access/haul roads for the presence of any new elderberry shrubs prior to construction activity.

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APPENDIX A

Figures

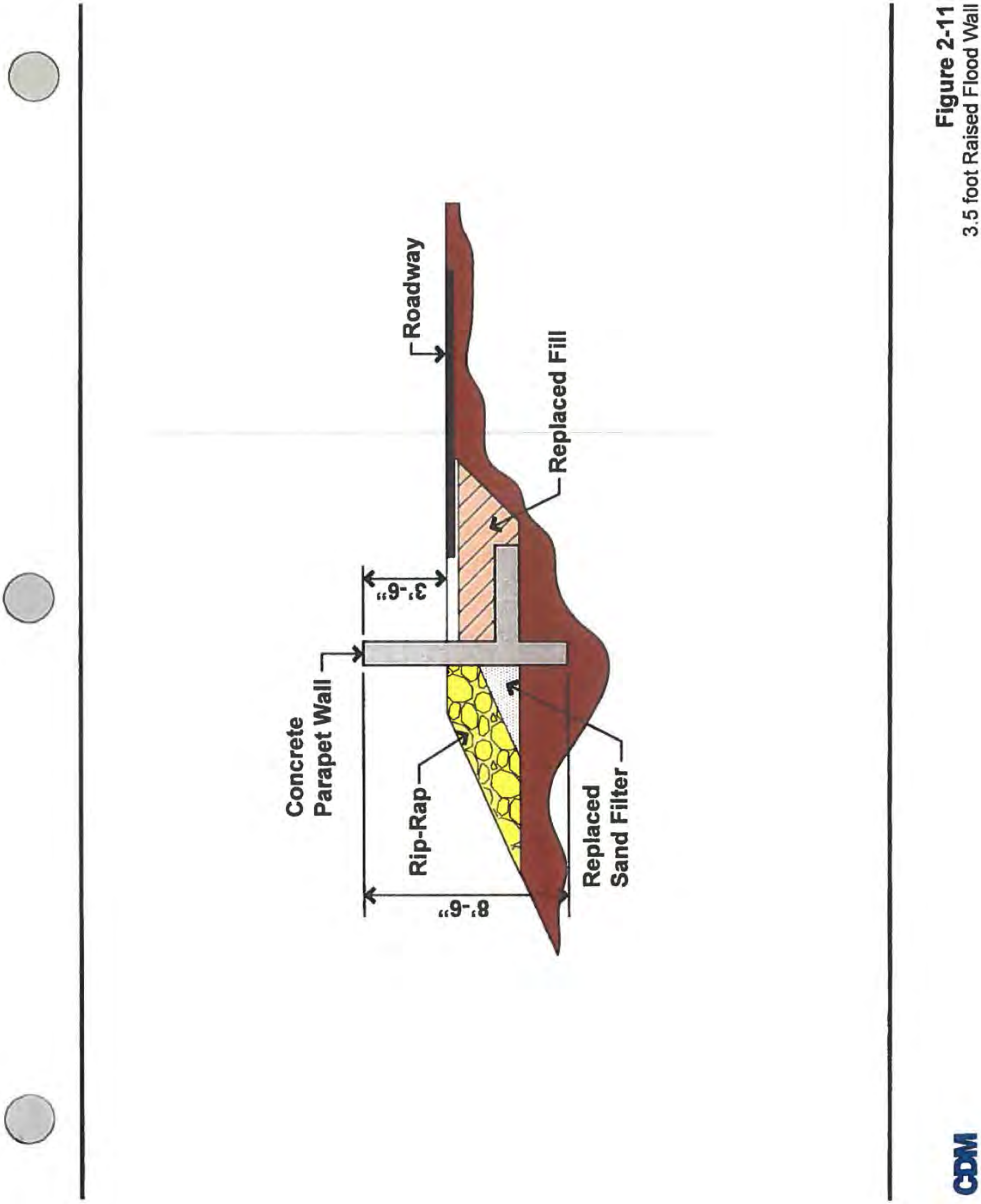


Figure 1. Conceptual illustration of a 3.5 foot reinforced concrete floodwall

Figure 2. Staging areas, haul routes, and Left Wing Dam

Figure 3. Staging areas, haul routes, and Dikes 1-3

Figure 4. Staging areas, haul routes, Dikes 4-6, and Right Wing Dam

Figure 5. Staging areas, haul routes, Dikes 7-8, and Left Wing Dam

Figure 6. Staging areas, haul routes, and Mormon Island Auxiliary Dam

APPENDIX B

Habitat Evaluation Procedures (HEP)
February 2007

INTRODUCTION

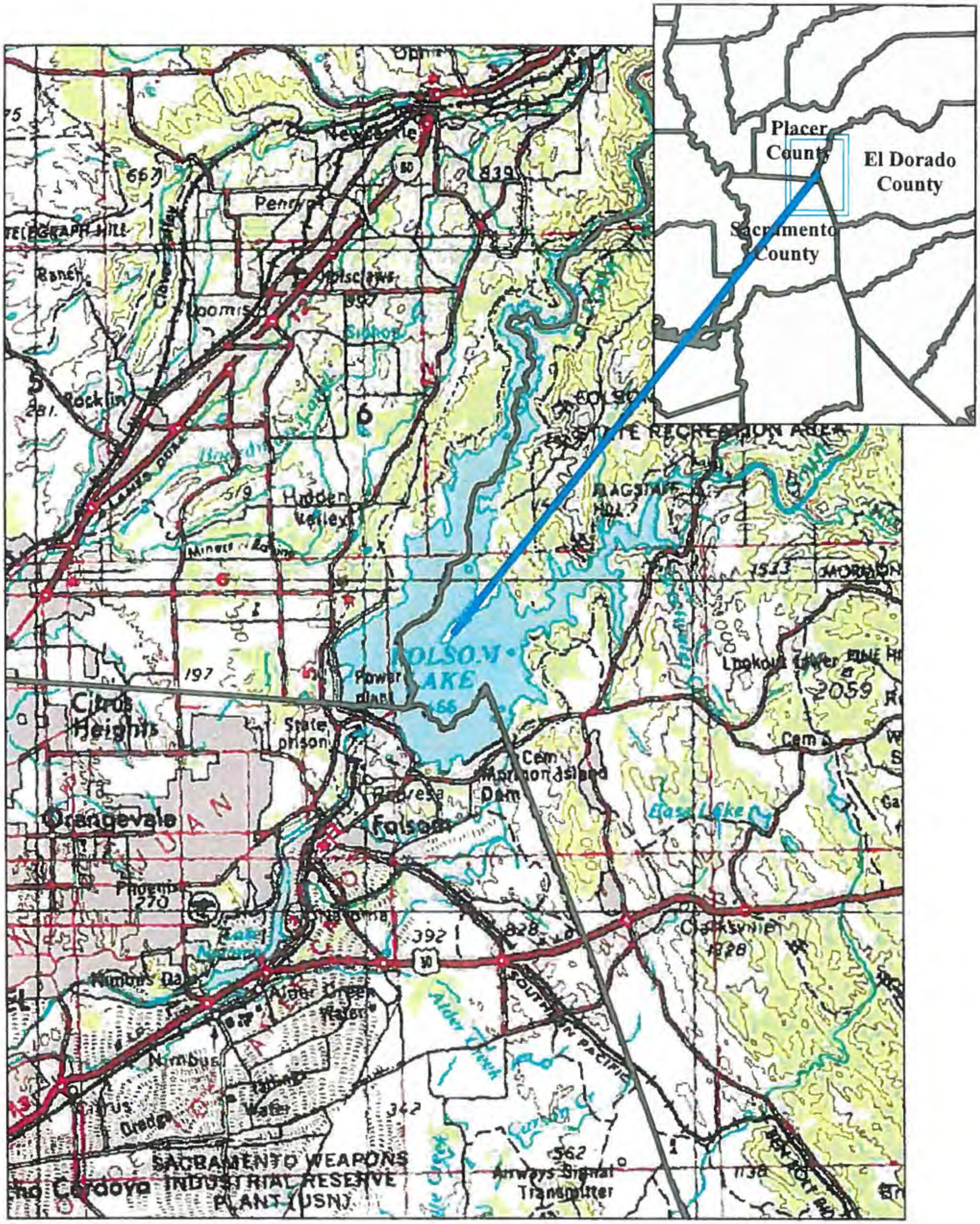
The U.S. Army Corps of Engineers (Corps) and the U.S. Bureau of Reclamation (Reclamation) seek to significantly reduce the risk of flooding along the main stem of the American River in the Sacramento area while meeting dam safety and public safety objectives. The project is authorized by the Corps' American River Watershed Investigation, Folsom Dam Modification project under section 101 (a) (6) of the Water Resources Development Act (WRDA) of 1999 and the Bureau's Dam Safety Program (static, earthquake, etc) (Reclamation 2006). Modifications to the existing authorities were made in the Energy and Water Appropriations Act of 2006, which directed the Secretary of the Army and the Secretary of the Interior to collaborate on authorized activities to maximize flood damage reduction improvements and address dam safety needs at Folsom Dam and Reservoir as one Joint Federal Project.

This application of Habitat Evaluation Procedures (HEP) is intended to provide a quantification of the impacts on fish and wildlife resources associated with Folsom Dam Safety and Flood Damage Reduction (Folsom DS/FDR). Any dam raise or spillway construction measure would be a major modification and would allow Folsom Dam to pass the probable maximum flood (PMF) volume without failure and meet Reclamation's Dam Safety Program.

PROJECT AREA

The project area is in the American River watershed, and would affect lands around Folsom Reservoir, and along the North and South Forks of the American River, which are impounded by Folsom Dam (Figure 1 and Figure 2). The project could also directly affect the Mormon Island Preserve located just downstream of Mormon Island Auxiliary Dam (MIAD) and the lower American River--the river's reach downstream of Folsom Dam (Figure 3).

The American River is the second largest tributary to the Sacramento River. The three forks (north, middle, and south) of the river originate in the Sierra Nevada Mountains at an elevation of about 10,400 feet (mean sea level), and generally flow in a southwesterly direction. The Middle Fork joins the North Fork near the City of Auburn, just upstream of Folsom Reservoir; the North Fork then joins the South Fork just upstream of Folsom Dam. All three forks of the American River above Folsom Reservoir are nationally popular areas for whitewater sports, and the reach of the South Fork from Coloma to the reservoir is the State's most popular whitewater rafting run.



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Project Vicinity- Folsom Reservoir

Figure 1

Prepared by the US Fish and Wildlife Service Sacramento Fish and Wildlife Office. Flood and Waterway Planning Branch. Sacramento, CA. September 18, 2006

This map is for illustrative purposes only. The US Fish and Wildlife Service shall not be held liable for improper or incorrect use of the data described and or contained herein

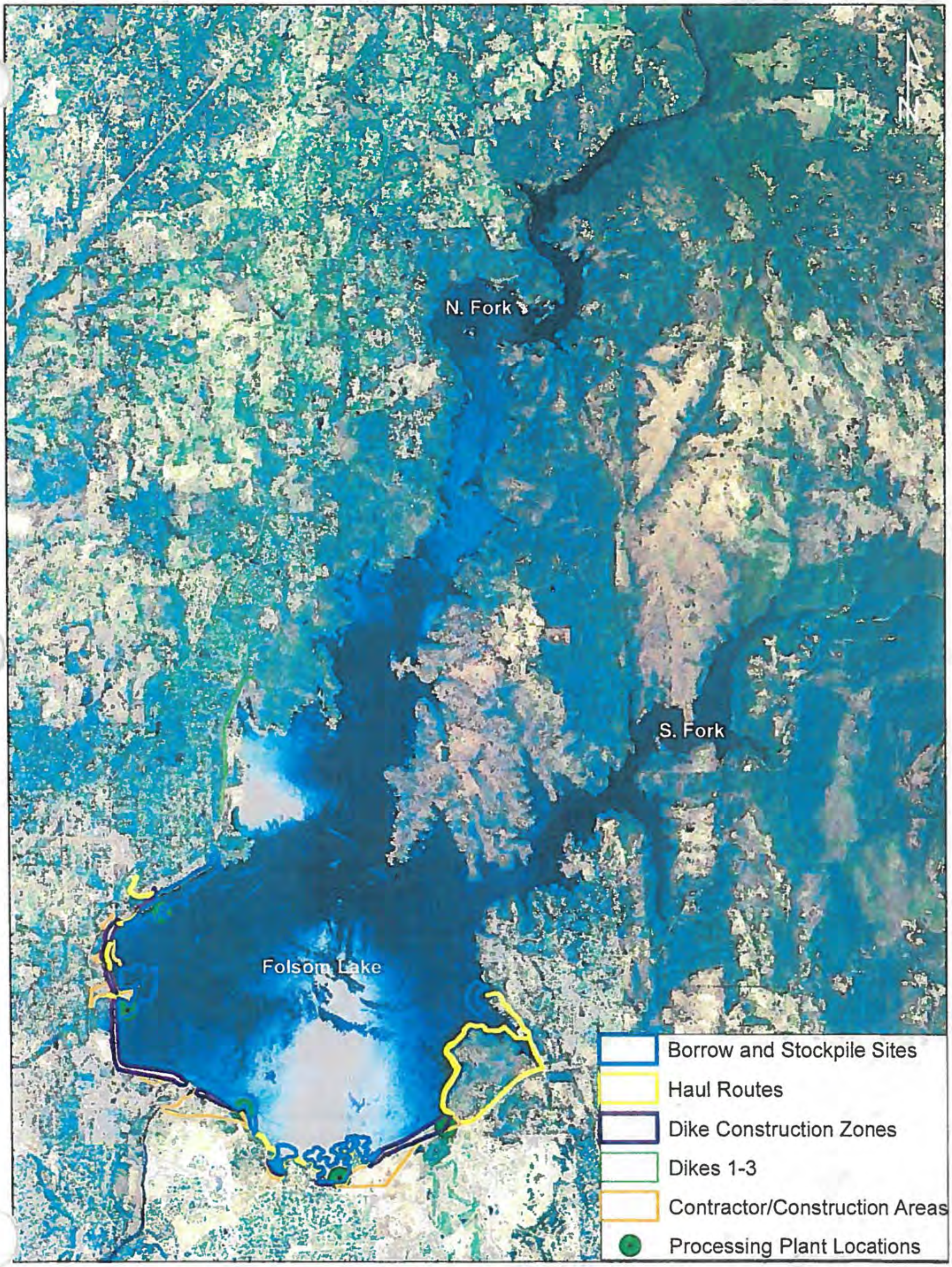

Figure 2- Project Location

Prepared by the US Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Flood and Waterway Planning Branch, February 27, 2007

This map is for illustrative purposed only. The US Fish and Wildlife Service shall not be held liable for improper or incorrect use of the data described and/or contained herein

0 0.5 1 2 Miles

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Mormon Island Auxiliary Dam and Morman Island Preserve Figure 3

Prepared by the US Fish and Wildlife Service, Sacreaments Fish and Wildlife Office, Fl... Planning Branch, Sept. 18, 2006

Draft Subject to Change

Folsom Dam, located near the city of Folsom, is a multi-purpose dam built by the Corps in 1955, and operated by Reclamation. It is the largest of about 20 dams in the American River watershed and, except for Nimbus Dam, is the furthest downstream. Five reservoirs in the upper American River watershed (Loon Lake, Ice House, Union Valley, French Meadows, and Hell Hole) represent 90% of the existing storage capacity upstream of Folsom Reservoir.

The main dam is a 345-foot high concrete gravity dam across the American River channel. Associated with Folsom Dam is a series of auxiliary dams and dikes which span topographic lows; these structures are needed to contain the reservoir. Mormon Island Dam is the largest of these structures, and is located on the southeast end of the reservoir. Folsom Reservoir blocks about 20 miles of the North Fork and 10 miles of the South Fork, and has a total storage capacity of 974,000 acre-feet, which fills the reservoir to an elevation of 466 feet above mean sea level (msl).

Reclamation operates Folsom Dam as an integrated component of the Central Valley Project. The dam's primary purposes have been to: provide flood control; provide instream flows; manage Sacramento-San Joaquin Delta water quality; produce hydropower; provide recreation; and more recently, protection and restoration of the region's fish and wildlife resources.

PROJECT DESCRIPTION

The Folsom DS/FDR project includes measures to remedy dam safety issues associated with seismic, static, and hydrologic concerns, and to provide increased flood damage protection. These measures include several different options to remedy the various issues at the Folsom facilities. The Folsom Facilities to be addressed by one or more of the engineering options include the main concrete dam, the right and left wing dams, Mormon Island Auxiliary Dam (MIAD), and eight dikes (1 through 8). The concrete dam and earthen wing dams serve to impound water associated with the main stem of the American River. MIAD serves to dam water within an historic river channel, while the earthen dikes serve to contain water at low spots in the topography during periods when the reservoir is full or nearly full.

The improvements would be designed so that they could be constructed and operated without affecting ongoing water conservation and hydropower operations. The plan would maintain the current Folsom Dam design flood control release of 115,000 cubic feet per second (cfs) and an emergency release of 160,000 cfs. Four scales of enlargement alternatives were developed using maximum flood control pool elevations of 468, 486.5, 489.5 and 499.5 feet msl.

Several constraints were imposed on plan formulation for Folsom DS/FDR project, these are:

- dam raise measures are solely for flood control as stipulated in section 566 of WRDA 1999;

- dam raise measures are to avoid disruptions to the normal operation of Folsom Dam for water supply, hydropower, and flood control;
- no loss of flood protection from existing flood damage reduction projects is permitted;
- minimize disturbance of habitat for threatened and endangered species.

The no action alternative serves as the base against which the proposed flood protection and Dam Safety alternatives will be evaluated to determine effectiveness and to identify effects that would result from them. Several actions that are currently authorized are expected to be completed prior to implementation of any Folsom DS/FDR project. Therefore, the effects and benefits associated with these actions are part of the no-action condition. See the accompanying Fish and Wildlife Coordination Act report for a complete description of the no action condition. A complete project description can be seen in the March 2007 Folsom DS/FDR FEIR/EIR.

Alternative 1 – No Dam Raise/Minimal Embankment Raise, Fuseplug Spillway

Under Alternative 1, there would be no raise to the concrete structure with minimal modifications to the existing spillway. A large auxiliary spillway would be constructed adjacent to the left wing dam to address hydrologic and flood control concerns. Some of the earthen structures would be raised to address hydrologic concerns, but not to increase the flood storage capacity of the reservoir since this alternative is a Dam Safety only alternative.

Alternative 2 – 4-foot Dam and Embankment Raise

Alternative 2 incorporates a 4-foot dam raise with a fuseplug auxiliary spillway and gate-controlled tunnel spillway for better hydrologic control of large flood events. Under this alternative, there could be a 4-foot raise to the concrete structure with some modifications to the existing spillway gates. An auxiliary spillway with a chute or a tunnel would be constructed to address hydrologic and flood control concerns. All of the earthen structures could be raised to address hydrologic concerns and to provide additional flood storage capacity.

Alternative 3; Preferred Alternative- Joint Auxiliary Spillway, 3.5-foot Parapet Wall Raise

Under the Preferred Alternative a smaller six-submerged tainter gate (six gate) auxiliary spillway would be constructed to address both Dam Safety and Flood Damage Reduction objectives including hydrologic and flood control concerns. Construction of the six gate auxiliary spillway would increase project discharge capacity. The 3.5-foot raise, in conjunction with modification and/or replacement of the three emergency spillway gates and the six-gate auxiliary spillway, would only serve as additional freeboard for the Folsom facilities. Once construction is completed the raise would not exceed the existing take line for a 200-year design event and there would be an anticipated lower maximum water surface elevation. The 3.5-foot raise, modification and/or replacement of the three emergency spillway gates and the six-gate auxiliary spillway, have been identified by the Corps as their Selected Plan within the Corps' Post Authorization Change report. The remaining elements of Alternative 3 are Dam Safety Modification as revised above.

A tentative schedule showing the sequencing of construction for the preferred alternative is shown in Table 1.

Table 1
Folsom DS/FDR Project Phase Sequencing

Activity ID	Folsom Facility	Construction Period
1	Auxiliary Spillway Excavation Phase 1	September 2007 to March 2009
2	Right and Left Wing Dam Static Modifications	February 2008 to March 2009
3	Mormon Island Jet Grouting	July 2008 to December 2009
4	Auxiliary Spillway Excavation Phase 2	September 2010 to January 2014
5	Dike 5 Static Modifications	September 2009 to May 2010
6	Mormon Island Seismic Overlay	June 2015 to April 2017
7	Dike 4 and 6 Static Modifications	September 2017 to April 2018
8a	Pier Tendon Installation at Main Dam	January 2014 to March 2015
8b	Spillway Pier Wraps & Braces	August 2016 to April 2018
8c	Spillway Gate Repairs	January 2018 to August 2020
9	Auxiliary Spillway Approach Channel Excavation and Gate Structure Construction	September 2011 to December 2014
10	Raise of all Folsom Facilities	September 2018 to September 2019

Alternative 4 – 7-foot Dam and Embankment Raise

Alternative 4 contains many of the same elements as Alternative 3 with the exception of a 7-foot raise that could result in increased reservoir flood storage during large flood events. Under this alternative all Folsom Facilities and earthen structures would be raised 7 feet. A smaller four-submerged tainter gate (four gate) auxiliary spillway would be constructed to address hydrologic and flood control concerns.

Alternative 5 – 17-foot Dam and Embankment Raise

Alternative 5 was specifically developed as an alternative that would address both Dam Safety and Flood Damage Reduction requirements without the construction of an auxiliary spillway. Under this alternative all Folsom Facilities could be raised 17 feet which would increase reservoir storage capacity to control large flood events.

METHODOLOGY

HEP is a methodology developed by the Fish and Wildlife Service (Service) and other State and Federal resource and water development agencies which can be used to document the quality and quantity of available habitat for selected fish and wildlife species. HEP provides information for two general types of habitat comparisons: (1) the relative value of different areas at the same point in time; and (2) the relative value of the same areas at future points in time. By combining the two types of comparisons, the impacts of proposed or anticipated land-use and water-use changes on habitat can be quantified. In a similar manner, any mitigation needs (in terms of acreage) for the project can also be quantified, provided a mitigation plan has been developed for specific alternative mitigation sites.

A HEP application is based on the assumption that the value of a habitat for selected species or the value of a community can be described in a model which produces a Habitat Suitability Index (HSI). This HSI value (from 0.0 to 1.0) is multiplied by the area of available habitat to obtain Habitat Units (HUs). The HUs and Average Annual Habitat Units (AAHUs) over the life of the project are then used in the comparisons described above.

The reliability of a HEP application and the significance of HUs are directly dependent on the ability of the user to assign a well-defined and accurate HSI to the selected evaluation elements or communities. Also, a user must be able to identify and measure the area of each distinct habitat being utilized by fish and wildlife species within the project area. Both the HSIs and the habitat acreage must also be reasonably estimable at various future points in time. The HEP team, comprised of Corps, Reclamation and Service staff, determined that these HEP criteria could be met, or at least reasonably approximated, for the Folsom DS/FRD project. Thus HEP was considered an appropriate analytical tool to analyze impacts of the proposed project alternatives[1]. Further the HEP team determined that HSI values for habitats impacted by the Folsom DS/FRD project would be taken from the American River Watershed Investigation, Folsom Bridge (Bridge) project, the American River Watershed Investigation Long-Term Evaluation (Long-Term) and the American River Watershed Investigation Folsom Dam Modification (MODS) project. HSI values for oak/grey pine woodland and seasonal wetland habitats were used from the data collected in Reach 1 and riparian woodland habitat HSI values were used from data collected in Reach 3 in 2005, from the Bridge project. Chaparral HSI values were taken from Long-Term data, collected in 2000 for the inundation impacts and the direct impacts for chaparral HSI values were taken from MODS data, collected in 2004, for the staging, borrow and construction use areas.

GENERAL HEP ASSUMPTIONS

Some general assumptions are necessary to use HEP and Habitat Suitability Index (HSI) Models in the impact assessment:

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[1] For further information on HEP see ESM 100-104 which is available from the Service's Sacramento Fish and Wildlife Office

Use of HEP:

1. HEP is the preferred method to evaluate the impacts of the proposed project on fish and/or wildlife resources.
2. HEP is a suitable methodology for quantifying project-induced impacts to fish and wildlife habitats.
3. Quality and quantity of fish and wildlife habitat can generally be numerically described using the indices derived from the HSI models and associated habitat units.
4. The HEP assessment is applicable to the habitat types being evaluated.

Use of HSI Models

5. HSI models are hypotheses based on available data.
6. HSI models are conceptual models and may not measure all ecological factors that affect the quality of a given cover-type for the evaluation species (e.g. vulnerability to predation). In some cases, assumptions may need to be made by the HEP Team and incorporated into the analysis to account for loss of those factors not reflected by the model.

The additional HEP field work for the project was completed by staff from the Service's Sacramento Fish and Wildlife Office, the Corps (Sacramento District) and Reclamation and occurred during May 2006 and included vegetation mapping around the Folsom Reservoir. Six cover-types would be permanently impacted by the project including oak woodland, oak savannah, blue oak/grey pine woodland, riparian woodland, seasonal wetland, annual grassland and other[2]. These cover-types were mapped by the HEP Team on aerial photographs in the field then digitized into ArcGIS. Using the project footprint supplied by Reclamation and the Corps acreages were quantified using GIS. The cover-types and acreage affected by the proposed work is summarized in Table 2 and Table 3.

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2. "Other" 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

Table 2. Summary of Cover-Types, Acres Impacted, and Compensation Recommended for the Alternatives Compared to the Preferred Alternative for the Construction of the Folsom DS/FRD Project, California.

Folsom DS/FRD Project					
Alternative	3 (Preferred)	1	2	4	5
Cover-Type	Impacted Acres: Compensation Needed	Difference from the Preferred Alternative Impacted Acres	Difference from the Preferred Alternative Impacted Acres	Difference from the Preferred Alternative Impacted Acres	Difference from the Preferred Alternative Impacted Acres
Oak/grey pine woodland	52.4 : 64.5	0.39	0.39	0.70	-1.07
Riparian woodland	42.7 : 48.0	-0.28	-0.62	-0.15	-1.66
Chaparral	0.7 : 0.8	0	0	0	-0.21
Seasonal wetland	1.2 : 4.7	0	0	0	0
Total	**97.0 : 117.9**				

Table 3. Preliminary Summary of Cover-Types, Impacted Acres and Compensation Recommended for the Inundation and Construction at Dikes 1-3 of the Folsom Reservoir for the Folsom Dam Raise Alternatives 3.5, 4.0, 7.0, or 17 feet as part of the Folsom DS/FDR Project, California.

Folsom Dam Raise Alternatives				
	3.5-ft Raise (Preferred)	**4-ft Raise**	**7-ft Raise**	**17-ft Raise**
Cover Type	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed
Oak/Grey Pine woodland	781.5 : 939.4	820.2 : 985.8	935.1 : 1,123.8	1,331.8 : 1,600.1
Riparian woodland*	45.47 : 0.02	48.68 : 0.02	56.5 : 0.02	48.68 : 0.02
Chaparral	32.2 : 34.1	34.3 : 36.3	40.8 : 43.2	34.3 : 36.3
Seasonal wetland*	0.58 : 0.0	0.58 : 0.0	0.58 : 0.0	0.58 : 0.0
Total	**859.8 : 973.5**	**903.8 : 995.12**	**1,033 : 1,167**	**1,415.4 : 1,636.4**

*No permanent impacts to riparian woodland and seasonal wetland are expected from the short inundation that would occur from a raise component of the Folsom DS/FDR project. Acres shown are from the construction at Dikes 1-3.

Eleven HSI models were used in this HEP application to quantify project impacts. A summary of the models applied for each cover-type is also included in Table 4. The western gray squirrel and plain titmouse models were selected to evaluate the oak woodland, and oak/grey pine woodland cover-types. These species were chosen because they utilize this cover-type for

Table 4. HEP Cover-types, proposed HSI models, and model variables for the Folsom DS/FDR Project, California.

COVER-TYPE	PROPOSED I	HSI MODEL VARIABLES
(1) Oak woodland	Western gray squirrel	V1 - Canopy closure of mast-producing species>5m tall V2 - Density of leaf litter layer V3 - Tree canopy cover V4 - Den site availability per acre
	Plain titmouse	V1 - Tree diameter V2 - Trees per acre V3 - % composition of tree species that are oaks
(2) Riparian woodland	Yellow warbler	V1 - % deciduous shrub crown cover V2 – Average height of deciduous shrub canopy V3 - % deciduous shrub canopy comprised of hydrophytic shrubs
	Northern oriole	V1 - Average height of deciduous tree shrub V2 – % deciduous tree crown cover V3 – Stand width
	Western fence lizard	V1 - % ground cover V2 – Average size of ground cover objects V3 – Structural diversity/interspersion V4 - % canopy cover
(3) Seasonal wetlands	Great egret (feeding)	V1 - Percentage of area with water 10-23 cm deep V2 - Percentage of submerged or emergent vegetation cover in zone 10-23 cm deep
	California vole	V1 - Height of herbaceous vegetation V2 - Percent cover of herbaceous vegetation V3 - Soil type V4 - Presence of logs and other types of cover
	Red-winged blackbird	V1 - Predominance of narrow or broadleaf monocots V2 - Water presence throughout the year V3 - Presence or absence of carp V4 - Presence or absence of damselflies or dragonflies V5 - Mix of herbaceous vegetation V6 - Suitability of foraging substrate
(4) Chaparral	Bobcat	V1 - % shrub cover V2 - % herbaceous cover V3 – degree of patchiness V4 – rock outcroppings
	Wrentit	V1 - % shrub cover V2 - % shrub cover $\leq$5 feet
	California thrasher	V1 – Presence of low shrub openings V2 – Shrub/seedling cover
(5) Annual grassland	No HEP proposed; disturbed areas will be reseeded after construction is complete.	

nesting and foraging. The western fence lizard, yellow warbler, and northern oriole models were chosen to evaluate the project impacts to the riparian woodland cover-type. These species were selected because the bird species utilize the riparian tree canopy provided by the cover-type for nesting and foraging. For analysis purposes these two cover types were treated as one because the same models were chosen by the HEP Team. The western fence lizard utilizes the ground component of the cover-type including rocks boulders, and downed wood for shelter and foraging.

The red-winged blackbird, great egret (feeding) and California vole models were selected for evaluating impacts to the seasonal wetland cover-type because these species forage, nest, or inhabit this cover-type.

The bobcat, wrentit and California thrasher models were selected for evaluating impacts to the chaparral cover-type because these species forage, nest, or inhabit this cover-type.

The annual grassland and "other" cover-types were not included in the HEP analysis because they do not currently provide significant habitat for wildlife species or the conditions (habitat values) after the completion of work are expected to be similar to pre-project conditions.

The cover-type designations and HSI models were also selected in part to be consistent with previous impact analyses completed for the American River Watershed Investigation Folsom Dam Modification project which is occurring concurrently with the Folsom Bridge project. More information on the HEP for those projects can be found in the Service's Fish and Wildlife Coordination Act Report for those projects.

RESULTS AND DISCUSSION

This HEP analyzed the potential impacts of the proposed Folsom DS/FDR project. Impact areas were divided into five components to facilitate possible design changes and subsequent impact analyses as the planning process proceeds toward selection of a construction alternative. The components are: (1) the construction footprint of the spillway alternatives; (2) impacts associated with Safety of Dams construction at dikes 4 thru 8, both wing dams, and MIAD; (3) impacts from borrow and stockpile; (4) impacts associated with the Flood Damage Reduction construction as dikes 1 thru 3; and (5) the potential impacts to vegetation in the new reservoir inundation zone.

The HEP does not address potential impacts to aquatic resources at Folsom Reservoir during construction, nor are potential lower American River fishery impacts addressed for the construction period or subsequent reservoir operation.

Construction Impacts
The impacts and mitigation recommended for the Preferred Alternative for the Folsom DS/FDR project is summarized in Table 5. A specific compensation site was not analyzed in this HEP application. Instead a typical site was developed, and assumptions were made that the site would be an annual grassland area without existing woody vegetation for a baseline condition. For the riparian and seasonal wetland cover-types, a critical assumption was made that any site selected for compensation would require the appropriate hydrology to support these cover-types.

Folsom Reservoir Inundation
Between 811.74 and 1,323.35 acres could be affected by enlarging Folsom Dam, depending on which dam raise alternative is selected. Some of these lands are already developed or otherwise disturbed habitat which provides little or no value for wildlife species, and some support vegetation that is tolerant of flooding. Table 5 summarizes the acreages of each habitat which provides value for wildlife and is expected to receive inundation over the life of the project. Inundation effects around Folsom Reservoir would occur in large part by the frequency, timing, and duration of flooding. Studies to date indicate that predicting the effects of inundation on vegetation is not straightforward. The raising of Folsom Dam would have potential for at least two significant impacts on vegetation: (1) changes in vegetation composition caused by inundation affecting survival and reproduction of vegetation within the zone between current and proposed maximum reservoir levels; and (2) effects of inundation on soil erosion and slippage, especially on steep slopes as are found along the upper reservoir and the forks of the American River.

The vegetation types exposed to flooding are not, in general, highly tolerant of flooding. With the exception of riparian and riverine habitats, natural flooding does not occur in the areas which would be flooded by raising Folsom Dam. Studies of the effects of inundation on blue oaks (1975 *in* USFWS 1980; MWA-JSA 1994) have found that blue oaks can survive some flooding, but may be sensitive to periods of inundation of as little as 7 days. It is not clear from these studies, however, at what time of year flooding occurred, and the ability of vegetation to tolerate inundation depends on the time of year. For example, deciduous trees, such as oaks, tend to be much more sensitive to flooding during their period of active growth (i.e., in the spring), while winter-dormant plants appear to be more tolerant of flooding (USFWS 1980). Folsom Reservoir can reasonably be expected to fill during a major spring flood event, when oaks are actively growing. The absence of blue oaks within the current inundation zone of Folsom Reservoir and other foothill impoundments indicate that blue oaks cannot tolerate the flooding regime existing there. Further, evergreen species, including grey pines and live oaks, occur commonly around the reservoir, and tend to be more sensitive to inundation than deciduous trees such as blue oaks (MWA-JSA 1994).

The other factor which could affect vegetation is erosion of the saturated soil in the new inundation area during a flood event from the water being drawn down or wind driven wave wash during a major storm event. Slopes in the Folsom Reservoir area are generally between 5 and 25% (USACE 2001). Slopes in the Mooney Ridge area in the northwestern corner of the

Table 5. **Alternative 3, Preferred**- Summary of Cover-Types, Acres Impacted, Net Change in Average Annual Habitat Units With- and Without-Project, and Compensation Recommended for the Direct Impacts and Inundation Impacts of Construction and Raise of the Folsom DS/FDR Project, California.

Folsom Dam Auxiliary Spillway and Dike Construction						
	Cover-Type	**Acres Impacted**	**AAHUs W/O Project**	**AAHUs W/ Project**	**Net Change in AAHUs**	**Compensation Needed**
Construction, Haul Rds, Borrow & Stockpile	Oak - grey pine woodland	35.29	0.07	16.23	-16.16	42.37
	Riparian woodland	39.08	0.13	30.09	-19.96	43.88
	Seasonal wetland	0.89	0.00	0.18	-0.18	3.56
	Chaparral	0.26	0.04	0.15	-0.10	0.27
Dikes 4-8, Wing Dams & MIAD	Oak - grey pine woodland	16.04	7.38	0.04	-7.34	20.75
	Riparian woodland	1.93	1.49	0.01	-1.48	2.19
	Seasonal wetland	0.28	0.06	0.00	-0.06	1.12
	Chaparral	0.26	0.15	0.04	-0.10	0.28
Spillway (Six-Gate)	Oak - grey pine woodland	1.07	0.49	0.00	-0.49	1.38
	Riparian woodland	1.66	1.28	0.01	-1.27	1.88
	Seasonal wetland	0	0	0	0	0
	Chaparral	0.21	0.12	0.03	-0.08	0.22
Raise- 0 feet (Inundation)	Oak - grey pine woodland	773.08	355.62	1.57	-354.04	928.23
	Riparian woodland	45.45	35.00	35.00	0.00	0
	Seasonal wetland	0.58	0.12	0.12	0.00	0
	Chaparral	32.22	23.20	5.24	-17.96	34.08
[3]Dikes 1-3 Raise	Oak - grey pine woodland	8.46	3.89	0.02	-3.87	11.16
	Riparian woodland	0.02	0.02	0.54	-0.02	0.02
	Seasonal wetland	0	0	0	0	0
	Chaparral	0	0	0	0	0

[3] Construction at Dike 1-3 is dependent on the implementation of the raise component of the Folsom DS/FDR project. Impact acres for this component are preliminary in this document.

reservoir and the shoreline just west of the South Fork of the American River exceed 30% (USACE 2001). It is likely that during a major flood event some, or all, of the soil on steep slopes would experience some erosion. The extent of erosion and its effect on vegetation would be difficult to predict.

Assuming a worst case scenario that over the life of the project all of the existing vegetation (except riparian and seasonal wetlands) in the inundation zone would be lost, a mitigation need was developed for each cover-type using the HEP results. Statistically, there is a relatively small chance of complete inundation coupled with total loss of vegetation. However, it is reasonable to expect some impacts, especially at the lower zones due to the potential for more frequent inundation, over the life of the project.

Given the uncertainties on effects of inundation on vegetation and soil erosion, the HEP Team decided to recommend that a monitoring and adaptive management program be developed to monitor vegetation around the reservoir over the life of the project. Baseline conditions would be managed and updated at intervals (10 years). After major flood events (those which encroach above the existing maximum flood pool elevation), vegetation would be surveyed and damages attributable to inundation would be mitigated as deemed appropriate using the best management practices at the time (replanting on site would be the first priority).

FOLSOM BRIDGE PROJECT

REACH 1 EAST NATOMA STREET TO PARKING LOT NEAR SOUTH END OF DAM

PA 1 - Future Without Project (Impact Area)

OAK WOODLAND

WESTERN GRAY SQUIRREL

TY 0 - Baseline (measured)
V1 - % canopy closure of trees and shrubs that produce hard mast (65%)
V2 - Density of leaf litter layer (M)
V3 - % tree cover (61%)
V4 - Den site availability (53)

HSI Food $= (V1 \times V2)^{1/2}$ HSI Cover/Reproduction $= (V3 \times V4)^{1/2}$

HSI = 0.46 (lowest of values)

TY 1
V1 - no change from TY 0
V2 - no change from TY 0
V3 - no change from TY 0
V4 - no change from TY 0

HSI = 0.46

TY 60
V1 - no change from TY 1
V2 - no change from TY 1
V3 - no change from TY 1
V4 - no change from TY 1

HSI = 0.46

PLAIN TITMOUSE

TY 0 - Baseline (measured)
V1 - dbh
V2 - Number trees/acre
V3 - % trees that are oaks

$$HSI = \frac{V1 + V2 + V3}{3}$$

HSI = 0 .65

TY 1
V1 - no change from TY 0
V2 - no change from TY 0
V3 - no change from TY 0

HSI = 0.65

TY 60 V1 - no change from TY 0
V2 - no change from TY 0
V3 - no change from TY 0

HSI = 0.65

PA 2 - Future With Project (Impact Area)

Assume: 1. All vegetation removed from temporary and permanent impact zones in year 1
2. temporary easement areas will not be replanted with woody vegetation

WESTERN GRAY SQUIRREL

TY 0 - Baseline (measured) HSI = 0.46

TY 1 -	V1 - no trees	SI = 0
	V2 - low leaf litter	SI = 0.2
	V3 - no trees	SI = 0
	V4 - no den sites	SI = 0

HSI Food $= (V1 \times V2)^{1/2} = (0 \times 0.2)^{1/2} = 0$

HSI Cover/Reproduction $= (V3 \times V4)^{1/2} = (0 \times 0)^{1/2} = 0$

HSI = 0

TY 60- V1 - no change from TY 1
V2 - no change from TY 1
V3 - no change from TY 1
V4 - no change from TY 1

HSI = 0

TY 100 no change from TY60

PLAIN TITMOUSE

TY 0 - Baseline (measured) HSI = 0.65

TY 1 -	V1 - no trees	SI = 0.2
	V2 - no trees	SI = 0
	V3 - no trees	SI = 0

$$HSI = \frac{V1 + V2 + V3}{3} = \frac{0.2}{3} = 0.06$$

TY 60 - V1 - no change from TY 1
V2 - no change from TY 1
V3 - no change from TY 1

HSI = .06

TY 100 – no change from TY60

MP 1 - Management Area - Future Without Project (Compensation Site)

Assume: 1. Annual grassland area selected for conversion to oak woodland.

WESTERN GRAY SQUIRREL

TY 0 - Baseline (estimated)

V1 - % canopy closure of trees and shrubs that produce hard mast (no trees) SI = 0
V2 - Density of leaf litter (low) SI = 0.2
V3 - Den site availability (no trees) SI = 0

HSI Food = $(V1 \times V2)^{1/2}$ = $(0 \times 0.2)^{1/2}$ = 0

HSI Cover/Reproduction = $(V3 \times V4)^{1/2}$ = $(0 \times 0)^{1/2}$ = 0

HSI = 0

TY 1 -

V1 - no change from TY 0
V2 - no change from TY 0
V3 - no change from TY 0
V4 - no change from TY 0

HSI = 0

TY 15 - no change from TY 1 HSI = 0
TY 60 - no change from TY 15
TY 100- no change from TY TY60

PLAIN TITMOUSE

TY 0 - Baseline (estimated)

V1 - dbh (0) SI = 0.2
V2 - Number trees/acre (0) SI = 0
V3 - % trees that are oaks (0) SI = 0

$$HSI = \frac{V1 + V2 + V3}{3} = \frac{0.2 + 0 + 0}{3} = .06$$

TY 1 -

V1 - no change from TY 0
V2 - no change from TY 0
V3 - no change from TY 0

HSI = .06

TY 15 - no change from TY 1 HSI = .06
TY 60 - no change from TY 15 HSI = .06
TY 100- no change from TY 60

MP 2 - Management Area - Future With Project (Compensation Site)

Assume:
1. Acquire lands (currently annual grasslands)
2. Annual grassland area prepared for planting in TY 1 , provide access and maintenance roads
3. Plant 100% blue and live oak trees (4"x4"x14" tree pots) at a density of 400 trees/acre and cover crop
4. Moderate management intensity (assume 1.5 inches dbh after 10 yrs; 90 percent survival).
5. Watering, weed, pest control for minimum of 3 years and remedial actions as necessary to ensure plant establishment.
6. Assume maximum growth rate of 12"/year
7. Develop O&M manual
8. TY 51 values equal values measured for impact zone

WESTERN GRAY SQUIRREL

TY 0 - Baseline (estimated) HSI = 0

TY 1 -	V1 - tree species planted /no mast	SI = 0
	V2 - low	SI = 0.2
	V3 - 0 (no trees)	SI = 0
	V4 - 0 (no trees)	SI = 0

HSI = 0

TY 15 -	V1 - oak trees reach 16ft. high 8%	SI = 0.15
	V2 - low	SI = 0.2
	V3 - 8%	SI = 0.15
	V4 - 0	SI = 0

HSI Food $= (V1 \times V2)^{1/2} = (0.15 \times 0.2)^{1/2} = .17$

HSI Cover/Reproduction $= (V3 \times V4)^{1/2} = (0.15 \times 0)^{1/2} = 0$

HSI = 0

TY60	V1 - 40%	SI = 0.8
	V2 - medium	SI = 0.8
	V3 - 53%	SI = 1.0
	V4 - 24/ac	SI = 1.0

HSI Food $= (V1 \times V2)^{1/2} = (0.8 \times 0.2)^{1/2} = 0.40$

HSI Cover/Reproduction $= (V3 \times V4)^{1/2} = (1.0 \times 1.0)^{1/2} = 1.0$

HSI = 0.40

TY 100	V1 - 60%	SI = 1.0
	V2 - high	SI = 1.0
	V3 - 53%	SI = 1.0
	V4 - 24/ac	SI = 1.0

HSI Food $= (V1 \times V2)^{1/2} = (1.0 \times 1.0)^{1/2} = 1.0$

HSI Cover/Reproduction $= (V3 \times V4)^{1/2} = (1.0 \times 1.0)^{1/2} = 1.0$

HSI = 1.0

PLAIN TITMOUSE

TY 0 - Baseline (estimated)

HSI = .06

TY 1 -	V1 - tree species planted (oak) (0 dbh)	SI = 0.2
	V2 - 400 (100% $\leq$ 16 ft tall; no trees)	SI = 0
	V3 - 100% (no trees)	SI = 0

$$HSI = \frac{V1 + V2 + V3}{3} = \frac{0.2 + 0 + 0}{3} = 0.06$$

TY 15 -	V1 - oak trees reach 16 ft. high (dbh = 1.75)	SI = 0.2
	V2 - $\geq$ 100 tree/ac	SI = 1.0
	V3 - 100%	SI = 1.0

$$HSI = \frac{0.2 + 1.0 + 1.0}{3} = 0.73$$

TY 60 -	V1 - 13 dbh	SI = 0.6
	V2 - $\geq$ 100 tree/ac	SI = 1.0
	V3 - 100%	SI = 1.0

$$HSI = \frac{0.6 + 1.0 + 1.0}{3} = 0.86$$

TY 100- no change from TY60

PA 1 - Future Without Project (Impact Area)

SEASONAL WETLAND

GREAT EGRET

TY 0 – Baseline (measured)

V1 - % area with water 4-9 inches deep
V2 - % of substrate in zone 4-9 inches deep with sub- and emergent vegetation

$$HSI = \frac{V1 + V2}{2} = 0.23$$

TY 1 – no change from baseline HSI = 0.23
TY 60 – no change from baseline HSI = 0.23
TY 100- no change from baseline

RED-WINGED BLACKBIRD

TY 0 – Baseline (measured)

V6 quality of foraging areas within 620 feet of suitable nest areas

Condition C wetland $HSI = (0.1 \times V6)^{1/2} = 0.2$

TY 1 – no change from baseline HSI = 0.2
TY 60 – no change from baseline HSI = 0.2
TY 100 – no change from baseline

CALIFORNIA VOLE

TY 0 – Baseline (measured)

V1 – Height herbaceous vegetation
V2 - % herbaceous cover
V3 – Soil type

$$HSI = \frac{V1 + V2 + V3}{3} = 0.76$$

TY 1 – no change from baseline HSI = 0.76
TY 60 – no change from baseline HSI = 0.76
TY 100- no change from baseline

PA 2 - Future With Project (Impact Area)

Assume: 1. All vegetation removed from temporary and permanent impact zones in year 1
2. temporary easement areas will not be replanted with woody vegetation
3. existing drainages culverted under roads

GREAT EGRET

TY 0 – Baseline (measured)

V1 - % area with water 4-9 inches deep
V2 - % of substrate in zone 4-9 inches deep with sub- and emergent vegetation

$$HSI = \frac{V1 + V2}{2} = 0.23$$

TY 1 – V1 – 0 SI = 0
V2 - 0 SI = 0.1

$$HSI = \frac{0 + 0.1}{2} = 0.05$$

TY 60 – no change from TY 1 HSI = 0.05
TY 100 no change from TY60

RED-WINGED BLACKBIRD

TY 0 – Baseline (measured)

V6 quality of foraging areas within 620 feet of suitable nest areas

Condition C wetland $HSI = (0.1 \times V6)^{1/2} = 0.2$

TY 1 – no change from baseline HSI = 0
TY 60 – no change from baseline TY 1 HSI = 0
TY 100 – no change from baseline

CALIFORNIA VOLE

TY 0 – Baseline (measured)

V1 – Height herbaceous vegetation
V2 - % herbaceous cover
V3 – Soil type

$$HSI = \frac{V1 + V2 + V3}{3} = 0.76$$

TY 1 – V1 – 0 SI = 0
V2 – 0 SI = 0
V3 – not silty or loamy ; not friable SI = 0.2

$$HSI = \frac{0 + 0 + 0.2}{3} = 0.06$$

TY 60 – no change from TY 1 HSI = 0.06
TY 100 – no change from TY60

MP 1 - Future Without Project (Compensation Area)

Assumption: 1. Annual grassland area will be converted to wetlands

GREAT EGRET

TY 0 - Baseline (measured)
V1 - % of area with water 4-9 inches deep (0) SI = 0
V2 - % of area 4-9 deep with emergent/submergent vegetation (0) SI = .1

$$HSI = \frac{V1 + V2}{2} = \frac{0 + 0.1}{2} = .05$$

TY 1 no change from TY 0
TY 4 no change from TY 1
TY 60 no change from TY 4
TY 100 no change from TY 60

CALIFORNIA VOLE

TY 0 - Baseline (estimated)
V1 - Height of herbaceous vegetation (≥ 6in.) SI = 1.0
V2 - % cover of herbaceous vegetation (80%) SI = 6.7
V3 - soil type (mod. friable) SI = 0.5

TY 1 - V1 - no change from TY 0
V2 - no change from TY 0
V3 - no change from TY 0

$$HSI = \frac{V1 + V2 + V3}{3} = \frac{1.0 + 0.7 + 0.5}{3} = .73$$

TY 4 - V1 - no change from TY 1
TY 60 - V1 - no change from TY 4
TY 100- no change from TY 60

RED-WINGED BLACKBIRD

TY 0 - Baseline (estimated) - upland area unsuitable for species HSI = 0

TY 1 - no change from TY 0
TY 4 - no change from TY 1
TY 60 - no change from TY 4
TY 100 – no change from TY 60

MP 2 - Future With Project (Compensation Site)

Assumption:
1. Acquire annual grassland area
2. Portion of wetland area will have permanent water
3. Wetland will be designed to provide equal mix of open water and emergent vegetation
4. Carp will not be stocked
5. Site baseline is a Condition C wetland.
6. Site is minimum of 1-acre in size and access and maintenance roads are provided.
7. 40% of area designed for summer conditions of water 4-9 in deep
8. Plant appropriate wetland plant species, provide pest control and maintenance as needed for minimum of 3 years or until wetland is established.
9. Cover crop planted on all disturbed non-wetland areas.

GREAT EGRET

TY 0 - Baseline (estimated)

V1 - % of area with water 4-9 inches deep (0)	SI = 0
V2 - % of area with water 4-9 deep with emergent/submergent vegetation	SI = 0.1

$$HSI = \frac{V1 + V2}{2} = \frac{0 + 0.1}{2} = .05$$

TY 1 -

V1 - 40%	SI = 0.4
V2 - 5%	SI = 0.2

$$HSI = \frac{0.4 + 0.2}{2} = \frac{0.6}{2} = .30$$

TY 4 -

V1 - 40%	SI = 0.4
V2 - 40% - 60%	SI = 1.0

$$HSI = \frac{0.4 + 1.0}{2} = .70$$

TY 60 - no change from TY 4 HSI = .70
TY 100 no change from TY 60

CALIFORNIA VOLE

TY 0 - Baseline (estimated)

V1 - Height of herbaceous vegetation ($\geq$ 6 in.)	SI = 1.0
V2 - % cover of herbaceous vegetation (80%)	SI = 0.7
V3 - soil type (mod friable)	SI = 0.5

$$HSI = \frac{V1 + V2 + V3}{3} = \frac{1.0 + 0.7 + 0.5}{3} = .73$$

TY 1 -	V1 - ≥ 6 in	SI = 1.0
	V2 - 90%	SI = 0.85
	V3 - no change fro baseline	SI = 0.5

$$HSI = \frac{1.0 + 0.85 + 0.5}{3} = .78$$

TY 4 -	V1 - no change from TY 1	SI = 1.0
	V2 - 100%	SI = 0
	V3 - no change from TY 1	SI = 0.5

$$HSI = \frac{1.0 + 0.85 + 0.5}{3} = .78$$

TY 60- no change from TY 4
TY 100 –no change from TY 60

RED-WINGED BLACKBIRD

TY 0 - Baseline (estimated) - upland area unsuitable for species

HSI = 0

TY 1 -	V1 - Emergent vegetation is old/new growth monocot (other)	SI = 0.1
	V2 - Water present throughout year (yes)	SI = 1.0
	V3 - Carp presence (absent)	SI = 1.0
	V4 - larvae of dragonflies/damselflies presence (yes)	SI = 1.0
	V5 - vegetation density (sparse first year)	SI = 0.1

$$HSI = (V1 + V2 + V3 + V4 + V5)^{1/5} = (0.1 \times 1.0 \times 1.0 \times 1.0 \times 0.1)^{1/5} = 0.1$$

TY 4 -	V1 - old/new growth monocots	SI = 1.0
	V2 - no change	SI = 1.0
	V3 - no change	SI = 1.0
	V4 - no change	SI = 1.0
	V5 - 50%	SI = 1.0

$$HSI = (1.0 \times 1.0 \times 1.0 \times 1.0 \times 1.0)^{1/5} = 1.0$$

TY 60 - no change from TY 4 HSI = 1.0
TY 100- no change from TY 60

REACH 3 - FOLSOM PRISON ACCESS ROAD TO SOUTH END OF BRIDGE

RIPARIAN

YELLOW WARBLER

TY 0 – Baseline (measured)

V1 - % deciduous shrub crown cover
V2 - average height of deciduous shrub canopy
V3 - % deciduous shrub canopy comprised of hydrophytic shrubs

$HSI = (V1 \times V2 \times V3)^{1/3}$

TY 1 – no change from baseline HSI = 0.22
TY 60 – no change from baseline HSI = 0.22
TY 100 – no change from baseline

NORTHERN ORIOLE

TY 0 – Baseline (measured)

V1 - average height of deciduous tree canopy
V2 - % deciduous tree crown cover
V3 – stand width

$HSI = (V1 \times V2 \times V3)^{1/3}$

TY 1 – no change from baseline HSI = 0.77
TY 58 – no change from baseline HSI = 0.77
TY 100 – no change from baseline

WESTERN FENCE LIZARD

TY 0 – Baseline (measured)

V1 - % ground cover
V2 - average size of ground cover objects
V3 - structural diversity/interspersion
V4 - % canopy cover

$CI = (2V1 \times V2 \times V3)^{1/3}$
$TI = (V1 \times V4)^{1/2}$

$HSI = (CI \times TI)^{1/2} = 0.63$ (average of transects)

TY 1 – no change from baseline HSI = 0.63

TY 60 – no change from baseline   HSI = 0.63
TY 100 – no change from basline

PA 2 - Future With Project (Impact Area)

Assume: 1. All vegetation removed from temporary and permanent impact zones in year 1.
2. Temporary easement areas will not be replanted with woody vegetation.

YELLOW WARBLER

TY 0 – Baseline (measured)

V1 - % deciduous shrub crown cover
V2 - average height of deciduous shrub canopy
V3 - % deciduous shrub canopy comprised of hydrophytic shrubs

$HSI = (V1 \times V2 \times V3)^{1/3}$

TY 1	V1 – no shrubs	SI = 0
	V2 – no shrubs	SI = 0
	V3 - no shrubs	SI = 0

$HSI = (V1 \times V2 \times V3)^{1/3} = 0$

TY 60	V1 – no shrubs	SI = 0
	V2 – no shrubs	SI = 0
	V3 - no shrubs	SI = 0

$HSI = (V1 \times V2 \times V3)^{1/3} = 0$

TY 100- no change from TY 60

NORTHERN ORIOLE

TY 0 – Baseline (measured)

V1 - average height of deciduous tree canopy
V2 - % deciduous tree crown cover
V3 – stand width

$HSI = (V1 \times V2 \times V3)^{1/3}$

TY 1	V1 – no trees	SI = 0
	V2 – no trees	SI = 0
	V3 – no trees	SI = 0

$HSI = (V1 \times V2 \times V3)^{1/3} = 0$

TY 60 – V1 – no trees SI = 0
V2 – no trees SI = 0
V3 – no trees SI = 0

$HSI = (V1 \times V2 \times V3)^{1/3} = 0$

TY100 - no change from TY 60

WESTERN FENCE LIZARD

TY 0 – Baseline (measured)

V1 - % ground cover
V2 - average size of ground cover objects
V3 - structural diversity/interspersion
V4 - % canopy cover

$CI = (2V1 \times V2 \times V3)^{1/3}$

$TI = (V1 \times V4)^{1/2}$

$HSI = (CI \times TI)^{1/2} = 0.63$ (average of transects)

TY 1 – V1 – no ground cover SI = 0
V2 – no cover objects SI = 0
V3 – A SI = 0.1
V4 – no canopy cover SI = 1.0

$CI = (2V1 \times V2 \times V3)^{1/3} = 0$

$TI = (V1 \times V4)^{1/2} = 0$

$HSI = (CI \times TI)^{1/2} = 0$

TY 60 – no change from TY 1
TY100 - no change from TY 60

MP 1 – Management Area – Future Without the Project (Compensation Site)

Assume: 1. Existing riparian river bank upstream of Rossmoor Bar can be enhanced by planting riparian species (south side of river).

YELLOW WARBLER

TY 0 – Baseline (measured)

V1 - % deciduous shrub crown cover (0) SI = 0
V2 - average height of deciduous shrub canopy (5 ft) SI = 0.82
V3 - % deciduous shrub canopy comprised of hydrophytic shrubs (0) SI = 0

$HSI = (V1 \times V2 \times V3)^{1/3} = 0$

TY 1 – no change from baseline	HSI = 0
TY 15 – no change from baseline	HSI = 0
TY 30 – no change from baseline	HSI = 0
TY 60 – no change from baseline	HSI = 0
TY100 - no change from TY 60	

NORTHERN ORIOLE

TY 0 – Baseline (measured)

V1 - average height of deciduous tree canopy (27 ft)	SI = 0.77
V2 - % deciduous tree crown cover (0)	SI = 0
V3 – stand width (1)	SI = 0.2

$HSI = (V1 \times V2 \times V3)^{1/3} = 0$

TY 1 – no change from baseline	HSI = 0
TY 15 – no change from baseline	HSI = 0
TY 30 – no change from baseline	HSI = 0
TY 60 – no change from baseline	HSI = 0
TY100 - no change from TY 60	

WESTERN FENCE LIZARD

TY 0 – Baseline (measured)

V1 - % ground cover (0)	SI = 0
V2 - average size of ground cover objects (< 1 ft)	SI = 0.2
V3 - structural diversity/interspersion (A)	SI = 0.1
V4 - % canopy cover (0)	SI = 1.0

$CI = (2V1 \times V2 \times V3)^{1/3} = 0$

$TI = (V1 \times V4)^{1/2} = 0$

$HSI = (CI \times TI)^{1/2} = 0$

TY 1 – no change from baseline	HSI = 0
TY 15 – no change from baseline	HSI = 0
TY 30 – no change from baseline	HSI = 0
TY 60 – no change from baseline	HSI = 0
TY100 - no change from TY 60	

MP 2 – Management Area – Future With Project (Compensation Site)

Assume:
1. Acquire lands.
2. Watering, weed and pest management for a minimum of 3 years and remedial actions as necessary to ensure plant establishment.
3. Willow species and cottonwoods (80% of woody plantings will be planted near the mean summer water surface elevation and less water tolerant plants (oaks, etc) will be planted higher on the bank.
4. The site will extend no more than 25 feet up the bank from mean summer water surface elevation
5. Assume average growth rate of 24 inches/year for willows and cottonwood trees..

YELLOW WARBLER

TY 0 – Baseline (measured)

V1 - % deciduous shrub crown cover (0)	SI = 0
V2 - average height of deciduous shrub canopy (5 ft)	SI = 0.82
V3 - % deciduous shrub canopy comprised of hydrophytic shrubs (0)	SI = 0

$HSI = (V1 \times V2 \times V3)^{1/3} = 0$

TY 1 – V1 - % deciduous shrub crown cover (5%)	SI = 0.15
V2 - average height of deciduous shrub canopy (1 ft)	SI = 0.17
V3 - % deciduous shrub canopy comprised of hydrophytic shrubs (80%)	SI = 0.80

$HSI = (0.15 \times 0.17 \times 0.80)^{1/3} = 0.14$

TY 15 – V1 - % deciduous shrub crown cover (75%)	SI = 1.0
V2 - average height of deciduous shrub canopy (5ft)	SI = 0.82
V3 - % deciduous shrub canopy comprised of hydrophytic shrubs (80%)	SI = 0.80

$HSI = (1.0 \times 0.82 \times 0.80)^{1/3} = 0.81$

TY 30 – V1 - % deciduous shrub crown cover (75%)	SI = 1.0
V2 - average height of deciduous shrub canopy (5ft)	SI = 0.82
V3 - % deciduous shrub canopy comprised of hydrophytic shrubs (80%)	SI = 0.80

$HSI = (1.0 \times 0.82 \times 0.80)^{1/3} = 0.81$

TY 60 – no change from TY 30
TY100 - no change from TY 60

NORTHERN ORIOLE

TY 0 – Baseline (measured)

V1 - average height of deciduous tree canopy (27 ft)	SI = 0.77
V2 - % deciduous tree crown cover (0)	SI = 0
V3 – stand width (1)	SI = 0.2

$HSI = (V1 \times V2 \times V3)^{1/3} = 0$

TY 1 – V1 - average height of deciduous tree canopy (27 ft) SI = 0.77
V2 - % deciduous tree crown cover (0) SI = 0
V3 – stand width (< 300 ft) SI = 0.5

$HSI = (V1 \times V2 \times V3)^{1/3} = 0$

TY 15 – V1 - average height of deciduous tree canopy (16 ft) SI = 0.77
V2 - % deciduous tree crown cover (25%) SI = 1.0
V3 – stand width (< 300 ft) SI = 0.5

$HSI = (0.77 \times 1.0 \times 0.5)^{1/3} = 0.54$

TY 30 – V1 - average height of deciduous tree canopy (40 ft) SI = 1.0
V2 - % deciduous tree crown cover (50%) SI = 1.0
V3 – stand width (< 300 ft) SI = 0.5

$HSI = (1.0 \times 1.0 \times 0.5)^{1/3} = 0.79$

TY 60 - V1 - average height of deciduous tree canopy (>40 ft) SI = 1.0
V2 - % deciduous tree crown cover (75%) SI = 0.9
V3 – stand width (< 300 ft) SI = 0.5

$HSI = (1.0 \times 0.9 \times 0.5)^{1/3} = 0.77$

TY 100- no change from TY 60

WESTERN FENCE LIZARD

TY 0 – Baseline (measured)

V1 - % ground cover (0) SI = 0
V2 - average size of ground cover objects (< 1 ft) SI = 0.2
V3 - structural diversity/interspersion (A) SI = 0.1
V4 - % canopy cover (0) SI = 1.0

$CI = (2V1 \times V2 \times V3)^{1/3} = 0$

$TI = (V1 \times V4)^{1/2} = 0$

$HSI = (CI \times TI)^{1/2} = 0$

TY 1 – V1 - % ground cover (0) SI = 0
V2 - average size of ground cover objects (< 1 ft) SI = 0.2
V3 - structural diversity/interspersion (A) SI = 0.1
V4 - % canopy cover (0) SI = 1.0

$CI = (2V1 \times V2 \times V3)^{1/3} = 0$

$TI = (V1 \times V4)^{1/2} = 0$
$HSI = (CI \times TI)^{1/2} = 0$

TY 15 – V1 - % ground cover (5%)	SI = 0
V2 - average size of ground cover objects (≤ 1 ft)	SI = 0.2
V3 - structural diversity/interspersion (A)	SI = 0.1
V4 - % canopy cover (40%)	SI = 1.0

$CI = (2V1 \times V2 \times V3)^{1/3} = 0$

$TI = (V1 \times V4)^{1/2} = 0$

$HSI = (CI \times TI)^{1/2} = 0$

TY 30 – V1 - % ground cover (25%)	SI = 1.0
V2 - average size of ground cover objects (2 ft)	SI = 0.8
V3 - structural diversity/interspersion (C)	SI = 1.0
V4 - % canopy cover (75%)	SI = 0.33

$CI = (2V1 \times V2 \times V3)^{1/3} = 1.16\ (1.0)$

$TI = (V1 \times V4)^{1/2} = 0.57$

$HSI = (CI \times TI)^{1/2} = 0.75$

TY 60 – V1 - % ground cover (50%)	SI = 1.0
V2 - average size of ground cover objects (2 ft)	SI = 0.8
V3 - structural diversity/interspersion (C)	SI = 1.0
V4 - % canopy cover (75%)	SI = 0.33

$CI = (2V1 \times V2 \times V3)^{1/3} = 1.16\ (1.0)$

$TI = (V1 \times V4)^{1/2} = 0.57$

$HSI = (CI \times TI)^{1/2} = 0.75$

TY100 - no change from TY 60

AMERICAN RIVER WATERSHED INVESTIGATION
FOLSOM DAM OUTLET MODIFICATION PROJECT

PA 1 - Future Without Project (Impact Area)

CHAPARRAL

BOBCAT

TY 0 – Baseline (measured)

V1 - % shrub cover
V2 - % herbaceous cover
V3 - degree of patchiness
V4 – rock outcroppings

$$HSI = \frac{V1 + V2 + V3 + 2V4}{5} = 0.56$$

TY 1 V1 – no change from TY 0
V2 - no change from TY 0
V3 - no change from TY 0
V4 – no change from TY 0

HIS = 0.56

TY 60 V1 – no change from TY 1
V2 - no change from TY 1
V3 - no change from TY 1
V4 – no change from TY 1

HSI = 0.56
TY100 - no change from TY 60

WRENTIT

TY 0 – Baseline (measured)

V1 - % shrub cover
V2 - % shrub cover $\leq$ 5 feet(19%)
$HSI = (V1 \times V2)^{1/2} = 0.34$

TY 1 V1 – no change from TY 0
V2 - no change from TY 0
$HSI = (V1 \times V2)^{1/2} = 0.34$

TY 60 V1 – no change from TY 1
V2 - no change from TY 1

$HSI = (V1 \times V2)^{½} = 0.34$
TY100 - no change from TY 60

CALIFORNIA THRASHER

TY 0 – Baseline (measured)

V1 – Presence of low shrub openings	SI=1.0
V2 - Shrub/seedling cover	SI=1.0

$HSI = (V1 \times V2^2)^{⅓} = 1.0$

TY 1 - V1 – no change from TY 0
V2 - no change from TY 0

TY 60- V1 – no change from TY 1
V2 - no change from TY 1
TY100 - no change from TY 60

PA 2 - Future With Project (Impact Area)

Assume: 1. All vegetation removed from temporary and permanent impact zones in year 1
2. Temporary easement areas will not be replanted with woody vegetation

BOBCAT

TY 0 – Baseline (measured)

V1 - % shrub cover
V2 - % herbaceous cover
V3 - degree of patchiness
V4 – rock outcroppings

$$HSI = \frac{V1 + V2 + V3 + 2V4}{5} = 0.56$$

TY 1	V1 – no shrub cover	SI = 0.2
	V2 - no herbaceous cover	SI = 0.2
	V3 – patchiness (1)	SI = 0.2
	V4 – no rock outcroppings	SI = 0.1

$$HSI = \frac{0.2 + 0.2 + 0.2 + 0.2}{5} = 0.16$$

TY 60 V1 – no change from TY 1
V2 - no change from TY 1
V3 - no change from TY 1

V4 – no change from TY 1

HSI = 0.16
TY100 - no change from TY 60

WRENTIT

TY 0 - V1 - % shrub cover
V2 - % shrub cover ≤ 5 feet

HSI = $(V1 \times V2)^{½}$ = 0.34

TY 1 V1 – no shrub cover SI = 0
V2 - no shrubs SI = 0

HSI = $(0 \times 0)^{½}$ = 0

TY 60 V1 – no change from TY 1
V2 - no change from TY 1

HSI = 0
TY100 - no change from TY 60

CALIFORNIA THRASHER

TY 0 – Baseline (measured)

V1 – Presence of low shrub openings
V2 - Shrub/seedling cover

HSI = $(V1 \times V2^2)^{⅓}$ = 0.34

TY 1 - V1 – no shrubs SI = 0
V2 - no shrubs/seedlings SI = 0

HSI = $(0 \times 0^2)^{⅓}$ = 0

TY 60- V1 – no change from TY 1
V2 - no change from TY 1
TY100 - no change from TY 60

PA 3 - Future Without Project (Inundation Area)

CHAPARRAL

BOBCAT

TY 0 – Baseline (measured)

V1 - % shrub cover	SI=1.0
V2 - % herbaceous cover	SI=0.98
V3 - degree of patchiness	SI= 0.6
V4 – rock outcroppings	SI=1.0

$$HSI = \frac{V1 + V2 + V3 + 2V4}{5} = 0.72$$

TY 1
V1 – no change from TY 0
V2 - no change from TY 0
V3 - no change from TY 0
V4 – no change from TY 0

HIS = 0.72

TY 60
V1 – no change from TY 1
V2 - no change from TY 1
V3 - no change from TY 1
V4 – no change from TY 1

HSI = 0.72

TY100 - no change from TY 60

WRENTIT

TY 0 – Baseline (measured)

V1 - % shrub cover	SI=0.40
V2 - % shrub cover ≤ 5 feet(19%)	SI=0.09

$HSI = (V1 \times V2)^{1/2} = 0.19$

TY 1
V1 – no change from TY 0
V2 - no change from TY 0

$HSI = (V1 \times V2)^{1/2} = 0.19$

TY 60
V1 – no change from TY 1
V2 - no change from TY 1

$HSI = (V1 \times V2)^{1/2} = 0.19$

TY100 - no change from TY 60

CALIFORNIA THRASHER

TY 0 – Baseline (measured)

V1 – Presence of low shrub openings	SI=1.0
V2 - Shrub/seedling cover	SI=1.0

$HSI = (V1 \times V2^2)^{1/3} = 1.0$

TY 1 - V1 – no change from TY 0
V2 - no change from TY 0

TY 60- V1 – no change from TY 1
V2 - no change from TY 1

TY100 - no change from TY 60

PA 4 - Future With Project (Inundation Area)

Assume: 1. All vegetation removed from temporary and permanent impact zones in year 1
2. Temporary easement areas will not be replanted with woody vegetation

BOBCAT

TY 0 – Baseline (measured)

V1 - % shrub cover	SI=1.0
V2 - % herbaceous cover	SI=0.98
V3 - degree of patchiness	SI=0.6
V4 – rock outcroppings	SI=1.0

$$HSI = \frac{V1 + V2 + V3 + 2V4}{5} = 0.72$$

TY 1

V1 – no shrub cover	SI = 0.2
V2 - no herbaceous cover	SI = 0.2
V3 – patchiness (1)	SI = 0.2
V4 – no rock outcroppings	SI = 0.1

$$HSI = \frac{0.2 + 0.2 + 0.2 + 0.2}{5} = 0.16$$

TY 60 V1 – no change from TY 1
V2 - no change from TY 1
V3 - no change from TY 1
V4 – no change from TY 1

HSI = 0.16

TY100 - no change from TY 60

WRENTIT

TY 0 - V1 - % shrub cover
V2 - % shrub cover ≤ 5 feet

$HSI = (V1 \times V2)^{1/2} = 0.34$

TY 1 V1 – no shrub cover SI = 0
V2 - no shrubs SI = 0

$HSI = (0 \times 0)^{1/2} = 0$

TY 60 V1 – no change from TY 1
V2 - no change from TY 1

HSI = 0

TY 100 - no change from TY 60

CALIFORNIA THRASHER

TY 0 – Baseline (measured)

V1 – Presence of low shrub openings
V2 - Shrub/seedling cover

$HSI = (V1 \times V2^2)^{1/3} = 1.0$

TY 1 - V1 – no shrubs SI = 0
V2 - no shrubs/seedlings SI = 0

$HSI = (0 \times 0^2)^{1/3} = 0$

TY 60- V1 – no change from TY 1
V2 - no change from TY 1

TY 100 - no change from TY 60

<u>MP 1 - Management Area - Future Without Project (Compensation Site)</u>

Assume: 1. Annual grassland area selected for conversion to oak woodland.

BOBCAT

TY 0 – Baseline (estimated)

V1 - % shrub cover (no shrubs) SI = 0.2
V2 - % herbaceous cover (100%) SI = 0.8
V3 - degree of patchiness (1) SI = 0.2
V4 – rock outcroppings (no) SI = 0.1

$$HSI = \frac{V1 + V2 + V3 + 2V4}{5} = \frac{0.8 + 0.8 + 0.2 = 0.2}{5} = 0.28$$

TY 1 V1 – no change from TY 0
V2 - no change from TY 0
V3 - no change from TY 0
V4 – no change from TY 0

HSI = 0.28

TY 15 V1 – no change from TY 1
V2 - no change from TY 1
V3 - no change from TY 1
V4 – no change from TY 1

HSI = 0.28

TY 30 V1 – no change from TY 15
V2 - no change from TY 15
V3 - no change from TY 15
V4 – no change from TY 15

HSI = 0.28

TY 100 V1 – no change from TY 30
V2 - no change from TY 30
V3 - no change from TY 30
V4 – no change from TY 30

HSI = 0.28

WRENTIT

TY 0 – Baseline (estimated)

V1 - no shrub cover SI = 0
V2 – no shrubs SI = 0

$HSI = (V1 \times V2)^{1/2} = (0 \times 0)^{1/2} = 0$

TY 1 V1 – no change from TY 0
V2 - no change from TY 0

HSI = 0

TY 15 V1 – no change from TY 1
V2 - no change from TY 1

HSI = 0

TY 30 V1 – no change from TY 15
V2 - no change from TY 15

HSI = 0

TY 100 V1 – no change from TY 30
V2 - no change from TY 30

HSI = 0

CALIFORNIA THRASHER

TY 0 – Baseline (estimated)

V1 – no shrubs SI = 0
V2 – no shrubs/seedlings SI = 0

$HSI = (V1 \times V2^2)^{1/3} = (0 \times 0^2)^{1/3} = 0$

TY 1 - V1 – no change from TY 0
V2 - no change from TY 0

HSI = 0

TY 15 - V1 – no change from TY 1
V2 - no change from TY 1

HSI = 0

TY 30 - V1 – no change from TY 15
V2 - no change from TY 15

HSI = 0

TY 100- V1 – no change from TY 30
V2 - no change from TY 30

HSI = 0

MP 2 - Management Area - Future With Project (Compensation Site)

Assume:
1. Acquire lands (currently annual grasslands)
2. Annual grassland area prepared for planting in TY 1 , provide access and maintenance roads
3. Plant chaparral species at a density of 400 trees/acre and cover crop
4. Watering, weed, pest control for minimum of 3 years and remedial actions as necessary to ensure plant establishment.
5. Develop O&M manual

BOBCAT

TY 0 – Baseline (estimated)

V1 - % shrub cover (no shrubs)	SI = 0.2
V2 - % herbaceous cover (100%)	SI = 0.8
V3 - degree of patchiness (1)	SI = 0.2
V4 – rock outcroppings (no)	SI = 0.1

$$HSI = \frac{V1 + V2 + V3 + 2V4}{5} = \frac{0.8 + 0.8 + 0.2 = 0.2}{5} = 0.28$$

TY 1	V1 – area cleared and planted (1%)	SI = 0.2
	V2 – 100%	SI = 0.8
	V3 - no change from TY 0	SI = 0.2
	V4 – no change from TY 0	SI = 0.1

HSI = 0.28

TY 15	V1 – 30%	SI = 1.0
	V2 – 100%	SI = 0.8
	V3 – 2	SI = 0.6
	V4 – no change from TY 1	SI = 0.1

$$HSI = \frac{1.0 + 0.8 + 0.6 + 0.2}{5} = 0.52$$

TY 30	V1 – 50%	SI = 1.0
	V2 – 100%	SI = 0.8
	V3 – 2	SI = 0.6
	V4 – no change from TY 1	SI = 0.1

$$HSI = \frac{1.0 + 0.8 + 0.6 + 0.2}{5} = 0.52$$

TY 100	V1 – 50%	SI = 1.0
	V2 – 100%	SI = 0.8
	V3 – 2	SI = 0.6
	V4 – no change from TY 1	SI = 0.1

HSI = $\underline{1.0 + 0.8 + 0.6 + 0.2}$ = 0.52

WRENTIT

TY 0 – Baseline (estimated)

	V1 - no shrub cover	SI = 0
	V2 – no shrubs	SI = 0
	$HSI = (V1 \times V2)^{1/2} = (0 \times 0)^{1/2} = 0$	
TY 1	V1 – area cleared and planted (1%)	SI = 0
	V2 – area cleared and planted (100%)	SI = 1.0
	$HSI = (V1 \times V2)^{1/2} = (0 \times 1.0)^{1/2} = 0$	
TY 15	V1 – 30%	SI = 0.15
	V2 – 80%	SI = 0.8
	$HSI = (0.15 \times 0.8)^{1/2} = 0.49$	
TY 30	V1 – 50 %	SI = 0.33
	V2 – 80 %	SI = 0.8
	$HSI = (0.33 \times 0.8)^{1/2} = 0.64$	
TY 100	V1 – 50 %	SI = 0.33
	V2 – 80 %	SI = 0.8
	HSI = 0.64	

CALIFORNIA THRASHER

TY 0 – Baseline (estimated)

	V1 – no shrubs	SI = 0
	V2 – no shrubs/seedlings	SI = 0
	$HSI = (V1 \times V2^2)^{1/3} = (0 \times 0^2)^{1/3} = 0$	
TY 1 -	V1 –no	SI= 0
	V2 - 1%	SI= 0
	HSI = 0	
TY 15 -	V1 – yes	SI = 1.0
	V2 - 30%	SI = 0.35
	$HSI = (1.0 \times 0.35^2)^{1/3} = 0.50$	

TY 30 - V1 – yes SI = 1.0
V2 - 50% SI = 1.0

$$HSI = HSI = (1.0 \times 1.0^{2})^{1/3} = 1.0$$

TY 100- V1 – no change from TY 30
V2 - no change from TY 30

HSI = 1.0

APPENDIX A-2

HSI MODELS

NORTHERN ORIOLE
HABITAT SUITABILITY INDEX MODEL

HABITAT SUITABILITY INDEX MODEL

NORTHERN ORIOLE (*Icterus spurius*)

BREEDING HABITAT, CENTRAL VALLEY

CALIFORNIA

U.S. Fish and Wildlife Service
Ecological Services
Sacramento, California

January 1988

COVER TYPE	LIFE REQUISITE VARIABLES	HABITAT
Valley Woodland (W)	Average height of deciduous tree canopy (V_1)	Reproduction/ Cover
Riparian (R)	Percent deciduous tree Crown cover (V_2)	
	Stand width (V_3)	

FOOD

The diet of the northern oriole is comprised mainly of insects. Fruits, berries, and nectar are also utilized (Bent 1958; Martin et al. 1961). For purposes of this model, it is assumed that if suitable habitat is available for nesting and cover, food resources are not limiting.

Minimum habitat area

Minimum habitat area is defined as the minimum amount of contiguous habitat that is required before an area will be occupied by a species. Based on reported pair densities (Walcheck 1970; Gaines 1974; Pleasant 1979), it is assumed that at least 0.25 acres of suitable habitat must be available for the northern oriole to occupy an area. If less than this amount is present, the HSI is assumed to be zero.

VARIABLE	HABITAT TYPE	SUGGESTED TECHNIQUE
V_1 Average height of deciduous tree canopy	R, W	Range finder and clinometer on belt transect
V_2 Percent deciduous tree crown cover	R, W	Line intercept
V_3 Stand width	R, W	Visual observation, aerial interpretation

HSI Determination

LIFE REQUISITE	EQUATION	COVER TYPE

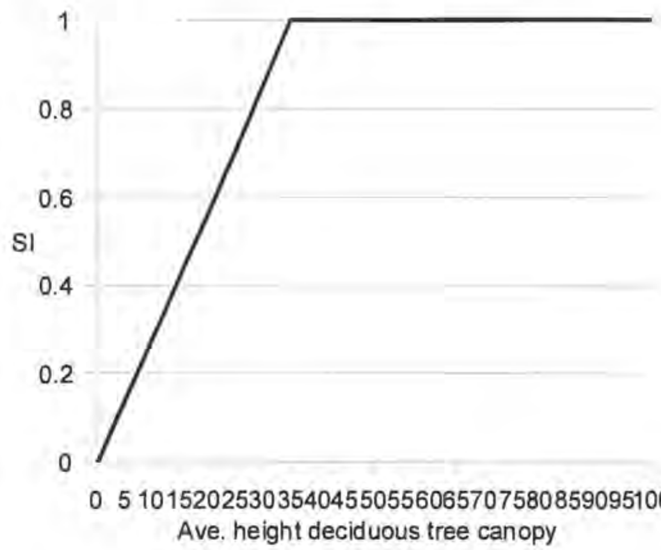
Reproduction R, W $(V_1 \times V_2 \times V_3)^{1/3}$

The HSI value for the northern oriole is equal to the reproduction/cover value.

<u>Model Applicability</u>
The model applies to breeding habitat of the northern oriole in the Central Valley of California up to 500 feet in elevation.

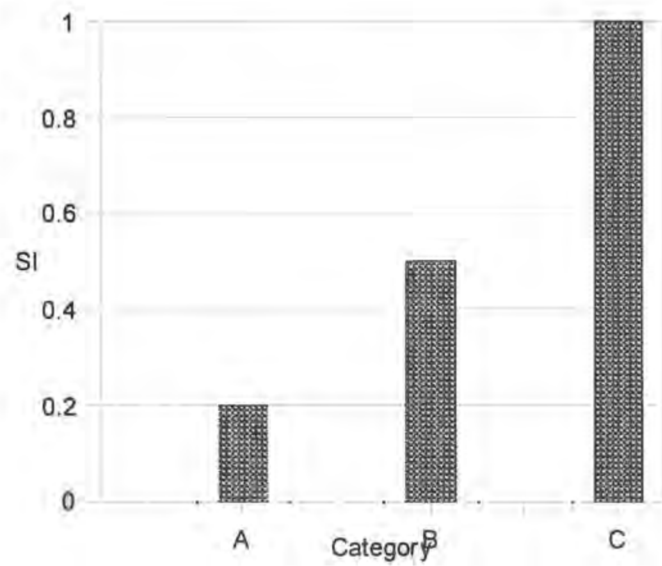
1. Average height of deciduous tree canopy.

Assumption: Orioles nest almost exclusively in large, preferably deciduous, trees (derived from nesting data of Schaefer (1976A)). Tree height of 35 feet or greater is optimum the dominant canopy strata equals those trees comprising 50% of total canopy closure.



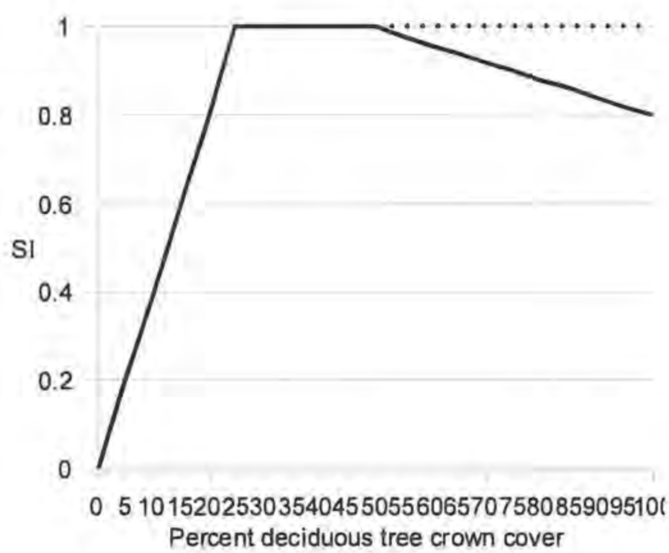
2. Percent deciduous tree crown cover.

Assumption: Orioles prefer open stands of deciduous trees for nesting (Grinnel and Miller 1944). Crown cover of 25-50% is assumed to be optimum.



3. Stand width

Assumption: Orioles prefer large blocks of riparian or oak woodland for nesting (USFWS 1981).



A - Woodland a narrow band comprising the width of one tree.

B - Woodland a strip less than 300 feet wide at its widest point.

C - Woodland greater than 300 feet wide at widest point.

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WESTERN FENCE LIZARD

HABITAT SUITABILITY INDEX MODEL

HABITAT SUITABILITY INDEX MODEL

WESTERN FENCE LIZARD (*Sceloporus occidentalis*)

by
Daniel H. Strait
U.S. Fish and Wildlife Service
Division of Ecological Services
Sacramento, California

INTRODUCTION

The western fence lizard (*Sceloporus occidentalis*) ranges from British Columbia southward through Washington, Oregon and throughout California and the Great Basin to northwestern Baja California (Smith, 1948; Stebbins, 1985). It occupies a wide variety of habitats, excluding extreme desert conditions, from sea level to over 9500 feet in the Sierra Nevada. In California, four subspecies are present (Jennings, 1987). Preferring wooded, rocky areas, it frequents talus and rocky outcrops of hillsides, canyons and along streams. Western fence lizards are attracted to old buildings, woodpiles, fences, telephone poles, woodrat nests and banks with rodent burrows. It requires cover and, except for dispersing females (Jennings, personal communication) is seldom encountered in open fields or extremely barren areas (Stebbins, 1954). It is frequently a colonizer of disturbed habitats (Lillywhite, et. al., 1977).

The western fence lizard can be semi-arboreal (Cunningham, 1955; Davis and Verbeek, 1972). Trees apparently do not constitute a life requisite as was shown by *Sceloporus occidentalis* populations in chaparral (Lillywhite, Friedman and Ford 1972) and at high elevations (Grinnell and Storer, 1924). Trees may simply act as another type of available cover. This indicates the microhabitat plasticity of this species (Rose, 1978).

MODEL APPLICABILITY

This model was designed for use in plant communities found in the Central Valley of California and surrounding foothills up to an elevation of approximately 1500 feet and applies to the subspecies *S. o. occidentalis* and *S.o. biseriatus*. The model is based on both empirical data provided by expert review and information obtained from current literature.

Cover Type	Life Requisite	Habitat Variable
		Percent ground cover (V_1)
	Cover/Reproduction	Average size of ground cover objects (V_2)
Riparian (R) Oak savannah (O) Oak woodland (W) Scrub (S) Annual Grassland (G)		Structural diversity/ Interspersion (V_3)
	Thermoregulation	Percent ground cover (V_1)
		Percent canopy cover (V_4)

Habitat Variable	Cover Type	Suggested Techniques

V_1 - Percent ground cover	R.O.W.S,G	Line intercept, measurement of random points using a 3 feet diameter loop.
V_2 - Average size of ground cover objects	R.O.W.S,G	Line intercept
V_3 - Structural diversity/ interspersion	R.O.W.S,G	Ocular estimate
V_4 - Percent canopy cover	R.O.W.S,G	Spherical densiometer, line intercept, point intercept on aerial photos.

Variable 1. Percent ground cover

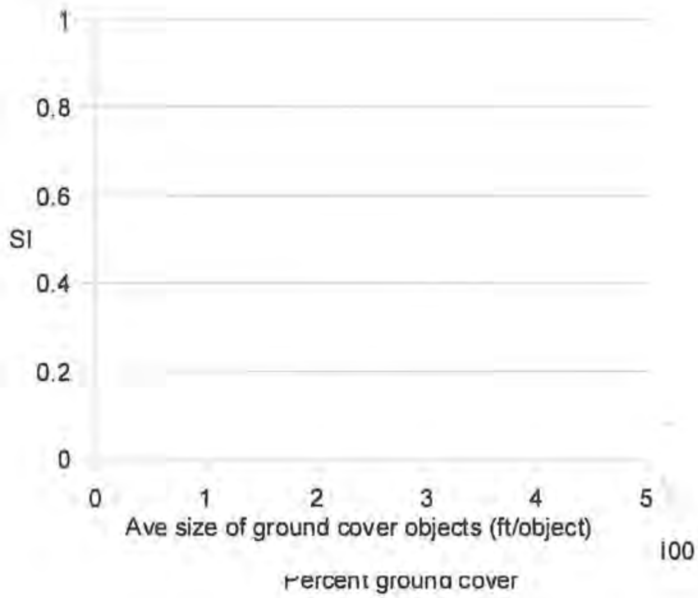
Assumes:

Only those objects less than 8 feet above the ground surface are considered. This includes rocks, logs, branches, tree trunks, fences, wood piles and live vegetation. Western fence lizards exhibit no well-defined habitat preference, but favor areas with logs, trees or other objects upon which they can climb, sun and display (Fitch, 1940). Brush piles and cavities under rocks and logs provide refuge (Marcellini and Mackey, 1979). An amount of ground cover beyond a particular density results in less than optimal conditions as it conceals predators and interferes with movement and the ability to defend a territory (Davis and Ford, 1983). Davis and Verbeek (1972) found that western fence lizards avoided dense grasslands. However, dispersing juveniles will cross dense grasslands and colonize any suitable isolated habitat found (Jennings, personal communication).

In California, western fence lizards centered their territorial activities about logs, fence posts, stumps and exposed boulders from which males display (Carpenter, 1980) and to observe mates or rival males (Fitch, 1940).

Eggs are placed in damp, friable, well-aerated soil from mid-May to mid-July in pits dug by the female and covered with loose soil (Stebbins, 1954) or under rocks and logs (Jennings, personal communication). In non-riparian conditions, nest sites are probably limited to areas within the shade of large cover objects.

Ground cover ranging from 25 to 70 percent is considered optimum for western fence lizards as it provides sufficient cover for maximum use of an area while not being so abundant as to interfere with movement. Western fence lizards undergo hibernation from November to February (Smith, 1946) and require cover for winter survival (Jennings, personal communication).



Variable 2. Average size of ground cover objects.

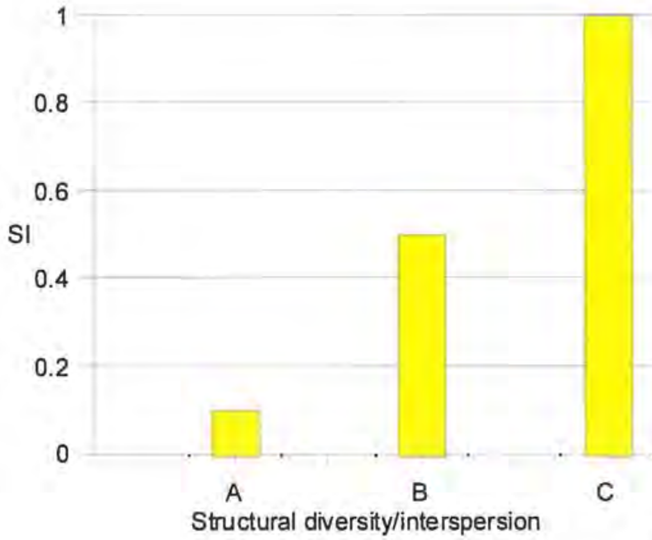
Assumes:

Ground cover objects include tree trunks but no other living material. The objects must be sufficiently large to provide escape cover. Western fence lizards have the habit of running to the opposite side of their perch (rock, log, etc.) when approached (Nussbaum et al., 1983). The objects must also be large enough to provide cover for hibernation, nest building, shade for summer thermoregulation, and to offer vantage points for territorial defense and mating display.

An average ground cover object size of 3.0 feet and larger is considered optimum as it is sufficiently large to provide for escape cover, thermoregulation and reproductive needs.

The average size of ground cover objects greater than 4 inches is diameter are measured in the field using the line intercept method and is determined by the formula:

$$\text{Average size of ground cover objects} = \frac{\text{Total feet of line intercepted}}{\text{Total number of ground cover objects intercepted}}$$



Variable 3. Structural diversity/interspersion

Assumes:

This variable is related to the habitat heterogeneity. The western fence lizard areas have a mixture and sufficient quantity of cover types (rocks, logs, living vegetation, rodent burrows, cracks and crevices) in a semi-open environment with lots of habitat edge allowing for sufficient exposure to the sun (Ruth, personal communication), escape cover and a production base for food organisms (Jennings, personal communication). These areas usually have a significant vertical component in the form of large boulders, trees, fence rows, old buildings or log piles (Nussbaum et al, 1983). Davis and Ford (1983) found optimal habitat was provided by large fallen oaks in various stages of decay or by large, standing oaks from which limbs and branches had fallen to the ground creating massive tangles. Western fence lizards commonly show low distributions in climax communities due to the homogeneity of the habitat(Ruth, personal communication).

A - Low habitat diversity. Ground cover limited to 1 or 2 types (i.e., grassland and bare soil). Site mostly homogeneous with little edge. Cover component mostly one dimensional without a significant vertical element (average less than 1 foot above ground). An exception may be rock talus which can be good (Ruth, communication).

B - Moderate habitat diversity. Two or more major ground cover types occur (i.e., large rocks, logs and woodpiles). A moderate amount of edge and interspersion is present between vegetation types and/or ground cover types. A significant vertical element to the cover component (average 1 -4 feet above ground) is present.

C - High habitat diversity. Three or more major ground cover types are present (i.e., large rocks, logs and woodpiles). Heterogeneity is high with logs of edge between evenly dispersed vegetation and cover types. Overall, habitat has a significant vertical component (average greater than 4 feet above ground). May include rock talus.

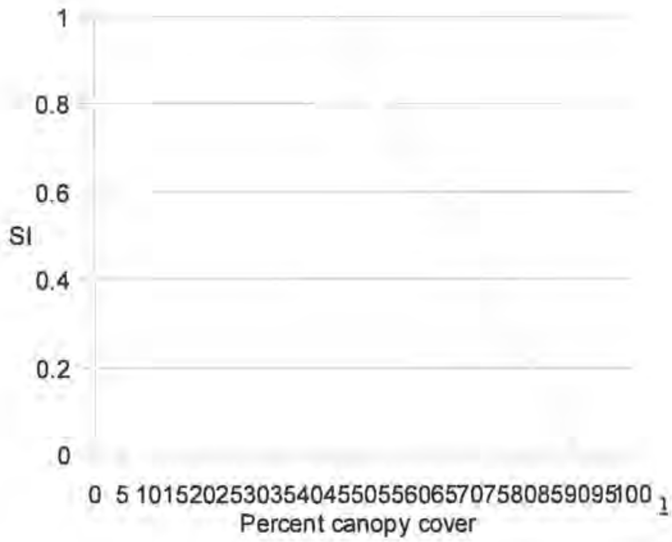
Variable 4. Percent canopy cover

Assumes:

The canopy is defined as standing live vegetation greater than 6 feet above ground. This variable relates directly to the ability of the habitat to provide sufficient exposure so that western fence lizards can thermoregulate.

The ability of a western fence lizard to thermoregulate in an area is a major determinant of its habitat occupancy. The ability of this species to absorb sunlight and warm quickly enables it to inhabit areas from sea level to over 9000 feet in elevation (Tanner and Hopkin, 1972). Western fence lizards typically move from areas of sunlight to shade to maintain their desired body temperature. Davis and Verbeek (1972) found this species shifted from rocks to trees and vice versa according to ambient temperature. Western fence lizards avoid dense, shaded woods (Stebbins, 1959).

A canopy cover ranging from 0 - 45 percent is considered optimum as it provides sufficient sunlight on the ground or ground cover surface for thermoregulation by western fence lizards. An area with a canopy cover greater than 90 percent is considered uninhabitable for western fence lizards due to a lack of sunlight on the ground surface for thermoregulation.



CALCULATIONS

Life Requisite

Cover//Reproduction $_3)^{1/3}$

Thermoregulation R.O.W.S,G $TI = (V_1 \times V_4)^{1/2}$

HSI Determination $HSI = (CI \times TI)^{1/2}$

Assumes percent ground cover is the major determining factor due to its importance in reproduction, predator avoidance and thermoregulation.

An HSI value of 1.0 is considered optimum. An HSI value greater than 1.0 achieved through the use of this formula is to be considered 1.0.

ASSUMPTIONS

Feeding

It is assumed that where all necessary habitat components are present, food availability is not a factor limiting the use of an area by western fence lizards. Low availability of insects may be a limiting factor on winter recruitment of juveniles into the adult population (Jennings, personal communication). In arid areas, food can be limiting to adults in late summer (Ruth, personal communication).

The western fence lizard is an opportunistic insectivore which feeds on a variety of insects and other arthropods including leaf hoppers, aphids, beetles, wasps, termites, ants and spiders (Fitch, 1940; Johnson, 1965; Rose, 1976; Stebbins, 1954).

Rose (1976) found the three primary groups in the fence lizard diet to be ants (*Formicidae*), beetles (*Coleoptera*) and termites (*Isoptera*). Johnson (1965) found flies (*Diptera*), beetles and ants to be important prey while Clark (1973) found grasshoppers (*Acrididae*) the most common prey item. Otvos (1977) found moths or butterflies (*Lepidoptera*) the most common prey item in stomachs analyzed. Western fence lizards commonly bask or loaf in the shade and eat whatever arthropod comes close enough to attract their attention (Tanner and Hopkin, 1972). It can therefore be assumed that food availability is not a limiting factor under normal lizard population levels and habitat conditions.

Reproduction

It is assumed that, if ground cover of rocks, logs, trees, woodpiles, etc. of sufficient size and quantity are available for non-reproductive activities, then areas with moist, friable soil necessary for lizard nesting purposes would be present beneath the cover and should not be a limiting factor. Females may travel several hundred feed to find appropriate nesting conditions (Ruth, personal communication).

Water requirements

Considering the wide distribution of this species in all but the most extreme desert regions, it is unlikely that water availability would be a limiting factor to the western fence lizard though densities are often highest where water (seeps, ponds, etc.)are nearby (Ruth, personal communication). This assumes that sufficient ground cover exists for thermoregulation and nesting. This species receives the bulk of its moisture through metabolic water from its prey (Ruth, personal communication). These lizards may lower metabolic rates to compensate for higher body temperatures and water stress during warm seasons (Tsuji, 1985).

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We thank Mark R. Jennings, PhD., Department of Herpetology, California Academy of Sciences, Dixon, California and Stephen B. Ruth, Ph.D., Monterey Peninsula College, Monterey, California for reviewing the draft model and for providing field observations, data and suggestions which aided in establishing field applicability for the model. Their contributions are greatly appreciated.

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FWS/OBS-82/10.27
July 1982

HABITAT SUITABILITY INDEX MODELS: YELLOW WARBLER

by

Richard L. Schroeder[4]
Habitat Evaluation Procedures Group
Western Energy and Land Use Team
U.S. Fish and Wildlife Service
Drake Creekside Building One
2625 Redwing Road
Fort Collins, CO 80526

Western Energy and Land Use Team
Office of Biological Services
Fish and Wildlife Service
U.S. Department of the Interior
Washington, DC 20240

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PREFACE

This document is part of the Habitat Suitability Index (HSI) Model Series (FWS/OBS-82/10), which provides habitat information useful for impact assessment and habitat management. Several types of habitat information are provided. The Habitat Use Information Section is largely constrained to those data that can be used to derive quantitative relationships between key environmental variables and habitat suitability. The habitat use information provides the foundation for HSI models that follow. In addition, this same information may be useful in the development of other models more appropriate to specific assessment or evaluation needs.

The HSI Model Section documents a habitat model and information pertinent to its application. The model synthesizes the habitat use information into a framework appropriate for field application and is scaled to produce an index value between 0.0 (unsuitable habitat) and 1.0 (optimum habitat). The application information includes descriptions of the geographic ranges and seasonal application of the model, its current verification status, and a listing of model variables with recommended measurement techniques for each variable.

In essence, the model presented herein is a hypothesis of species-habitat relationships and not a statement of proven cause and effect relationships. Results of model performance tests, when available, are referenced. However, models that have demonstrated reliability in specific situations may prove unreliable in others. For this reason, feedback is encouraged from users of this model concerning improvements and other suggestions that may increase the utility and effectiveness of this habitat-based approach to fish and wildlife planning. Please send suggestions to:

Habitat Evaluation Procedures Group
Western Energy and Land Use Team
U.S. Fish and Wildlife Service
2625 Redwing Road
Ft. Collins, CO 80526

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YELLOW WARBLER (*Dendroica petechia*)

HABITAT USE INFORMATION

<u>General</u>

The yellow warbler (*Dendroica petechia*) is a breeding bird throughout the entire United States, with the exception of parts of the Southeast (Robbins et al. 1966). Preferred habitats are wet areas with abundant shrubs or small trees (Bent 1953). Yellow warblers inhabit hedgerows, thickets, marshes, swamp edges (Starling 1978), aspen (*Populus* spp.) groves, and willow (*Salix* spp.) swamps (Salt 1957), as well as residential areas (Morse 1966).

Food

More than 90% of the food of yellow warblers is insects (Bent 1953), taken in proportion to their availability (Busby and Sealy 1979). Foraging in Maine occurred primarily on small limbs in deciduous foliage (Morse 1973).

Water

Dietary water requirements were not mentioned in the literature. Yellow warblers prefer wet habitats (Bent 1953; Morse 1966; Stauffer and Best 1980).

Cover

Cover needs of the yellow warbler are assumed to be the same as reproduction habitat needs are discussed in the following section.

Reproduction

Preferred foraging and nesting habitats in the Northeast are wet areas, partially covered by willows and alders (*Alnus* spp.), ranging in height from 1.5 to 4 m (5 to 13.3 ft) (Morse 1966). It is unusual to find yellow warblers in extensive forests (Hebard 1961) with closed canopies (Morse 1966). Yellow warblers in small islands of mixed coniferous-deciduous growth in Maine utilized deciduous foliage far more frequently than would be expected by chance alone (Morse 1973). Coniferous areas were mostly avoided and areas of low deciduous growth preferred.

Nests are generally placed 0.9 to 2.4 m (3 to 8 ft) above the ground, and nest heights rarely exceed 9.1 to 12.2 m (30 to 40 ft) (Bent 1953). Plants used for nesting include willows, alders, and other hydrophytic shrubs and trees (Bent 1953), including box-elders (*Acer negundo*) and cottonwoods (*Populus* spp.) (Schrantz 1943). In Iowa, dense thickets were frequently occupied by yellow warblers while open thickets with widely spaced shrubs rarely contained nests (Kendeigh 1941).

Males frequently sing from exposed song perches (Kendeigh 1941; Ficken and Ficken 1965), although yellow warblers will nest in areas without elevated perches (Morse 1966).

A number of Breeding Bird Census reports (Van Velzen 1981) were summarized to determine nesting habitat needs of the yellow warbler, and a clear pattern of habitat preferences emerged. Yellow warblers nested in less than 5% of census areas comprised of extensive upland forested cover types (deciduous or coniferous) across the entire country. Approximately two-thirds of all census areas with deciduous shrub-dominated cover types were utilized, while shrub wetlands types received 100% use. Wetlands dominated by shrubs had the highest average breeding densities of all cover types [2.04 males per ha (2.5 acre)]. Approximately two-thirds of the census areas comprised of forested draws and riparian forests of the western United States were used, but average densities were low [0.5 males per ha (2.5 acre)].

Interspersion

Yellow warblers in Iowa have been reported to prefer edge habitats (Kendeigh 1941); Stauffer and Best 1980). Territory size has been reported as 0.16 ha (0.4 acre) (Kendeigh 1941) and 0.15 ha (0.37 acre) (Kammeraad 1964).

Special Considerations

The yellow warbler has been on the Audubon Society's Blue List of declining birds for 9 of the last 10 years (Tate 1981).

HABITAT SUITABILITY INDEX (HSI) MODEL

Model Applicability

Geographic area. This model has been developed for application within the breeding range of the yellow warbler.

Season. This model was developed to evaluate the breeding season habitat needs of the yellow warbler.

Cover types. This model was developed to evaluate habitat in the dominant cover types used by the yellow warbler. Deciduous Shrubland (DS) and Deciduous Scrub/Shrub Wetland (DSW) (terminology follows that of U.S. Fish and Wildlife Service 1981). Yellow warblers only occasionally utilize forested habitats and reported populated densities in forests are low. The habitat requirements in forested habitats are not well documented in the literature. For these reasons, this model does not consider forested cover types.

Minimum habitat area. Minimum habitat area is defined as the minimum amount of contiguous that is required before an area will be occupied by a species. Information on the minimum habitat area for the yellow warbler was not located in the literature. Based on reported territory sizes, it is assumed that at least 0.15 ha (0.37 acre) of suitable habitat must be available for the yellow warbler to occupy an area. If less than this amount is present, the HSI is assumed to be 0.0.

Verification level. Previous drafts of the yellow warbler habitat model were reviewed by Douglass H. Morse and specific comments were incorporated into the current model (Morse, pers. comm.).

Model Description

Overview. This model considers the quality of the reproduction (nesting) habitat needs of the yellow warbler to determine overall habitat suitability. Food, cover, and water requirements are assumed to be met by nesting needs.

The relationship between habitat variables, life requisites, cover types, and the HSI for the yellow warbler is illustrated in Figure 1.

The following sections provide a written documentation of the logic and assumptions used to interpret the habitat information for the yellow warbler and to explain and justify and variable and equations that are used in the HSI model. Specifically, these sections cover the following: (1) identification of variables that will be used in the model; (2) definition and justification of the suitability levels of each variable; and (3) description of the assumed relationship between variables.

Reproduction component. Optimal nesting habitat for the yellow warbler is provided in wet areas with dense, moderately tall stands of hydrophytic deciduous shrubs. Upland shrub habitats on dry sites will provide only marginal suitability.

It is assumed that optimal habitats contain 100% hydrophytic deciduous shrubs and that habitats with no hydrophytic shrubs will provide marginal suitability. Shrub densities between 60 and 80% crown cover are assumed to be optimal. As shrub densities approach zero cover, suitability also approaches zero.

Figure 1. Relationship between habitat variables, life requisites, cover types, and the HSI for the yellow warbler.

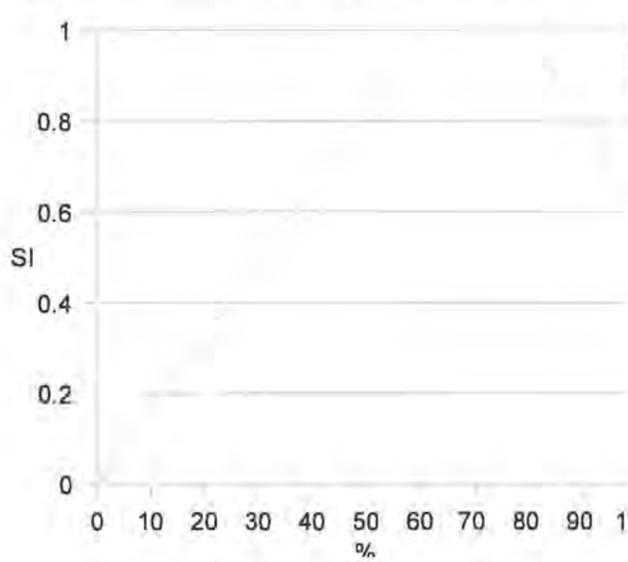
Habitat variable	Life requisite	Cover types	
Percent deciduous shrub crown cover			
Average height of deciduous shrub canopy	Reproduction	Deciduous Shrubland Deciduous Scrub/ Shrub Wetland	HSI
Percent of shrub canopy comprised of hydrophytic shrubs			

Totally closed shrub canopies are assumed to be of only moderate suitability, due to the probable restrictions on movement of the warblers in those conditions. Shrub heights of 2 m (6.6 ft) or greater are assumed to be optimal, and suitability will decrease as heights decrease to zero.

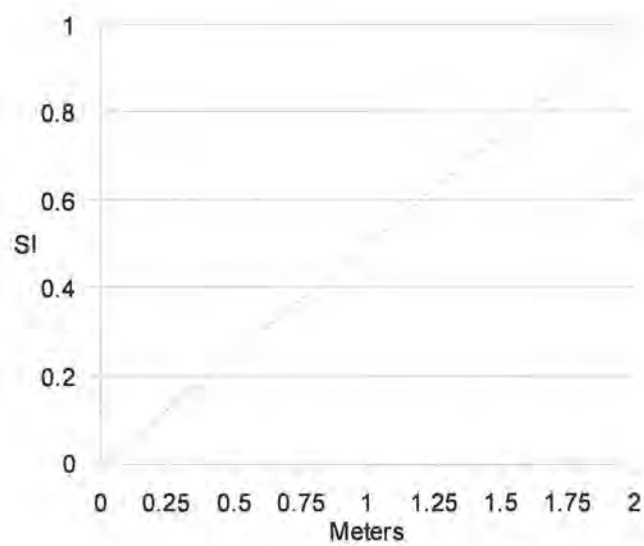
Each of these habitat variables exert a major influence in determining overall habitat quality for the yellow warbler. A habitat must contain optimal levels of all variables to have maximum suitability. Low values of any one variable may be partially offset by higher values of the remaining variables. Habitats with low values for two or more variables will provide low overall suitability levels.

Model Relationships

Suitability Index (SI) graphs for habitat variables. This section contains suitability index graphs that illustrate the habitat relationships described in the previous section.

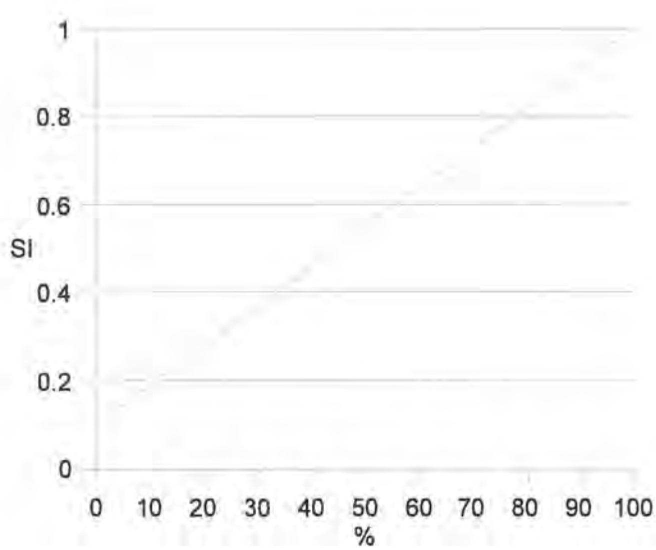


Cover-type Variable
DS,DSW V_1
Percent deciduous shrub crown cover.



DS,DSW V_2
Average height of deciduous shrub canopy.

DS, DSW V_3
Percent of deciduous shrub canopy comprised of hydrophytic shrubs.



Equations. In order to obtain life requisite values for the yellow warbler, the SI values for appropriate variables must be combined with the use of equations. A discussion and explanation of the assumed relationship between variables was included under Model Description, and the specific equation in this model was chosen to mimic these perceived biological relationships as closely as possible. The suggested equation for obtaining a reproduction value is presented below.

Life requisite	Cover type	Equation
Reproduction	DS,DSW	$(V_1 \times V_2 \times V_3)^{1/2}$

HSI determination. The HSI value for the yellow warbler is equal to the reproduction value.

Application of the Model

Definitions of variables and suggested field measurement techniques (Hays et al. 1981) are provided in Figure 2.

Figure 2. Definitions of variables and suggested measurement techniques.

Variable (definition)	Cover types	Suggested techniques
V_1 Percent deciduous shrub crown cover (the percent of the ground that is shaded by a vertical projection of the canopies of woody deciduous vegetation which are less than 5 m (16.5 ft) in height).	DS,DSW	Line intercept
V_2 Average height of deciduous shrub canopy (the average height from the ground surface to the top of those shrubs which comprise the uppermost	DW,DSW	Graduated rod

shrub canopy).

V_3 Percent of deciduous shrub canopy comprised of hydrophytic shrubs (the relative percent of the amount of hydrophytic shrubs compared to all shrubs, based on canopy cover).	DW.DSW	Line Intercept

SOURCES OF OTHER MODELS

No other habitat models for the yellow warbler were located.

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HABITAT SUITABILITY INDEX MODELS: RED-WINGED BLACKBIRD

by

Henry L. Short
Habitat Evaluation Procedures Group
Western Energy and Land Use Team
U.S. Fish and Wildlife Service
2627 Redwing Road
Fort Collins, CO 80526-2899

Western Energy and Land Use Team
Division of Biological Services
Research and Development
Fish and Wildlife Service
U.S. Department of the Interior
Washington, DC 202240

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PREFACE

This document is part of the Habitat Suitability Index (HSI) Model Series [Biological Report 82(10)] which provides habitat information useful for impact assessment and habitat management. Several types of habitat information are data that can be used to derive quantification relationships between key environmental variables and habitat suitability. This information provides the foundation for the HSI model and may be useful in the development of other models more appropriate to specific assessment or evaluation needs.

The HSI Model Section documents the habitat and includes information pertinent to its application. The model synthesizes the habitat use information into a framework appropriate for field application and is scaled to produce an index value between 0.0 (unsuitable habitat) and 1.0 (optimum habitat). The HSI Model Section includes information about the geographic range and seasonal application of the model, its current verification status, and a list of the model variables with recommended measurement techniques for each variable.

The model is a formalized synthesis of biological and habitat information published in the scientific literature and may include unpublished information reflecting the opinions of identified experts. Habitat information about wildlife species frequently is represented by scattered data sets collected during different seasons and years and from different sites throughout the range of a species. The model presents this broad data base in a formal, logical, and simplified manner. The assumptions necessary for organizing and synthesizing the species-habitat information into the model are discussed. The model should be regarded as a hypothesis of species-habitat relationships and not as a statement of proven cause and effect relationships. The model may have merit in planning wildlife habitat research studies about species, as well as in providing an estimate of the relative quality of habitat for that species.

ACKNOWLEDGMENTS

I gratefully acknowledge Dr. Gordon H. Orians, Department of Zoology, University of Washington, Seattle, for his review of this red-winged blackbird model . The cover of this document was illustrated by Jennifer Shoemaker. Word processing was provided by Carolyn Gulzow, Dora Ibarra, and Elizabeth Graf.

RED-WINGED BLACKBIRD (*Agelaius phoeniceus L.*)

HABITAT USE INFORMATION

General

The red-winged blackbird *(Agelaius phoeniceus L)* nests in fresh-water and brackish herbaceous wetlands, bushes and small trees along watercourses, and certain upland cover types from (American Ornithologists' Union 1983:723):

> ... east-central, south-coastal and southern Alaska..., southern Yukon west-central and southern Mackenzie, northwestern and central Saskatchewan, central Manitoba, central Ontario, southern Quebec..., New Brunswick, Prince Edward Island, Nova Scotia and southwestern Newfoundland south to northern Baja California, through Mexico... and along both coasts of Central America to Nicaragua and northern Costa Rica .... and to southern Texas, the Gulf coast and southern Florida. [This blackbird winters] from southern British Columbia, Idaho, Colorado, Kansas, Iowa, the southern Great Lakes region, southern Ontario and New England... south throughout the remainder of the breeding range, with the southwestern and most of Middle American populations being sedentary.

The red-winged blackbird traditionally was considered to be a wetland nesting bird. It has adapted, within the last century, to habitat changes brought about by man; it now commonly nests in hayfields, along roadsides and ditches, and in other upland sites (Dolbeer 1980).

Food

Red-winged blackbirds vary their diet throughout the year, presumably in response to the nutritive demands of reproduction. The percent of waste grain and seeds in the diet of male blackbirds in one study in Ontario, Canada, was at least 80 to 87% in March and April, 46% in May, only 10% in July, and 85% in late July to October (McNicol et al. 1982). Insects amounted to 51 to 84% of the diet during May and July. The diet of female red-winged blackbirds varied between 67 and 79% insect parts in May and July but was only 15% insectivorous in late July-October, after fledging had occurred.

Water

References describing the dependency of the red-winged blackbird on surface water for drinking and bathing were not found in the literature. Nesting occurs in herbaceous wetlands and upland habitat near surface water and in suitable vegetation distant from free water. Red-winged blackbirds seem to prefer habitats near wetlands for foraging. Communal roosting, which occurs after fledging is completed, is either in herbaceous wetlands or dense communities of young trees with thick canopies growing on moist sites (Micacchion and Townsend 1983).

Cover

The red-winged blackbird nests in a variety of habitats. Blackbirds in southern Michigan prefer old and new hay fields, pastures, old fields, and wetlands with robust vegetation capable of supporting nests and dense cover that provides protection for nests (Albers 1978). They avoid cut or fallow fields, woodlots, agricultural croplands, open water, and tilled soil.

Areas with tall, dense, herbaceous vegetation seem to provide preferred nest sites. Blackbirds that nest early in the breeding season select tall, dense, old-growth herbaceous vegetation while blackbirds that nest late in the breeding season select tall, dense, new-growth herbaceous vegetation (Albers 1978). Upland nest sites of red-winged blackbirds in Ontario were in plant communities commonly dominated by goldenrod (*Solidago* spp.), alfalfa (*Medicago sativa*), fleabane (*Erigeron* spp.), clover (*Trifolium* spp.), various thistles (*Cirsium* spp.), and similar herbaceous weeds (Joyner 1978). Blackbirds in fresh water sites selected old- and new-growth of broad-leaved monocots, like cattails (*Typha* spp.) and broad-leaved sedges (*Carex* spp.), and commonly rejected old- and new-growth of narrow-leaved monocots and forbs (Albers 1978). Woody species, such as hightide bush (*Iva* frutescens) and groundselbush (*Baccharis halimifolia*), and robust herbaceous plants, like cattails, supported the most nests in tidal herbaceous wetlands (Meanley and Webb 1963).

The density of preferred plant cover is not adequately described either in the literature or in this model. The height of preferred plant cover is inferred, below, from descriptions of nest sites.

Red-winged blackbirds frequently use scattered trees and fence posts near their breeding territories as observation posts. Blackbirds use both herbaceous wetlands and trees for communal roosts after fledging is completed. Roost trees characteristically are young, occur at high densities, provide thick canopies, and are adapted to moist sites (Micacchion and Townsend 1983).

Reproduction

Red-winged blackbirds are migratory in the northern portion of their range. Males migrate to or congregate at future nesting habitats in late winter, and females arrive at the territories in early spring (Case and Hewitt 1963). In areas with resident populations, individuals of both sexes may remain near breeding territories throughout the year, even though the areas are not actively defended or used in winter except, perhaps, as roosting sites (Orians pers. comm.). Males are polygynous, and up to six females commonly nest within a male's territory (Holm 1973). Harem size was larger in herbaceous wetlands with open stands of cattails than in herbaceous wetlands dominated by bulrushes (*Scirpus* spp.) or by closed stands of cattails (Holm 1973). Harem size has sometimes been observed to exceed 10 to 12 females and, in one instance, numbered 32 females (Orians pers. comm.).

Males do not participate in nest building, incubation, or feeding of the incubating female (Orians pers. comm.). Males may help feed nestlings and are likely to help feed fledglings. The timing of breeding varies throughout the range of the red-winged blackbird. Nesting frequently begins in March or April and is completed by mid-July in the more temperate habitats. Most young in North America are fledged by late July.

Herbaceous wetlands dominated by cattails generally seem to be the most productive habitats for red-wing blackbirds in terms of nests/ha or number of young fledged/ha (Robertson 1972). Favorable herbaceous wetland sites produce more suitable food per unit area and have higher nest densities, highly synchronous nesting, higher nest survival rates. and lower nest predation rates than do upland nest sites.

Nests of red-winged blackbirds are placed on the edges of cattail clumps that border areas of open water (Wiens 1965). Herbaceous wetlands that are dominated by cattails and have open, permanent water have the optimum number of available nest sites. Early nests are placed in the old growth vegetation remaining from past growing seasons, while late nests may be built on new growth. Nest success in one herbaceous wetland habitat seemed related to: (1) increased depth of permanent water (up to 50 cm or more), which apparently reduced mammalian predation on nests; (2) nest placement close to water (greater nest success was observed for nests 20 cm above water than nests 100 cm above water), (3) nest placement in herbaceous wetland vegetation interspersed with open water, rather than in herbaceous wetland vegetation where no open water was present; and (4) nest placement in marsh grass and loosestrife (*Decadon verticillatus*), rather than in sweet gale *(Myrica gale*) and sedges (Weatherhead and Robertson 1977). Other studies have indicated that nests placed at 1.2 m heights were more successful than nests placed at 0.6 m heights in tidal herbaceous wetlands on Chesapeake Bay (Meanley and Webb 1963) and that nest success was higher when permanent water levels were greater than 25 cm (Robertson 1972).

Nests of red-winged blackbirds in upland sites typically are wound between and attached to stalks of herbaceous vegetation (Bent 1958). Early nests are entwined with old growth stems and late nests with the sturdiest stems of the new growth. Activities, such as intensive livestock grazing, mowing, and burning of old growth stubble, make herbaceous uplands unavailable for early nest placement. Mowing hayfields during the nesting season disrupts nesting success on upland sites (Albers 1978). Red-winged blackbirds seem to prefer areas with the densest, tallest herbaceous vegetation for nest placement. Vegetation that restricted visibility was more important than the number of plant stems and leaves per unit area. Trees greater than 5.0 m in height were in most territories (Albers 1978). The mean height of nest placement was 15 cm in monotypic stands of reed canarygrass (*Phalaris arundinacea*) 58 cm high (Joyner 1978). Nest sites often are close to open water (Joyner 1978), although no specific descriptions of acceptable distances of upland nest sites from open water were found in the literature.

Interspersion

The red-winged blackbird seems to be closely associated with the presence of standing water (Bent 1958) and certain types of dense herbaceous vegetation for nest placement. Herbaceous wetlands or sloughs I with extensive cattails, bulrushes, sedges, reeds (*Phragmites* spp.), or tules (*Scirpus* spp.), historically have provided important nesting habitat for the blackbird (Bent 1958). However, blackbirds also nest in dense herbaceous cover in hayfields, along roadsides and ditches, and in other upland sites (Dolbeer 1980). Red-winged blackbirds forage for insects in understory, midstory, and overstory canopies (Snelling 1968) during the nesting season.

The blackbird is primarily a seed eater, except during fledging. The species sometimes forms large communal flocks in wetland herbaceous habitats or in trees and brushlands and these birds may forage on agricultural crops or understory seed sources (Mott et al. 1972; Johnson and Caslick 1982). After the autumn migration from the northern portion of their range, red-winged blackbirds frequently roost in herbaceous wetland habitats, trees, or shrubs and feed on seeds within understory vegetation.

Special Consideration

Red-winged blackbirds shift from a dispersed insectivorous feeding behavior during the nesting season to a communal granivorous feeding habit after fledging has occurred. They frequently move into agricultural areas at this time. Costs related to their consumption of grain can become high and may exceed the benefits of insect control related to their foraging habits during fledging (Bendell et al. 1981). Damage to ripening corn (*Zea mays*) occurs during August and September (Somers et al. 1981; Stehn and de Becker 1982), when blackbirds often congregate at night in herbaceous wetlands or in roosts in young deciduous trees in great concentrations (perhaps up to 1 million birds) (Stehn and de Becker 1982). The distance from these autumn roosts to corn fields and the proximity of corn fields to traditional flightlines strongly influences the amount of damage inflicted on individual corn fields. Bird damage to crops in Ohio diminished consistently as distances from communal roosts increased from 3.2 to 8 km, and the level of damage remained constant and low at distances of 8 to 19.2 km (Dolbeer 1980).

HABITAT SUITABILITY INDEX (HSI) MODEL

Model Applicability

Geographic area. This model will produce an HSI for nesting habitats of the red-winged blackbird. The breeding range and the year-round range of the blackbird occur throughout the contiguous 48 States.

Season. The model will produce an HSI for nesting habitat throughout the nesting seasons, which generally occurs from March to late July.

Cover types. This model was developed to evaluate habitat in herbaceous wetlands (HW) and upland herbaceous cover types, such as pasture and hayland (P/H), forbland (F), and grassland (G) (terminology follows that of U.S. Fish and Wildlife Service 1981).
Minimum habitat area. Minimum habitat area is defined as the minimum amount of contiguous habitat that is required before a species will live and reproduce in an area. Specific information on minimum areas required for red-winged blackbirds was not found in the literature. It is assumed, however, that a wetland area must contain at least 0.10 ha in emergent herbaceous vegetation, like cattails, to be considered nesting habitat for the blackbird. Several studies have described the minimum territory for male red-winged blackbirds as 0.02 ha (Weatherhead and Robertson 1977; Orians 1980). A 0.10 ha area of emergent herbaceous vegetation might, therefore, potentially provide territories for up to five male blackbirds. Territories in upland habitats are much larger than those in wetland habitats. It is assumed that a block of upland and habitat must be at least 1.0 ha in area to provide adequate breeding habitat for red-winged blackbirds.

Verification level. This model was developed from descriptive information about nesting cover and species-habitat relationships identified in the literature. The HSI derived from the use of this model describes the potential of an area for providing nesting habitat for the red-winged blackbird. The model is designed to rank the suitability of nesting habitat as would a biologist with expert knowledge about the reproductive requirements of the blackbird. The model should not be expected to rank habitats in the same way as population data because many nonhabitat-related criteria can significantly impact populations of wildlife species.

Model Description

Overview. The red-winged blackbird uses a variety of habitat layers throughout the year. Tall, dense, herbaceous vegetation seems to satisfy nesting, foraging, and cover requirements. The red-winged blackbird readily uses midstory and overstory layers of habitat at times but does not seem to be dependent on the presence of these layers.

The red-winged blackbird typically nests in tall (over 0.5 m), dense (undefined) herbaceous vegetation, although it occasionally nests in shrubs and trees. This nest site requirement is best met in herbaceous wetland habitats where nest sites are available in sturdy cattails over open, permanent water. Nesting requirements also can be met by suitable herbaceous vegetation in upland sites. Tall, sturdy, herbaceous stems or midstory or overstory components are used as display perches or observation posts. Red-winged blackbirds nesting in herbaceous wetland habitats may feed on insects associated with shrub, tree canopy, or herbaceous vegetation within the wetland or on insects associated with midstory and overstory canopies or in the grass understory outside the wetland boundary (Snelling 1968). Birds nesting in upland sites typically forage for insects in understory vegetation near the nest site.

This model attempts to evaluate the ability of a habitat to meet the food and reproductive needs of the red-winged blackbird during the nesting season. The logic used in this species-habitat model is described in Figure 1. The following sections document this logic and the assumptions used to translate habitat information for the red-winged blackbird into the variables selected for the HSI model. These sections also describe the assumptions inherent in the model, identify the variables used in the model, define and justify the suitability level of each variable, and describe the assumed relationships between variables.

FIGURE 1

Food and reproductive components (herbaceous wetland cover types). There are three conditions (A, B, and C) included in Figure 1. Condition A wetlands, with a minimum of 0.10 ha in emergent herbaceous vegetation, can be very productive nesting habitats for red-winged blackbirds if water is present throughout the year, water chemistry is favorable for photosynthesis, and abundant, persistent, emergent vegetation suitable for nest placement is present. The qua l ity of such a wetland as nesting habitat for red-winged blackbirds can be estimated with the following five habitat variables.

Variable 1 (V1) refers to the type of emergent herbaceous vegetation available in the wetland.

V1 = 1.0 if emergent herbaceous vegetation is predominantly old or new growth of broad-leaved monocots, like cattails.

V1 = 0.1 if emergent herbaceous vegetation is predominantly narrow-leaved monocots or other herbaceous materials.

Variable 2 (V2) considers the water regime of the wetlands. The suitability index of V2 is 1.0 if the wetland is permanently flooded or intermittently exposed with water usually present throughout the year. This is a desirable condition because permanent water is necessary to support persistent populations of invertebrates that overwinter in various larval instars, maximizing the production of aquatic insects that emerge throughout the next spring and early summer. These insects seem to be the favored food source for blackbirds nesting in herbaceous wetlands (Orians 1980). The presence of permanent water within the wetland may reduce mammalian predation on nests of red-winged blackbirds (Robertson 1972).

V2 = 1.0 if water usually is present in the wetland throughout the year.

V2 = 0.1 if the wetland usually is dry during some portion of the year.

Variable 3 (V3) pertains to the abundance of carp (*Cyprinus carpio*) within the wetlands. Carp disturb submergent vegetation within the wetlands, which may destroy habitat for emergent aquatic insects (like Odonates) and reduce wetland food sources for blackbirds.

V3 = 1.0 if carp are absent from the wetland.

V3 = 0.1 if carp are present within the wetland.

Variable 4 (V4) in the model measures the abundance of larvae of emergent aquatic insects. The adult form of these species provides a potentially important food source for red-winged blackbirds nesting in wetland habitats. The biomass of these benthic invertebrates is variable within a herbaceous wetland at any one time, as well as between sampling periods (Hynes 1972). This biomass should not be regarded as a direct measure of productivity because production, in terms of both numbers and weight, is many times larger than that present at any one sample periods, and the assessment of numbers or biomass per unit of area presents formidable, perhaps insurmountable, difficulties (Hynes 1972). The presence or absence of suitable benthic invertebrates can be determined by sampling with a sieve net (Needham and Needham 1970) along the edge of clumps of emergent vegetation. Sampling is more likely to be accurate than inferences about the presence of benthic invertebrates based on measures of water chemistry that may inadequately consider pollutants that impact aquatic food chains. Inferences about the presence of benthic invertebrates based on the appearance of aquatic vegetation also are less accurate than sampling (Orians pers. comm.). Therefore, sampling to determine the presence or absence of important benthic invertebrates is the preferred assessment technique.

V4 = 1.0 if larvae of damselflies and dragonflies (Order Odonata) are present in the wetland.

V4 = 0.1 if larvae of damselflies and dragonflies are not present in the wetland.

Dense stands of emergent vegetation in wetlands prevent sunlight from penetrating to the water surface, which reduces aquatic productivity. A mat of vegetation can form a wetland "floor", which reduces the availability of arthropods to red-winged blackbirds and may result in increased nest predation. Open water, interspersed throughout the emergent herbaceous vegetation, supports submergent vegetation within the wetland boundary that can be used by aquatic insects as food and cover. The openings also provide an interface between emergent vegetation and open water, which increases the vegetation surface area available to emerging insects and foraging red-winged blackbirds and may increase the presence of potential nest sites. Blackbirds frequently nest on the edge of cattail clumps that border open water (Wiens 1965). They are highly territorial, and the number of territories in a wetland is assumed to be dependent on the quantity of edge between emergent vegetation and open water that is available for nest sites. An exact measure of the amount of edge within a wetland can be difficult and unreliable because of the highly dynamic nature of the herbaceous vegetation, resulting from water level fluctuations, life cycles of the vegetation, and activities of animals like muskrats (*Ondatra zibethica*). Measures of the patchiness of emergent herbaceous vegetation and open water within a wetland is represented by variable 5 (V5) in the model.

Blackbirds prefer patchy stands of cattails interspersed with areas of open water over dense homogeneous stands of cattails (Robertson 1972). Variable 5 is assumed to have a suitability index of 1.0 when the quantity of open water and emergent vegetation is about even (about 40% to 60%). Robertson (1972) found a nesting density of about 96 nests/ha in herbaceous wetland habitat when patchy vegetation was about 41% of the total wetland area. Wetlands with large areas of emergent vegetation and small areas of open water receive relatively low SIs because of the small quantity of suitable nest sites. Case and Hewitt (1963) described the Inlet Valley Marsh in New York as a small, closed herbaceous wetland with upland trees and shrubs immediately adjacent for nesting and foraging sites. The red-winged blackbird nesting density in this herbaceous wetland was about 33/ha. Variable 5 is assigned an SI of 0.3 when a wetland is completely covered with emergent herbaceous vegetation, as described above.

Conditions where there are small areas of emergent vegetation and large areas of open water also receive a low SI because of the reduced availability of niche spaces. Moulton (1980) found red-winged blackbirds nesting in emergent vegetation along ditch banks that surrounded large areas of open water in rice (*Oryza sativa*) paddies in northern Minnesota. Nest densities averaged about 2.5 nests/ha of total wetland habitat, presumably because both nests and emergent vegetation were restricted to long, narrow strips of edge. The territorial behavior of red-winged blackbirds may have restricted the nest density along the ditch banks. An SI of 0.1 is assigned to V5 for wetland habitats with a limited amount of emergent herbaceous cover. The SI's for wetlands with different amounts of emergent herbaceous vegetation are listed below. User's can interpolate between listed values as needed.

V5 = 1.0 if the wetland area contains about an equal mix of emergent herbaceous vegetation and open water.

V5 = 0.3 if the wetland area is covered by a dense stand of emergent herbaceous vegetation.

V5 = 0.1 if the wetland area contains a few patches of emergent herbaceous vegetation and extensive areas of open water.

Condition B wetlands are wetlands that are likely to be dry sometime during the year or that do not have an aquatic insect resource. These wetlands may still provide some habitat for nesting red-winged blackbirds. Blackbirds will tend to use the available emergent vegetation as nest sites and rely on vegetation surrounding the wetland as a foraging substrate. The distance that red-winged blackbirds will fly from wetlands to forage on insects in upland habitats is not known. In this model, only foraging sites within 200 m of wetlands that contain nest sites are assumed to be useful to blackbirds. The quality of a wetland without permanent water or an aquatic insect resource is assumed to be no better than the quality of available foraging sites outside the wetland (V6). Wetlands that only have upland habitats with understory vegetation (such as old fields, pastures, or hay fields) available as foraging substrates are given an SI of 0.1. Wetlands near uplands that have a deciduous midstory or tree canopy as a foraging substrate are assumed to have an SI of 0. 4. Red-winged blackbirds nesting in one herbaceous wetland will forage on insects in other, close-by, herbaceous wetlands (Holm 1973). Condition B wetlands situated within 200 m of a condition A herbaceous wetland that has an emergent aquatic insect fauna (Odonates) and undefended foraging areas are given an SI of 0.9.

V6 = 0.1 if the only suitable foraging substrate is an understory layer.

V6 = 0.4 if the suitable foraging substrates include a midstory and/or an overstory layer.

V6 = 0.9 if the suitable foraging area is a condition A wetland.

<u>Food and reproductive components (upland cover types)</u>. Upland habitats (Fig. 1; condition C) frequently are less productive than are wetland habitats. The number of young red-winged blackbirds fledged per territory may be as large in upland sites as in some wetland habitats (Dolbeer 1976). The number of young fledged/ha in upland sites, however, frequently is less than 10% of the number fledged/ha in good

quality wetland habitat. For example, Robertson (1972) reported 133 young fledged/ha in one wetland study area, while only 5 young fledged/ha in nearby upland sites. The nesting density in the wetland habitat, with patches of emergent, herbaceous vegetation interspersed with patches of open water, was about 10 times higher than in upland habitats. Robertson found about 100 red-winged blackbird nests/ha in suitable wetland habitat, 2 to 13 nests/ha in hay fields, and 0.1 nests/ha in a Christmas tree plantation.

Robertson's (1972) data on the numbers of nests/ha and young fledged/ha suggest that, if the best wetland habitats have an HSI of 1.0, the best upland sites may have an HSI of about 0.1. Graber and Graber (1963) determined that summer populations of red-winged blackbirds (number/40 ha) in Illinois from 1958 to 1959 were 301 birds in herbaceous wetlands (whether condition A or B is unknown), 342 birds in edge shrubs, 204 birds in sweet clover, 158 birds along drainage ditches, 134 birds in mixed hay, 89 birds in red clover (*Trifolium pratense*), 65 birds in oat (*Avena sativa*) fields, 64 birds in ungrazed grasslands, 58 birds in alfalfa, 30 birds in wheat (*Triticum aestivum*), 27 birds in fallow fields, 24 birds in pastureland, 23 birds in shrub-grown areas, 5 birds in corn fields, and 3 birds in soybeans (Glycine max). The observed nest densities would not exceed the values measured by Robertson (1972) for upland habitats even if all of the birds in each of these different habitat types were nesting females.

The type of upland cover available as nest sites for the red-winged blackbird is represented by V7 in the model. Red-winged blackbirds nest in a wide variety of upland sites. For example, blackbirds nested in hay fields and old fields, but not in tilled and fallow fields, in southern Michigan (Albers 1978). Important characteristics of upland nest sites include the presence of dense, tall, herbaceous vegetation, the availability of fence posts and other structures that serve as display perches for males and as observation posts for both males and females, and a proximity to open water (Joyner 1978). Specific information on the preferred proximity of nest sites in upland habitats to open water were not found in the literature.

Variable 7 (V7) describes the availability of dense, sturdy herbaceous vegetation in forbland, grassland, and pasture/hayland upland sites. Variable 7 has a habitat suitability index of 0.1 if the herbaceous vegetation is dense and tall, like sweet clover (Melilotus spp.), mixed hay, alfalfa, and coarse weeds, which provide suitable nest sites and protective cover. Variable 7 has a suitability index of 0.0 if the habitat site has some other surface cover, such as cut or fallow fields, agricultural fields, woodlots, or tilled soils.

V7 = 0.1 if upland habitat provides dense, tall, herbaceous vegetation.
V7 = 0.0 if upland habitat has some other surface cover.

Early nests of red-winged blackbirds in upland sites are more productive than are late nests (Dolbeer 1976). Early nests are placed in robust, dense, old herbaceous growth. Activities that are destructive to this vegetation, such as mowing, heavy grazing pressure, or burning, reduce habitat suitability for red-winged blackbirds. The occurrence of disturbances that might impact nesting success in upland cover types is included as V8 in the model.

V8 = 0.1 if disturbances, such as mowing, heavy grazing, or burning, do not occur to the potential habitat site in most years.

V8 = 0.0 disturbances occur to the potential habitat site in most years.

HSI determination. Three types of habitat conditions (A, B, and C) are described in Figure 1. Condition A represents a wetland that contains the preferred vegetative structure for nest placement, permanent water that supports a population of emergent aquatic insects that are available as food, the absence of carp, and the interspersion of open water within emergent herbaceous vegetation. The equation combining the SIs for VI to VS to estimate an HSI for condition A wetlands is:

$$HSI = (V1 \times V2 \times V3 \times V4 \times V5)$$

Condition B habitats (Fig. 1) are wetlands where the emergent herbaceous vegetation does not have the preferred structure, there is no permanent water, carp are present, or benthic invertebrates are absent. Condition B habitats have a basic SI of 0.1, determined by the 0.1 SI for the unsuitable conditions of V1, V2, V3, or V4. The basic SI of 0.1 can be increased if suitable foraging substrate is available outside the boundary of the wetland. Food sources are considered more limiting if only an understory layer is available than if deciduous midstory and/or overstory layers also are available as foraging surfaces. A condition B habitat may be of highest value to red-winged blackbirds if the birds can readily feed on emergent aquatic insects in a nearby condition A herbaceous wetland habitat. The equation for estimating the HSI for condition B habitats is:

$$HSI = (0.1 \times V6)^{1/2}$$

Condition C habitats are upland sites, like grass, forb, and pasture/hayland cover types. Their HSI'S, which will be either 0.1 or 0, are described by the following equation:

$$HSI = (V7 \times V8)^{1/2}$$

The measure of habitat quality represented by the HSI actually reflects an estimate of the quantity of niche space available to the blackbird. Habitats with higher HSIs are assumed to contain more niche space than habitats with lower HSI'S. More niche space in a habitat frequently means that more individuals will occur in that habitat.

Application of the Model

Summary of model variables. This model can be applied by interpreting a recent, good quality, aerial photograph of the assessment area and making selected field measurements. The habitat to be evaluated is outlined on the aerial photograph. Each wetland within the assessment area is identified and a 200 m zone drawn around its perimeter. The wetlands within the assessment area are evaluated, on a per ha basis, with field observations and measurements that determine: (1) the type of emergent vegetation present; (2) the probable permanency of the water; (3) the presence or absence of carp; (4) the presence or absence of larval stages of emergent aquatic insects; (5) the mix of open water and emergent herbaceous vegetation; and (6) the nature of vegetative cover within 200 m surrounding the wetland (Fig. 2). The proportion of open water and emergent herbaceous vegetation within the wetland is estimated from a map made after boating or wading through the wetland. The presence of benthic invertebrates is determined from field sampling. Upland habitats within the assessment area are evaluated by ground truthing to determine cover types and land-use practices. Habitat conditions, like the presence of dense, tall herbaceous cover and the probability that disturbances such as grazing, burning, mowing, and tilling will occur during the March to July nesting season, are noted.

Definitions of variables and suggested field measurement techniques are provided in Figure 3.

Model assumptions. I have assumed that it is possible to synthesize results from many studies conducted in different seasons of the year different locations in North America into a model years, and a wide variety of nest sites throughout North America into a model describing the relative quality of breeding habitat for the red-winged blackbird. My basic assumptions about habitat criteria important to red-winged blackbirds are based on descriptive and correlative relationships expressed in the literature. My descriptors of habitat quality will obviously be in error if authors made incorrect judgements or measurements or if I have emphasized the wrong data sets or misinterpreted the meaning of published data.

I have assumed that the quality of some wetland habitats exceeds the quality of best upland habitats. This assumption was based largely on quality of the blackbirds fledged per hectare of wetland and upland habitats. I compiled and analyzed characteristics of wetland habitats that seemed to distinguish habitats where varying numbers of red-winged blackbirds were fledged. I assumed that I could meaningfully bound the size of study areas to be evaluated as nesting habitat as ≥ 0.1 ha for wetland sites and ∃ 1.0 ha for suitable upland sites. I arbitrarily selected distances (200 m) that blackbirds might fly from their nests in wetlands to forage on insects and seeds in surrounding vegetative cover. I assumed that the presence of dense, tall, herbaceous cover reasonably close to water, coupled with a strong probability that the dense cover would remain relatively undisturbed during the breeding season, would adequately indicate the value of upland habitats as nest sites for the red-winged blackbird.

The values for Variables 1 through 8 are estimates. The ecological information available does not seem sufficient to suggest: (1) other pertinent variables; (2) more appropriate values for the present variables; or (3) more definitive interrelationships between the variables. Finally, I have assumed that the multiplicative relationship described in the model is appropriate summary statement to provide a Habitat Suitability Index that reflects the relative importance of different habitats as nest sites for the red-winged blackbird.

Figure 3. Definitions of variables and suggested measurement techniques.

Variable (definition)		Cover type	Suggested technique
VI	Type of emergent	HW	Identify the dominant species of emergent herbaceous vegetation in the wetland. Determine if the dominant species is a broad-leaved monocot.
V2	Water regime	HW	Determine whether or not water will be retained in the wetland throughout the year in most years; use, if possible, indicators like muskrat houses and fish. Evaluate records describing permanence and level of water in wetland. Determine the classification type of wetland if the wetland has been classified.
V3	Abundance of carp within the wetland.	HW	Determine presence of carp by seining, using local data about presence of carp within wetland or observations to see if water is clear or generally murky, as it is when carp are feeding.

V4	Abundance of larval	HW	Collect insect larvae by dragging astages of emergent aquatic sieve net along water bottom near edge insects(Order Odonata) of clumps of emergent herbaceous within the wetland. vegetation. Sampling is done for some fixed time period. A second sampling procedure involves kicking up the substratum at the edge of clumps of emergent herbaceous vegetation in front of the mouth of a net in some standardized manner (Hynes 1972:240). The collected invertebrates are sorted and identified by comparison with illustrations in an appropriate manual (like Needham and Needham 1970) to determine the presence of damselfly and dragonfly larvae (Order Odonata).
V5	Percent emergent	HW	Determine the mix of open water and herbaceous canopy emergent herbaceous vegetation within the wetland study area. Estimate the mix from a map prepared after wading, walking, or boating through the wetland or from a map made from a recent, high quality, aerial photograph
V6	Types of foraging sites	HW	Use map measurer (Hays et al. 1981) available outside the wetland. to determine if another wetland with an emergent aquatic insect population occurs within 200 m of nest sites within the wetland being evaluated. Map vegetation within 200 m of the wetland and determine, using a dot grid (Hays et al. 1981) or a planimeter, if deciduous midstory and overstory layers comprise at least 10% cover when projected to the ground surface. If midstory and/or overstory do not provide at least 10% cover, and a condition. A wetland does not occur within 200 m of the wetland being evaluated assume only the understory layer is available as a foraging substrate.
V7	Presence of dense, sturdy	F,G,P/H	Interpret the aerial photograph or a herbaceous vegetation Vegetation on-site map prepared from the aerial photograph to determine areas of upland herbaceous vegetation. Ground truth to determine types of herbaceous vegetation occurring in the upland within the assessment

			area and determine if tall, dense, herbaceous cover covers at least 10% of the surface area.
V8	Occurrence of disturbances	F,G,P/H	Ground truth to predict past and future like grazing, mowing, burning, land-use practices (types of and tilling on potential uplanddisturbances that may impact nesting nest sites. success).

SOURCES OF OTHER MODELS

Weatherhead and Robertson (1977) identified and quantified some parameters that affected the nesting success of red-winged blackbirds in wetland habitats in Ontario, Canada. They determined that nesting success, as judged by numbers of young fledged per female, was positively correlated with territory quality scores based on nest placement. Nesting success seemed to be related to four parameters: (1) water depth within the wetland; (2) height of nest above the herbaceous wetland floor; (3) relative openness of nesting cover within the wetland; and (4) the identity of the support vegetation holding the nest. Two of these variables are represented in the present model of habitat suitability for the red-winged blackbird: (1) presence or absence of permanent water; and (2) the relative openness of vegetation within flooded herbaceous wetlands. No other models for use in predicting the quality of nesting habitat for red-winged blackbirds were found in the literature.

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HABITAT SUITABILITY INDEX MODELS: GREAT EGRET

by

Brian R. Chapman
Department of Biology
Corpus Christi State University
Corpus Christi, TX 78412

and

Rebecca J. Howard
National Coastal Ecosystems Team
U.S. Fish and Wildlife Service
1010 Gause Boulevard
Slidell, LA 70458

Project Officer

Paul L. Fore
Regional Office, Region 2
U.S. Fish and Wildlife Service
Albuquerque, NM 87103
Performed for
National Coastal Ecosystems Team
Division of Biological Services
Research and Development
Fish and Wildlife Service
U.S. Department of the Interior
Washington, DC 20240

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PREFACE

The habitat suitability index (HSI) model for the great egret presented in this report is intended for use in the habitat evaluation procedures (HEP) developed by the U.S. Fish and Wildlife Service (1980) for impact assessment and habitat management. The model was developed from a review and synthesis of existing information and is scaled to produce an index of habitat suitability between 0 (unsuitable habitat) and 1.0 (optimally suitable habitat). Assumptions used to develop the HSI model and guidelines for model applications, including methods for measuring model variables, are described.

This model is a hypothesis of species-habitat relations, not a statement of proven cause and effect. The model has not been field tested, but it has been applied to three hypothetical data sets that are presented and discussed. The U.S. Fish and Wildlife Service encourages model users to convey comments and suggestions that may help increase the utility and effectiveness of this habitat-based approach to fish and wildlife management. Please send any comments or suggestions you may have on the great egret HSI model to the following address.

National Coastal Ecosystems Team
U.S. Fish and Wildlife Service
1010 Gause Boulevard
Slidell, LA 70458

ACKNOWLEDGMENTS

Earlier versions of the habitat suitability index model and narrative for the great egret were reviewed by Dr. R. Douglas Slack and Jochen H. Wiese. The model's structure and functional relationships were thoroughly evaluated by personnel of the U.S. Fish and Wildlife Service's (FWS) National Coastal Ecosystems Team. Model and narrative reviews were also provided by FWS Regional personnel.

GREAT EGRET (*Casmerodius albus*)

INTRODUCTION

The great egret, also called common egret or American egret, is a large white heron in the order Ciconiiformes, family Ardeidae. Great egrets stand 37-41 inches tall and have a wing spread to 55 inches (Terres 1980). The species is associated with streams, ponds, lakes, mud flats, swamps, and freshwater and salt marshes. The birds feed in shallow water on fishes, amphibians, reptiles, crustaceans and insects (Terres 1980).

Distribution

The great egret is a common breeding species in all coastal areas south from southern Oregon on the Pacific coast and from Maine on the Atlantic coast; in riverine, palustrine and estuarine habitats along the coast of the Gulf of Mexico; and in the Eastern-Central United States (Palmer 1962; Erwin and Korschgen 1979; American Ornithologists' Union 1983). The great egret undergoes an extensive postbreeding dispersal that extends the range of the species to most of the United States exclusive of the arid Southwest (Byrd1978). Young birds hatched in Gulf coast colonies tend to move northward for a short period (Byrd 1978; Ogden 1978). However, with the onset of colder weather most great egrets and other herons migrate south and many winter along the gulf coast in Texas, Louisiana, and Florida (Lowery 1974; Oberholser and Kincaid 1974; Byrd 1978). Analysis of banding data indicates that many birds winter in Cuba, the Bahamas, the Greater and Lesser Antilles, Mexico, and Central America (Coffey 1948). Lowery (1974) suggested that during severe winters, a higher proportion of the population winters farther south.

Life History Overview

Great egrets nest in mixed-species colonies that number from a few pairs to thousands of individuals. A colony may include other species of herons, spoonbills, ibises, cormorants, anhingas, and pelicans. Colony and nest-site selections begin as early as December along the gulf coast, but most great egrets do not initiate nesting activities until mid-February or early March (Bent 1926; Oberholser and Kincaid 1974; Chaney et al. 1978; Morrison and Shanley 1978). Eggs have been recorded from March through early August, and young have been observed in nests from mid-May through late August (Oberholser and Kincaid 1974; Chaney et al. 1978). Clutch size varies from one to six eggs per nest, but three to four eggs is most common (Bent 1926). Incubation period in a Texas colony ranged from 23 to 27 days (Morrison and Shanley 1978). The first flights of young have been noted about 42 days after hatching (Terres 1980).

SPECIFIC HABITAT REQUIREMENTS

Food and Foraging Habitat

Fish constitute up to 83% of the great egret's diet (Hoffman 1978). Most fish taken by great egrets are minnow-sized 3.9 inches, but fish up to 14 inches can be captured and swallowed (Willard 1977; Schlorff 1978). Other major food items include insects, crustaceans, frogs, and snakes, while small mammals, small birds, salamanders, turtles, snails, and plant seeds are occasionally taken (Baynard 1912; Bent 1926; Hunsaker 1959; Palmer 1962; Genelly 1964; Kushlan 1978b).

Little specific information exists on the food habits of various age classes of great egrets. An adult great egret weighing 32.3 ounces (oz) (Palmer 1962) may require approximately 3.9 oz of food per day (estimated by using the wading bird weight-daily food requirement model proposed by Kushlan 1978b). Daily food requirements are undoubtedly higher during the nesting season when adults are feeding young (Kushlan 1978b).

Great egrets usually forage in open, calm, shallow water areas near the margins of wetlands. They show no preference for fresh-, brackish, or saltwater habitat. Custer and Osborn (1978a,b) found that feeding habitat selection in coastal areas of North Carolina varied daily with the tidal cycle. During low tide, great egrets fed in estuarine seagrass beds. During high tide, freshwater ponds and the margins of *Spartina* marshes were used. Inland, great egrets feed near the banks of rivers or lakes, in drainage ditches, marshlands, rain pools (Bent 1926; Dusi et al. 1971; Kushlan 1976b), and occasionally in grassy areas (Weise and Crawford 1974). Feeding sites are generally not turbid and are fairly open with no vegetative canopy and few emergent shoots (Thompson 1979b).

Great egrets forage singly, in single-species groups, and in mixed-species associations (Kushlan 1978b). Great egrets generally fly alone to feeding sites (Custer and Osborn 1978a,b) and may use the same feeding site repeatedly. The density and abundance of fish at a given location in estuarine habitats may vary with season, time of day, tidal stage, turbidity, and other factors. If feeding success is low, great egrets may move to other areas (Cypert 1958; Schlorff 1978) and join other conspecifics in good feeding habitats (Custer and Osborn 1978a,b). Most instances of group feeding have been observed during specific environmental conditions, such as lowered water levels, that tend to concentrate prey (Kushlan 1976a,b; Schlorff 1978).

Meyerriecks (1960, 1962) and Kushian (1976a, 1978a, b) provided detailed information on hunting techniques employed by great egrets. The "stand-and-wait" and "slow-wade" methods are used most frequently. Because of their long legs, great egrets can forage in somewhat deeper water than most other herons. In New Jersey, foraging depths ranged from 0 (standing on the bank while fishing) to 11 inches, but depths ranging from 4 to 9 inches were most commonly used (Willard 1977). In North Carolina, great egrets fed in water with a mean depth of 25.1 cm (9.8 inches) in *Spartina* habitat and of 6.8 inches in non-*Spartina* habitat (Custer and Osborn 1978b). Mean water depth was 7.9 inches for foraging great egrets in California (Hom 1983). In addition to wading, great egrets can feed by alighting on the surface of deep waters to catch prey, a method rarely employed (Reese 1973; Rodgers 1974, 1975).

Although recent declines of great egret populations in the central coastal region of Texas occurred simultaneously with declines in coastal marine and estuarine fish populations (Chapman 1980), no causal relationship has been proven. At present there are no known management practices that provide suitable food alternatives for piscivorous species, such as the great egret, during periods of fish population decline. Known fish nursery and feeding areas need protection from destruction or habitat alteration to ensure adequate prey populations for fish-eating birds.

Water

The physiologic water requirement of great egrets is probably met during feeding activities in aquatic habitats (Dusi et al . 1971). Water depth affects the quantity, variety, and distribution of food and cover; great egret food and cover needs are generally met between the shoreline and water 1.6 feet deep (Willard 1977).

Interspersion

Suitable habitat for the great egret must include (1) extensive shallow, open water habitat from 4 to 9 inches deep (Willard 1977); (2) food species present in sufficient quantity (Custer and Osborn 1977); and (3) adequate nesting or roosting habitat close to feeding habitat. Most great egrets at a colony in North Carolina flew less than 2.5 miles from nesting colonies (and presumably, from roosting sites) to feeding areas (Custer and Osborn 1978a), but flight distances of up to 22.4 miles have been recorded in the floodplain of the Upper Mississippi River (Thompson 1979b).

Several heronries may be close together. Great egrets from one colony may fly over or near an adjacent colony, but rarely feed in the same areas as conspecifics from the adjacent colony (Thompson 1979b).

HABITAT SUITABILITY INDEX (HSI) MODELS

Model Applicability

Geographic area. The habitat suitability index (HSI) models in this report were developed for application in coastal wetland habitats in Texas and Louisiana. Because there are few differences in habitat requirements along the Atlantic coast, the remainder of the gulf coast, and inland sites in the Southeastern United States, the HSI models may also be used to evaluate potential habitat in those areas.

Season. This model will produce an HSI values based upon habitat requirements of great egrets during the breeding season (February to August). Because there is no apparent seasonal difference in feeding habitat preference and because winter nocturnal roosts are similar to nesting sites, the HSI models may also be used to evaluate winter habitat for the great egret.

Cover types. Great egrets nest on upland islands and in the following cover types of Cowardin et al. (1979): Estuarine Intertidal Scrub-Shrub wetland (E2SS), Estuarine Intertidal Forested wetland (E2FO), Palustrine Scrub-Shrub wetland (PSS) (including deciduous and evergreen subclasses), and Palustrine Forested wetland (PFO) (including deciduous and evergreen subclasses). Great egrets may also feed in these wooded wetlands, but preferred feeding areas may be any one of a wide variety of wetland cover types.

Minimum habitat area. Minimum habitat area is defined as the minimum amount of contiguous suitable habitat required before an area can be occupied by a particular species. Specific information on minimum areas required by great egrets was not found in the literature. If local information is available to define the minimum habitat area, and less than this amount of area is available, the HSI for the species will be zero.

Verification level. The output of these HSI models is an index between 0 and 1.0 that is believed to reflect habitat potential for great egrets. Two biologists reviewed and evaluated the great egret HSI model throughout its development: Dr. R. Douglas -Slack, Texas A&M University, College Station, and Jochen H. Wiese, Environmental Science and Engineering Company, Gainesville, Florida. Their recommendations were incorporated into the model-building effort. The authors, however, are responsible for the final version of the models. The models have not been field-tested.

Model Descriptions

Feeding HSI model. Great egret feeding habitat suitability is related to prey availability. Habitat suitability is optimal when two conditions are met: (1) the populations of minnow-sized fish are high; and (2) shallow open water (necessary for successful prey capture), aquatic vegetation (necessary for prey survival and reproduction), and deeper water are present in a ratio that maximizes prey density and minimizes hunting interference. Use of this model assumes that deep or permanent water environments are not limiting in coastal habitats and that fish populations are distributed uniformly. Because great egrets hunt a variety of species in many different habitat types, a general approach to modeling feeding habitat suitability is presented. Suitability of all wetland cover types for feeding is determined by integrating two factors: (1) the abundance of prey and (2) the accessibility of prey.

The abundance of prey is determined by the ability of the habitat to support the major prey species, especially minnow-sized fish. It is assumed that the abundance of major prey species is related to the primary and secondary productivity of the aquatic habitat; however, few field studies have documented this relationship. The model assumes that prey abundance is not limiting in coastal habitats. Therefore, the accessibility of prey is used as the indicator of feeding habitat suitability.

The accessibility of prey is determined by water depth and percentage cover of aquatic vegetation. A wetland with 100% of its area covered by water 4-9 inches deep is assumed to be optimal for feeding by great egrets (V_1). Although an absence of submerged or emergent vegetation would render fish species most vulnerable to capture, it is unlikely that many prey species would use such an area because it totally lacks cover. The model assumes, therefore, that optimal conditions for both the occurrence and susceptibility to capture of prey species exist when 40%-60% of the wetland substrate is covered by submerged or emergent vegetation (V_2). When such vegetation is lacking, the habitat has a low value for feeding great egrets because small fish may use unvegetated water that is too shallow for their larger aquatic predators.

	Habitat variable	Component
V_1	Percentage of area with water 10-23 cm deep.	

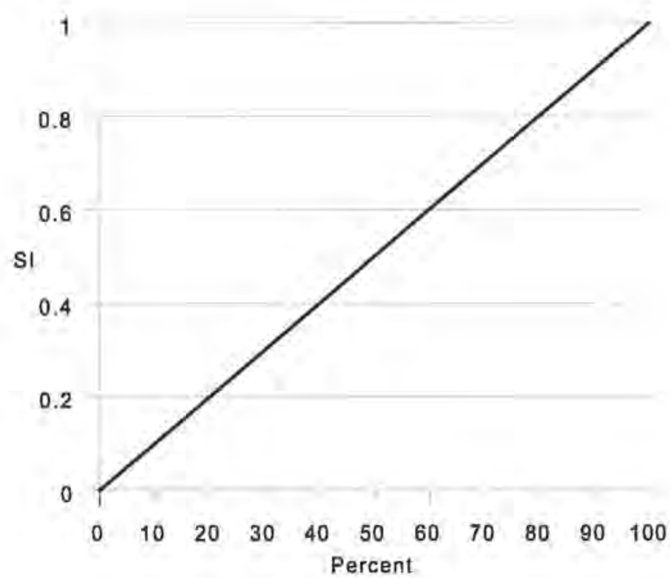
Food HSI (Feeding)

V_2 Percentage of submerged or emergent vegetation cover in zone 10-23 cm deep.

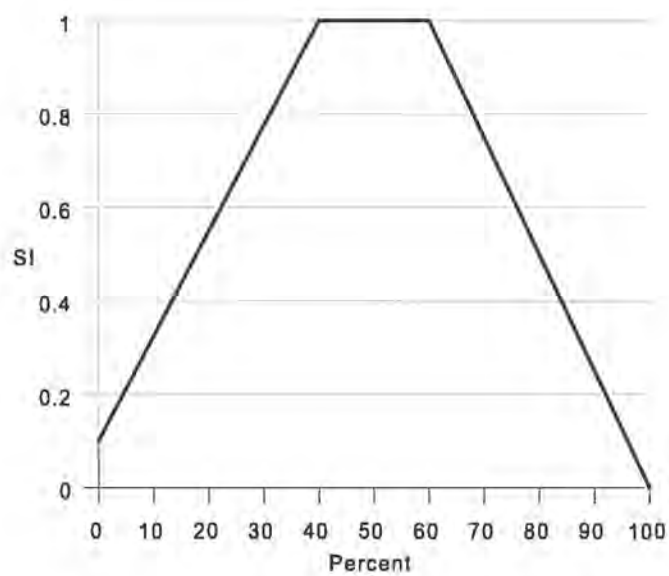
Suitability Index (SI) Graphs for Model Variables
This section provides graphic representation of the relationship between habitat variables and habitat suitability for the great egret in wetland (see Table 2 for abbreviations) and upland (U) cover types. The SI values are read directly from the graph (1.0 = optimal suitability, 0.0 = no suitability) for each variable.

The SI graphs are based on the assumption that the suitability of a particular variable can be represented by a two-dimensional linear response surface. Although there may be interdependencies and correlations between many habitat variables, the model assumes that each variable operates independently over the range of other variables under consideration.

V_1 Percentage of study area with water 4-9 inches deep. In tidal areas, use depth at mean low tide. In nontidal areas, use average summer conditions.



V_2 Percentage of substrate in zone 4-9 inches deep covered by submerged or emergent vegetation.



Feeding HSI.

$$HSI = \frac{V_1 + V_2}{2}$$

Data representing three hypothetical study areas for great egret were used to calculate sample HSI values The HSI values obtained are believed to reflect the potential of the areas to support feeding or nesting great egrets.

Field Use of Models

The level of detail needed for application of these models will depend on time, money, and accuracy constraints. Detailed field sampling of all variables will provide the most reliable and replicable HSI values. Any or all variables can be estimated to reduce the amount of time or money required to apply the models. Increased use of the subjective estimates decreases reliability and replicability, and these estimates should be accompanied by appropriate documentation to insure that decision makers understand both the method of HSI determination and quality of data used in the model. Techniques for measuring habitat variables included in the great egret HSI models are suggested in Table 5.

A project area may contain both potential feeding and nesting habitat. To decrease the cost and time necessary to evaluate the area, assume that food is not limiting and apply only the nesting HSI model. This recommendation is based upon the following assumptions: (1) in most coastal areas of Texas and Louisiana, aquatic habitats suitable for feeding are abundant and are, therefore, less of a limiting factor to great egrets than are suitable nesting sites; and (2) nesting value is easier and more accurately estimated by using subjective methods than is food value. The variables used to measure food use of past colony sites, and (2) the enhancement of a site by the presence of other herons. These two factors are usually, but not always, interrelated. Great egrets tend to use the same colony site in successive years until the site is degraded, and the site may include great blue herons. When applying the HSI model , the user should be aware that an area known to be used by great egrets (or great blue herons) is more likely to be used in future years than an area with an equal HSI value not known to have a history as a colony site.

Table 5. Suggested measurement techniques for habitat variables used in the great egret HSI models.

Variable	Suggested technique
V_1	The percentage of the area with water 4-9 inches deep can be determined by line transect sampling of water depth.
V_2	The percentage of substrate in the 4-9 inches water depth zone covered by submerged or emergent vegetation can be determined from available cover maps, aerial photographs, or by line transect sampling.

HABITAT SUITABILITY INDEX MODEL

CALIFORNIA VOLE (*Microtus californicus*)

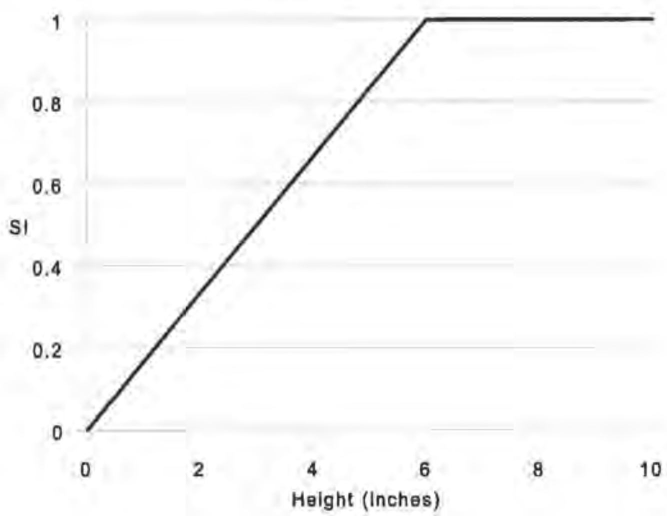
U.S. Fish and Wildlife Service
Division of Ecological Services
Sacramento, California

Cover-Type	Life Requisite	Habitat Variable
Annual Grassland Seasonal Wetland	Food/Cover Reproduction	Height of herbaceous vegetation (V1) Percent cover of herbaceous vegetation (V2) Soil Type (V3)
Riparian Woodland Oak Woodland	Reproduction Food/Cover	Height of herbaceous vegetation (V1) Percent cover herbaceous vegetation (V2) Soil Type (V3) Presence of logs and other types of cover (V4)

Variable	Cover-Type	Sampling Technique
V1 - Height of herbaceous	Annual Grassland Oak Woodland Riparian Woodland Seasonal Wetland	Average vegetation height in 1 m^2 quadrat
V2 - Percent cover of herbaceous vegetation	Annual Grassland Seasonal Wetland Oak Woodland Riparian Woodland	1 m^2 quadrat
V3 - Soil Type	Annual Grassland Seasonal Wetland Oak Woodland Riparian Woodland	Site inspection County Soil Survey
V4 - Presence of logs and other types of cover	Annual Grassland Seasonal Wetland Oak Woodland Riparian Woodland	Visual inspections Sample point

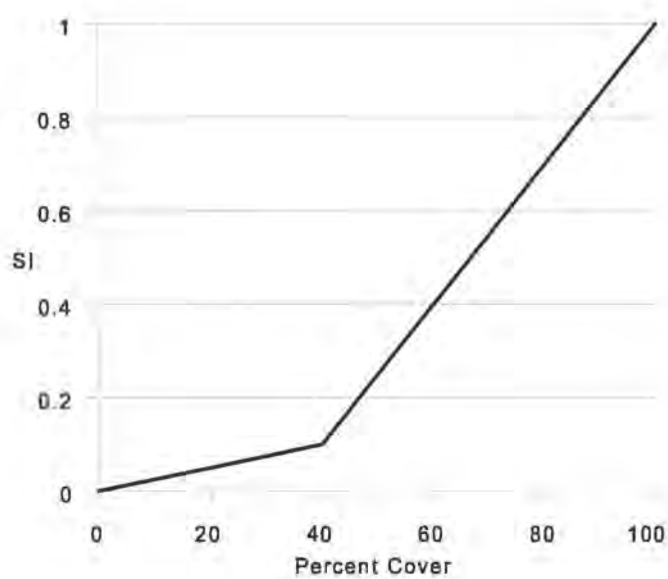
Variable 1: Height of herbaceous vegetation.

Assumes: California voles require relatively tall herbaceous vegetation for both food (Gill 1977. Batzil 1986) and cover (Ingles 1965). Herbaceous vegetation ≥ 6 in tall is considered optimum.



Variable 2: Percent cover of herbaceous vegetation.

Assumes: Relatively dense herbaceous vegetation is needed for cover percent cover ≥ 100 percent is considered optimum (CDFG undated).



Variable 3: Soil type

Assumes: Friable soils such as silts and loams are optimum because voles can dig their burrows (Ingles 1965). Soils such as sands and clays are not optimum.

Suitability Index (SI)

SI = 1.0 if soil type is silty or loamy and friable.

SI = 0.5 if soil type is not silty or loamy and is moderately friable

SI = 0.2 if soil type is not silty or loamy and is not friable.

Variable 4: Presence of logs and other cover types within the sample area.

Assumes: California voles will use logs, brush piles, and rocks for cover in addition to their burrows (California Department of Fish and Game). These sources of cover are more important in woodland habitats than grassland and wetland habitats.

SI = 1.0 logs, brush piles, and rocks are abundant and well distributed throughout the sample site (e.g., $\geq$ 4 per sample site).

SI = 0.7 if logs, brush piles, and rocks are moderate abundant and distributed throughout the sample site (e.g., 2-4 per sample site).

SI = 0.4 logs, brush piles, and rocks are absent or sparsely distributed throughout the sample site ($\leq$ 1 per sample site).

SI = 0.1 if logs, brush piles, matted vegetation, and/or rocks are absent From sample area.

<u>HSI Determination</u>

For annual grasslands and seasonal wetlands.

$$HSI = \frac{V_1 + V_2 + V_3}{3}$$

For oak woodlands and riparian woodlands:

$$HSI = \frac{V_1 + V_2 + V_3 + V_4}{4}$$

All variables are assumed to contribute equally to the availability of a given habitat type for the California vole. Water is assumed not be a limiting factor and is represented by the herbaceous vegetation variables.

<u>Model Applicability</u>

This model is a hypothesis of the relationships between various attributes of grassland, wetland, and oak riparian woodland habitats and the suitability of these habitats to California voles. The model is designed for use in the Central Valley of California up to 2,500 feet in elevation. California voles are permanent year-round residents, and this model can be applied to these habitats at all times of the year.

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HABITAT SUITABILITY INDEX MODEL
Plain Titmouse (*Parus inornatus*)

by
Michael Long and Daniel Strait
U.S. Fish and Wildlife Service
Division of Ecological Services
Sacramento, California

June 1989

Habitat Use Information

General

The plain titmouse inhabits oak and piñon-juniper woodlands from Oregon south and west to Texas. It is a year-round resident, and maintains a territory throughout the year. The species is generally a secondary cavity nester, although it may occasionally excavate its own hole.

Food

As a group, titmice take a wide variety of foods, but they are considered insectivorous during the summer, and consumers of fruit, seeds, and some insects in the winter (Ferrins 1979). Root (1967 - cited by Verner 1979), found that a large proportion of their food consisted of plant material and arthropods living on the bark of trees. Wagner (1981) found the plain titmouse took a great variety of arthropod taxa.

The titmouse is primarily a bark forager, although it also forages on tree foliage and occasionally on the ground (Hertz et. al. 1976). Most foraging by this species is done between 0-30 feet (0-9 m) of the ground (Wagner 1981; Hertz et. al. 1976). Hertz et al. found that plain titmice showed a preference for foraging in blue oaks (*Quercus douglasii*) over coast live oaks (*Q. agrifolia*). Hertz et. al. (1976) attributed the avoidance of live oaks to their smooth bark which is poor habitat for arthropods. Block and Morrison (1986) also found the titmouse to use blue oaks more than valley oaks (*Q. lobata*), black oak (*Q. kelloggii*), and canyon live oak (*Q. chrysolepis*) for foraging at Tejon Ranch, California. The plain titmouse will forage extensively in live oaks however, especially when other oak species are not present (Dixon 1964).

Reproduction

The plain titmouse is a secondary cavity nester, nesting in natural cavities, old woodpecker holes, or nest boxes. It prefers natural cavities over excavated cavities (Wilson, pers. comm.). Bent (1946) reported nests from 3-32 feet (1-10 m) above the ground. Bent, citing Dawson (1923), reported the titmouse to occasionally excavate its own nest cavity in blue oaks. The plain titmouse prefers wooded areas with intermediate to high percentage canopy coverage dominated by blue, live and valley oaks (Verner and Boss 1980).

Cover

Cover is provided by the oak woodlands and riparian areas in which the plain titmouse lives. Roost sites are provided by natural cavities, old woodpecker holes, or by dense foliage which simulates a cavity (Dixon 1949).

Interspersion

Plain titmice maintain year-round territories. Three territories observed by Hertz et. al. (1976) averaged 2.0 acres (0.8 ha) in California oak woodland. Dixon (1949) found 12 territories ranged located primarily in live oak woodland. These territories ranged in size from 3.3-12.5 acres (1.3-5.1 ha) with an average size of 6.3 acres (2.6 ha). According to Dixon (1956) 2.5 acres (1.0 ha) would probably be close to an absolute minimum size for a territory.

Water Requirements

In a study by Williams and Koenig (1980), the plain titmouse was classified as an occasional drinker.

Model Applicability

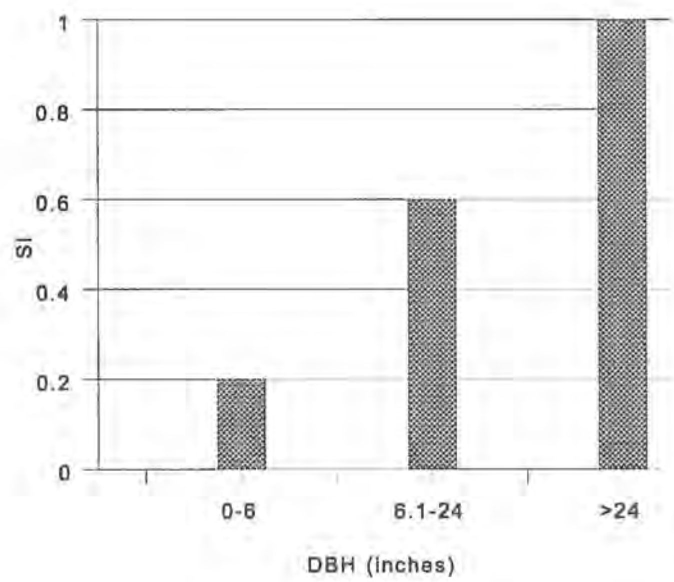
This model was developed for use in evaluating habitat suitability of oak savannah, oak woodland, and riparian woodland in Merced, Fresno, Stanislaus, and San Benito Counties in California from 500 - 2,500 ft in elevation. The basic assumptions for using the model are that meeting the reproductive needs of the plain titmouse will take care of its cover and food needs throughout the year. This assumption seems warranted. Verner (1979) believes that proper management for oaks for breeding birds should also provide the habitat needs for species that use oaks at other times of the year. In addition, it is assumed that water is not a limiting factor. It is assumed that the model is valid for use in riparian areas as well as the oak woodlands despite the fact that the model was initially developed for oak woodlands.

Model Description

Little quantitative data were found on the habitat needs of the plain titmouse. The most useful information was the information on habitat factors related to breeding for the species presented by Ohmann and Mayer (1986). Using data from the California Wildlife Habitat Relationships data base and the Forest Inventory and Analysis Research Unit inventory, Ohmann and Mayer developed a habitat suitability index model for the plain titmouse from which Variable 1 was derived.

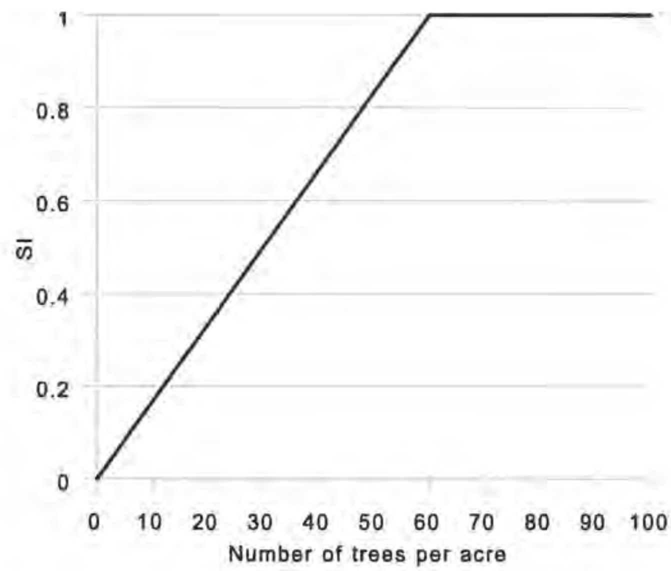
Variable 1. Tree diameter. (A tree is defined as a woody plant species 16 feet high or greater)

Ohmann and Mayer found tree size and percent canopy closure to be the major variables determining suitability of a habitat for the plain titmouse. Our model will assume that the diameter of a tree and the size of the canopy are correlated to the extent that they can be considered a single variable to be represented in this model by diameter at breast height (DBH). Presumably this variable best represents older trees with more cavities for nesting and greater bark surface which supports a greater prey base.



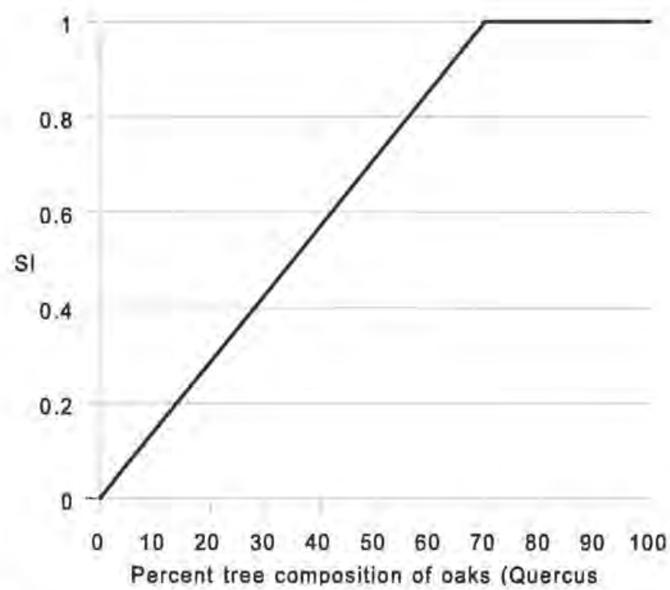
Variable 2. Trees per acre.

Plain titmouse abundance was found to increase as the number of trees increased (Wilson, pers. comm.). This may be particularly important in areas of low to moderate canopy cover. Studies at the Hopland, California field station found titmouse abundances to peak in areas with 60 trees/acre.



Both Variables 1 and 2 relate directly to the extent of a stand's canopy closure such that the importance placed on canopy closure by Ohmann and Mayer is incorporated into this model through the use of Variables 1 and 2.

Variable 3. Percent composition of tree species that are oaks (*Quercus*).
Verner and Boss (1980) stated that the plain titmouse prefers stands dominated by blue, live and valley oaks. We have been unable to find and studies documenting the presence of the plain titmouse in an area without a major proportion of oaks. For the sake of this model then, we will consider the presence of oaks to be a life requisite such that the optimum titmouse habitat is one dominated by oaks.



<u>HSI Determination</u>

In each sample area, tree diameter is measured along with the number of trees per acre and the percentage of those trees that are oaks. The Habitat Suitability Index for the sample site is then determined using the following formula:

$$HSI = \frac{V1 + V2 + V3}{3}$$

Suggestions for Applying the Model

1. The tree diameter classes for calculating Variable 1 (DBH) were not specified by Ohmann and Mayer. Therefore, all trees within the sample plot should be included in the DBH determination.

2. If no trees, 4-inch DBH or greater, are found in the sample plot, the HSI for the sample plot is 0.0. A 4-inch DBH tree is probably about the smallest tree that could have a cavity of sufficient size for the titmouse.

3. Ideally, all tree species in the study area should be fully leafed out when applying the model. Therefore, the best time for sampling is spring and summer.

Literature Cited

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Ohmann, J.L. and K.E. Mayer. 1986. Wildlife habitat of California's hardwood forests - linking extensive inventory data with habitat models. In: Proceedings of the Symposium on Multiple-use Management of California's Hardwood Resources, November 12-14, 1986, San Luis Obispo, California. Gen. Tech. Rep. PSW-100, Berkeley, California. Pacific Southwest Forest and Range Experiment Station, For Serv., U.S. Dept. Agric.:1967.

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Verner, J. 1979. Birds of California's oak habitats - management implications. In: Plumb, Timothy R., tech. coord. Proceedings of the Symposium on the Ecology, Management, and Utilization of California Oaks, Claremont, California, Calif., June 26-28, 1979. Gen. Tech. Rep. PSW-44. Berkeley, Ca: Pacific Southwest Forest and Range Experiment Station. For. Serv., U.S. Dept. of Agri: 1980:246-264.

Verner, J. and A.S. Boss, tech. coords. 1980. California Wildlife and Their Habitats: Western Sierra Nevada. Gen. Tech. Rep. PSW-37. Pacific Southwest Forest and Range Experiment Station, For. SHP LaserJet Series IIHPLASEII.PRSdland. Auk 97:339-350.

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HABITAT SUITABILITY INDEX MODEL

BOBCAT (*Felis rufus*)

Pacific Gas and Electric Company

1986

Geographic Area: This HSI Model was developed for use on the west slope of the Sierra Nevada in Fresno County, California.

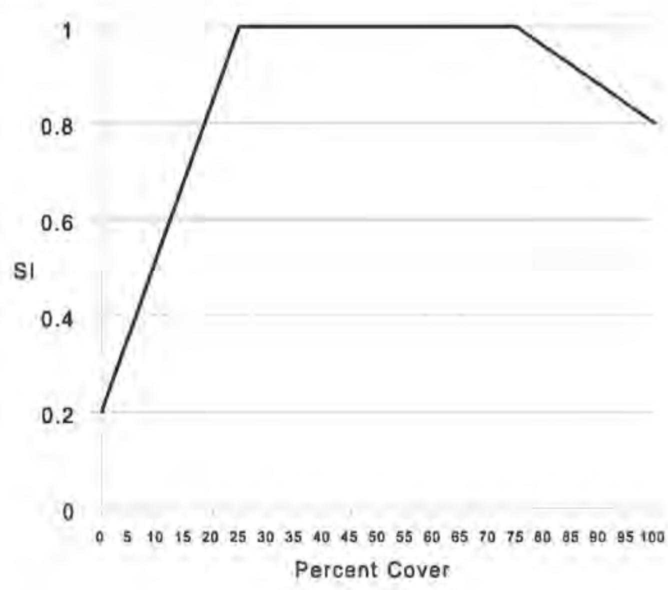
Season: This model was developed to evaluate year-round habitat suitability for the bobcat *(Felis rufus)*.

Cover Types: This model was designed to evaluate habitat suitability for the bobcat in the Chaparral cover type (terminology follows that of Verner and Boss 1980).

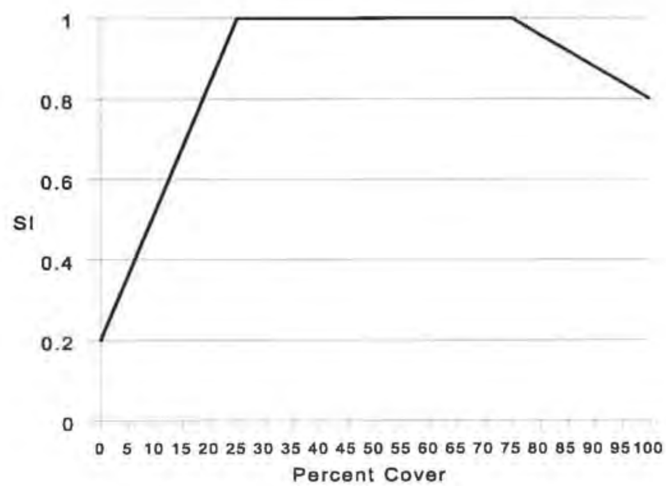
Guild:	Feeding	Breeding
	Surface	Subsurface

Equation: $$HSI = \frac{(V_1 + V_2 + V_3 + V_4)}{5}$$

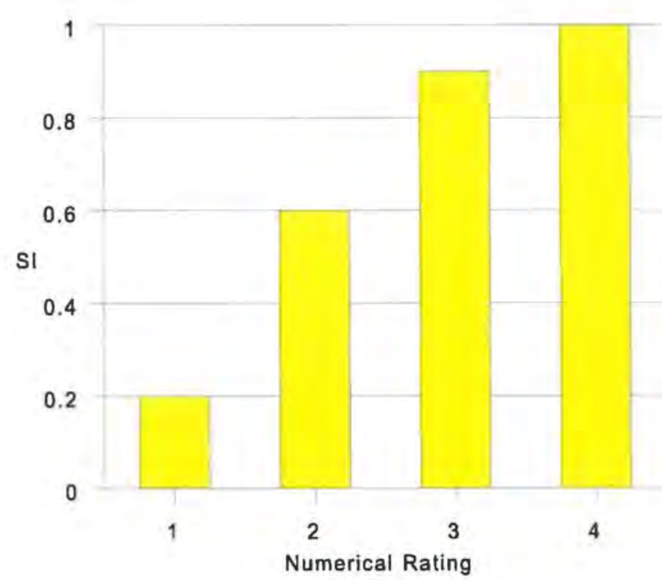
V1 - Percent Shrub Cover



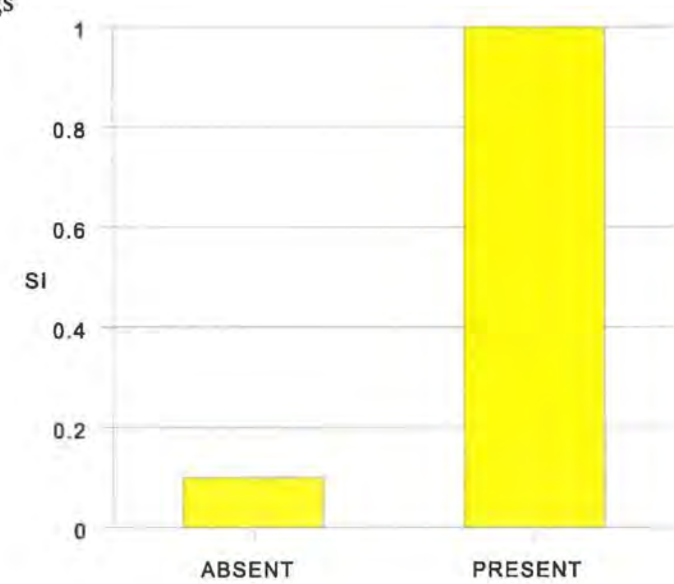
V2 - Herbaceous Cover



V3 - Degree of Patchiness



V4 - Rock Outcroppings



FISH AND WILDLIFE HABITAT CAPABILITY MODELS

AND

SPECIAL HABITAT CRITERIA

FOR THE NORTHEAST ZONE NATIONAL FORESTS

<u>LASSEN NATIONAL FOREST</u>
<u>MENDOCINO NATIONAL FOREST</u>
<u>MODOC NATIONAL FOREST</u>
<u>PLUMAS NATIONAL FOREST</u>

Ken Shimamoto and Daniel Airola (editors)

JANUARY 15, 1981

INTRODUCTION

by Hal Salwasser and Karen Shimamoto

Under National Forest Management Act (NFMA) planning regulations (36 CFR 219), fish and wildlife management indicator species are selected by each Forest for planning and management attention. These species will help guide land allocations and shape multiple-resource prescriptions in meeting legal requirements and local resource demand. To support this role each species must have a documented description of the habitat conditions needed to sustain it at different population levels. The minimum habitat conditions necessary for sustaining population viability are also required. The development of prescriptions to favor certain management indicator species also requires a description of habitat conditions associated with high population levels of each species. The descriptions of habitat conditions associated with different population levels are called _Habitat Capability Models (HCM)_.

NFMA regulations mandate that each Forest maintain habitat conditions to support wildlife and fish populations at or above the abundance and distribution needed for long-term population viability. However, neither managers nor scientists fully know what kinds, amounts, and distribution of habitats are necessary to maintain population viability. Therefore, existing knowledge of species ecology and habitat needs must serve to describe the habitat conditions needed. Models (standards and criteria) must be formulated to describe in quantitative and qualitative terms the habitat conditions by which to judge existing and projected habitat resources.

Most of the HCMs address the habitat conditions required by individual reproductive units within wildlife and fish populations. This is because land management projects usually affect small part of populations such as a breeding pair, a family unit, a small group of breeding pairs, or a small group of family units before whole population changes are noticed. Total population abundance and distribution on the Forest can be projected by aggregating and mapping those land areas that provide capable, available, and suitable habitat for reproductive units of populations.

The HCMs do not address some aspects of population viability. Minimum to optimum distances between reproductive units and population size are two important attributes of viability that must be addressed for relevant species outside the HCMs.

Special Habitat Criteria were first developed by biologists on the Shen-islous National Forest as an extension of the HCM concept (Hurley et al 1985). While HCMs describe habitat conditions for individual management indicator species, the information in the Special Habitat Criteria models describes conditions necessary to maintain or optimize populations of fish and wildlife species closely associated with special habitats (riparian, aspen, snags, etc.).

HABITAT CAPABILITY MODELS

The following format was used in the construction of each habitat capability model.

Model Applicability

Life Stage(s) - Identify the appropriate life stages covered by the model e.g. egg, larval, fry, juvenile, adult, all

Season(s) - Identify the appropriate season(s) e.g. fall, winter, spring, summer

Geographic Area - The model may apply to the species' entire range. However, if regional differences in habitat use and preference occur, seperate models may be appropriate.

Intended Application - Most models will be formulated with Forest planning in mind. Some models, however, may be detailed enough to apply to project work. Provide a clear statement of the intended use.

Expected Reliability - The following hierarchy was used:

Level 1 - Model predicts existing carrying capacity density with acceptable variance, i.e. 10-20%

Level 2 - Model habitat capability ratings directly correlate with density estimates

Level 3 - Model habitat capability ratings directly correlate with ratings of the same sites by species authorities

iii

Level 4 - Model structure and outputs appear reasonable to species authorities.

Level 5 - Model structure and outputs meet technical standards and appear reasonable to author(s), editor(s), and users.

Verification Status - The purpose of verification is to ensure that the model meets the expected reliability criteria and that it faithfully provides the intended outputs. Each step in verification depends on the expected reliability of the model. The following hierarchy was used:

1) Model is in draft.

2) Model reviewed by editor (the editor should check for conformance with model quality standards, sufficiency of documentation, and understandability).

3) Model reviewed by editor and users.

4) Model reviewed by species authority.

5) Model evaluated with sample data - apply the model with sample data sets which mimic various habitat conditions, e.g., high, medium, and low habitat capability. Evaluate model outputs as to how well they give a reasonable prediction of habitat conditions.

6) Model tested with field data - Field data must be available to provide measurements of both habitat variables and indicators of habitat capability. The latter can range from ratings of habitat capability by species authorities to density estimates to actual densities. Statistical and sampling expertise is required to design and perform these tests.

Model variables were restricted to physical, chemical, or biological characteristics of habitats. Species population variables, such as birth rates and sex ratios, are not suitable due to high cost of measurement, difficulty of prediction, and dependency on other factors beyond habitat. The critical question answered was, "What environmental variable, when changed, will affect the capability of an area to support a management indicator species?"

Each of the identified habitat variables were combined with the others to produce a habitat capability model. Each variable has values with different implications for habitat capability. For example, the variable average tree canopy cover has a high habitat value for goshawks when it is between 40-60%. Each of the variables and its respective values were ranked according to habitat capability:

High: the values are related to the highest densities of the species; the values are preferred over other values;

Medium: the values are related to moderate densities of the species; the values are required for the long-term viability of the population or reproductive unit of the population;

Low: the values are related to the lowest densities of the species; the values are remote marginal habitat capability for the species and would not be capable of supporting a viable population.

The variables were organized according to their importance in determining habitat capability and arrayed in rows under the headings high, medium, and low. An attempt was made to reduce redundant variables, retaining only those variables that are most practical to measure.

Documentation

As in model reliability and verification status, documentation for each model is in varying stages of completion. The levels of documentation are:

Level 1 - Literature references, written or personal communication, and the author's judgement are cited.

Level 2 - A narrative accompanies the model, summarizing why each variable was selected, how each variable is related to the species' habitat needs, and how habitat capability values were determined. This level also includes Level 1.

Level 3 - A narrative accompanies the model with documentation on the species ecology and habitat use. This information is related to the habitat variables in the model. It involves preparing a species note with the following information:

I. Distribution, Abundance, and Seasonality

II. Specific Habitat Requirements

A. Feeding

B. Cover

C. Water

D. Reproduction

E. Pattern

III. Species Life History

A. Activity Patterns

B. Seasonal Movements/Migration

C. Home Range/Territory

D. Reproduction

E. Niche

This level also includes Levels 1 and 2.

Level 4 - The habitat variables are aggregated to develop a mathematical formulation of the model (U.S. Fish and Wildlife Service 1980). Assumptions and limitations to be used when applying the model are provided and the necessary steps to correctly use the mathematical model is documented. The latter includes how to collect data on model variables, how to treat that data as model inputs, and how to interpret habitat capability based on the data. This level includes levels 1, 2, and 3.

Because many initial species models will be developed from scant data, modelers will rely on experiential evidence and intuition to establish the model variables and relationships. Such models will have level 1 or 2 documentation. As model application and verification improve, habitat relationships can be more accurately represented and the models made more quantitative. Models with level 3 or 4 documentation are examples of species where more information is known and the models have been "calibrated" with real data.

Vegetation Types and Successional Stages

The vegetation types and successional stages used in the habitat capability models are consistent with the California Wildlife Habitat Relationships Program for the Northeast Interior Zone (Laudenslayer in prep), the Western Sierra Zone (Verner and Boss 1980) and the North Coast-Cascades Zone (Marcot 1979). For convenience, the codes used for successional stages are defined in Table 1.

Rating Overall Habitat Capability

For any given area of land, habitat capability ratings (high, medium, low) will be different for each habitat variable. This makes rating the overall habitat capability difficult. Models for spotted owl and mule deer, have been developed to include a mathematical calculation of habitat capability where different ratings are quantitatively assessed and an overall capability index is mathematically calculated. The method for rating overall habitat capability for the other models, however, must be done using subjective biological judgment.

For such cases, the simplest approach is to assess the overall habitat capability rating in terms of a simple majority of variable ratings. For example, if three variables were rated as medium and one variable as high for bald eagle habitat, the overall rating could be considered medium.

In other situations, experience may justify identifying one or more variables as more important or possibly overriding other variables. Biologists should then weight these variables accordingly when determining overall habitat capability.

Table 1. Successional stage codes

Code	Definition
1	Barren/grass/forbs
2	Shrub/seedling/sapling; tree saplings <11" DBH
2a	<40% tree canopy closure
2b	40-70% tree canopy closure
2c	>70% tree canopy closure
3	Small sawtimber; 11-24" DBH
3a	<40% overstory canopy closure
3b	40-70% overstory canopy closure
3c	>70% overstory canopy closure
4	Medium to large sawtimber; >24" DBH
4a	<40% overstory canopy closure
4b	40-70% overstory canopy closure
4c	>70% overstory canopy closure
5	Two-storied stand: scattered overstory over a well-stocked understory (4a over 2c or 3c)

Literature Cited

Hurley, J. F., S. H. Robertson, S. R. Brougher, and A. H. Palmer. 1981. Wildlife habitat capability models and habitat quality criteria for the Western Sierra Nevada. Stanislaus National Forest, 56p.

Laudenslayer, Jr., W. F. (in prep) California wildlife habitat relationships program: northeast interior zone. Vol. 1 – Species/habitat matrix. USDA Forest Service Region 5.

Marcot, B.G. (ed). 1979. California wildlife habitat relationships program: North Coast-Cascades Zone. USDA Forest Service. Six Rivers National Forest.

US Fish and Wildlife Service. 1980. Habitat Evaluation Process. 103 ESM.

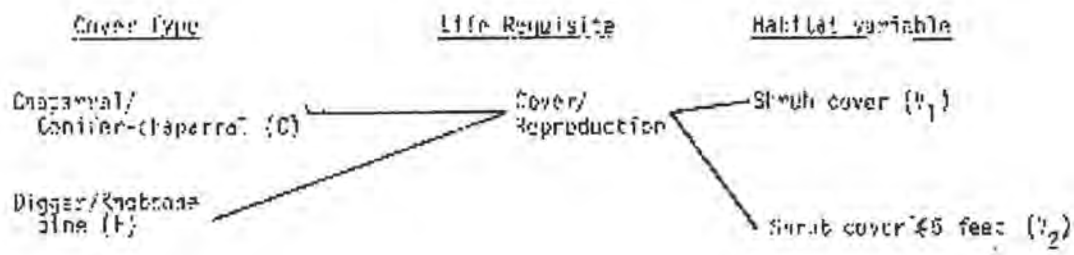
Verner, J. and A. S. Boss (Technical Coordinators). 1980. California wildlife and their habitats: western Sierra Nevada. USDA Forest Service. Gen. Tech. Rep., PSW-37, 439p.

DRAFT
HABITAT SUITABILITY INDEX MODEL
WRENTIT (*Chamaea fasciata*)

U.S. Fish and Wildlife Service
Division of Ecological Services
Sacramento, California

September 1984

VARIABLE		COVER TYPES	SUGGESTED TECHNIQUE
(V_1)	Shrub cover - % of ground shaded by a vertical projection of the shrub canopy	C,F	Line intercept
(V_2)	Shrub cover ≤5 feet	C,F	Belt transect, graduated rod

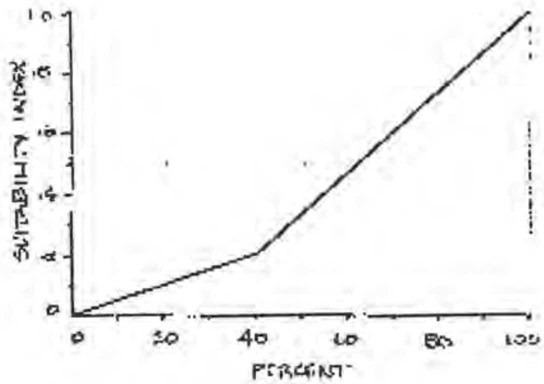

Cover Type
Life Requisite
Habitat variable
Chaparral/
Conifer-chaparral (C)
Digger/Knobcone
pine (P)
Cover/
Reproduction
Shrub cover (V_1)
Shrub cover ≤5 feet (V_2)

Variable 1. Shrub cover - % of ground shaded by a vertical projection of the shrub canopy

Assumes: 1) Dense stands of chaparral needed for optimum conditions.

2) Sample size should include an area of at least 2.0 acres

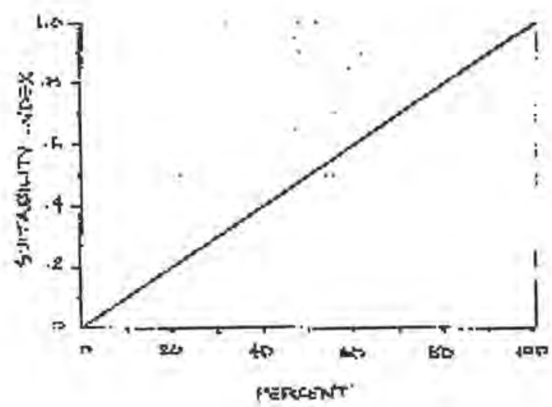
3) 40 percent canopy provides marginal quality and that 100 percent is optimum



Variable 2. Shrub cover ≤5 feet

Assumes: 1) Most nests are located within 1-4 feet from the ground.

2) Some additional height is needed for overhead protection.



4

Equation Used to Calculate Suitability Indices

Cover/Reproduction: $V_1 \times V_2$

HSI determination

Cover/reproduction was the only life requisite considered in this model, and the HSI for the wrentit is equal to the life requisite value for cover/reproduction.

General Assumptions

Overview

This model uses the reproductive habitat needs of the wrentit to determine overall habitat quality. It is assumed that cover needs are met by reproductive habitat needs and that neither food nor water will be more limiting than the wrentit's cover/reproductive needs. All of the life requirements of the wrentit can be provided in chaparral and other dense brush.

Cover/ reproduction component

Optimal nesting habitat for the wrentit is provided in moderately tall, dense stand of chaparral (Bent 1958, Small 1974). Dense stands of chaparral provides maximum protection for feeding and nesting. As such, it is assumed that optimal habitat contains 100 percent or greater of shrub crown canopy. Studies indicate that most of the nesting occurs between 1 and 4 feet off the ground and only occasionally have nests been found up to 7 feet from the ground (Bent 1969). Most of the wrentit's existence is spent beneath the crown foliage of brush not more than 5 feet from the ground (Bent 1969). Studies indicate that most of the life requisites of the wrentit are provided within an area ranging in size from 0.2 to 1.2 ha (0.5 to 3.0 acres) (Cogswell 1952, Bent 1958, Erickson 1938).

Literature Cited

Bent, A.C. 1948. Life histories of North American nuthatches, wrens, thrashers, and their allies. U.S. Natl. Mus. Bull. 195. 475 pp.

Cogswell, H.L. 1962. Territory size in three species of chaparral birds in relation to vegetation density and structure. PhD. Thesis, Univ. California, Berkeley. 567 pp.

Erickson, M.M. 1938. Territory, annual cycle, and numbers in a population of wrentits (Chamaea fasciata). Univ. California Publ. Zool. 42: 247-334

Harrison, H.H. 1978. A field guide to western birds nests. Houghton Mifflin Co. Boston.

Small, A. 1974. The Birds of California. Collier Macmillan Pub. Co., New York

Williams, P.L., and W.D. Koenig. 1980. Water dependence of birds in a temperate oak woodland. Auk 97: 339-350.

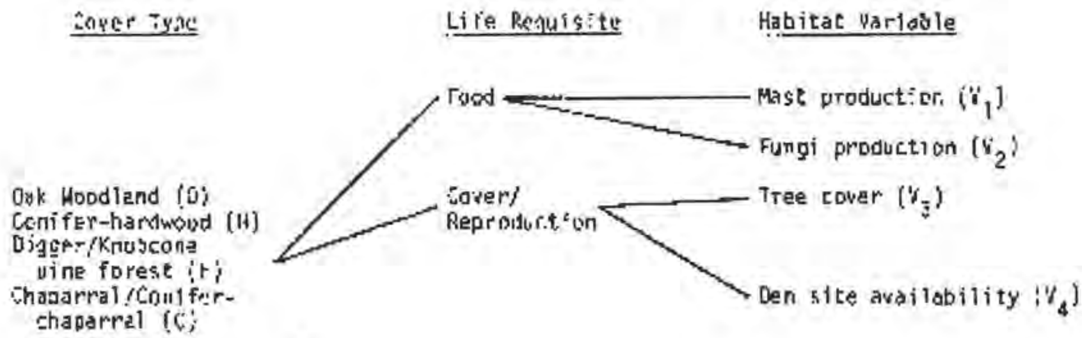
DRAFT HABITAT SUITABILITY INDEX MODEL
WESTERN GRAY SQUIRREL (*Sciurus griseus*)

U.S. Fish and Wildlife Service
Division of Ecological Services
Sacramento, CA

September 1984

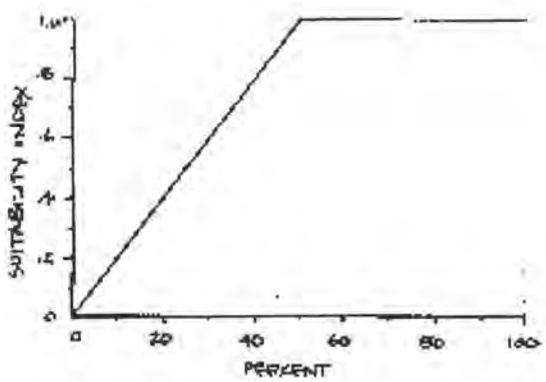
Squirrel

VARIABLE	COVER TYPES	SUGGESTED TECHNIQUE
(V_1) Mast production - % canopy closure of trees > 5 m (16.5 ft) tall and shrubs that produce hard mast	O,H,F,C	Line intercept
(V_2) Fungi production - estimate of density of leaf litter layer	O,H,F,C	Ocular estimate along line intercept
(V_3) Tree cover - % of ground surface shaded canopies of all woody vegetation > 5 m (16.5 ft) in height	O,H,F,C	Line intercept
(V_4) Den site availability - number of trees per acre with dbh ≥ 38.1 cm (15 in).	O,H,F,C	Belt transect, diameter tape



Squirrel

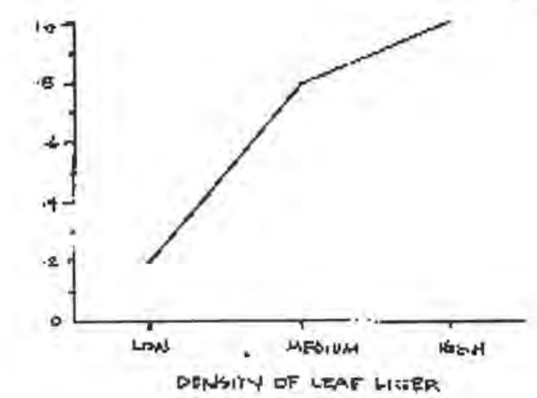
Variable 1. Hard mast production - % canopy closure of trees ≥ 5 m (16.5 ft) tall and shrubs that produce hard mast (e.g. oaks and conifers).



Assumes: 1) Optimum density of hard mast trees is between 40 - 100% canopy closure (derived from Shimamoto and Airola, 1981).

2) Trees ≤ 5 m (16.5 ft) tall will not produce significant mast (Allen, 1982).

Variable 2. Fungi production - an estimate of the density of the leaf litter layer.



Assumes: 1) Hypogeous fungi is a major component of the western gray squirrel diet (Stienecker, 1977).

2) Fungi is related to the amount of organic material (represented by leaf litter) in the uppermost soil layers (SCS, 1980).

Density of Leaf Litter (from SCS, 1980):

High - leaf litter is abundant with thick identifiable layers of leaves over mulch.

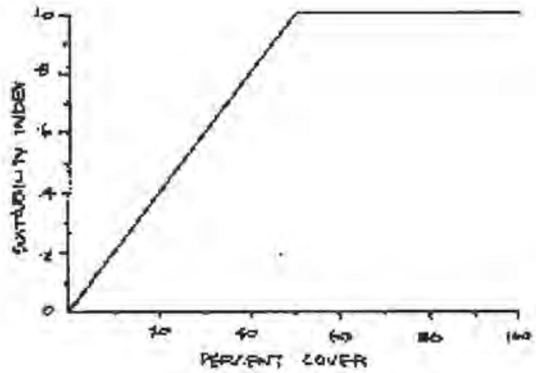
Medium - leaf litter is moderately abundant with low to moderate separation of leaf-mulch layers.

Low - leaf litter scarce with very thin leaf - mulch layers, little or no separation.

4

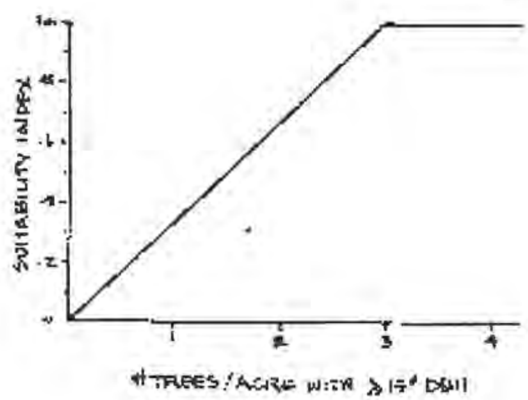
Squirrel

Variable 3. Tree cover - % of ground surface shaded by vertical projection of canopies of all woody vegetation ≥ 5 m (15 ft.) tall



Assumes: 1) Optimum conditions occur when tree cover ranges from 40 to 100% (derived from Shimamoto and Airola, 1981).

Variable 4. Den site availability - number of trees per acre with dbh ≥ 38.1 cm (15 in)



Assumes: 1) Western gray squirrel's most often utilize oak, cottonwoods, maples, conifers, and sycamores for den sites (Ingles, 1947).

2) Optimum den sites are provided by trees having an average dbh of 15 inches (Shimamoto and Airola, 1981).

5

Squirrel

Equations Used to Calculate Suitability Indices

a) Food:

Cover Type	Equation
D,H,F,C	$(V_1 \times V_2)^{1/2}$

b) Cover/Reproduction:

Cover Type	Equation
D,H,F,C	$(V_3 \times V_4)^{1/2}$

HSI Determination:

1) The minimum habitat area equals the mean minimum home range. If habitat area is less than one acre, the HSI value equals zero. (Ingles, 1947).

2) The HSI for the western gray squirrel will equal the lowest of the values for the food and cover/reproduction component.

Literature Cited

Allen, A.W. 1982. Habitat Suitability index models. Gray squirrel. FWS/OBS (WELUT) - 82/10.19. 11 pp.

Ingles, L.G. 1947. Ecology and life history of the California gray squirrel. Calif. Fish and Game 33(3):139-158.

Shimamoto, K. and D. Airola. 1981. Fish and wildlife habitat capability models and special habitat criteria for the northeast zone national forests. U.S. Forest Service publ. 250 pp.

Soil Conservation Service. 1980. Draft habitat suitability index model - western gray squirrel - Ecoregion 2510 - Central Valley. 15 pp.

Steinecker, W.F. 1977. Supplemental data on the food habits of the western gray squirrel. Calif. Fish and Game 56(1):36-48.

APPENDIX C

Endangered Species List

U.S. Fish & Wildlife Service
Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested
Document Number: 150129120853
Current as of: January 29, 2015

Listed Species

Invertebrates

Branchinecta conservatio
Conservancy fairy shrimp (E)

Branchinecta lynchi
vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus
valley elderberry longhorn beetle (T)

Lepidurus packardi
vernal pool tadpole shrimp (E)

Fish

Hypomesus transpacificus
delta smelt (T)

Oncorhynchus mykiss
Central Valley steelhead (T) (NMFS)
Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha
Central Valley spring-run chinook salmon (T) (NMFS)
winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense
California tiger salamander, central population (T)

Rana draytonii
California red-legged frog (T)

Reptiles

Thamnophis gigas
giant garter snake (T)

Plants

Calystegia stebbinsii
Stebbins's morning-glory (E)

Ceanothus roderickii
Pine Hill ceanothus (E)

Fremontodendron californicum ssp. decumbens
Pine Hill flannelbush (E)

Galium californicum ssp. sierrae
El Dorado bedstraw (E)

Orcuttia viscida
Critical habitat, Sacramento Orcutt grass (X)
Sacramento Orcutt grass (E)

Senecio layneae
Layne's butterweed (=ragwort) (T)

Quads Containing Listed, Proposed or Candidate Species:

CLARKSVILLE (511A)
FOLSOM (511B)
ROCKLIN (527C)
PILOT HILL (527D)

County Lists
No county species lists requested.

Key:
(E) Endangered - Listed as being in danger of extinction.
(T) Threatened - Listed as likely to become endangered within the foreseeable future.
(P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
Critical Habitat - Area essential to the conservation of a species.
(PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
(C) Candidate - Candidate to become a proposed species.
(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
(X) Critical Habitat designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.
See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be April 29, 2015.

APPENDIX F

USFWS AND CNDDP SPECIAL STATUS SPECIES LISTS

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the CLARKSVILLE (511A) U.S.G.S. 7 1/2 Minute Quad

Report Date: January 21, 2015

Listed Species

Invertebrates

Branchinecta lynchi
vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus
valley elderberry longhorn beetle (T)

Lepidurus packardi
vernal pool tadpole shrimp (E)

Fish

Hypomesus transpacificus
delta smelt (T)

Oncorhynchus mykiss
Central Valley steelhead (T) (NMFS)

Oncorhynchus tshawytscha
Central Valley spring-run chinook salmon (T) (NMFS)
winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense
California tiger salamander, central population (T)

Rana draytonii
California red-legged frog (T)

Reptiles

Thamnophis gigas
giant garter snake (T)

Plants

Calystegia stebbinsii
Stebbins's morning-glory (E)

Ceanothus roderickii
Pine Hill ceanothus (E)

Fremontodendron californicum ssp. decumbens
Pine Hill flannelbush (E)

Galium californicum ssp. sierrae
El Dorado bedstraw (E)

Senecio layneae
Layne's butterweed (=ragwort) (T)

Key:

- (E) Endangered - Listed as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the FOLSOM (511B) U.S.G.S. 7 1/2 Minute Quad

Report Date: January 21, 2015

Listed Species

Invertebrates

Branchinecta conservatio
Conservancy fairy shrimp (E)

Branchinecta lynchi
vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus
valley elderberry longhorn beetle (T)

Lepidurus packardi
vernal pool tadpole shrimp (E)

Fish

Hypomesus transpacificus
delta smelt (T)

Oncorhynchus mykiss
Central Valley steelhead (T) (NMFS)
Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha
Central Valley spring-run chinook salmon (T) (NMFS)
winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense
California tiger salamander, central population (T)

Rana draytonii
California red-legged frog (T)

Reptiles

Thamnophis gigas
giant garter snake (T)

Plants

Orcuttia viscida
Critical habitat, Sacramento Orcutt grass (X)
Sacramento Orcutt grass (E)

Key:

- (E) Endangered - Listed as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the ROCKLIN (527C) U.S.G.S. 7 1/2 Minute Quad

Report Date: January 21, 2015

Listed Species

Invertebrates

Branchinecta lynchi
vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus
valley elderberry longhorn beetle (T)

Lepidurus packardi
vernal pool tadpole shrimp (E)

Fish

Hypomesus transpacificus
delta smelt (T)

Oncorhynchus mykiss
Central Valley steelhead (T) (NMFS)
Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha
Central Valley spring-run chinook salmon (T) (NMFS)
winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Rana draytonii
California red-legged frog (T)

Reptiles

Thamnophis gigas
giant garter snake (T)

Key:

- (E) Endangered - Listed as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

Selected Elements by Common Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad is (Folsom (3812162) or Rocklin (3812172) or Clarksville (3812161))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
bald eagle *Haliaeetus leucocephalus*	ABNKC10010	Delisted	Endangered	G5	S2	FP
Bisbee Peak rush-rose *Crocanthemum suffrutescens*	PDCIS020F0	None	None	G2Q	S2	3.2
Blennosperma vernal pool andrenid bee *Andrena blennospermatis*	IIHYM35030	None	None	G2	S2	
Boggs Lake hedge-hyssop *Gratiola heterosepala*	PDSCR0R060	None	Endangered	G2	S2	1B.2
Brandegee's clarkia *Clarkia biloba ssp. brandegeeae*	PDONA05053	None	None	G4G5T4	S4	4.2
burrowing owl *Athene cunicularia*	ABNSB10010	None	None	G4	S3	SSC
California black rail *Laterallus jamaicensis coturniculus*	ABNME03041	None	Threatened	G3G4T1	S1	FP
California linderiella *Linderiella occidentalis*	ICBRA06010	None	None	G2G3	S2S3	
California red-legged frog *Rana draytonii*	AAABH01022	Threatened	None	G2G3	S2S3	SSC
Cooper's hawk *Accipiter cooperii*	ABNKC12040	None	None	G5	S4	WL
double-crested cormorant *Phalacrocorax auritus*	ABNFD01020	None	None	G5	S4	WL
dwarf downingia *Downingia pusilla*	PDCAM060C0	None	None	GU	S2	2B.2
El Dorado bedstraw *Galium californicum ssp. sierrae*	PDRUB0N0E7	Endangered	Rare	G5T1	S1	1B.2
El Dorado County mule ears *Wyethia reticulata*	PDAST9X0D0	None	None	G2	S2	1B.2
golden eagle *Aquila chrysaetos*	ABNKC22010	None	None	G5	S3	FP
great blue heron *Ardea herodias*	ABNGA04010	None	None	G5	S4	
great egret *Ardea alba*	ABNGA04040	None	None	G5	S4	
Layne's ragwort *Packera layneae*	PDAST8H1V0	Threatened	Rare	G2	S2	1B.2
merlin *Falco columbarius*	ABNKD06030	None	None	G5	S3S4	WL
Northern Hardpan Vernal Pool *Northern Hardpan Vernal Pool*	CTT44110CA	None	None	G3	S3.1	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Northern Volcanic Mud Flow Vernal Pool *Northern Volcanic Mud Flow Vernal Pool*	CTT44132CA	None	None	G1	S1.1	
osprey *Pandion haliaetus*	ABNKC01010	None	None	G5	S4	WL
pallid bat *Antrozous pallidus*	AMACC10010	None	None	G5	S3	SSC
pincushion navarretia *Navarretia myersii ssp. myersii*	PDPLM0C0X1	None	None	G1T1	S1	1B.1
Pine Hill ceanothus *Ceanothus roderickii*	PDRHA04190	Endangered	Rare	G1	S1	1B.2
Pine Hill flannelbush *Fremontodendron decumbens*	PDSTE03030	Endangered	Rare	G1	S1	1B.2
purple martin *Progne subis*	ABPAU01010	None	None	G5	S3	SSC
Red Hills soaproot *Chlorogalum grandiflorum*	PMLIL0G020	None	None	G3	S3	1B.2
Ricksecker's water scavenger beetle *Hydrochara rickseckeri*	IICOL5V010	None	None	G2?	S2?	
Sacramento Orcutt grass *Orcuttia viscida*	PMPOA4G070	Endangered	Endangered	G1	S1	1B.1
Sanford's arrowhead *Sagittaria sanfordii*	PMALI040Q0	None	None	G3	S3	1B.2
silver-haired bat *Lasionycteris noctivagans*	AMACC02010	None	None	G5	S3S4	
steelhead - Central Valley DPS *Oncorhynchus mykiss irideus*	AFCHA0209K	Threatened	None	G5T2Q	S2	
Swainson's hawk *Buteo swainsoni*	ABNKC19070	None	Threatened	G5	S3	
tricolored blackbird *Agelaius tricolor*	ABPBXB0020	None	Endangered	G2G3	S1S2	SSC
valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	IICOL48011	Threatened	None	G3T2	S2	
Valley Needlegrass Grassland *Valley Needlegrass Grassland*	CTT42110CA	None	None	G3	S3.1	
vernal pool fairy shrimp *Branchinecta lynchi*	ICBRA03030	Threatened	None	G3	S2S3	
western pond turtle *Emys marmorata*	ARAAD02030	None	None	G3G4	S3	SSC
western spadefoot *Spea hammondii*	AAABF02020	None	None	G3	S3	SSC
white-tailed kite *Elanus leucurus*	ABNKC06010	None	None	G5	S3S4	FP

Record Count: 41

APPENDIX G

SMAQMD EMISSION THRESHOLDS ASSOCIATED WITH ALTERNATIVE 2

Emission Estimates for ->	Alternative 2: Vertical Top Seal Across All 8 Gates 2017									
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	0.2	1.4	1.4	67.7	0.1	67.6	14.1	0.1	14.1	275.7
Grading/Excavation	13.5	65.7	115.1	74.6	7.0	67.6	20.5	6.4	14.1	11,355.9
Drainage/Utilities/Sub-Grade	1.0	6.1	7.1	68.1	0.5	67.6	14.5	0.4	14.1	1,180.9
Paving	1.7	9.2	13.9	0.9	0.9	-	0.8	0.8	-	1,670.5
Maximum (pounds/day)	13.5	65.7	115.1	74.6	7.0	67.6	20.5	6.4	14.1	11,355.9
Total (tons/construction project)	1.5	7.4	13.0	7.6	0.8	6.8	2.1	0.7	1.4	1,289.3

Notes: Project Start Year ->	2017
Project Length (months) ->	12
Total Project Area (acres) ->	14
Maximum Area Disturbed/Day (acres) ->	3
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 -> Project Phases (English Units)	Alternative 2: Vertical Top Seal Across All 8 Gates 2018 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	0.2	1.3	1.3	67.7	0.1	67.6	14.1	0.1	14.1	275.7
Grading/Excavation	12.3	65.2	105.9	73.9	6.3	67.6	19.9	5.8	14.1	11,356.9
Drainage/Utilities/Sub-Grade	0.9	5.8	6.5	68.0	0.4	67.6	14.4	0.4	14.1	1,181.1
Paving	1.6	9.0	12.7	0.8	0.8	-	0.7	0.7	-	1,670.7
Maximum (pounds/day)	12.3	65.2	105.9	73.9	6.3	67.6	19.9	5.8	14.1	11,356.9
Total (tons/construction project)	1.4	7.4	12.0	7.5	0.7	6.8	2.1	0.7	1.4	1,289.5
Notes: Project Start Year ->	2018									
Project Length (months) ->	12									
Total Project Area (acres) ->	14									
Maximum Area Disturbed/Day (acres) ->	3									
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 -> Project Phases (English Units)	Alternative 2: Work Package 1 (Dikes 4-6) Earthen Embankment Raise 2018 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	1.8	9.6	19.4	98.4	0.9	97.5	21.1	0.8	20.3	2,805.6
Grading/Excavation	29.1	148.5	303.8	112.1	14.6	97.5	33.6	13.3	20.3	35,837.1
Drainage/Utilities/Sub-Grade	2.0	12.1	17.7	98.4	0.9	97.5	21.1	0.8	20.3	3,060.4
Paving	1.8	10.7	16.9	0.9	0.9	-	0.8	0.8	-	2,569.0
Maximum (pounds/day)	29.1	148.5	303.8	112.1	14.6	97.5	33.6	13.3	20.3	35,837.1
Total (tons/construction project)	3.3	16.9	34.4	12.0	1.7	10.3	3.7	1.5	2.1	4,076.6

Notes: Project Start Year ->	2018
Project Length (months) ->	12
Total Project Area (acres) ->	39
Maximum Area Disturbed/Day (acres) ->	10
Total Soil Imported/Exported (yd^3/day)->	100

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 ->	Alternative 2: Vertical Top Seal Across All 8 Gates 2019			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	0.2	1.3	1.2	67.7	0.1	67.6	14.1	0.1	14.1	275.8
Grading/Excavation	11.0	64.8	95.3	73.2	5.6	67.6	19.1	5.1	14.1	11,356.3
Drainage/Utilities/Sub-Grade	0.8	5.6	5.9	68.0	0.4	67.6	14.4	0.3	14.1	1,181.2
Paving	1.4	8.8	11.5	0.7	0.7	-	0.6	0.6	-	1,670.7
Maximum (pounds/day)	11.0	64.8	95.3	73.2	5.6	67.6	19.1	5.1	14.1	11,356.3
Total (tons/construction project)	1.2	7.3	10.8	7.4	0.6	6.8	2.0	0.6	1.4	1,289.4

Notes: Project Start Year ->	2019
Project Length (months) ->	12
Total Project Area (acres) ->	14
Maximum Area Disturbed/Day (acres) ->	3
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 -> Project Phases (English Units)	Alternative 2: Work Package 1 (Dikes 4-6) Earthen Embankment Raise 2019 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	1.6	9.4	16.7	98.3	0.8	97.5	21.0	0.7	20.3	2,795.6
Grading/Excavation	25.3	148.1	259.5	109.7	12.2	97.5	31.4	11.2	20.3	35,813.0
Drainage/Utilities/Sub-Grade	1.7	11.7	15.2	98.3	0.8	97.5	21.0	0.7	20.3	3,057.9
Paving	1.6	10.4	14.5	0.8	0.8	-	0.7	0.7	-	2,568.9
Maximum (pounds/day)	25.3	148.1	259.5	109.7	12.2	97.5	31.4	11.2	20.3	35,813.0
Total (tons/construction project)	2.9	16.8	29.4	11.7	1.4	10.3	3.4	1.3	2.1	4,073.8

Notes:	
Project Start Year ->	2019
Project Length (months) ->	12
Total Project Area (acres) ->	39
Maximum Area Disturbed/Day (acres) ->	10
Total Soil Imported/Exported (yd^3/day)->	100

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 -> Project Phases (English Units)	Alternative 2: Work Package 3 (Dikes 1-3) Earthen Embankment Raise 2019 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	1.6	9.4	16.7	88.3	0.8	87.5	18.9	0.7	18.2	2,795.6
Grading/Excavation	25.2	148.0	259.3	99.7	12.2	87.5	29.4	11.2	18.2	35,752.4
Drainage/Utilities/Sub-Grade	1.7	11.7	15.2	88.3	0.8	87.5	18.9	0.7	18.2	3,057.9
Paving	1.6	10.4	14.5	0.8	0.8	-	0.7	0.7	-	2,568.9
Maximum (pounds/day)	25.2	148.0	259.3	99.7	12.2	87.5	29.4	11.2	18.2	35,752.4
Total (tons/construction project)	2.9	16.8	29.4	10.6	1.4	9.2	3.2	1.3	1.9	4,067.0

Notes:

Project Start Year ->	2019
Project Length (months) ->	12
Total Project Area (acres) ->	35
Maximum Area Disturbed/Day (acres) ->	9
Total Soil Imported/Exported (yd^3/day)->	89

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 ->	Alternative 2: Vertical Top Seal Across All 8 Gates 2020									
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	0.2	1.2	1.1	67.7	0.1	67.6	14.1	0.1	14.1	275.1
Grading/Excavation	9.9	64.5	86.3	72.5	4.9	67.6	18.5	4.4	14.1	11,352.7
Drainage/Utilities/Sub-Grade	0.7	5.5	5.3	67.9	0.3	67.6	14.3	0.3	14.1	1,178.6
Paving	1.3	8.7	10.4	0.6	0.6	-	0.5	0.5	-	1,668.8
Maximum (pounds/day)	9.9	64.5	86.3	72.5	4.9	67.6	18.5	4.4	14.1	11,352.7
Total (tons/construction project)	1.1	7.3	9.7	7.3	0.6	6.8	1.9	0.5	1.4	1,289.0

Notes:	
Project Start Year ->	2020
Project Length (months) ->	12
Total Project Area (acres) ->	14
Maximum Area Disturbed/Day (acres) ->	3
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 -> Project Phases (English Units)	Alternative 2: Work Package 2 (Dikes 7 and 8, MIAD) Earthen Embankment Raise 2020 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	1.6	10.7	21.1	157.9	0.9	157.0	33.4	0.7	32.7	4,668.1
Grading/Excavation	24.5	159.1	252.7	168.5	11.5	157.0	43.0	10.3	32.7	40,720.4
Drainage/Utilities/Sub-Grade	1.9	14.1	15.3	157.8	0.8	157.0	33.3	0.7	32.7	4,258.8
Paving	1.6	11.5	13.0	0.7	0.7	-	0.6	0.6	-	2,958.5
Maximum (pounds/day)	24.5	159.1	252.7	168.5	11.5	157.0	43.0	10.3	32.7	40,720.4
Total (tons/construction project)	2.8	18.1	28.7	17.9	1.3	16.6	4.6	1.2	3.4	4,647.3

Notes: Project Start Year ->	2020
Project Length (months) ->	12
Total Project Area (acres) ->	63
Maximum Area Disturbed/Day (acres) ->	16
Total Soil Imported/Exported (yd^3/day)->	254

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 -> Project Phases (English Units)	Alternative 2: Work Package 3 (Dikes 1-3) Earthen Embankment Raise 2020 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	1.4	9.3	14.8	88.2	0.7	87.5	18.8	0.6	18.2	2,783.4
Grading/Excavation	23.0	147.7	231.1	98.3	10.8	87.5	28.0	9.8	18.2	35,719.6
Drainage/Utilities/Sub-Grade	1.6	11.4	13.5	88.2	0.7	87.5	18.8	0.6	18.2	3,049.9
Paving	1.5	10.2	12.9	0.7	0.7	-	0.6	0.6	-	2,565.0
Maximum (pounds/day)	23.0	147.7	231.1	98.3	10.8	87.5	28.0	9.8	18.2	35,719.6
Total (tons/construction project)	2.6	16.8	26.2	10.5	1.2	9.2	3.0	1.1	1.9	4,063.2

Notes:	
Project Start Year ->	2020
Project Length (months) ->	12
Total Project Area (acres) ->	35
Maximum Area Disturbed/Day (acres) ->	9
Total Soil Imported/Exported (yd^3/day)->	89

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 ->	Alternative 2: Concrete Walls LWD and RWD 2020									
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	2.7	15.4	69.6	533.4	2.1	531.3	111.8	1.3	110.5	19,316.5
Grading/Excavation	14.3	88.4	175.6	538.5	7.2	531.3	116.3	5.8	110.5	39,252.7
Drainage/Utilities/Sub-Grade	2.5	21.0	26.7	532.6	1.3	531.3	111.3	0.8	110.5	10,704.5
Paving	1.4	12.0	7.4	0.6	0.6	-	0.4	0.4	-	3,526.1
Maximum (pounds/day)	14.3	88.4	175.6	538.5	7.2	531.3	116.3	5.8	110.5	39,252.7
Total (tons/construction project)	1.7	10.2	20.4	56.9	0.8	56.1	12.3	0.7	11.7	4,625.6

Notes:	
Project Start Year ->	2020
Project Length (months) ->	12
Total Project Area (acres) ->	213
Maximum Area Disturbed/Day (acres) ->	53
Total Soil Imported/Exported (yd^3/day)->	39

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 -> Project Phases (English Units)	Alternative 2: Work Package 2 (Dikes 7 and 8, MIAD) Earthen Embankment Raise 2021 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	1.5	10.6	18.2	157.8	0.8	157.0	33.3	0.6	32.7	4,614.4
Grading/Excavation	22.8	158.6	227.0	167.3	10.3	157.0	41.9	9.3	32.7	40,627.1
Drainage/Utilities/Sub-Grade	1.7	13.7	13.6	157.8	0.8	157.0	33.3	0.6	32.7	4,245.5
Paving	1.5	11.2	11.8	0.6	0.6	-	0.5	0.5	-	2,958.3
Maximum (pounds/day)	22.8	158.6	227.0	167.3	10.3	157.0	41.9	9.3	32.7	40,627.1
Total (tons/construction project)	2.6	18.0	25.8	17.8	1.2	16.6	4.5	1.1	3.4	4,636.4

Notes:

Project Start Year ->	2021
Project Length (months) ->	12
Total Project Area (acres) ->	63
Maximum Area Disturbed/Day (acres) ->	16
Total Soil Imported/Exported (yd^3/day)->	254

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 ->	Alternative 2: Concrete Walls LWD and RWD 2021									
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	2.6	15.3	56.0	533.4	2.1	531.3	111.8	1.2	110.5	18,912.5
Grading/Excavation	13.5	87.4	151.2	537.9	6.6	531.3	115.8	5.3	110.5	38,839.0
Drainage/Utilities/Sub-Grade	2.4	20.0	22.1	532.5	1.2	531.3	111.2	0.7	110.5	10,585.2
Paving	1.3	11.4	6.6	0.5	0.5	-	0.4	0.4	-	3,526.4
Maximum (pounds/day)	13.5	87.4	151.2	537.9	6.6	531.3	115.8	5.3	110.5	38,839.0
Total (tons/construction project)	1.6	10.1	17.5	56.9	0.8	56.1	12.3	0.6	11.7	4,575.7

Notes: Project Start Year ->	2021
Project Length (months) ->	12
Total Project Area (acres) ->	213
Maximum Area Disturbed/Day (acres) ->	53
Total Soil Imported/Exported (yd^3/day)->	39

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.

APPENDIX H

NOISE STANDARDS

Table A. Noise Ordinance Standards (City of Folsom).*

		Noise Levels not to be Exceeded in Residential Zone (dBA)**	
Maximum Time of Exposure	Noise Metric	7 a.m. to 10 p.m. (daytime)	10 p.m. to 7 a.m. (nighttime)
Exterior Noise Standards			
30 Minutes/Hour	L50	50	45
15 Minutes/Hour	L25	55	50
5 Minutes/Hour	L8.3	60	55
1 Minute/Hour	L1.7	65	60
Any period of time	Lmax	70	65
Interior Noise Standards			
5 Minutes/Hour	L8.3	45	35
1 Minute/Hour	L1.7	50	40
Any period of time	Lmax	55	45

*Construction Noise Exemption Times: 7:00 a.m. - 6:00 p.m. Weekdays
8:00 a.m. - 5:00 p.m. Weekends
**5 dBA reduction for impact noise during non-exempt times
SOURCE: City of Folsom, CA Municipal Code. Chapter 8.42, Table 8.42.040

Table B. Noise Ordinance Standards (Sacramento County).

			Noise Levels Not to Be Exceeded in Residential Zone (dBA)**	
Exterior Noise Standards	Maximum Time of Exposure	Noise Metric	7am to 10pm (daytime)	10pm to 7am (nighttime)
	30 Minutes/Hour	L_{50}	55	50
	15 Minutes/Hour	L_{25}	60	55
	5 Minutes/Hour	$L_{8.3}$	65	60
	1 Minute/Hour	$L_{1.7}$	70	65
	Any period of time	L_{max}	75	75
Interior Noise Standards				
	5 Minutes/Hour	$L_{8.3}$	-	-
	1 Minute/Hour	$L_{1.7}$	-	-
	Any period of time	L_{max}	-	-

*Construction Noise Exemption Times: 6:00 a.m. - 8:00 p.m. Weekdays
7:00 a.m. - 8:00 p.m. Weekends
** dBA reduction for impact noise during non-exempt times
Source: Sacramento County Municipal Code, Chapter 6.68.070

Table C. Noise Ordinance Standards (Placer County).*

	Noise Levels not to be Exceeded in Residential Zone (dBA)**	
Sound Level Descriptor	7 a.m. to 10 p.m. (daytime)	10 p.m. to 7 a.m. (nighttime)
Hourly Leq	55	45
Any Period of Time (L_{max})	70	65

*Construction Noise Exemption Times: 6:00 a.m. – 8:00 p.m. Weekdays
8:00 a.m. – 8:00 p.m. Weekends

**5 dBA reduction for impact noise during non-exempt times

SOURCE: Placer County Code, Chapter 9.36.

APPENDIX I

CULTURAL RESOURCES APPENDIX

Folsom Dam Raise Project Section 106 Consultation Record with Native American Tribes and Interested Parties*

***May not include all communication for project.**

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
1/29/2014	Outgoing Email	United Auburn Indian Community (UAIC)	Marcos Guerrero	Requested that if the UAIC is interested in meeting to discuss a Programmatic Agreement for future Corps Section 106 undertakings at Folsom Dam and Lake to send three available dates in February.
1/29/2014	Incoming Email	UAIC	Marcos Guerrero	In response to email above, proposed February 12, 14, or 21.
1/29/2014	Outgoing Email	UAIC	Marcos Guerrero	Response to Mr. Guerrero's proposed dates for a meeting to discuss Programmatic Agreement for future Corps Section 106 undertakings at Folsom, asked who UAIC would like to attend (other tribes or individuals) and who at the Corps should attend.
1/29/2014	Incoming Email	UAIC	Marcos Guerrero	In response to email above asking about who should attend meeting to discuss Programmatic Agreement, will ask the committee and reply back on 1/30/14.
1/30/2014	Outgoing Email	UAIC, Shingle Springs Band of Miwok Indians (SSBMI), Tsi-Akim Maidu (TAM), Wilton Rancheria (WR)	Marcos Guerrero, Jason Camp, Andrew Godsey, Daniel Fonseca, Steven Hutchason, Grayson Coney	Provided public meeting letter with dates, times, and locations of the Folsom Dam Raise public meetings on 2/19/14 and 2/24/14.
2/21/2014	Outgoing Email	UAIC, SSBMI, WR, TAM	Marcos Guerrero, Jason Camp, Andrew Godsey, Daniel Fonseca, Steven Hutchason, Grayson Coney	Proposed meeting dates in March on 3/19, 3/25, or 3/31 for meeting to discuss the Corps' Section 106 undertakings at Folsom: Water Control Manual, Dam Raise. Proposed general agenda to provide information on the projects, project schedules, the Corps' plan to comply with Section 106, and hear the tribes' concerns, areas of interest, how they want to be involved.
2/24/2014	Incoming Email	UAIC	Marcos Guerrero	Response from Mr. Guerrero that 3/31/14 would be best for a meeting with the UAIC, but all dates presently available.
2/24/2014	Outgoing Email	UAIC	Marcos Guerrero	Acknowledgement of email received 2/24/14, will follow up once additional information and responses received.
2/26/2014	Outgoing Email	SSBMI, TAM, WR	Andrew Godsey, Daniel Fonseca, Steven Hutchason, Grayson Coney	Follow up to email sent 2/24/14 to ask tribes who have not responded for their availability on 3/19, 3/25, or 3/31. Asked for a response in order to schedule a meeting by the end of the week (2/28/14).

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
2/28/2014	Outgoing Meeting Invitation	UAIC, SSBMI, WR, TAM	Marcos Guerrero, Jason Camp, Andrew Godsey, Daniel Fonseca, Steven Hutchason, Grayson Coney	Meeting invitation sent to tribes to request a meeting on 3/19/14 at DWR offices to discuss Corps Section 106 undertakings at Folsom (Water Control Manual and Dam Raise).
2/28/2014	Incoming Email	UAIC	Marcos Guerrero	Mr. Guerrero accepted meeting invitation for 3/19/14.
3/4/2014	Incoming Email	UAIC	Melodi McAdams	Ms. McAdams accepted meeting invitation for 3/19/14.
3/13/2014	Outgoing Meeting Invitation	UAIC, SSBMI, WR, TAM	Marcos Guerrero, Jason Camp, Andrew Godsey, Daniel Fonseca, Steven Hutchason, Grayson Coney	Meeting update for meeting invitation sent 2/28/14, stating that United Auburn has RSVPed, and that if other tribal representatives are not available to get in touch with Melissa Montag to schedule another date and time for a meeting.
3/13/2014	Incoming Email	SSBMI	Andrew Godsey	Mr. Godsey accepted meeting invitation for 3/19/14.
3/19/2014	Incoming Email	WR	Steven Hutchason	Mr. Hutchason accepted meeting invitation for 3/19/14.
3/19/2014	Meeting	UIAC, SSBMI, WR	Marcos Guerrero, Jason Camp, Andrew Godsey, Kara Perry, Steven Hutchason	Meeting held with Native American tribal representatives, the Bureau of Reclamation, California Department of Water Resources to discuss the Corps' Section 106 undertakings at Folsom (Water Control Manual and Dam Raise).
3/20/2014	Outgoing Email	UIAC, SSBMI, WR	Marcos Guerrero, Jason Camp, Andrew Godsey, Kara Perry, Steven Hutchason	Forwarded Reclamation Sedimentation Survey from 2005 for Folsom Lake and Dam, as requested during 3/19/14 meeting.
7/22/2014	Incoming Email	UAIC	Marcos Guerrero	Email from Mr. Guerrero with subject line "Folsom Dam Safety Project" indicated the UAIC is "under the impression the that project will definitely have an adverse effect on historic properties, human remains, and funerary objects." Referenced a July 16 letter for the supplemental V EA/DEIR and asked about the progress of the proposed PA.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
7/22/2014	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	Response to 7/22/14 email from Mr. Guerrero asking if he is referring to the JFP Phase IV project and asking if UAIC believes historic properties will be adversely affect by the JFP that UAIC identify which historic properties within the JFP APE and how UAIC has determined the JFP will be adversely affecting those historic properties. Due to the many projects at Folsom, Ms. Montag responded to try and clarify which project Mr. Guerrero is referring to. Ms. Montag clarified that Dam Safety is specifically Reclamation's authority at Folsom and that a PA for the Dam Raise and Water Control Manual projects is still in progress and that UAIC's interest is known and they will be re-engaged with when there is additional information to provide. Offered to discuss by phone if there are further questions.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
1/13/2015	Outgoing Letter	Strawberry Valley Rancheria (SVR), California Valley Miwok Tribe, Ione Band of Miwok Indians (IBMI), UAIC, Yocha Dehe Wintun Nation, Tsi-Akim Maidu, Colfax-Todds Consolidated Tribe, Jackson Rancheria Band of Miwuk Indians, Mechoopda Indian Tribe of Chico Rancheria (Mechoopda), El Dorado Miwok Tribe, SSBMI, WR, Buena Vista Rancheria (BVR), Cachil DeHe Band of Wintun Indians of the Colusa Indian Community of the Colusa Rancheria, Enterprise Rancheria of Maidu Indians (ERMI), Mooretown Rancheria of Maidu Indians, Nashville-El Dorado Miwok, Cortina Wintun Environmental Protection Agency	Cathy Bishop, Silvia Burley, Anthony Burris, Jason Camp, Cynthia Clarke, Grayson Coney, Pamela Cubbler, Adam Dalton, Michael DeSpain, Rose Enos, Kesner Flores, Nicholas Fonseca, Daniel Fonseca, Andrew Franklin, Reno Franklin, Andrew Godsey, Marcos Guerrero, Steven Hutchason, Leland Kinter, Roselynn Lwenya, Judith Marks, Marshall McKay, Yvonne Miller, Ambar Mohammed, Eileen Moon, Glenda Nelson, April Wallace Moore, Rhonda Pope, Dennis Ramirez, Don Ryberg, Guy Taylor, Cosme Valdez, Gene Whitehouse, Charlie Wright, Randy Yonemura	Letters sent to Native American Tribes invited them to open forum meetings scheduled for 1/26/15 and 2/2/15 at locations in downtown Sacramento and Folsom. Letters included project descriptions for Folsom Dam Raise and Water Control Manual Update projects, information on partners on project, project purpose and description, maps of preliminary APEs.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
1/14/2015	Outgoing Email	SVR, UAIC, TAM, Mechoopda, IBMI, SSBMI, ERMI, WR, BVR	Cathy Bishop, Jason Camp, Grayson Coney, Michael DeSpain, Randy Yonemura, Kesner Flores, Yvonne Miller, Daniel Fonseca, Andrew Godsey, Kara Perry, Cynthia Franco, Reno Franklin, Marcos Guerrero, Steven Hutchason, Roselynn Lwenya, Rhonda Pope	Email transmittal to available email addresses of 1/13/15 letter.
1/14/2015	Incoming Email		Kesner Flores, IBMI	Emails to Mr. Flores and IBMI main email address were returned as undeliverable.
1/16/2015	Incoming Voice Mail	Mechoopda	Mike DeSpain	Left message to refer comments on the projects to UAIC, SSBMI, and BVR.
1/23/2015	Outgoing Email	Mechoopda	Mike DeSpain	In reply to voice message left on 1/16/15, acknowledged that the Corps has also sent information on the projects to UAIC, SSBMI, and BVR and that the tribe has referred comments on those projects to those tribes.
1/26/2015	Open Forum for Tribes	UAIC	Marcos Guerrero, Jason Camp, Donald Rey	Open forum included maps and project information, staff from Department of Water Resources, Bureau of Reclamation, Corps environmental and cultural resources. Three representatives from UAIC were present. They asked questions about the project scope, expressed concerns that the Corps had begun survey and inventory efforts without consulting or notifying the tribes, that the Corps was not operating in a way that was reasonable and in good faith, and expressed concerns that there could be areas of concern within the project and survey areas. Ms. Melissa Montag stated that surveys were undertaken as part of efforts to begin identification of historic properties, that the Corps will continue to work with the tribes within efforts to comply with Section 106, proposed a meeting in the field in March.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
1/28/2015	Incoming Email	UAIC	Marcos Guerrero	Mr. Guerrero reiterated UAIC's concerns about the survey and inventory undertaken without consulting or notifying the tribe, asked for availability for a follow up meeting, asked if it was necessary for the Corps to obtain an ARPA permit, asked how the survey would be reported, and requested contact information for the archeologist conducting the survey at Folsom.
1/29/2015	Outgoing Email	UAIC	Marcos Guerrero, Mark Gilfillan, Donald Rey, Jason Camp, John Williams	In response to 1/28/15 email, proposed three possible dates in March for a site visit to see project area, learn about areas of concern to the tribe, and of any sacred sites or traditional cultural areas. Stated that the Corps is committed to working together with Reclamation, DWR, and tribes on the project and will convey information when it is appropriate. Responded that an ARPA permit was not necessary and the inventory report will be provided when it is completed, a date for which is unknown at this time. Stated that the survey efforts are being conducted by an archeologist meeting the required qualifications and the Corps is not able to provided resume or cell phone as this is private information though the tribe may submit a FOIA request. Asked that questions or information be provided to Ms. Montag or Ms. Jane Rinck.
1/29/2015	Incoming Email	UAIC	Marcos Guerrero	In response to Ms. Montag's email on 1/29/15, Mr. Guerrero stated that it is standard ethical practice to include resumes and qualifications statements in all survey reports, and that most ethical archeologists do not have a problem sharing this information. Unsolicited Mr. Guerrero also included his resume and chart of current projects. Mr. Guerrero further stated that UAIC feels it would be better to wait for the site visit until after the tribe has reviewed the report, requested to know when the report would be completed. He also stated that UAIC considers "these places" (none specifically identified) as significant and eligible for listing in the NRHP, and that operations of Folsom Lake continue to adversely effect the integrity of the resources.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
1/30/2015	Outgoing Email	UAIC	Marcos Guerrero, Mark Gilfillan, Donald Rey, Jason Camp, John Williams	In response to Mr. Guerrero's email on 1/29/15, Ms. Montag stated that if it is UAIC's preference to wait until after the survey report is completed that is acceptable, but if UAIC would like to provide any information for the Corps to consider for inclusion into the survey report (information on sites, prehistoric context, ethnographic context) those would be topics that can be discussed at a meeting in March. The estimated completion date for the survey report is presently late March or early April. Suggested March 3, 4, or 18 to meet.
1/30/2015	Incoming Email	UAIC	Marcos Guerrero	Mr. Guerrero stated he would discuss the invitation from the Corps to provide information into the Corps' survey report with the tribal preservation committee and the UAIC THPO. Further stated: "Per previous discussions, since it would still be possible to have the draft survey updated to include the information we provide, it would probably be best to wait for this time to be sure that our comments and potential areas of concern get included into the final report." Suggested to have the site visit on March 3 to meet the archoelogist for the project and get a project update.
2/2/2015	Outgoing Email	UAIC	Marcos Guerrero, Mark Gilfillan, Donald Rey, Jason Camp, John Williams	In response to Mr. Guerrero's email on 1/30/15, Ms. Montag suggested the tenative March 3rd at 10AM time to meet, and to meet at Beals Point area. Stated that access to Dikes 1-6 would be possible, but if UAIC would like to see wing dams, Dikes 7-8, or MIAD that additional notice would be needed due to active construction and security concerns. Asked if there are additional Corps staff or other members of tribes to invite that UAIC let Ms. Montag know in order to coordinate with them.
2/2/2015	Open Forum for Tribes	None	None	Open forum included maps and project information, staff from Department of Water Resources, Bureau of Reclamation, Corps environmental and cultural resources. There were no attendees from tribes.
2/3/2015	Incoming Email	UAIC	Marcos Guerrero	Asked for confirmation of areas currently under construction.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
2/3/2015	Outgoing Email	UAIC	Marcos Guerrero	Clarified that areas under construction are for the Corps' JFP construction project and provided a map of the current APE where construction activities could be occurring. Also explained that areas around the right and left wing dams are considered high security and require an escort. Provided the information that archeologist who conducted survey for Folsom Dam Raise won't be back in March as planned but suggested still having site visit on March 3rd as planned to hear the tribe's concerns about the project, or the meeting could be deferred to April if the tribe would like to discuss more specifics of the survey. Asked the tribe to respond with their preference.
2/3/2015	Returned Letter	El Dorado Miwok Tribe		Returned 1/13/15 letter as "Unable to forward. Forward expired 2+ years ago."
2/5/2015	Outgoing Meeting Invitation	UAIC	Marcos Guerrero, Jason Camp	Meeting invitation sent to UAIC to meet at Beals Point on 3/3/15, included information that Dikes 1-6 can be visited, update on project will be provided, the Corps is interested in hearing about sites of concern, sacred sites, TCPs.
2/5/2015	Incoming Meeting Acceptance	UAIC	Jason Camp	Accepted 3/3/15 meeting invitation.
2/5/2015	Incoming Meeting Acceptance	UAIC	Marcos Guerrero	Accepted 3/3/15 meeting invitation.
2/5/2015	Returned Letter	Colfax-Todds Valley Consolidated Tribe	Pamela Cubbler	Returned 1/13/15 letter as "Not deliverable as addressed--unable to forward."
2/9/2015	Returned Letter		Kesner Flores	Returned 1/13/15 letter as "Not deliverable as addressed--unable to forward."
3/2/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	Sent email to remind parties about field visit on 3/3/15.
3/2/2015	Incoming Email	UAIC	Marcos Guerrero	Asked if the archeologist would be present at site visit and if inventory report would be done.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
3/2/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	In reply to Mr. Guerrero's 3/2/15 email, reiterated from email sent 2/3/15 that due to scheduling conflicts the archeologist who completed the survey will not be able to be present, Corps and Reclamation archeologists will be. Since the tribe has previously stated there are sites of concern, the site visit is an opportunity for the Corps to get information on those sites so they may be considered for inclusion in the survey report, which is not yet completed.
3/2/2015	Incoming Email	UAIC	Marcos Guerrero	In reply to 3/2/15, stated that the UAIC THPO, Jason Camp, would prefer to wait to have the site visit until after reviewing the draft inventory report. Asked if it would be possible for the archeologist who conducted survey to be present at site visit and when report might be complete. Further stated that the tribe is well aware of sites within the Corps' project area, that those properties listed in the tribe's inventory are considered eligible, and that ongoing activities at the reservoir are resulting in adverse effects.
3/3/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Mark Gilfillan	Cancelling site visit at the tribe's request, to be rescheduled when the inventory and survey report is complete. Stated that the Corps is not able to provide draft reports for review outside the Corps and that the Corps has been attempting to consult to UAIC to identofy historic properties the Corps should consider for the Dam Raise Project and to include that information in the inventory report. Reiterated that the tribe has expressed they are aware of locations of cultural sites in the project area but is choosing at this time not to participate in the Corps identification efforts. Stated the inventory report will likely be completed mid to late April and the Corps will consult with tribes and SHPO on the findings of the report at that time, and Ms. Montag will be back in touch then to schedule the site visit. Stated again the Corps is interested in information UAIC is willing to share to be considered in the Section 106 process. Stated that the ongoing reservoir opertions and the potential effects to historic properties are under Reclamation authority.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
3/3/2015	Outgoing Letters	UAIC, SSBMI, WR, TAM	Gene Whitehouse, Marcos Guerrero, Jason Camp, Nicholas Fonseca, Daniel Fonseca, Andrew Godsey, Andrew Franklin, Steven Hutchason, Dan Ryberg, Grayson Coney, Eileen Moon	Letters sent to Native American Tribes within project area for Folsom Dam Raise with project description for the Corps' Folsom Dam Project, maps of the preliminarily defined APE, invites consultion from tribe on the project, requests comments on the APE, and any information the tribe may be willing to share to assist the Corps with identifying historic properties.
3/3/2015	Incoming Email	UAIC	Marcos Guerrero, Jason Camp, Mark Gilfillan	In response to email sent 3/3/15, Mr. Guerrero responded that UAIC hopes the Corps would consider effects of the operation of Folsom Dam as negative to cultural resources, and that he recommends Folsom Lake as an archaeological district that should be evaluated as such. Stated he will discuss with UAIC committee how to disclose TCPs for evaluation and asked for a time to discuss this. Further started UAIC has been participating in consultation and that the Corps chose to complete surveys without consulting with the tribe who had expressed an interest to participate. Asked if UAIC would not be able to comment on the survey report. Stated that once the Corps has completed the survey report UAIC can compate locations with the UAIC inventory. Suggested that the Corps is not senstive to handling information on sacred sites and asked if since the project is on federal land if NAGPRA applies. Also stated that UAIC would welcome the Corps' tribal liaison to come and see the tribe's database if USACE needs to confirm information.
3/5/2015	Outgoing Email	UAIC, SSBMI, WR, TAM	Marcos Guerrero, Jason Camp, Daniel Fonseca, Andrew Godsey, Kara Perry, Steven Hutchason, Grayson Coney	Email transmittal to available email addressed of 3/3/15 letter. Asked tribe to contact Ms. Montag if they would like to schedule a consultation meeting or have any questions.
3/5/2015	Returned Letter	TAM	Eileen Moon, Don Ryberg	Letters dated 3/3/15 to Ms. Moon and Mr. Ryberg were returned as "Unclaimed Unable to Forward."
3/5/2015	Outgoing Email	TAM	Grayson Coney	Sent an email to Mr. Coney to ask if he has updated addresses for Ms. Moon and Mr. Ryberg to send the returned letters to.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
3/6/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Mark Gilfillan	In response to Mr. Guerrero's 3/3/15 email, replied that the Corps will consider comments from his email and suggested meeting to discuss locations of TCPs for consideration for the project. Asked for availability the week of March 16th and 23rd. Stated the Corps welcomes the opportunity for Mark to look at the UAIC database.
3/9/2015	Incoming Email	UAIC	Marcos Guerrero	In response to 3/6/15 email, proposed 3/23/15 at UAIC at 1PM to meet.
3/9/2015	Incoming Email	UAIC	Marcos Guerrero	In reply to 3/5/15 email, Mr. Guerrero stated that UAIC is aware of burials, arch sites and traditional cultural properties within the Corps' work areas. Asked for a copy of complete survey report.
3/10/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Mark Gilfillan	In reply to 3/9/15 email, confirmed 3/23/15 at UAIC at 1PM to meet would work. Asked that Mr. Guerrero let the Corps know if they would like other technical staff present.
3/10/2015	Incoming Email	UAIC	Marcos Guerrero	In reply to 3/10/15 email, Mr. Guerrero asked to meet when Mark Gilfillan is available in order to have time to include the committee.
3/10/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp, Melodi McAdams, Mark Gilfillan	In reply to 3/10/15 email, Ms. Montag stated meeting will attempt to be scheduled when Mark Gilfillan is available to attend in person or by phone. Asked Mark for his availability the week or March 30th or April 6th.
3/16/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	In reply to 3/9/15 email, Ms. Montag stated the survey report is not complete yet and UAIC will be notified when the report is available.
3/16/2015	Incoming Email	UAIC	Marcos Guerrero	In reply to 3/16/15 email, Mr. Guerrero stated that once UAIC receives the survey report they will be able to review and comment based on the tribe's previous inventories of the project area. Further stated that usually the tribe would have provided this information prior to identification and survey effort but because they have not been involved UAIC will wait until the survey report has been distributed. After they have reviewed the results UAIC would like to schedule a field visit.
4/21/2015	Incoming Email	UAIC	Marcos Guerrero	Reiterated UAIC's interest in the project, their wish to meet to discuss the survey report, requested a burial and treatment plan.
7/16/2015	Incoming Email	UAIC	Marcos Guerrero	Asked if the survey report has been completed and if UAIC could review the finds from the survey.
7/21/2015	Outgoing Email	UAIC	Marcos Guerrero, Jason Camp	In response to 7/16/15 email, Ms. Montag stated that the survey report is not yet complete but should be done in a few weeks. The survey identified one site, site forms are being finalized and will be provided as soon as they are available.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
3/4/2016	Outgoing Email	UAIC, SSBMI, WR, TAM	Marcos Guerrero, Jason Camp, Kara Perry, Cynthia Franco, Daniel Fonseca, Steven Hutchason, Antonio Ruiz, Grayson Coney, TAM main email	Provided information about review of cultural resources inventory report for Folsom Dam Raise Project, that report would be available through AMRDEC for 14 days and comments are requested by COB 4/4/16. Requested any information the tribes are willing to share about sites within the project APE of importance to the tribes so it may be considered for the final survey report and upcoming draft EIS.
3/4/2016	Incoming Email	TAM	TAM main email	Email to the main TAM email (akimmaidu@att.net) failed to deliver.
3/4/2016	File Pick Up	SSBMI	Kara Perry	Ms. Perry downloaded the Folsom Dam Raise inventory report via AMRDEC.
3/7/2016	Incoming Email	UAIC	Marcos Guerrero	Mr. Guerrero asked if it would be possible to set up a working group meeting to discuss the report and project.
3/7/2016	File Pick Up	UAIC	Marcos Guerrero	Mr. Guerrero downloaded the Folsom Dam Raise inventory report via AMRDEC.
3/7/2016	Outgoing Email	UAIC, SSBMI, WR, TAM	Marcos Guerrero, Jason Camp, Kara Perry, Cynthia Franco, Daniel Fonseca, Steven Hutchason, Antonio Ruiz, Grayson Coney, TAM main email	In response to 3/7/16 email from Mr. Guerrero, Ms. Montag stated the Corps would be willing to meet with the tribes regarding the project and report. Requested information on what they envision the meeting would be in terms of meeting attendees, agenda topics, logistics. Also stated that as the details for the meeting get worked out the Corps is looking forward to receiving comments from the tribe by 4/4/16.
3/7/2016	Incoming Email	UAIC	Marcos Guerrero	In response to Ms. Montag's email on 3/7/16, Mr. Guerrero suggested a consultation meeting could address topics of concern to the tribes and should include the tribes in the email chain. He also suggested someone should take notes so the notes can be included in the official record.
3/10/2016	Outgoing Email	UAIC, SSBMI, WR, TAM	Marcos Guerrero, Jason Camp, Kara Perry, Cynthia Franco, Daniel Fonseca, Steven Hutchason, Antonio Ruiz, Grayson Coney, TAM main email	Ms. Montag asked tribes (per Mr. Guerrero's email) to please respond by 3/18/16 with their interest in attending a consultation meeting as suggested, specific agenda topics, and availability to meet the weeks of March 28th and April 4th.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
4/12/2016	Outgoing Email	UAIC, SSBMI, WR, TAM	Marcos Guerrero, Jason Camp, Kara Perry, Cynthia Franco, Daniel Fonseca, Steven Hutchason, Antonio Ruiz, Grayson Coney, TAM main email	Follow up to 3/4/16 and 3/10/16 emails extending review period of inventory report to 5PM 4/18/16 and asking the tribes to notify Ms. Montag if there is interest in scheduling a consultation meeting on the report or project.
4/22/2016	Incoming Email	UAIC	Marcos Guerrero	In reply to 4/12/16 email, Mr. Guerrero asked about results from cultural survey completed a few years ago and who to ask for results, as well as if a FOIA request is needed. Suggested a face-to-face meeting as appropriate, that tribes have interest in the project but little effort to consult with government or staff is occurring.
4/22/2016	Incoming Email	UAIC	Marcos Guerrero	Requested an electronic version of the report mentioned in 4/12/16 email and UAIC requested an extension on the comment review period.
4/22/2016	Outgoing Email	UAIC, SSBMI, WR, TAM	Marcos Guerrero, Jason Camp, Kara Perry, Cynthia Franco, Daniel Fonseca, Steven Hutchason, Antonio Ruiz, Grayson Coney, TAM main email	In response to 4/22/16 email requesting electronic version of the report, Ms. Montag noted the report was uploaded and downloaded by Mr. Guerrero on 3/7/16 and asked if he needed it uploading again. Report is too large to send by email but can be uploaded for those who request it. Ms. Montag also requested the date UAIC is requesting to extend their review period to and stated the Corps would consider the request.
4/22/2016	Incoming Email	UAIC	Marcos Guerrero	In reply to 4/22/16 email, Mr. Guerrero request the report be sent again to the group on the email.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
4/22/2016	Outgoing Email	UAIC, SSBMI, WR, TAM	Marcos Guerrero, Jason Camp, Kara Perry, Cynthia Franco, Daniel Fonseca, Steven Hutchason, Antonio Ruiz, Grayson Coney, TAM main email	In response to 4/22/16 email asking about survey results and if a FOIA request is needed, Ms. Montag asked for clarification on what survey results UAIC feels it has not received. Ms. Montag stated that all survey results have been provided in draft form in the draft report submitted to tribes for review on 3/4/16 and that the draft is being provided to give tribes the opportunity to comment before the document is finalized and before decisions are made. Letter correspondence has not occurred recently as these are draft documents provided to tribes to review. Ms. Montag stated a FOIA request may be submitted but any documents the tribe requests that the Corps is able to legally provide will be provided, but further clarification on what the tribe is looking for is needed. Further, the Corps is open to holding a meeting and has made several attempts to schedule a meeting but has not heard back from tribes. Ms. Montag requested available dates between May 26-June 10 to schedule a meeting.
4/22/2016	File Pick Up	SSBMI	Kara Perry	Ms. Perry downloaded the Folsom Dam Raise inventory report via AMRDEC.
4/22/2016	Incoming Email	SSBMI	Kara Perry	In reply to uploaded inventory report, Ms. Perry stated at that time the only concern the tribe has is the isolated find and further discussion can occur at the future meeting.
5/3/2016	Incoming Email	UAIC	Marcos Guerrero	UAIC provided availability for a meeting later in May. Expressed concern that there was little to no evidence of Native American occupation as this is contrary to information UAIC has on file. Requested copies of surveyer's resumes. Also stated the project is subject to NAGPRA and asked how the Corps will deal with this.
5/11/2016	Outgoing Email	UAIC, SSBMI, WR, TAM	Marcos Guerrero, Jason Camp, Kara Perry, Cynthia Franco, Daniel Fonseca, Steven Hutchason, Antonio Ruiz, Grayson Coney, TAM main email	Requested availability from tribes to meet the week of June 13th, and to reply to Jane Rinck by May 27th with availability. In reply to Mr. Guerrero's request for resumes, Ms. Montag stated it is Corps policy not to release resumes and that all individuals completing work meet the Secretary of the Interior's professional qualifications standards for their technical area.
5/12/2016	Incoming Email	UAIC	Marcos Guerrero	In response to 5/11/16 email, Mr. Guerrero stated UAIC is available June 13-16.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
5/12/2016	Outgoing Meeting Invitation	UAIC	Marcos Guerrero, Melodi McAdams, Matthew Moore	Jane Rinck sent meeting request for June 14th to discuss the Corps' Folsom Dam Raise Project to UAIC staff.
5/23/2016	Incoming Email	Wilton Rancheria	Antonio Ruiz	Mr. Ruiz stated Wilton Rancheria is unavailable to meet the week or June 13th but asked to be kept appraised of what occurs at the meeting, future site visits, and electronic/hard copies of documents provided at the meeting, sign in sheet, and meeting minutes.
6/6/2016	Outgoing Meeting Invitation	SSBMI, TAM	Cynthia Franco, Kara Perry, Daniel Fonseca, Grayson Coney	Ms. Montag forwarded 6/14/16 meeting request to SSBMI and TAM, stated that if that meeting date does not work for the tribes and they would like to meet separately to contact Ms. Montag.
6/9/2016	Incoming Email	UAIC	Marcos Guerrero	Mr. Guerrero request GIS shapefiles of the APE to prepare for meeting on 6/14/16.
6/10/2016	Outgoing Email	UAIC	Marcos Guerrero, Melodi McAdams, Matthew Moore	In reply to 6/9/16 email, Ms. Montag provided the GIS shapefiles for the APE to include recreation trails, haul roads, dikes and 50 foot buffer, and staging areas.
6/14/2016	Consultation Meeting	DWR, Reclamation, Corps, UAIC	Jacqueline Wait, David Martasian, Laureen Perry, Scott Williams, Melissa Montag, Jane Rinck, Mariah Brumbaugh	As requested by UAIC, this meeting was scheduled for 6/14/16 and invitations sent 5/12/16. No representatives from UAIC attended the meeting and no notification of cancellation was received prior to the meeting.
6/14/2016	Incoming Email	UAIC	Marcos Guerrero	Mr. Guerrero responded in an email to Ms. Rinck several hours after the scheduled meeting time that the meeting fell off his calendar but that was perhaps better since other tribes had not been available. He asked about rescheduling the meeting.
6/15/2016	Outgoing Email	UAIC, SSBMI, WR, TAM, DWR, Reclamation	Marcos Guerrero, Melodi McAdams, Matthew Moore, Cynthia Franco, Kara Perry, Daniel Fonseca, Grayson Coney, Antonio Ruiz, Steven Hutchason, Jacqueline Wait, David Martasian, Laureen Perry, Scott Williams	In response to Mr. Guerrero's 6/14/16 email, Ms. Rinck stated that in consideration of everyone's time and in light of agency heads being available to attend a meeting the tribes did not, that it would be best to wait on scheduling a meeting until specific comments on the survey report are submitted. Updated APE maps were provided, and comments requested by 7/1/16, at which point the Corps will finalize the report. Ms. Rinck also stated that 36 CFR 800.13 will be followed in the event of previously unknown historic properties, and NAGPRA in the event of items subject to that law. Provided information that the draft EIS will be released in late June and tribes will receive the document for review and comment.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
6/30/2016	Incoming Email	UAIC	Melodi McAdams	Ms. McAdams forwarded an ethnohistory written as part of work completed in Old Folsom. In a separate email Ms. McAdams provided sensivity maps of the Folsom Dam Raise Project APE and areas of sensitivity as well as "known cultural resources," some of which overlap with the Corps' APE. Ms. McAdams also provided a brief list of several sites known to the tribe and stated they are significant, but no further elaboration was provided regarding the specifics of why sites are important, simply that they exist within or near the APE.
7/5/2016	Incoming Email	UAIC	Marcos Guerrero	In reference to a Reclamation trail restoration project, Mr. Guerrero included Ms. Montag on an email stating the tribe would like to set up a site visit in conjunction with a site visit UAIC is trying to set up for the "folsom dam levee raise project."
7/5/2016	Incoming Email	Reclamation	John Fogerty	In reply to Mr. Guerrero's 7/5/16 email, Mr. Fogerty stated he would be happy to meet with UAIC around a site visit for the Corps project.
7/6/2016	Outgoing Email	UAIC	Marcos Guerrero, Melodi McAdams, Matthew Moore, Jane Rinck	In reply to Ms. McAdams' email on 6/30/16, Ms. Montag requested additional specific information on the sites identified by the tribe in order to make National Register determinations and in order to evaluate possible effects to historic properties as a result of the Corps' project. Also requested to be allowed to share information sent by UAIC with Reclamation and DWR, and asked for clarification on if a buffer area was applied around the sites noted by UAIC on their sensitivity maps. Requested information be provided by 7/22/16 for consideration in the Section 106 compliance process.
7/6/2016	Outgoing Email	UAIC	Marcos Guerrero, Matthew Moore, Laureen Perry, John Fogerty, Scott Williams	In reply to 7/5/16 emails, Ms. Montag stated although scheduling a meeting for the Corps project is not something she is aware of occuring, the Corps is not opposed to meeting. Suggested including Scott Williams as the Reclamation contact person, and that UAIC propose some dates for a meeting.

Folsom Dam Raise Project Section 106 Consultation Record with SHPO*

***May not include all communication for project.

Date	Type of Contact	Organization	Person Contacted	Contents of Communication
3/3/2015	Outgoing Letter	SHPO	Jessica Tudor	Initial letter identifying the area of potential effects (APE) for project and requesting comments. Provided project description, proposed identification efforts, any comments.
3/6/2015	Incoming Email	SHPO	Jessica Tudor	Responded that 3/3/15 letter has been received and SHPO will wait to comment until the Corps has submitted a document that fully addresses the identification efforts and results.
3/16/2015	Outgoing Email	SHPO	Jessica Tudor	In response to 3/6/15 letter, Ms. Montag replied that the letter was to provide the SHPO the opportunity to comment on the APE and description of identification efforts, there is no issue if the SHPO chooses not to comment on those at this time. The results of identification efforts should be complete in a month or so and will be followed up with SHPO at that time.

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

JAN 13 2015

TO NATIVE AMERICAN TRIBES:

The U.S. Army Corps of Engineers, Sacramento District (Corps) and the Central Valley Flood Protection Board (CVFPB) will be holding two open forums to provide information on the Folsom Dam Raise (Dam Raise) and Folsom Dam Water Control Manual Update (Manual Update) and to solicit input from the Native American tribes. The Dam Raise was most recently authorized in the 2004 Energy and Water Development Appropriations Act, Public Law (PL) 108-137, and the Manual Update was authorized in the Water Resources Development Act of 1999, PL 106-53. The Corps and CVFPB are preparing two separate draft Supplemental Environmental Impact Statement/ Environmental Impact Reports (SEIS/SEIR), one for the Dam Raise and one for the Manual Update, to evaluate potential impacts as a result of the independent projects. The Corps will serve as lead agency for compliance with the National Environmental Policy Act (NEPA) and the National Historic Preservation Act of 1966, as amended (NHPA), and CVFPB will serve as lead agency for compliance with the California Environmental Quality Act (CEQA). For the Dam Raise the U.S. Bureau of Reclamation (Reclamation) is an involved party and for the Manual Update Reclamation is a cooperating agency. The Sacramento Area Flood Control Agency is a responsible agency for both projects.

Pursuant to 36 CFR § 800.3(f)(2), the implementing regulations of Section 106 of the NHPA, the Corps has identified you as a Native American tribe that may be interested in consulting on the Dam Raise and the Manual Update. These forums will only be open to Native American tribes.

Folsom Dam and Lake is a multipurpose project operated by Reclamation as a part of the Central Valley Project. The Corps is responsible for prescribing operations pertaining to use of the storage allocated for flood risk management. The dam provides flood risk management benefits to the city of Sacramento and its surrounding areas by regulating runoff from approximately 1,860 square miles of drainage area.

The purpose of the Dam Raise is flood risk management and ecosystem restoration. The Dam Raise is authorized for 4 components: 1) emergency spillway gate modifications; 2) raising the right and left wings of the main dam, Mormon Island Auxiliary Dam (MIAD), and the reservoir dikes (1-8) by 3.5 feet; 3) temperature control shutter automation and reconfiguration; and 4) downstream ecosystem restoration of Bushy Lake and Woodlake. The current Dam Raise analysis will address the flood damage reduction components, the emergency spillway gate modifications and the 3.5 foot raise, which are being prioritized for construction. The Dam Raise project will address the proposed structural modifications to the Folsom Dam, MIAD, and the dikes only. Any changes in operation as a result of the construction of these projects, downstream ecosystem restoration, temperature control shutter automation, and reconfiguration components of the Dam Raise will be addressed in the future. A preliminary area of potential effects (APE) for the Dam Raise is shown in Enclosure 1.

The Folsom Dam Joint Federal Project, currently under construction, consists of a new auxiliary spillway with a crest elevation 50 feet lower in elevation than the current gated spillways on the main dam. In order to fully realize the benefits of the new auxiliary spillway, the current Folsom Dam and Lake Water Control Manual must be updated. The Manual Update will identify, evaluate, and recommend changes to the flood management operation rules of Folsom Dam and Lake to reduce flood risk to the Sacramento area by utilizing the new auxiliary spillway and by incorporating an improved understanding of the American River watershed upstream of Folsom Dam. The findings of the evaluation will be used to help define the Dam's new flood operations plan, with the intention of meeting flood risk management objectives and dam safety requirements in a manner that conserves as much water as possible and maximizes all authorized Folsom Dam project uses to the extent practicable. The Manual Update will not cover operational activities of Folsom Dam and Lake that Reclamation is responsible for. A preliminary APE for the Manual Update is shown in Enclosure 2.

In accordance with Section 106 of the NHPA, the Corps is required to take into account the effects of their undertakings on historic properties. This includes the identification of historic properties, finding of effect, and the resolution of adverse effects through the process identified in 36 CFR § 800. As part of our efforts to identify historic properties and consider the views of Native American tribes, we are inviting you to attend the open forums and consult on the Dam Raise and Manual Update projects. Your input on the above topics and any associated items that are important to you will be used to:

- Further determine the scope of the analysis in the SEIS/SEIR documents and in the efforts to identify historic properties.

- Provide input on the range of alternatives to be evaluated in the SEIS/SEIR.

- Obtain local knowledge or information to assist in the environmental analysis and assessment of adverse effects on historic properties.

Project team staff will be on hand to accept comments and address questions regarding the projects. You will be given the opportunity to provide written and verbal comments at the open forums.

Written comments and suggestions about the Dam Raise and Manual Update may be submitted to Melissa Montag, Corps Cultural, Recreational, & Social Assessment Section. For e-mailed comments, please include "Folsom Dam Raise" or "Folsom Manual Update" in the subject line, attach comments in MS Word format, and include the commenter's U.S. Postal Service mailing address. Questions about the projects and the SEIS/SEIR should be addressed to:

Melissa Montag,
CESPK-PD-RC
1325 J St, Sacramento,
CA 95814
Phone: 916-557-7907
Fax: 916-557-7856
e-mail: Melissa.L.Montag@usace.army.mil

The open forums will be held at the following locations:

Sacramento Library Galleria
828 I Street, Sacramento, CA
January 26th, 2015
5pm to 7pm

Folsom Community Center
52 Natoma Street, Folsom, CA
February 2nd, 2015
5pm to 7pm

For more information please visit the Folsom Dam Raise website at http://www.spk.usace.army.mil/Missions/CivilWorks/FolsomDamRaise.aspx or the Folsom Dam Manual Update website at http://www.spk.usace.army.mil/Missions/CivilWorks/FolsomWaterControlManualUpdate.aspx.

Sincerely,

Alicia E. Kirchner for
Chief, Planning Division

cc: (w/enclosures)
Cathy Bishop, Chairperson, Strawberry Valley Rancheria, 1540 Strader Avenue, Sacramento, CA 95815
Silvia Burley, Chairperson, California Valley Miwok Tribe, 10601 N. Escondido PL, Stockton, CA 95212-9231

Anthony Burris, Ione Band of Miwok Indians, P.O. Box 699, Plymouth, CA 95699
Jason Camp, Tribal Historic Preservation Officer, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, CA 95603
Cynthia Clarke, Yocha Dehe Wintun Nation, P.O. Box 18, Brooks, CA 95606
Grayson Coney, Tsi-Akim Maidu, P.O. Box 1316, Colfax, CA 95713
Pamela Cubbler, Colfax-Todds Valley Consolidated Tribe, P.O. Box 734, Foresthill, CA 95631
Adam Dalton, Chairperson, Jackson Rancheria Band of Miwuk Indians, P.O. Box 1090, Jackson, CA 95642
Michael D. DeSpain, Director of OEPP, Mechoopda Indian Tribe of Chico Rancheria, 125 Mission Ranch Boulevard, Chico, CA 95926
El Dorado Miwok Tribe, P.O. Box 711, El Dorado, CA 95623
Rose Enos, 15310 Bancroft Road, Auburn, CA 95603
Kesner Flores, P.O. Box 1047, Wheatland, CA 95692
Nicolas Fonseca, Chairperson, Shingle Springs Band of Miwok Indians, P.O. Box 1340, Shingle Springs, CA 95682-1340
Daniel Fonseca, Tribal Historic Preservation Officer, Shingle Springs Band of Miwok Indians, P.O. Box 1340, Shingle Springs, CA 95682
Andrew Franklin, Chairperson, Wilton Rancheria, 9728 Kent Street, Elk Grove, CA 95624
Reno Franklin, Tribal Historic Preservation Officer, Enterprise Rancheria of Maidu Indians, 2133 Monte Vista Avenue, Oroville, CA 95966
Andrew Godsey, Assistant Director, Cultural Resources Department, Shingle Springs Band of Miwok Indians, P.O. Box 1340, Shingle Springs, CA 95682
Marcos Guerrero, Cultural Resources Manager, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, CA 95603
Steven Hutchason, Executive Director of Environmental Resources, Wilton Rancheria, 9728 Kent Street, Elk Grove, CA 95624
Leland Kinter, Yocha Dehe Wintun Nation, P.O. Box 18, Brooks, CA 95606
Roselynn Lwenya, Tribal Historic Preservation Officer, Buena Vista Rancheria, 1418 20th Street, Suite 200, Sacramento, CA 95811
Judith Marks, Colfax-Todds Valley Consolidated Tribe, 1068 Silverton Circle, Lincoln, CA 95648
Marshall McKay, Yocha Dehe Wintun Nation, P.O. Box 18, Brooks, CA 95606
Yvonne Miller, Chairperson, Ione Band of Miwok Indians, P.O. Box 699, Plymouth, CA 95669-0699
Ambar Mohammed, Cachil DeHe Band of Wintun Indians of the Colusa Indian Community of the Colusa Rancheria, 3730 State Highway 45 # B, Colusa, CA 95932
Eileen Moon, Vice Chairperson, Tsi-Akim Maidu, 1239 East Main Street, Grass Valley, CA 95945

Glenda Nelson, Chairperson, Enterprise Rancheria of Maidu Indians, 2133 Monte Vista Avenue, Oroville, CA 95966

April Wallace Moore, 19630 Placer Hills Road, Colfax, CA 95713

Rhonda Morningstar Pope, Chairperson, Buena Vista Rancheria, 1418 20th Street, Suite 200, Sacramento, CA 95811

Dennis Ramirez, Chairperson, Mechoopda Indian Tribe of Chico Rancheria, 125 Mission Ranch Boulevard, Chico, CA 95926

Don Ryberg, Chairman, Tsi-Akim Maidu, 1239 East Main Street, Grass Valley, CA 95945

Guy Taylor, Representative, Mooretown Rancheria of Maidu Indians, 31 Alverde Drive, Oroville, CA 95966

Cosme Valdez, Interim Chief Executive Officer, Nashville-El Dorado Miwok, P.O. Box 580986, Elk Grove, CA 95758

Gene Whitehouse, Chairperson, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, CA 95603

Charlie Wright, Chairperson, Cortina Wintun Environmental Protection Agency, P.O. Box 1630, Williams, CA 95987

Randy Yonemura, 4305 39th Avenue, Sacramento, CA 95824

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

Mr. Gene Whitehouse, Chairperson
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, CA 95603

Dear Mr. Whitehouse:

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Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

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

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAR 0 3 2015

Mr. Nicolas Fonseca, Chairperson
Shingle Springs Band of Miwok Indians
P.O. Box 1340
Shingle Springs, CA 95682-1340

Dear Mr. Fonseca:

We are writing with regard to the proposed Folsom Dam Raise Flood Risk Management (Dam Raise FRM) Project. The U.S. Army Corps of Engineers, Sacramento District (Corps), in coordination with the U.S. Bureau of Reclamation (USBR), Central Valley Flood Protection Board, and the Sacramento Area Flood Control Agency, is implementing the Dam Raise FRM in order to provide flood risk management benefits while also resolving certain dam safety issues associated with passing the probable maximum flood. The Dam Raise FRM Project was authorized in the Energy and Water Development Appropriation Act of 2004 based on recommendations contained in the November 2002 Chief of Engineers' Report that were based on findings in the 2002 American River Watershed Long-Term Study Final Supplemental Plan Formulation Report Environmental Impact Statement/Environmental Impact Report.

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Sincerely,

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Chief, Planning Division

Enclosure

cc:
Daniel Fonseca, Tribal Historic Preservation Officer, Shingle Springs Band of Miwok Indians, P.O. Box 1340, Shingle Springs, CA 95682
Andrew Godsey, Assistant Director, Cultural Resources Department, Shingle Springs Band of Miwok Indians, P.O. Box 1340, Shingle Springs, CA 95682

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
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Environmental Resources Branch

MAR 0 3 2015

Mr. Don Ryberg, Chairman
1239 East Main Street
Grass Valley, California 95945

Dear Mr. Ryberg:

We are writing with regard to the proposed Folsom Dam Raise Flood Risk Management (Dam Raise FRM) Project. The U.S. Army Corps of Engineers, Sacramento District (Corps), in coordination with the U.S. Bureau of Reclamation (USBR), Central Valley Flood Protection Board, and the Sacramento Area Flood Control Agency, is implementing the Dam Raise FRM in order to provide flood risk management benefits while also resolving certain dam safety issues associated with passing the probable maximum flood. The Dam Raise FRM Project was authorized in the Energy and Water Development Appropriation Act of 2004 based on recommendations contained in the November 2002 Chief of Engineers' Report that were based on findings in the 2002 American River Watershed Long-Term Study Final Supplemental Plan Formulation Report Environmental Impact Statement/Environmental Impact Report.

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Sincerely,

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Enclosure

cc:
Grayson Coney, Tsi-Akim Maidu, P.O. Box 1316, Colfax, California 95713
Eileen Moon, Vice Chairperson, 1239 East Main Street, Grass Valley, California 95945

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
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Environmental Resources Branch MAR 03 2015

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United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, CA 95603

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Chief, Planning Division

Enclosure

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Marcos Guerrero, Cultural Resources Manager, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603

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SACRAMENTO CA 95814-2922

REPLY TO
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Environmental Resources Branch

MAR 0 3 2015

Mr. Andrew Franklin, Chairperson
Wilton Rancheria
9728 Kent Street
Elk Grove, California 95642

Dear Mr. Franklin:

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Alicia E. Kirchner
Chief, Planning Division

Enclosure

cc:
Stevenson, Hutchason, Executive Director of Environmental Resources, Wilton Rancheria, 9728 Kent Street, Elk Grove, California 95642

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U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

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Enclosure

cc:
Stevenson, Hutchason, Executive Director of Environmental Resources, 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

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAR 03 2015

Mr. Don Ryberg, Chairman
1239 East Main Street
Grass Valley, California 95945

Dear Mr. Ryberg:

We are writing with regard to the proposed Folsom Dam Raise Flood Risk Management (Dam Raise FRM) Project. The U.S. Army Corps of Engineers, Sacramento District (Corps), in coordination with the U.S. Bureau of Reclamation (USBR), Central Valley Flood Protection Board, and the Sacramento Area Flood Control Agency, is implementing the Dam Raise FRM in order to provide flood risk management benefits while also resolving certain dam safety issues associated with passing the probable maximum flood. The Dam Raise FRM Project was authorized in the Energy and Water Development Appropriation Act of 2004 based on recommendations contained in the November 2002 Chief of Engineers' Report that were based on findings in the 2002 American River Watershed Long-Term Study Final Supplemental Plan Formulation Report Environmental Impact Statement/Environmental Impact Report.

We would like to invite your consultation under Section 106 of the National Historic Preservation Act of 1966, as amended. The area of potential effects (APE) for the Dam Raise FRM Project is located at the Folsom Dam Left and Right Wing Dam embankments, Dikes 1-8, and Mormon Island Auxiliary Dam (MIAD) around Folsom Lake in Sacramento, Placer, and El Dorado Counties. The project is located on the Folsom, Rocklin, and Clarkeville, California, 7.5-minute U.S.G.S. topographic maps. A preliminary APE for the Dam Raise FRM Project is shown in the enclosure. The APE includes a 50-foot buffer area around where construction activities may occur at the wing dams, dikes, and MIAD, as well as areas for staging of equipment during construction. Access to these locations will be by existing paved roads around Folsom Lake.

Raising the wing dams, dikes, and MIAD by 3.5 feet would allow for holding discharges longer at 160,000 cubic feet per second, the downstream constraint, by creating additional surcharge space (temporary water storage space utilized during rare flood events) in the reservoir. The authorized top of flood pool would remain at reservoir water surface elevation 468.34 feet NAVD 88. The Section 106 undertaking for the current Dam Raise FRM Project addresses the proposed structural modifications to the wing dams, MIAD, and dikes only. Construction of any of the proposed actions would not substantially alter current overall operations of Folsom Dam, MIAD, and Dikes

1-8. The Dam Raise FRM Project is a construction project that includes emergency spillway gate modifications, and raising the right and left wings of the main dam, MIAD, and the reservoir dikes (1-8) by 3.5 feet.

We have preliminarily determined that the APE includes those areas highlighted and outlined in the enclosure. We have completed a records and literature search at the North Central Information Center at California State University, Sacramento as well as a search of surveys and sites within USBR's records. The only known cultural resources within the APE for the Dam Raise FRM Project are Folsom Dam (CA-SAC-937H), Dikes 1-8 (CA-SAC-1103H), MIAD (CA-ELD-2868H), and CA-SAC-659, a large granite boulder with bedrock mortar cupules. Since the previous surveys for the JFP were conducted in 2006 and 2007 we have begun to conduct updated pedestrian surveys of the APE.

We are sensitive toward the protection of traditional cultural properties and sacred sites, and make every effort to avoid them. If you have comments on the APE, our efforts to identify historic properties, or if you have knowledge of locations of archaeological sites, sacred sites, or areas of traditional cultural value or concern in or near the Dam Raise FRM Project APE, we request that you contact us. 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, 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

Enclosure

cc:
Grayson Coney, Tsi-Akim Maidu, P.O. Box 1316, Colfax, California 95713
Eileen Moon, Vice Chairperson, 1239 East Main Street, Grass Valley, California 95945

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

MAR 0 3 2015

Mr. Nicolas Fonseca, Chairperson
Shingle Springs Band of Miwok Indians
P.O. Box 1340
Shingle Springs, CA 95682-1340

Dear Mr. Fonseca:

We are writing with regard to the proposed Folsom Dam Raise Flood Risk Management (Dam Raise FRM) Project. The U.S. Army Corps of Engineers, Sacramento District (Corps), in coordination with the U.S. Bureau of Reclamation (USBR), Central Valley Flood Protection Board, and the Sacramento Area Flood Control Agency, is implementing the Dam Raise FRM in order to provide flood risk management benefits while also resolving certain dam safety issues associated with passing the probable maximum flood. The Dam Raise FRM Project was authorized in the Energy and Water Development Appropriation Act of 2004 based on recommendations contained in the November 2002 Chief of Engineers' Report that were based on findings in the 2002 American River Watershed Long-Term Study Final Supplemental Plan Formulation Report Environmental Impact Statement/Environmental Impact Report.

We would like to invite your consultation under Section 106 of the National Historic Preservation Act of 1966, as amended. The area of potential effects (APE) for the Dam Raise FRM Project is located at the Folsom Dam Left and Right Wing Dam embankments, Dikes 1-8, and Mormon Island Auxiliary Dam (MIAD) around Folsom Lake in Sacramento, Placer, and El Dorado Counties. The project is located on the Folsom, Rocklin, and Clarkeville, California, 7.5-minute U.S.G.S. topographic maps. A preliminary APE for the Dam Raise FRM Project is shown in the enclosure. The APE includes a 50-foot buffer area around where construction activities may occur at the wing dams, dikes, and MIAD, as well as areas for staging of equipment during construction. Access to these locations will be by existing paved roads around Folsom Lake.

Raising the wing dams, dikes, and MIAD by 3.5 feet would allow for holding discharges longer at 160,000 cubic feet per second, the downstream constraint, by creating additional surcharge space (temporary water storage space utilized during rare flood events) in the reservoir. The authorized top of flood pool would remain at reservoir water surface elevation 468.34 feet NAVD 88. The Section 106 undertaking for the current Dam Raise FRM Project addresses the proposed structural modifications to the wing dams, MIAD, and dikes only. Construction of any of the proposed actions would not substantially alter current overall operations of Folsom Dam, MIAD, and Dikes

1-8. The Dam Raise FRM Project is a construction project that includes emergency spillway gate modifications, and raising the right and left wings of the main dam, MIAD, and the reservoir dikes (1-8) by 3.5 feet.

We have preliminarily determined that the APE includes those areas highlighted and outlined in the enclosure. We have completed a records and literature search at the North Central Information Center at California State University, Sacramento as well as a search of surveys and sites within USBR's records. The only known cultural resources within the APE for the Dam Raise FRM Project are Folsom Dam (CA-SAC-937H), Dikes 1-8 (CA-SAC-1103H), MIAD (CA-ELD-2868H), and CA-SAC-659, a large granite boulder with bedrock mortar cupules. Since the previous surveys for the JFP were conducted in 2006 and 2007 we have begun to conduct updated pedestrian surveys of the APE.

We are sensitive toward the protection of traditional cultural properties and sacred sites, and make every effort to avoid them. If you have comments on the APE, our efforts to identify historic properties, or if you have knowledge of locations of archaeological sites, sacred sites, or areas of traditional cultural value or concern in or near the Dam Raise FRM Project APE, we request that you contact us. 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, 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

Enclosure

cc:
Daniel Fonseca, Tribal Historic Preservation Officer, Shingle Springs Band of Miwok Indians, P.O. Box 1340, Shingle Springs, CA 95682
Andrew Godsey, Assistant Director, Cultural Resources Department, Shingle Springs Band of Miwok Indians, P.O. Box 1340, Shingle Springs, CA 95682

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

MAR 03 2015

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, as amended, we are writing to inform you of the proposed Folsom Dam Raise Flood Risk Management (Dam Raise FRM) Project. The Dam Raise FRM Project was authorized in the Energy and Water Development Appropriation Act of 2004 based on recommendations contained in the November 2002 Chief of Engineers' Report that were based on findings in the 2002 American River Watershed Long-Term Study Final Supplemental Plan Formulation Report Environmental Impact Statement/Environmental Impact Report. The U.S. Army Corps of Engineers, Sacramento District (Corps), in coordination with the U.S. Bureau of Reclamation (USBR), Central Valley Flood Protection Board, and the Sacramento Area Flood Control Agency, is implementing the Dam Raise FRM in order to provide flood risk management benefits while also resolving certain dam safety issues associated with passing the probable maximum flood. Pursuant to 36 CFR Part 800.3 we are initiating the Section 106 process for the Dam Raise FRM Project and we are asking for your comments on our proposed efforts to identify historic properties under 36 CFR Part 800.4. We are also asking for your concurrence with our determination of the area of potential effects (APE) for the Dam Raise FRM Project in accordance with 36 CFR Part 800.4(a)(1).

The APE for the Dam Raise FRM Project is located at the Folsom Dam Left and Right Wing Dam embankments, Dikes 1-8, and Mormon Island Auxiliary Dam (MIAD) around Folsom Lake in Sacramento, Placer, and El Dorado Counties. The project is located on the Folsom, Rocklin, and Clarkeville, California, 7.5-minute U.S.G.S. topographic maps. A preliminary APE for the Dam Raise FRM Project is shown in the enclosure. The APE includes a 50 foot buffer area around where construction activities may occur at the wing dams, dikes, and MIAD, as well as areas for staging of equipment during construction. Access to these locations will be by existing paved roads around Folsom Lake.

Raising the wing dams, dikes, and MIAD by 3.5 feet would allow for holding discharges longer at 160,000 cubic feet per second, the downstream constraint, by creating additional surcharge space (temporary water storage space utilized during rare flood events) in the reservoir. The authorized top of flood pool would remain at reservoir water surface elevation 468.34 feet NAVD 88. The Section 106 undertaking for the current Dam Raise FRM Project addresses the proposed structural modifications to the wing dams, MIAD, and dikes only. Construction of any of the proposed actions would not substantially alter current overall operations of Folsom Dam, MIAD, and Dikes 1-8. The Dam Raise FRM Project is a construction project that includes emergency spillway gate modifications, and raising the right and left wings of the main dam, MIAD, and the reservoir dikes (1-8) by 3.5 feet.

We have preliminarily determined that the APE includes those areas highlighted and outlined in the enclosure. We invite any comments you may have on our preliminary determination of the APE for the Dam Raise FRM Project. Most of the APE was included in Section 106 consultation conducted by the USBR for their Dam Safety Project under the Joint Federal Project (JFP) in 2006 and 2007 (reference number BUR061114A) and during our previous consultation for the Phases I-IV of the Corps' JFP (reference number COE081120C). We would also like to ask for your comments on our proposed efforts to identify historic properties as outlined below.

We have completed a records and literature search at the North Central Information Center at California State University, Sacramento as well as a search of surveys and sites within USBR's records. The only known cultural resources within the APE for the Dam Raise FRM Project are Folsom Dam (CA-SAC-937H), Dikes 1-8 (CA-SAC-1103H), MIAD (CA-ELD-2868H), and CA-SAC-659, a large granite boulder with bedrock mortar cupules. Since the previous surveys for the JFP were conducted in 2006 and 2007 we have begun to conduct updated pedestrian surveys of the APE.

The United Auburn Indian Community of the Auburn Rancheria, Shingle Springs Band of Miwok Indians, Wilton Rancheria, and Tsi-Akim Maidu have expressed interest in the Dam Raise FRM Project. We held two open forums on January 26, 2015 and February 2, 2015 to solicit input from Native American tribes regarding the Dam Raise FRM Project. As part of our efforts to identify potential historic properties, we plan to continue to inquire if tribes have knowledge of locations of archeological sites, sacred sites, or areas of traditional cultural value or concern in or near the Dam Raise FRM Project APE.

Pursuant to 36 CFR Part 800.4(a)(1), we request your comments on our preliminary determination of the APE for the Dam Raise FRM Project. We also request any comments your office may have on our proposed efforts to identify historic properties under 36 CFR Part 800.4. 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, please contact Ms. Montag by email at: Melissa.L.Montag@usace.army.mil or by phone at (916) 557-7907.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

cc: (w/o enclosures)
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
Daniel Fonseca, Cultural Resources Director, 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, Chairperson, Wilton Rancheria, 9300 W. Stockton Blvd, Suite 200, Elk Grove, California 95758
Andrew Godsey, Assistant Director, Cultural Resources Department, Shingle Springs Band of Miwok Indians, P.O. Box 1340, Shingle Springs, California 95682
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
Eileen Moon, Vice Chairperson, Tsi-Akim Maidu, 1239 East Main Street, Grass Valley, California 95945
Don Ryberg, Chairman, Tsi-Akim Maidu, 1239 East Main Street, Grass Valley, California 95945
Gene Whitehouse, Chairperson, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603

cc: (w/enclosure)
Scott Williams, U.S. Department of the Interior, Bureau of Reclamation, 2800 Cottage Way, MP-153, Sacramento, California 95825
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

APPENDIX J

LIST OF RECIPIENTS

Elected Officials		
Honorable Ami Bera, M.D.	1535 Longworth House Office Building	Washington, DC 20515
Honorable Doris Matsui	2311 Rayburn Building	Washington, DC 20515
Honorable Ted Gaines	State Capitol, Room 3070	Sacramento, CA 95814
Honorable Beth Gaines	8799 Auburn-Fosom Road, Suite #A	Granite Bay, CA 95746
Honorable Tom McClintock	2331 Rayburn House Office Building	Wasington, DC 20515
Honorable Barbara Boxer	112 Hart Senate Office Building	Washington, DC 20510
Honorable Dianne Feinstein	331 Hart Senate Office Building	Washington, DC 20510

Agencies		
Bureau of Reclamation	7794 Folsom Dam Road	Folsom, CA 95630
California Air Resources Board	P.O. Box 2815	Sacramento, CA 95812
California Department of Corrections and Rehabilitation	9838 Old Placerville Road, Suite B,	Sacramento, CA 95827
California Department of Fish and Wildlife	1701 Nimbus Road	Rancho Cordova, CA 95670
Central Valley Regional Water Quality Control Board	11020 Sun Center Drive, Suite 200	Rancho Cordova, CA 95670
California Department of Parks and Recreation	7806 Folsom-Auburn Road	Folsom, CA 95630
City of Folsom	50 Natoma Street	Folsom, CA 95630
Department of Water Resources (DWR)	3464 El Camino Ave, Suite 200	Sacramento, CA 95821
SAFCA	1007 7th Street, 7th Floor	Sacramento, CA 95814
SMAQMD	777 12th Street, 3rd Floor	Sacramento, CA 95814
U.S. Environmental Protection Agency	1001 I Street	Sacramento, CA 95814
US Fish and Wildlife Service	2800 Cottage Way, W-2605	Sacramento, CA 95825-1888

Tribes		
Shingle Springs Band of Miwok Indians	P.O. Box 1340	Shingle Springs, CA 95682
T'si-Akim Maidu	1239 East Main Street	Grass Valley, CA 95945

United Auburn Indian Community of the Auburn Rancheria	10720 Indian Hill Road	Auburn, CA 95603
Wilton Rancheria	9728 Kent Street	Elk Grove, CA 95642

Residents		
CURRENT RESIDENT	753 LORENA LN	FOLSOM, CA 95630
CURRENT RESIDENT	756 LORENA LN	FOLSOM, CA 95630
CURRENT RESIDENT	757 LORENA LN	FOLSOM, CA 95630
CURRENT RESIDENT	760 LORENA LN	FOLSOM, CA 95630
CURRENT RESIDENT	761 LORENA LN	FOLSOM, CA 95630
CURRENT RESIDENT	764 LORENA LN	FOLSOM, CA 95630
CURRENT RESIDENT	767 LORENA LN	FOLSOM, CA 95630
CURRENT RESIDENT	768 LORENA LN	FOLSOM, CA 95630
CURRENT RESIDENT	771 LORENA LN	FOLSOM, CA 95630
CURRENT RESIDENT	783 LORENA LN	FOLSOM, CA 95630
CURRENT RESIDENT	788 LORENA LN	FOLSOM, CA 95630
CURRENT RESIDENT	1509 GIONATA WAY	FOLSOM, CA 95630
CURRENT RESIDENT	765 CRISTINA CT	FOLSOM, CA 95630
CURRENT RESIDENT	766 CRISTINA CT	FOLSOM, CA 95630
CURRENT RESIDENT	805 CRISTINA CT	FOLSOM, CA 95630
CURRENT RESIDENT	809 CRISTINA CT	FOLSOM, CA 95630
CURRENT RESIDENT	810 CRISTINA CT	FOLSOM, CA 95630
CURRENT RESIDENT	813 CRISTINA CT	FOLSOM, CA 95630
CURRENT RESIDENT	814 CRISTINA CT	FOLSOM, CA 95630
CURRENT RESIDENT	355 MOUNTAIN VIEW DR	FOLSOM, CA 95630
CURRENT RESIDENT	361 MOUNTAIN VIEW DR	FOLSOM, CA 95630
CURRENT RESIDENT	363 MOUNTAIN VIEW DR	FOLSOM, CA 95630
CURRENT RESIDENT	365 MOUNTAIN VIEW DR	FOLSOM, CA 95630
CURRENT RESIDENT	170 ELVIES LN	FOLSOM, CA 95630
CURRENT RESIDENT	195 ELVIES LN	FOLSOM, CA 95630
CURRENT RESIDENT	245 ELVIES LN	FOLSOM, CA 95630
CURRENT RESIDENT	295 ELVIES LN	FOLSOM, CA 95630
CURRENT RESIDENT	365 ELVIES LN	FOLSOM, CA 95630
CURRENT RESIDENT	850 NATURE WAY	FOLSOM, CA 95630
CURRENT RESIDENT	856 NATURE WAY	FOLSOM, CA 95630
CURRENT RESIDENT	862 NATURE WAY	FOLSOM, CA 95630
CURRENT RESIDENT	868 NATURE WAY	FOLSOM, CA 95630
CURRENT RESIDENT	874 NATURE WAY	FOLSOM, CA 95630
CURRENT RESIDENT	880 NATURE WAY	FOLSOM, CA 95630
CURRENT RESIDENT	900 E NATOMA ST	FOLSOM, CA 95630
CURRENT RESIDENT	1000 E NATOMA ST	FOLSOM, CA 95630
CURRENT RESIDENT	1360 QUIGLEY CT	FOLSOM, CA 95630
CURRENT RESIDENT	1363 QUICLEY CT	FOLSOM, CA 95630

CURRENT RESIDENT	1364 QUIGLEY CT	FOLSOM, CA 95630
CURRENT RESIDENT	1367 QUIGLEY CT	FOLSOM, CA 95630
CURRENT RESIDENT	1368 QUIGLEY CT	FOLSOM, CA 95630
CURRENT RESIDENT	1371 QUIGLEY CT	FOLSOM, CA 95630
CURRENT RESIDENT	1372 QUIGLEY CT	FOLSOM, CA 95630
CURRENT RESIDENT	1375 QUIGLEY CT	FOLSOM, CA 95630
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CURRENT RESIDENT	1396 QUIGLEY CT	FOLSOM, CA 95630
CURRENT RESIDENT	1399 QUIGLEY CT	FOLSOM, CA 95630
CURRENT RESIDENT	1400 QUIGLEY CT	FOLSOM, CA 95630
CURRENT RESIDENT	1492 QUIGLEY CT	FOLSOM, CA 95630
CURRENT RESIDENT	1497 QUIGLEY CT	FOLSOM, CA 95630
CURRENT RESIDENT	1420 CUMMINGS WAY	FOLSOM, CA 95630
CURRENT RESIDENT	1421 CUMMINGS WAY	FOLSOM, CA 95630
CURRENT RESIDENT	1425 CUMMINGS WAY	FOLSOM, CA 95630
CURRENT RESIDENT	1433 CUMMINGS WAY	FOLSOM, CA 95630
CURRENT RESIDENT	1437 CUMMINGS WAY	FOLSOM, CA 95630
CURRENT RESIDENT	1441 CUMMINGS WAY	FOLSOM, CA 95630
CURRENT RESIDENT	1445 CUMMINGS WAY	FOLSOM, CA 95630
CURRENT RESIDENT	1475 CUMMINGS WAY	FOLSOM, CA 95630
CURRENT RESIDENT	1465 DURFEE CT	FOLSOM, CA 95630
CURRENT RESIDENT	1466 DURFEE CT	FOLSOM, CA 95630
CURRENT RESIDENT	1469 DURFEE CT	FOLSOM, CA 95630
CURRENT RESIDENT	1474 DURFEE CT	FOLSOM, CA 95630
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CURRENT RESIDENT	1469 LEONARD CT	FOLSOM, CA 95630
CURRENT RESIDENT	1471 LEONARD CT	FOLSOM, CA 95630
CURRENT RESIDENT	1472 LEONARD CT	FOLSOM, CA 95630
CURRENT RESIDENT	1475 LEONARD CT	FOLSOM, CA 95630

CURRENT RESIDENT	1476 LEONARD CT	FOLSOM, CA 95630
CURRENT RESIDENT	1479 LEONARD CT	FOLSOM, CA 95630
CURRENT RESIDENT	1480 LEONARD CT	FOLSOM, CA 95630
CURRENT RESIDENT	1415 BICKER CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1416 BICKER CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1419 BICKER CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1420 BICKER CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1423 BICKER CIR	FOLSOM, CA 95630
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CURRENT RESIDENT	1477 JIM HILL LN	FOLSOM, CA 95630
CURRENT RESIDENT	1481 JIM HILL LN	FOLSOM, CA 95630
CURRENT RESIDENT	1482 JIM HILL LN	FOLSOM, CA 95630
CURRENT RESIDENT	1485 JIM HILL LN	FOLSOM, CA 95630
CURRENT RESIDENT	1489 JIM HILL LN	FOLSOM, CA 95630
CURRENT RESIDENT	1490 JIM HILL LN	FOLSOM, CA 95630
CURRENT RESIDENT	1591 BALLOU CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1595 BALLOU CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1599 BALLOU CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1603 BALLOU CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1607 BALLOU CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1611 BALLOU CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1615 BALLOU CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1619 BALLOU CIR	FOLSOM, CA 95630

CURRENT RESIDENT	1623 BALLOU CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1627 BALLOU CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1631 BALLOU CIR	FOLSOM, CA 95630
CURRENT RESIDENT	1635 BALLOU CIR	FOLSOM, CA 95630