Folsom Dam Safety and Flood Damage Reduction
Draft Environmental Impact Statement (EIS)/
Environmental Impact Report (EIR)

Sacramento, El Dorado, and Placer Counties, California

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State of California

Lead Agencies:
NEPA Lead Agency: U.S. Department of the Interior, Bureau of Reclamation (Reclamation)
CEQA Lead Agency: State of California Reclamation Board

NEPA Cooperating Agency:
U.S. Army Corps of Engineers (Corps)

CEQA Responsible Agency:
Sacramento Area Flood Control Agency

ABSTRACT

Both Reclamation and the Corps have multiple authorized projects addressing hydrologic, seismic, static, and flood management issues at Folsom Dam and its Appurtenant Structures (Folsom Facility). The Folsom Joint Federal Project (JFP) was developed to coordinate Reclamation and Corps efforts at the Folsom Facility. This Draft EIS/EIR evaluates implementation of the Folsom JFP by analyzing alternatives that modify the Folsom Facility to increase overall public safety. The alternatives differ in construction actions on the structures, including dams and dikes, of the Folsom Facility. Direct, indirect, and cumulative impacts resulting from the alternatives on the physical, natural, and socioeconomic environment of the region surrounding the Folsom Facility are addressed.

This Draft EIS/EIR is prepared in compliance with the National Environmental Policy Act (NEPA), Reclamation NEPA procedures, and the California Environmental Quality Act (CEQA) and CEQA guidelines and meets the requirements of the Energy and Water Development Appropriations Act of 2006.

Comments on this document must be submitted by January 22, 2007.

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The U.S. Army Corps of Engineers (Corps) is a Federal Cooperating Agency for this Environmental Impact Statement/Environmental Impact Report (EIS/EIR). The Corps intends to adopt the final version of this EIS/EIR to satisfy the requirements of the National Environmental Policy Act (NEPA) for the flood damage reduction features described in this EIS/EIR. Questions or comments on the flood damage reduction related portions of the draft EIS/EIR can be directed to the Corps at the following address: U.S. Army Engineer District, Sacramento, Attn: Ms. Becky Victorine, 1325 J Street, Sacramento, California 95814-2922, or email: Rebecca.A.Victorine@usace.army.mil.

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Acronyms and Abbreviations

ACHP	Advisory Council on Historic Preservation
ADA	Americans With Disabilities Act
ADT	Average Daily Traffic/Average Daily Trips
AF	Acre-foot/Acre-feet
Agreement	Water Forum Agreement
AMP	Amphibians
AMS	American Meteorological Society
AMSL	Above mean sea level
APCD	Air Pollution Control District
APE	Area of Potential Effect
AQAP	Air Quality Attainment Plan
AQMD	Air Quality Management District
ARB	Air Resources Board
ARMR	Archaeological Resource Management Reports
ARWI	American River Watershed Investigation
AST	Aboveground Storage Tank Facilities
ATCMs	Airborne Toxic Control Measures
BACT	Best Available Control Technology
BP	Before Present
Bgs	Below ground surface

BISC	Boating Instruction Safety Centers
BLM	US Bureau of Land Management
BMPs	Best Management Practices
ºC	Degrees Celsius
CA	California
CA FID UST	California Facility Inventory Database
CA WDS	California Water Resources Control Board – Waste Discharge System
CAA	Clean Air Act
CAAQS	California ambient air quality standards
Caltrans	California Department of Transportation
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CAS	Corrective Action Study
CCAA	California Clean Air Act
CCR	California Code of Regulations
CCTS	Central California Taxonomic System
CCTV	Closed Circuit Television
CDCR	California Department of Corrections and Rehabilitation
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game
CDL	Clandestine Drug Labs
CE	Species that is State listed as endangered
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFCP	California Farmland Conservancy Program
CFP	State fully protected species
CFR	Comprehensive Facility Review
	Code of Federal Regulations
Cfs	cubic-foot/feet per second
CHMIRS	California Hazardous Material Incident Reporting System
CIP	Capital Improvements Program
CIWMB	California Integrated Waste Management Board
CNDDB	California Natural Diversity Database
CNEL	Community noise equivalent level

CNPS	California Native Plant Society
CO	Carbon monoxide
Corps	U.S. Army Corps of Engineers
COSFM	California Office of the State Fire Marshal
CPRC	California Public Resources Code
CPUC	California Public Utilities Commission
CRHR	California Register of Historical Resources
CR	Plant species that is State-listed as rare
CRP	Conservation Reserve Program
CS	Sacramento Co. Contaminated Sites
CSC	Species that is State-listed as a Species of Concern
CSLC	California State Lands Commission
CSPS	California State Prison, Sacramento
CSUS	California State University Sacramento
CT	Species that is State-listed as threatened
CVC	California Vehicle Code
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
CVRWQCB Basin Plan	CVRWQCB Water Quality Control Plan for the Sacramento River and San Joaquin River Basins
CWA	Clean Water Act
CY	Cubic yard
dB	Decibels
dBA	A-weighted sound levels are designated
DBW	California Department of Boating and Waterways
DEED	Deed Restriction Listing
DEM	Digital elevation model
DFG	Department of Fish and Game
DO	Dissolved oxygen
DOF	California Department of Finance
DPR	California Department of Parks and Recreation
DS/FDR	Dam Safety/Flood Damage Reduction
DTSC	Department of Toxic Substances Controls
DWR	California Department of Water Resources
EA	Environmental Assessment
EDD	Employment Development Department
EDR	Environmental Data Resources

EGR	Exhaust gas recirculation
ERP	Ecosystem Restoration Program
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EMFAC2002	On-road vehicle emission factor model
ENSA	Phase 1 Environmental Site Assessment
EOP	Enhanced outpatient
EPA	Environmental Protection Agency
ERNS	Emergency Response Notification System
ESA	Federal Endangered Species Act
ºF	Degrees Fahrenheit
FC	Federal Candidate Species
FCC	Federal Communications Commission
FD	Species that was formerly listed under the ESA
FE	Species that is Federally listed as endangered
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FIFRA	Federal Insecticide, Fungicide, & Rodenticide Act
FINDS	Facility Index System
FLSRA	Folsom Lake State Recreation Area
FMMP	Farmland Mapping and Monitoring Program
Folsom Facility	Folsom Dam and Appurtenant Structures
Folsom JFP	Folsom Joint Federal Project
FONSI	Findings of No Significant Impacts
FPE	Federal proposed endangered species
FPPA	Farmland Protection Policy Act
FS	Forest Service
FSP	Folsom State Prison
Ft	Foot/feet
FT	Species that is Federally listed as threatened
FTA	Federal Transit Authority
FTTS	FIFRA/TSCA Tracking System
FWCAR	Fish and Wildlife Coordination Act Report
FY	Fiscal Year
General Permit	State General Permit for Storm Water Discharges Associated with Construction Activity

GVR	Green Valley Road
GVW	Gross Vehicle Weight
GWh	gigawatt hours
HCM	Highway Capacity Manual
HDPE	High Density Polyethylene
HIST UST	Hazardous Substance Storage Container Database
HMIRS	Hazardous Materials Information Reporting System
HMVM	Hundred Million Vehicle Miles traveled
HRA	Health risk assessment
HTRW	Hazardous, toxic, and radiological wastes
Hz	Hertz
IMPLAN	Impact Planning and Analysis
INV	Invertebrates
Ips	Inches per second
IS	Initial Study
ITAs	Indian Trust Assets
ITE	Institute of Transportation Engineers
JFP	Joint Federal Project
Kg	Kilograms
kV	kilovolt
kW	kilowatts
lb	pound
L_{dn}	Day-night noise level
L_{eq}	Equivalent noise level
L_{max}	Maximum noise level
LND	Cultural
LOS	Level of Service
LTS	American River Watershed Long-term Study
LTS	Less than significant
LUST	Leaking Underground Storage Tanks
LWD	Left Wing Dam
M&I	municipal and industrial
MBTA	Migratory Bird Treaty Act
MCLs	Maximum Contaminant Levels
MDR	Medium Density Residential
Mg	Milligrams
MIAD	Mormon Island Auxiliary Dam
ML	Sacramento Co. Master List

MMRP	Mitigation Monitoring and Reporting Plan
MODS	American River Watershed Folsom Dam Modification Project
Mph	Miles per hour
Mpn	Most probably number
MPN	Multiple Property Nomination
MS	Placer Co. Master List
MSA	Metropolitan Service Area
MSCS	CALFED Bay-Delta Program Multi-Species Conservation Strategy
Msl	mean sea level
MTBE	Methyl-tert-butyl-ether
N/A	Not available
NAAQS	National Ambient Air Quality Standards
NAC	Noise abatement criteria
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NAVD	North America Vertical Datum
NCCP	Natural Community Conservation Plan
NCCPA	Natural Community Conservation Planning Act
NCIC	North Central Information Center
NED	National Economic Development
NEPA	National Environmental Policy Act
NFA	No Further Action
NHPA	National Historic Preservation Act
NHSTA	Nation Highway Traffic Safety Administration
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NOD	Notice of Determination
NOI	Notice of Intent
NOx	Nitrogen Oxides
NPDES	National Pollution Discharge Elimination System
NRC	Noise reduction coefficient
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTUs	Nephelometric Turbidity Units
NWR	National Wildlife Refuge

O&M	Operations and Maintenance
OAL	Office of Administrative Law
OHWM	Ordinary High Water Mark
OPR	Office of Planning and Research
O_s	Ozone
PA	Programmatic Agreement
PAC	Post-authorization Changes
PASS	Project Alternative Solutions Study
Pb	Lead
PCA	Project Cooperation Agreement
PCBs	Polychlorinated biphenyls
PCWA	Placer County Water Agency
PG&E	Pacific Gas and Electric
P.L.	Public Law
PM10	Particulate matter less than 10 microns in diameter
PM2.5	Fine particulate matter less than 2.5 microns in diameter
PMF	Probable Maximum Flood
ppm	Parts per million
PPV	Peak particle velocity
PRC	Public Resources Code
RCRA	Resource Conservation and Recovery Act
Reclamation	U.S. Bureau of Reclamation
Reclamation Board	State Reclamation Board
RMP	Resource Management Planning
ROD	Record of Decision
ROG	Reactive organic gasses
RWD	Right Wing Dam
RWQCB	Regional Water Quality Control Board
SACOG	Sacramento Council of Governments
SAD	Small Auxiliary Dikes
SAFCA	Sacramento Area Flood Control Agency
SB	Senate Bill
SC	Species designated as a candidate for listing by the State of California as endangered or threatened
SDWA	Safe Drinking Water Act
SE	Species listed by the State of California as endangered
SEL	Sound Exposure Level
SHPO	State Historic Preservation Officer

SIP	State Implementation Plan
SIR	Supplemental Information Report
SJWD	San Juan Water District
SLIC	Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
SMAQMD	Sacramento Metropolitan Air Quality Management District
SMARA	Surface Mining and Reclamation Act
SMS	Scenery Management System
SMUD	Sacramento Municipal Utility District
SNAs	Significant Natural Areas
SO_2	Sulfur Dioxide
SRA	State Recreation Area
SSLE	Reclamation's Safety, Security and Law Enforcement Program
SSTS	Section Seven Tracking System
SSURGO	Soil Survey Geographic Database
ST	Species listed by the State of California as threatened
STAA	Surface Transportation Assistance Act
STC	sound transmission coefficient
SWEEPS UST	Statewide Environmental Evaluation and Planning System
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
SWRCY	Recycling Facilities
SWTR	Surface Water Treatment Rule
TACs	Toxic air contaminants
TDS	Total dissolved solids
TIS	Traffic Impact Study
TMDL	Total Maximum Daily Load
TMDLs	Total Maximum Daily Loads
TNM	Traffic Noise Model
TOC	Total organic carbon
Tpd	Tons per day
TPH	Total petroleum hydrocarbons
Tpy	Tons per year
TSCA	Toxic Substances Control Act
URBEMIS	Urban Emissions Model
U.S.	United States

U.S. DOT	U.S. Department of Transportation
USC	United States Code
USCA	United States Code Annotated
USDA	United States Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Service
UST	Underground Storage Tank Facilities
VCP	Voluntary Cleanup Program Properties
UWMP	Urban Water Management Plan
V/C	Volume to capacity
VEG	Vegetation
VELB	Valley Elderberry Longhorn Beetle
VOC	Volatile organic compounds
WAPA	Western Area Power Administration
WIL	Wildlife
WQCP	Water Quality Control Plan
WRDA	Water Resources Development Act
WRP	Wetlands Reserve Program

Folsom Dam Safety and Flood Damage Reduction EIS/EIR Executive Summary

Purpose of Study and EIS/EIR

The limitations of the existing flood control system in the Sacramento area, and the urgent need to increase the level of flood protection have recently received increased public attention in the aftermath of the 2005 Gulf Coast hurricanes. Planning of significant improvements for flood damage reduction and dam safety has been underway for some years among numerous agencies and organizations, notably the United States Army Corps of Engineers (Corps), the United States Department of the Interior, Bureau of Reclamation (Reclamation), the State of California Reclamation Board (State Reclamation Board)/State of California Department of Water Resources (DWR), and the Sacramento Area Flood Control Agency (SAFCA).

This Environmental Impact Statement/Environmental Impact Report (EIS/EIR) presents the results of a joint agency study for the planning, design, and implementation of a flood damage reduction and Safety of Dams risk reduction action at Folsom Dam and Appurtenant Facilities (Folsom Facility). The objective of the study is the identification and selection of an alternative that would significantly reduce the risk of flooding along the main stem of the American River in the Sacramento area while also meeting dam safety and public safety objectives.

The Flood Control Act of 1944 (Public Law 534) authorized the Corps to construct the Folsom Facility. The Folsom Facility was constructed by the Corps between 1948 and 1956. Upon completion in 1956, the ownership was transferred to Reclamation for operation and maintenance as an integrated feature of the Central Valley Project (CVP). Both Federal agencies have obligations and interests in relation to the Folsom Facility but differ in respect to Congressional objectives, mandates, authorities, funding, and time lines. Through cooperation, Corps and Reclamation seek to integrate flood risk reduction measures with dam safety improvements under a single plan.

Planning studies to address Folsom Facility issues were initiated during the 1990s and cumulated initially under the Corps' Folsom Dams Modification Project (Folsom Mods Project) and Folsom Dam Raise Project. The objective of the Folsom Modification Project was to reduce damages from flooding to the Sacramento area by increasing outlet efficiencies at Folsom Dam in general by releasing water earlier prior to a flood event. However, cost concerns with enlarging the existing outlets caused the Corps to reevaluate modification options that would perform as a functional equivalent to the outlet modifications. The objective of the Corp's Dam Raise Project was to increase flood storage capacity at Folsom Reservoir.

At the same time the Corps was investigating flood damage reduction options, Reclamation was evaluating Safety of Dams issues related to all of the Folsom facilities. Reclamation initiated a Corrective Action Study (CAS) that evaluated public safety risks due to hydrologic, seismic, and static concerns. Beginning in 2004, Reclamation and the Corps established an Oversight Management Group, consisting of senior management from both agencies, to facilitate project coordination. Coordination activities included a comprehensive value planning effort to identify a joint project that the agencies' respective flood damage reduction and dam safety objectives. Congress formalized this effort in the FY 2006 Energy and Water Development Appropriations Act by directing the two agencies to continue progress toward a joint project. Since that time both agencies worked intensively to develop reasonable alternatives for a Joint Federal Project (JFP).

The objective of the Folsom Dam Safety and Flood Damage Reduction (DS/FDR) EIS/EIR is to assess engineering solutions addressing hydrologic control, and seismic and static issues that would integrate the Corps' authorized Folsom Dam Modification and Folsom Dam Raise projects with Reclamation's Safety of Dams objectives. Among other benefits, this would result in timely, cost effective completion of features at the Folsom Facility that expedite: (1) protection of public safety related to the structural integrity of the facilities and (2) improvement to flood control management for the communities along the lower American and Sacramento rivers.

The proposed structural modifications to the Folsom Facility could ultimately lead to revisions of Folsom Dam operations that would provide for earlier releases of reservoir water in advance of a major storm (hydrologic event). The modifications being considered in this EIS/EIR would allow for the release of 115,000 cubic feet per second (CFS) (the existing objective release) sooner than is now possible, with the potential for higher releases should the downstream levees be improved to accommodate the increased flows. These larger, earlier releases from Folsom would create and conserve flood storage space based on projected reservoir inflows resulting from a major storm impacting the upper American River watershed. However, the proposed modifications would be operated using existing criteria until the completion of the revised water control manual and supporting supplemental environmental compliance documentation, which would be completed one year prior to completion of proposed structural modifications, at which time the full potential benefits of the proposed modifications would be realized.

This EIS/EIR addresses project alternatives that include elements of the individual missions of Reclamation and the Corps. Due to specific Congressional authorizations limiting what actions each agency can implement, Reclamation would most likely implement separately those elements specific to its Safety of Dam's mission and the Corps would implement those elements specific to improving flood damage reduction protection, as summarized in the paragraphs below.

Study Authority

The current study was implemented under several existing authorizations. Primary authority and guidance for flood damage reduction is provided in the Folsom Dam Modification Project Authority under Section 101(a) (6) of the Water Resources Development Act (WRDA) of 1999 (Public Law (PL) 106-53) and the Folsom Dam Raise Authority under PL 108-137, the Energy and Water Development Appropriations Act for 2004. The Folsom Dam Modification and Folsom Dam Raise authorities share the objective of improving flood management on the American River, primarily through structural modifications to the existing Folsom Dam and Appurtenant Facilities. With the Folsom Dam Raise authority, Congress also authorized the Corps to construct an ecosystem restoration project component on the Lower American River and a permanent bridge, provided that certain funding conditions were met.

In addition, Reclamation has been pursuing Safety of Dams modifications separately through its existing Safety of Dams Program. Investigations and analyses by Reclamation have identified needed dam safety modifications at Folsom Dam and Appurtenant Facilities. In response to these studies, Reclamation initiated a Corrective Action Study (CAS) to identify technically feasible and environmentally and socially preferable alternatives that would address the identified safety concerns. A CAS Report, supported by the analyses in this EIS/EIR, will present a preferred alternative for incorporation into a Modification Report. This Modification Report will be submitted to Congress for approval.

Recent modifications to both agencies'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 project; and authorized both agencies to expend funds for design of a joint project.

Facility Description and Study Area

The Folsom Facility is comprised of twelve separate structures (Figure ES-1). The main structure, used to control releases to the American River, is the concrete dam. The Main Concrete Dam is located on the mainstem of the American River and is the only facility with operational gates and outlets used to retain and release water stored within the reservoir. Adjacent to the Main Concrete Dam and looking downstream are the Right Wing Dam and Left Wing Dam. The two wing dams serve to contain water within Folsom Reservoir. The other large earthen structure is Mormon Island Auxiliary Dam (MIAD), which retains water at the location of a historic river channel. The Folsom Facility also includes eight earthen dikes. The earthen dikes span areas of terrain with lower elevations and are primarily used to contain water

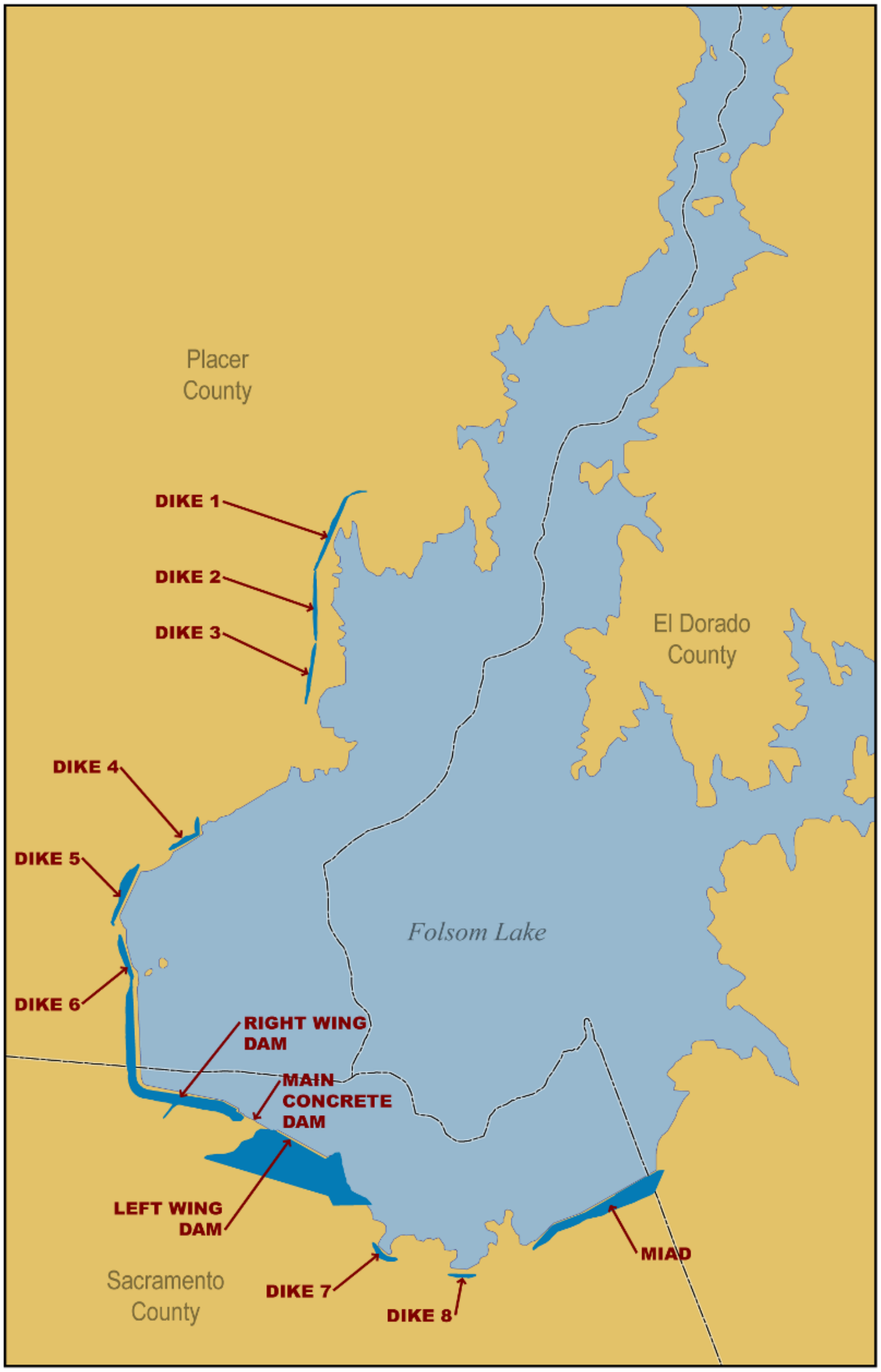

Figure ES-1
The Folsom Facility

when the reservoir is at or near capacity. Folsom Dam is also a producer of hydroelectric power.

Folsom is a multi-purpose facility operated by law for flood control, municipal and industrial (M&I) water supply, agricultural water supply, power, fish and wildlife, recreation, navigation and water quality purposes. The facility is primarily operated to maximize flood control and water supply storage benefits. To provide flood control storage capacity (protecting the Sacramento region), the reservoir is operated to provide the reservoir level at its lowest level starting in the fall of each year. The flood storage capacity is retained until April of each year when the reservoir is filled with snow-melt runoff from the Sierra Nevada. During the summer months when water elevations remain high, Folsom Lake serves a major regional recreational resource (Folsom Lake State Recreation Area).

The study area addressed in this EIS/EIR includes the entire Folsom Facility, including approximately 75 miles of shoreline surrounding the reservoir. Due to the requirement to bring in materials from outside suppliers, the study area includes adjacent roadways, the city of Folsom, and the community of Granite Bay.

Folsom DS/FDR EIS/EIR Purpose and Need/Project Objectives

As a part of their responsibilities, Reclamation and the Corps have determined that the Folsom facilities require structural improvements to increase overall public safety by improving the facilities' ability to reduce flood damages and addressing dam safety issues posed by hydrologic (flood), seismic (earthquake), and static (seepage) events. These events have a low probability of occurrence in a given year, however due to the large population downstream of Folsom Dam, modifying the facilities is prudent and required to improve public safety.

Reclamation has identified the need for expedited action to reduce specific hydrologic, static, and seismic risks under its Safety of Dams Program. The identified risks are among the highest of all dams in Reclamation's inventory and the Folsom facilities are among Reclamation's highest priorities within its Safety of Dams Program. Reclamation's primary interest for integrating dam safety activities with Corps' flood damage reduction projects is to expedite corrective action and realize cost sharing benefits of a coordinated effort.

The Corps in partnership with the Reclamation Board/DWR and SAFCA (non-federal sponsors) have determined that Folsom Reservoir does not have sufficient storage or release capacity to safely manage flood flows from floods with recurrence intervals greater than a 100-year recurrence level nor do the downstream levees have sufficient capacity to provide greater than 100-year flood protection (Corps letter to SAFCA dated December 9, 2004).

The non-federal sponsors have identified the need to reduce the risk of flooding in the Sacramento area. Due to the number and value of the exposed structures and the size of the population at risk, Sacramento has been identified as one of the most at risk communities in the nation. Consequently, there is a need to expeditiously reduce this risk through interim and permanent flood damage reduction measures. The goal of the non-federal sponsors is to achieve at least a 200-year level of flood protection for the Sacramento area as anticipated in the Congressionally authorized Folsom Modifications and Folsom Dam Raise Projects. Pursuit of this goal constitutes the non-federal sponsors' primary interest for integrating Corps flood damage reduction projects with Reclamation dam safety activities to increase flood protection for the downstream and surrounding communities on an expedited basis and realize cost sharing benefits of a coordinated effort.

Given these circumstances, there is a need to expedite dam safety corrective actions for the Folsom facilities in order to reduce potential failure due to seismic, static, and hydrologic conditions. There is also a need to incrementally increase minimum flood protection by improving reservoir pool release mechanisms and, if incrementally justified, increasing flood storage capacity. The purpose of the project will be to increase overall public safety, improve the reliability of local water supply and power generation, and maintain an important recreational resource. Project objectives are:

- Expeditiously reduce hydrologic risk of overtopping-related failure of any impoundment structure during a probable maximum flood (PMF) event in accordance with Reclamation's Public Protection Guidelines;
- Expeditiously reduce the risk of structural failure of any impoundment structure during a potential seismic (earthquake) event in accordance with Reclamation's Public Protection Guidelines;
- Expeditiously reduce the risk of structural failure of any impoundment structure during a potential static (seepage) event in accordance with Reclamation's Public Protection Guidelines;
- Expeditiously improve the flood management capacity of the facilities in a manner consistent with existing Corps authorities.

Development and Screening of Project Alternatives

The National Environmental Policy Act (NEPA) requires that a reasonable range of alternatives be analyzed, including a No Action alternative. The California Environmental Quality Act (CEQA) requires that environmental documents identify and analyze a reasonable range of feasible alternatives that could meet the project objectives to varying degrees. Under CEQA, the range of potential alternatives to the proposed project shall include those that could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects.

The development of alternatives presented in this document has been an iterative and collaborative process involving teams of engineers from Reclamation and the Corps. Alternative measures considered by the teams focused on addressing Corps flood damage reduction and Reclamation Safety of Dams objectives. The process commenced with an initial scoping phase followed by further refinement and selection of structural measures during a subsequent feasibility phase. Outcomes of the feasibility phase defined the proposed project/action by evaluating various structural measures that addressed the overall project's hydrologic, seismic, static, and flood damage reduction objectives.

Structural improvement measures identified during initial scoping efforts were reduced to those determined by technical experts to have the greatest potential of providing practical, implementable, cost effective, and environmentally sound means of achieving the required project objectives. Due to the number of potential structural measures with multiple design variations that achieved the same goal, representative measures were selected for further evaluation that would be reflective of similar design concepts and expected similar costs and environmental impacts.

The structural measures considered for the Folsom Facility are summarized in Table ES-1.

Table ES-1
Features and Objectives of Folsom Facility Engineering Measures

Folsom Facility	*Engineering Measure*	*Dam Safety and Flood Damage Reduction Accomplishment*
Main Concrete Dam	Dam raise Gate replacement Tendons Shear Keys Toe Blocks Pier and Gate reinforcement	Flood Damage Reduction Flood Damage Reduction Dam Safety seismic Dam Safety seismic Dam Safety seismic Dam Safety seismic
New Auxiliary Spillway	Auxiliary Spillway	Dam Safety hydrologic, Flood Damage Reduction
Wing Dams	Earthen Raise Parapet Wall Raise Reinforced Earth Wall Raise Filters	Flood Damage Reduction Flood Damage Reduction Flood Damage Reduction Dam Safety static
MIAD	Earthen Raise Replace foundation Jet Grouting Downstream Overlay Filters	Flood Damage Reduction Dam Safety seismic Dam Safety seismic Dam Safety seismic, static Dam Safety static
Dikes	Earthen Raise Parapet Wall Raise Reinforced Earth Wall Raise Filters	Flood Damage Reduction Flood Damage Reduction Flood Damage Reduction Dam Safety static

Folsom DS/FDR EIS/EIR Project Description

The engineering measures proposed to address hydrologic, seismic, static, and flood damage reduction objectives vary for each of the Folsom facilities. The text below summarizes the basic features and aspects of the proposed project.

The existing authorizations for Reclamation and the Corps direct the agencies to assess different dam safety and flood damage reduction measures. Reclamation focuses on dam safety (seismic, static, and hydrologic issues) and the Corps flood damage reduction (flood and hydrologic control). In addition to stand-alone dam safety and flood damage reduction activities, the agencies seek a common solution to the hydrologic control of the dam and reservoir that addresses Reclamation's dam safety hydrologic risk (overtopping of facilities in the event of a PMF) and the Corps flood damage reduction objective (minimum 1 in 200 year protection). This combined effort has identified a gated Auxiliary Spillway, otherwise referred to as the Joint Federal Project (JFP), as the common feature addressing both objectives. Specifically:

> Project Description. The JFP at Folsom Dam and Reservoir will consist of six 23-ft x 33-ft submerged tainter gates at invert 368 ft combined with a concrete lined Auxiliary Spillway approximately 170 ft wide and 1700 ft in length. Gate dimensions and invert elevation may be optimized during design to maximize performance and/or reduce costs. To achieve the objective of expedited feasibility level design, optimization of the spillway design will focus, to the extent feasible, upon varying the invert elevation of the tainter gates, but if necessary, may include varying the dimensions of the six tainter gates, approach channel or Auxiliary Spillway. The optimization will seek to improve upon the flood damage reduction objective of at least 1/200 year flood protection while continuing to preserve and expedite completion of the dam safety objective of safely passing the Probable Maximum Flood (PMF).
>
> Additions. Additional features may be proposed later as mutually determined by participating agencies in order to (1) achieve a minimum 1/200 year flood protection, or (2) as incrementally justified through appropriate analysis and evaluation. Potential additional features may include a raise of up to 3.5 feet for all embankments, or modification or replacement of the existing service gates or emergency spillway gates. Any additions to the JFP, as justified, will be for flood damage reduction purposes only.

The main feature of the JFP would be the phased construction of an Auxiliary Spillway in the area to the east of the concrete dam and in the left abutment and below the Left Wing Dam. The Auxiliary Spillway would be constructed on a natural ridge and would involve the removal of approximately 3.5 million cubic yards of material that would form the channel of the spillway. Construction of the spillway will be phased to fully meet dam safety objectives on an interim basis while design and construction of flood damage reduction objective elements are implemented or a permanent basis should flood damage reduction elements not be in place in a timely manner. An interim control section composed of a cofferdam/rockplug that could serve as a fuseplug and a permanent control structure composed of either a gated or fuseplug structure will be constructed as the final phase.

Other stand-alone dam safety (seismic and static) and flood damage reduction features are specific to each agency's mission and are not considered part of the JFP. Flood damage reduction actions could potentially involve some version of a raise or modification or replacement of existing gates as incrementally justified. Dam safety actions include such features as adding filters, anchoring of the main dam, and reinforcement of spillway gates and piers. To develop borrow for potential earthen raises, material excavated from the Auxiliary Spillway site would be hauled either to a storage location near dike 7, to Folsom Point, or to a storage location near MIAD. The material would be processed for proper sizing and eventually become borrow material for the raising and/or strengthening of the Left Wing Dam, Dikes 7 and 8, and MIAD.

The Left Wing Dam, and Dikes 7 and 8 would potentially be raised by either constructing a concrete parapet wall on the existing crests, through placement of additional earthen material, or through a combination of both measures. To address static concerns at these facilities, a filter zone would be installed beneath the downstream overlay. Material for the filter would most likely be produced at Beal's point or at Folsom Point, and hauled to the construction sites using construction roads within the reservoir or via city roadways. If it is determined that local material would not meet the specifications for the filter zone, then the material would be hauled to the site from local suppliers.

MIAD would be subject to several measures addressing hydrologic, seismic and static concerns. MIAD is an earthen structure with part of its base constructed on potentially unstable river bed material. Due to the potential risk of the MIAD embankment subsiding during an earthquake, the downstream base would either be excavated and replaced, or the weak material strengthened through a jet grouting process. A downstream overlay, with filter, would be constructed on the downstream slope of MIAD to provide increased stability of the structure and to reduce static issues.

Construction work would be scheduled to coincide with reservoir levels that would allow for development of borrow within the reservoir area. Construction work would be staged at several locations within the reservoir area near the borrow sites and near each of the structures requiring modifications. Staging areas would be located at Granite Bay (Dikes 1, 2, and 3), Beal's Point (Right Wing Dam and Dikes 4, 5, and

6), at the Main Concrete Dam, at the Left Wing Dam, at Folsom Point (Dikes 7 and 8, MIAD), and at MIAD. Most staging areas would have a portable materials processing (crushing and sizing) facility to prepare earthen material for earthen raises, to produce sand from granitic rock, to store general construction materials, and to serve as a contractor work area.

At a minimum, portable concrete batch plants would be set up at Beal's Point, the concrete dam, near the Left Wing Dam, and at MIAD to mix (batch) concrete for construction of the new Auxiliary Spillway, conducting modifications to the main dam, miscellaneous features, and to produce grout for stabilization of MIAD.

Borrow material for earthen raises and the MIAD overlay would be developed primarily from within reservoir sources. Borrow areas would be developed adjacent to Granite Bay, Beal's Point, and Folsom Point for excavation and subsequent processing of granitic material. The material excavated at the Auxiliary Spillway site would also be processed for use in earthen raises. Granitic material at Beal's Point would also be processed down to sand for filters. Borrow materials would be stored near each of the processing site, near each one of the facilities, and potentially at previously identified borrow storage sites such at Dike 7, or adjacent to the downstream construction zone, such as near the base of MIAD.

Much of the borrow material would be hauled using construction roads within the reservoir rim. Transport of borrow and sand material from Beal's Point to the Left Wing Dam and MIAD areas would involve the use of local roadways unless a processing site is set up at Folsom Point or the Observation Point parking lot.

Any potential raise of the Folsom Facility would also allow for an increase in the temporary storage capacity of the reservoir for flood damage reduction. The increased capacity in the reservoir would result in flooding of areas of land beyond the present project boundary. There are real estate solutions and construction solutions or a combination of the two that could be implemented to address occasional flooding of property not owned by the United States. The real estate solution involves the acquisition of occasional flowage easements from impacted property owners, or potentially, the acquisition of fee title, depending on the raise selected. The construction alternative would be implemented, where possible, by design and construction of new embankments on United States or non-government owned property. These flood damage reduction embankments would be built so as to eliminate the potential for flooding on non-government property. The decision regarding which solution will work in the various impacted areas around the reservoir will be looked at on a case by case basis and depend on feasibility, cost and acceptability to the landowners. Additional analyses, including a supplemental EIS/EIR, will be required to address real estate and new embankments design and construction details should a specific raise to the Folsom Facility be justified and approved.

An additional action being considered by Reclamation for the Folsom Facility is an enhanced security project. Folsom Dam has been designated as a National Critical Infrastructure Facility. A compromise of its integrity could potentially result in serious property damage and loss of life. The enhanced security project has several features. First is the identification of Folsom Dam staff through the use of a proximity badge and monitoring system. The second is a closed circuit television monitoring system for surveying all critical features and access points to the facilities. Third is the remote operation from a security control center of access to dikes, wing dams, and MIAD. Fourth is a provision for supplemental lighting of key facility features.

Project Alternatives

No Action/No Project Alternative

The No Action/No Project Alternative describes the reasonably foreseeable future without any SD/FDR action. Without the project hydrologic, seismic, static, and flood damage reduction risks currently posed by the Folsom Facility would continue into the future.

Action Alternatives

In addition to the No Action/No Project Alternative, the Folsom DS/FDR EIS/EIR evaluates five action alternatives. The basic features of the five alternatives are outlined below.

Alternative 1 – Fuseplug Auxiliary Spillway, No Concrete Dam Raise/Embankment Crest Protection

Under Alternative 1, there would be no raise to the concrete structure with minimal modifications to the existing spillway. A large fuseplug Auxiliary Spillway would be constructed adjacent to the Left Wing Dam to address hydrologic dam safety concerns. The crests of some of the earthen structures would be strengthened to address hydrologic dam safety concerns, but not to increase the flood storage capacity of the reservoir. The basic elements of Alternative 1 are listed below.

- Main Concrete Dam
  - No raise,
  - Minor to moderate modifications to existing spillway bridge, gates, and piers
  - Tendons, shear keys, or toe blocks to address seismic concerns
  - Large fuseplug Auxiliary Spillway for Safety of Dams risk

- Right and Left Wing Dams
  - Crest protection for Safety of Dams risk
  - Toe drains and crest filters to address static issues

- MIAD

- Crest protection for Safety of Dams risk
- Jet grouting of downstream foundation for seismic issues
- Downstream overlay for seismic and static issues
- Full-height filters

- Dikes, 1, 2, 3, 7, & 8
  - No action

- Dikes 4, 5 & 6
  - Crest protection for Safety of Dams risk
  - Full height filters and toe drains for static concerns

- Potentially impacted real estate (no need for action)

- Other Project Features
  - Staging for construction at Beal's Point, Main Dam, Folsom Point and MIAD
  - Utility and road relocations within the reservoir boundary
  - Haul road construction within existing reservoir boundary
  - Borrow site development and processing
  - Concrete and jet grout processing

Alternative 2 – Fuseplug Auxiliary Spillway with Tunnel, 4-ft Dam/Embankment Raise

Under Alternative 2, the existing concrete parapet wall would be strengthened with some modifications to the existing spillway gates. A smaller fuseplug Auxiliary Spillway with a chute and a tunnel would be constructed to address hydrologic and flood damage reduction concerns. All of the earthen structures would be raised to address hydrologic concerns and to provide additional flood storage capacity. The basic elements of Alternative 2 are listed below.

- Main Concrete Dam
  - Minimal raise of existing 3.5-ft upstream parapet wall along non-overflow structure.
  - Minor to moderate modifications to the spillway bridge, gates and piers
  - Tendons, shear keys, and toe blocks to address seismic concerns
  - Foundation drain enhancements
  - Smaller fuseplug Auxiliary Spillway with new spillway tunnel for Safety of Dams risk and flood damage reduction

- Right and Left Wing Dams
  - <0.5-ft earthen raise with 3.5-ft parapet wall raise for Safety of Dams risk
  - Toe drains and half-height filters to address static issues

- MIAD

- 4-ft earthen raise for Safety of Dams risk
- Excavate and replace downstream foundation for seismic issues
- Downstream overlay for seismic issues
- Toe drains and full-height filters to address static concerns

- Dikes, 1, 2, 3, 7 & 8
  - 4.0-ft earthen raise for Safety of Dams risk
  - Toe drains for static concerns

- Dikes 4, 5 & 6
  - 4.0-ft earthen raise for Safety of Dams risk
  - Toe drains and half-height filters for static concerns

- Potentially impacted real estate
  - Acquisition of occasional flowage easements or fee interest may be necessary.
  - Flood damage reduction embankments.

- Other Project Features
  - Staging for construction at Granite Bay, Beal's Point, Main Dam, Folsom Point and MIAD
  - Utility and road relocations within the reservoir boundary
  - Haul road construction within existing reservoir boundary
  - Borrow site development and processing
  - Concrete processing

Alternative 3 – JFP Gated Auxiliary Spillway with Potential 3.5-ft Parapet Wall Raise

Under Alternative 3, a gated Auxiliary Spillway would be constructed to address hydrologic dam safety and flood damage reduction concerns. Certain flood damage reduction enhancements could potentially be added to the gated spillway as incrementally justified. Potential flood damage reduction enhancements include an embankment raise of up to 3.5 ft and/or modification or replacement of existing service gates and emergency spillway gates. The basic elements of Alternative 3 and potential flood damage reduction enhancements are listed below:

- Main Concrete Dam
  - Major modifications to spillway bridge, gates, and piers (potential flood damage reduction enhancement as incrementally justified).
  - Tendons, shear to address seismic concerns
  - Foundation drain enhancements
  - Gated Auxiliary Spillway for safety of dams and flood damage reduction

- Right and Left Wing Dams

  - 3.5-ft parapet wall raise for flood damage reduction (potential flood damage reduction enhancement as incrementally justified).
  - Toe drains and full-height filters to address static issues

- MIAD
  - 3.5-ft parapet wall raise for flood damage reduction (potential flood damage reduction enhancement as incrementally justified).
  - Jet grouting of downstream foundation for seismic issues
  - Downstream overlay for seismic issues

- Dikes, 1, 2, 3, 7 & 8
  - 3.5-ft parapet wall raise for flood damage reduction (potential flood damage reduction enhancement as incrementally justified).
  - Toe drains for static concerns

- Dikes 4, 5 & 6
  - 3.5-ft parapet wall raise for flood damage reduction (potential flood damage reduction enhancement as incrementally justified).
  - Full height filters and toe drains for static concerns

- Potentially impacted real estate
  - Acquisition of occasional flowage easements will probably be necessary.
  - Flood damage reduction embankments.

- Other Project Features
  - Same as Alternatives 2

Alternative 4 – JFP Gated Auxiliary Spillway with Potential 7-ft Dam/Embankment Raise

Under Alternative 4, a smaller Auxiliary Spillway would be constructed to address both dam safety hydrologic and flood damage reduction objectives. If incrementally justified, a 7-ft raise of the concrete dam and all embankments could potentially be added to enhance flood damage reduction protection. All earthen structures would be raised to increase the temporary flood storage capacity of the reservoir. The flood storage capacity would be the same as for Alternative 3, but the additional raise would provide increased freeboard (i.e. the space between the maximum surface water elevation and the crest of the dams and dikes). The basic elements of Alternative 4 and potential additions for flood damage reduction purposes are listed below.

- Main Concrete Dam
  - 7-ft concrete raise of non-overflow section (potential flood damage reduction enhancement as incrementally justified).
  - Major modifications to spillway bridge, gates, and piers

- Tendons and shear keys to address seismic concerns
- Foundation drain enhancements
- Gated Auxiliary Spillway for Safety of Dams and flood damage reduction risk

- Right and Left Wing Dams
  - 7-ft earthen raise for flood damage reduction (potential flood damage reduction enhancement as incrementally justified).
  - Toe drains and full height filters to address static issues

- MIAD
  - 7-ft earthen raise for flood damage reduction (potential flood damage reduction enhancement as incrementally justified).
  - Jet grouting of downstream foundation for seismic issues
  - Downstream overlay for seismic issues
  - Full-height filters for static control

- Dikes, 1, 2, 3, 7, & 8
  - 7-ft raise for flood damage reduction (potential flood damage reduction enhancement as incrementally justified).
  - Toe drains and full-height filters for static concerns

- Dikes 4, 5 & 6
  - 7-ft raise for flood damage reduction (potential flood damage reduction enhancement as incrementally justified).
  - Full height filters and toe drains for static concerns

- Potentially impacted real estate
  - Acquisition of occasional flowage easements or fee interest will be necessary. Flood damage reduction embankments.

- Other Project Features
  - Same as for Alternatives 2 and 3

Alternative 5 – No Auxiliary Spillway, 17-ft Dam/Embankment Raise

Under Alternative 5 all Folsom project facilities would be raised approximately 17 feet. No Auxiliary Spillway would be constructed because the reservoir capacity would be increased to contain the PMF event. All of the earthen structures would be raised to address hydrologic concerns and to increase the flood storage capacity of the reservoir. The basic elements of Alternative 5 are listed below.

- Main Concrete Dam
  - 17-ft raise of non-overflow section
  - Major modifications to spillway bridge, gates, and piers
  - Tendons and shear keys to address seismic concerns

- Foundation drainage improvements

- Right and Left Wing Dams –
  - 17-ft earthen raise for Safety of Dams risk
  - Full-height filters and toe drains to address static issues

- MIAD
  - 17-ft earthen raise for Safety of Dams risk
  - Excavation and replacement of foundation for seismic issues
  - Downstream overlay for seismic issues
  - Full-height filters and toe drains

- Dikes, 1, 2, 3, 7 & 8
  - 17-ft raise for Safety of Dams risk
  - Full-height filters and toe drains for static concerns
  - Dikes 4, 5 & 6
  - Full height filters and toe drains for static concerns

- Potentially impacted real estate
  - Acquisition of occasional flowage easements or fee interest will be necessary. This could include the relocation of residences and/or businesses.
  - Flood damage reduction berms will be necessary.

- Other Project Features
  - Full development of all borrow sites, otherwise same as Alternatives 2, 3, and 4

Environmental Consequences

The environmental baseline used to establish the basis for determining effects of the Folsom DS/FDR alternatives is derived from the NEPA definition of future conditions without project and the CEQA definition of existing conditions. The reader is referred to the individual resource chapters in this EIS/EIR for discussions on how the baseline is being applied to each resource. Table ES-2 provides a summary of the impacts by resource area along with the proposed mitigation measures.

Table ES-2
Impacts and Proposed Mitigation Measures Summary- Folsom DS/FDER EIS/EIR

Resource Area	*Impact*	*Potential Mitigation*
Hydrology	• Reduce water source to wetlands	• Monitor water levels during/after construction
Water Quality	• Increased siltation • Increased turbidity • MAID water quality impacts	• Best management practices • Best management practices • Best management practices
Groundwater	• Localized groundwater level fluctuations	• Monitor water levels during/after construction
Water Supply	• Potential short-term disruption of Natomas pipeline	• Establish temporary water source
Air Quality	• Uncontrolled NO_x emissions from construction vehicles exceeding de minimis thresholds • Particulate (PM_{10}) emissions exceeding de minimis thresholds	• Develop construction sequencing plan that includes best available emissions control practices. • Best management controls for roadway, processing facility, and batch plant particulate emissions
Aquatic Resources	• Less than significant impact to fish • Potential loss of seasonal wetland/vernal shrimp habitat • Displacement of non-native fish species from stilling basin	• None required for fish • Mitigation plan • None required for non-native fish
Terrestrial Vegetation and Wildlife	• Potential impact to special status plant and animal species • Direct or indirect impacts to oak and pine woodlands, riparian woodland and chaparral habitats • Permanent loss of wetlands • Adverse impacts to the Valley Elderberry Long-Horn Beetle and its habitat • Potential impact to protected amphibian species	• Mitigation plan • Mitigation plan • Mitigation plan • Mitigation plan • Mitigation plan
Soils	• Loss of soil resource through excavation and borrow site development	• Best management practices
Minerals	• No impact	
Geological Resources	• Commitment of geological resources for facility construction • Naturally occurring asbestos disturbance	• None • Asbestos abatement plan incorporating best management practices
Visual Resources	• Temporary reduction in visual quality as a result of borrow development and construction activities • Permanent loss of lake views from trails, shoreline and residences due to new parapet walls and embankments	• Siting of processing facilities in less obtrusive areas • Not mitigable
Agricultural Resources	• No impact	
Transportation and Circulation Element	• Significant impact to roadways with current poor level of service	• Complete a peak hour capacity analysis to identify potential roadway improvements or operations modifications

Table ES-2 Impacts and Proposed Mitigation Measures Summary- Folsom DS/FDER EIS/EIR		
Resource Area	***Impact***	***Potential Mitigation***
		• Prepare a transportation management plan that outlines contractor haul routes for coordination with the local entities
Noise	• Increase in area noise levels due to construction, processing, and transport • Significant increase in nighttime noise levels at three sensitive receptor locations	• Construct portable noise barriers • Maintenance of exhaust mufflers • Scheduling truck traffic to day time hours • Blasting during daytime hours only • Monitoring of construction noise levels at sensitive locations
Cultural Resources	• Potential loss or disturbance of cultural resources	• Consultation with the State Historic Preservation Office and implementation of mitigation plan
Land Use, Planning, Zoning	• Land use change due to construction of new embankments, flowage easements, or property acquisition	• Construct flood damage reduction berms to prevent inundation of private property • Acquire real estate rights (easement or fee title) of inundated properties
Recreation	• Significant loss of visitor days and recreation revenues	• Construction related impacts to recreation facilities will be replaced in kind by the lead construction agency and disturbed recreation areas and facilities will be restored to pre-construction condition • Prepare signage and announcements related to construction schedules and closures • Replace trail staging area at Folsom Point with comparable parking capacity • Establish detours with signs for roads/trails • Following borrow excavation, recontour beach areas for public use • Construction, borrow, and staging areas will be sited as far from recreation areas as is practical • Reconfigure entrances to Beal's Point and Granite Bay to prevent conflict between recreation and construction traffic • Use flagmen to control traffic • Construction hours scheduled to accommodate high use periods
Public Services and Utilities	• Potential for temporary disruptions • Damage to rest rooms and roads • Relocate Natoma Pipeline • Would create solid waste	• Stage utility relocations and prior announcements • Repair or relocate • Establish temporary water source • Recycle when possible, select licensed landfills

Table ES-2 ***Impacts and Proposed Mitigation Measures Summary- Folsom DS/FDER EIS/EIR***		
Resource Area	***Impact***	***Potential Mitigation***
Hydropower	• No impact	
Population and Housing	• Relocation of Displaced residents or businesses	Locate comparable properties during relocation assistance work
Public Health and Safety	• Work site, roadway, and recreation site safety control	• Best management practices
Indian Trust Assets	• No impact	
Environmental Justice	• No impact	

Hydrology, Water Quality, and Groundwater

Construction of any of the DS/FDR alternatives will in themselves not change the hydrology of the American River nor alter current operations of the reservoir. Construction of the project would result in improved hydrologic control of the American River watershed flood flows, providing flood damage reduction benefits to the Sacramento region.

Excavation of in-reservoir borrow sites and construction of earthen raises would have the potential for significant water quality impacts. Water quality impacts would result from soil erosion both during and after the excavation of borrow material. The effect would be mitigated through use of best management practices.

Water Supply

Placement of excess material within the reservoir would reduce water supplies by less than 1 percent.

Air Quality

Exhaust emissions from construction equipment and materials hauling trucks, fugitive dust produced by construction equipment and haul trucks on disturbed ground, fugitive dust emissions from materials processing facilities and concrete batch plants would cumulatively produce a significant air quality impact. Depending on the alternative, NOx emissions would trigger a General Conformity evaluation, from which mitigation measures would be developed to reduce air quality impacts.

Aquatic Resources

Construction of the DS/FDR actions would have less than a significant impact on in-reservoir aquatic resources. The majority of the fish species inhabiting the reservoir are introduced game or prey species, and special status species are not known to inhabit the immediate vicinity of the project sites.

Construction near Dike 6 would have the potential to remove a seasonal wetland. Loss of the wetland would be considered to be significant requiring mitigation compensation.

Dewatering of the stilling basin would result in the removal of fish species.

Terrestrial Vegetation and Wildlife

Construction of any of the project alternatives would have the potential to adversely affect special status species, native habitats and wetlands. All vegetation impacts can be mitigated to non-significant levels. Construction activities could result in the alteration or loss of habitat for wildlife special status species. These impacts could be mitigated to non-significant level. Wetlands downstream of MIAD would be monitored throughout construction.

Soils, Minerals, and Geological Resources

Construction activities, particularly in the area of Auxiliary Spillway, the wing dams, MIAD, and dikes, would result in the loss of topsoil resources. This impact would be mitigated to non-significant levels through the implementation of best management construction practices. Use of granitic material from within the reservoir for the raising the dikes and dams represents a long-term commitment of this resource. The schist based bedrock comprising the borrow material east of dike 7 contains low-levels of asbestos. Although the concentrations of asbestos are too low to be an economic mineral, the schist will need to be managed to reduce air borne release of the asbestos fibers.

Visual Resources

Establishment of the material processing facilities, excavation of borrow sites, and construction work on the Folsom dams and dikes would result in a significant but temporary visual impact to Folsom Lake State Recreation Area visitors and to the home owners bordering the reservoir. The visual resource impairment would be an unavoidable adverse impact until construction work was completed at each facility.

Construction of new flood damage reduction embankments and security measures would permanently change the view and visual setting of residences along some areas of Folsom Lake, and from some areas of shoreline and trails.

Agricultural Resources

The Folsom DS/FDR actions would not impact local or regional agricultural resources.

Transportation and Circulation

The hauling of materials and supplies to the Folsom DS/FDR work sites would not have a significant impact on the Level of Service for most local roadways except for Scott Road north of White Rock, and East of Natoma Street. This impact could be mitigated through the scheduling of construction vehicles to off-peak times.

Noise

Construction equipment, materials processing facilities, and haul trucks all will increase noise levels within the project area. During the day time, there would be a perceptible increase in noise for the project area, but due to the distance between sensitive noise receptors and noise sources, the increase would not be considered as significant. However, nighttime noise increase at three residential receptor areas would exceed ambient noise criteria creating an unavoidable adverse impact, should mitigation measures not be effective in reducing noise levels.

Cultural Resources

Cultural resources are known to exist at many locations proposed for staging, borrow development, and facility construction. Cultural resources would be disturbed or destroyed under any of the action alternatives. Cultural resource impacts would be mitigated for under a programmatic agreement in consultation with the State Historic Preservation Office.

Land Use, Planning, and Zoning

Construction of Folsom staging, borrow site, and Facility improvements would be conducted in compliance with local planning and zone rules. New embankments, flowage easements, and/or property acquisition could change zoning. Construction of raises would result in the potential for temporarily increasing the surface elevation of the reservoir. This would result in the potential for flooding of non-government owned property along the current federal property boundary. This impact would be addressed by construction of flood damage reduction embankments and/or acquisition of occasional flowage easements of affected lands.

Recreation

The establishment of staging areas and borrow sites within existing recreational use areas coupled with construction work at the Folsom Facility and haul truck traffic would have significant and unavoidable adverse impacts to recreation at Folsom. State Parks, the entity managing the recreational aspects of Folsom, would be impacted by losing all public access at the Folsom Point recreation area, and portions of Beal’s Point and Granite Bay recreation facilities. This would result in a significant loss of recreation revenue to the State.

Public Services and Utilities

Construction planning and sequencing will be performed so that existing utilities would not be impacted by Folsom DS/FDR construction activities. Mitigation measures would reduce interruptions in service. All roads and other utilities damaged from the project would be repaired or replaced.

Hydropower

Construction of the Folsom DS/FDR actions would not impact hydropower operations at Folsom or Nimbus Dams.

Population and Housing

Actions taken under the Folsom DS/FDR could result in the relocation of residents or businesses. Agencies would locate comparable properties during relocation assistance work.

Public Health and Safety

The Folsom DS/FDR would include construction planning and implementation elements providing safety considerations for local public and visitors to the Folsom Lake State Recreation Area.

Indian Trust Assets

There are no Indian Trust Assets within the project area that would be affected by Folsom DS/FDR construction activities.

Environmental Justice

There are no ethnic or low income groups defined by Environmental Justice guidance within the project area that would be disproportionately impacted by Folsom DS/FDR activities.

Compliance With Applicable Laws and Regulations

This EIS/EIR complies with NEPA and CEQA requirements. The Proposed Action, as defined herein, would comply with all Federal, State, and local laws and permitting requirements.

Identification of Environmentally Preferred Alternative

The No Action/No Project Alternative, because it does not involve any construction activity, would have the least environmental effect to the project area, but it would not meet the project's purpose and need. The No Action/No Project Alternative would also have the greatest potential for lower American River impacts resulting from the inability to control large storm events with the existing Folsom Facility.

Alternative 1 would have the least environmental impact of the action alternatives, but it would not fully address the project's purpose and need. Alternative 1 does not adequately address the flood damage reduction goals of the Corps and state sponsors.

Alternative 2 with the inclusion of the gated Auxiliary Spillway tunnel partially addresses flood damage reduction objectives, but at greater impact than Alternative 3 due to the large amount of earthen material handled under Alternative 2. Alternative

3 fully addresses the project's purpose and need, although at greater impact than Alternative 1 due to the increased construction work at all facilities.

Alternative 4 would meet the project's purpose and need but would have greater environmental impact due to the increased amount of earthen material excavated, process and placed at the facilities. Alternative 5 would have the greatest environmental impact because it would require complete development of all potential in reservoir borrow sites to provide the earthen material necessary to construct the 17-ft raise.

Base on this summary, Alternative 3 has been identified as the environmentally preferred alternative addressing the CEQA requirement to address such in an EIS/EIR.

Chapter 1
Introduction

The proposed Folsom Dam Safety/Flood Damage Reduction (DS/FDR) actions reflect a cooperative effort by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and the U.S. Army Corps of Engineers (Corps), and the Corps non-federal sponsors, the State Reclamation Board (Reclamation Board)/Department of Water Resources (DWR) and the Sacramento Area Flood Control Agency (SAFCA). This Environmental Impact Statement/Environmental Impact Report (EIS/EIR) addresses proposed alternative measures for implementing Reclamation's dam safety and security obligations and the Corps' flood damage reduction structural modifications at Folsom Dam and appurtenant facilities. These facilities impound waters of the American River forming Folsom Reservoir and are collectively referred within this document as the Folsom Facility (Folsom Facility).

The improvements being considered for the Folsom Facility, as addressed in this EIS/EIR, respond in varying degrees to certain objectives of each of the aforementioned agencies. Reclamation's Safety of Dams Program objectives focus on reducing the risk of failure under hydrologic (flood), seismic (earthquake), and static (seepage) loads. Folsom Dam has been designated as a National Critical Infrastructure Facility and any compromise of the facility could result in grave property damage and loss of life. Reclamation's Security Program objectives are to protect public safety by securing Folsom Dam and its appurtenant structures and other Reclamation facilities, including the Folsom Powerplant, from attack or damage. The Corps' flood damage reduction objective is to improve the annual recurrence level of flood damage reduction provided to the lower American River corridor. Similarly, SAFCA and DWR seek to improve the level of flood protection for the Sacramento region.

This EIS/EIR presents an assessment of potential impacts for a comprehensive range of structural modification alternatives, which may be implemented under either a joint structural modification approach, which address both dam safety and flood damage reduction objectives, or through specific, separable dam safety, security and flood damage reduction structural modifications, which solely address the specific agency objective. From this range of alternatives, a comprehensive proposed and ultimately preferred alternative will be identified which addresses both the joint and separable structural modifications.

Under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), the roles of the federal, state, and local agencies involved in the implementation of the Folsom DS/FDR are summarized in the table below.

Agency	***NEPA/CEQA Role in Folsom DS/FDR***
Bureau of Reclamation	NEPA Lead Agency
U.S. Army Corps of Engineers	Cooperating Agency under NEPA
Reclamation Board, State of California/Department of Water Resources	CEQA Lead Agency
Sacramento Area Flood Control Agency	Responsible Agency under CEQA

1.1 Overview of the Folsom Facility

The Folsom Facility is located approximately 23 miles northeast of Sacramento, near the City of Folsom, in the State of California. There are 12 retention facilities (4 dams and 8 dikes) that make up the Folsom Facility (see Figure 1-1). These retention structures impound the waters of the North and South Forks of the American River forming Folsom Reservoir. The Folsom Facility is a multi-purpose facility operated by law for flood control, irrigation water supply, M&I water supply, power generation, fish and wildlife, recreation, and water quality purposes.

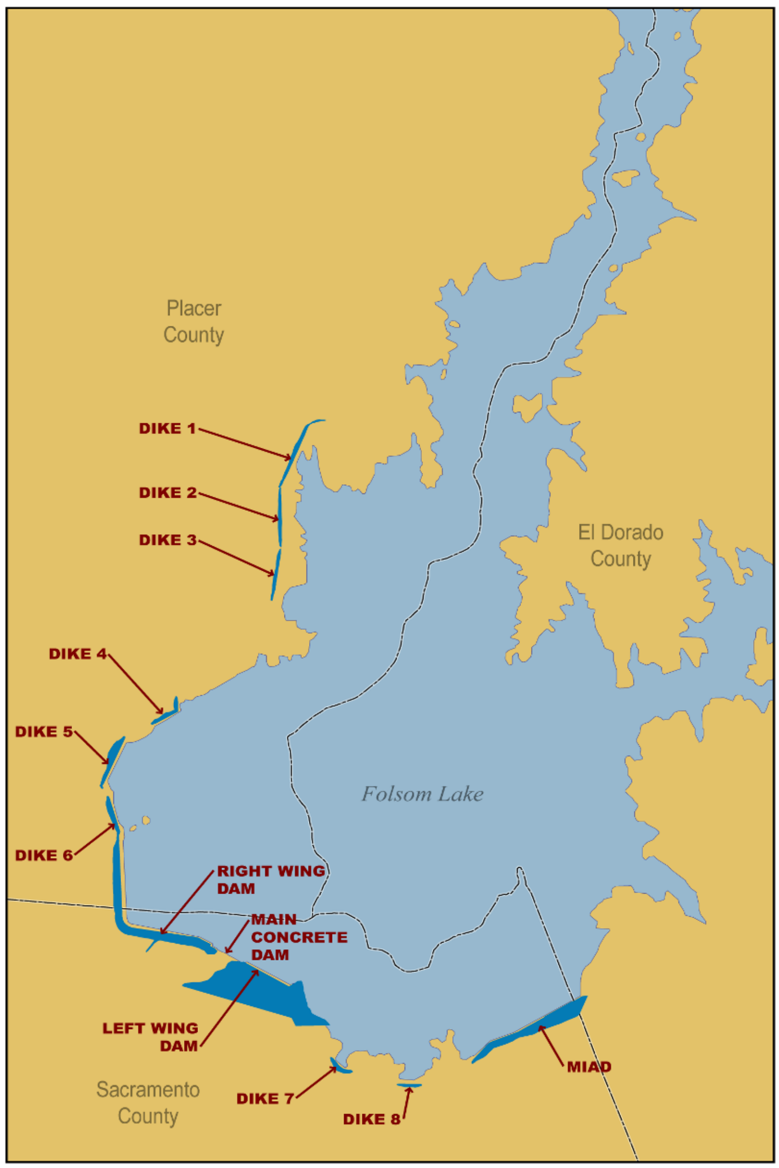

Figure 1-1
The Folsom Facility

The Folsom Facility was constructed by the Corps during the period 1948 to 1956. As required by the original legislation, ownership of the Folsom

Facility was transferred to Reclamation upon completion for operation and maintenance as an integrated feature of the Central Valley Project (CVP) (Reclamation 2005f).

The following description of the Folsom Facility was taken from the *Draft Folsom Dam, Safety of Dams Corrective Action Study Scoping Report, October 2005.* The Folsom Facility has a total of 12 dams and dikes that impound approximately 977,000 acre-feet (AF) at a reservoir water surface elevation of 466 feet (ft) on the American River to form the Folsom Reservoir, also commonly referred to as Folsom Lake. All retention structures of the Folsom Facility have a crest elevation of 480.5 ft above mean sea level (483.1 ft in NAVD 88). The design surcharge pool is 1,084,780 AF at an elevation of 475.4 ft with 5.1 ft of existing freeboard.

Figure 1-1 presents the locations of the 12 retention structures that comprise the Folsom Facility including the Main Concrete Dam, the Left and Right Wing Dams, Dikes 1 through 8, and Mormon Island Auxiliary Dam.

1.1.1 Main Concrete Dam

The main dam is a concrete gravity dam made up of 28 individual monoliths[1] and is the only concrete retention structure at the Folsom Facility. Figures 1-2 and 1-3 provide photos of the main dam. The main dam has a structural height of 340 ft and a crest length of 1,400 ft. The spillway of the main dam consists of eight tainter gates (i.e., a type of radial arm floodgate used to control water flow); five of which serve

Source: Corps 2005

Figure 1-2
Main Dam Spillway

Source: Corps 2005

Figure 1-3
Releases from Folsom Dam

as the main spillway/service gates for the main dam and three that are emergency

[1] Definitions of key terms are provided in Chapter 10, the Glossary.

gates. The total release capacity of the eight gates is 567,000 cubic feet per second (cfs) at an elevation of 475.4 ft. Below the five main spillway/service gates are two rows of four river outlets that have a total release capacity of 24,800 cfs at an elevation of 418 ft. Releases at lower levels can also be made through three power penstocks (i.e., large-diameter pipes that convey water through the dam while driving hydroelectric turbines), which have a total release capacity of approximately 8,000 cfs. Releases from the reservoir are restricted by the spillway capacity and by limits set on the rates at which water can be released through the dam structures. Downstream levees are designed to accommodate a sustained flow rate of 115,000 cfs and a maximum capacity of 160,000 cfs for a short duration during emergencies, without resulting in levee failure and downstream flooding.

1.1.2 Right Wing Dam and Left Wing Dam

Two earthfill wing dams, the Left Wing Dam (LWD) and Right Wing Dam (RWD), flank the main dam. The LWD has a structural height of 145 ft and a length of 2,100 ft, while the RWD has a structural height of 145 ft and a length of 6,700 ft.

1.1.3 Dikes 1 through 8 and Mormon Island Auxiliary Dam

Eight earthfill dikes referred to as Dikes 1 through 8, and an earthen auxiliary dam called Mormon Island Auxiliary Dam (MIAD), make up the remainder of the retention structures at the Folsom Facility. The eight dikes range in height from 10 to 100 ft and lengths of 740 to 2,060 ft. Dikes 1 through 6 are along the western side of the reservoir, while Dikes 7 and 8 are on the southeastern side of the reservoir between the LWD and MIAD. MIAD is an earthfill dam with a structural height of 165 ft and a length of 4,820 ft. MIAD does not have any spillway or outlet works structures. MIAD is referred to as a dam because it is placed in one of the historical river channels.

1.1.4 Folsom Powerplant

Directly below and downstream of the Main Concrete Dam is the Folsom Powerplant, which was constructed from 1952 to 1956 by Reclamation. Three 15ft-diameter penstocks deliver water from the dam to three generators, which together produce approximately 198,207 kilowatts (kW) of power (CDPR 2004). Nimbus Dam is approximately 7 miles downstream and serves as a regulating reservoir for the Nimbus Powerplant.

1.1.5 Folsom Dam Safety and Flood Damage Reduction Concerns

During initial construction of Folsom Dam and immediately upon completion of construction, major storm and flood events occurred on the American River which were precursor events to an event which occurred in February 1986. At that time, a series of major storms, commonly referred to as a "Pineapple Express", occurred in the Sacramento region that brought approximately 10 inches of rain over a period of

11 days, and exposed considerable deficiencies in the flood control system of the region (SAFCA Undated). Dam operators at Folsom and Nimbus Dams were required to release approximately 130,000 cfs, 15,000 cfs more than the downstream levees were designed to accommodate at a sustained flow rate. Water levels rose well above the designated freeboard of the downstream levees, and although major failure of the dam and levees did not occur, questions arose about the level of protection the structures could actually provide.

Also in the 1980s, seismic concerns were identified at MIAD by the Corps and Reclamation. The Corps and Reclamation jointly determined that liquefaction of the foundation and the subsequent failure of MIAD could occur during seismic (earthquake) activity. A phased structural modification program was rapidly undertaken in the early 1990s by Reclamation when reservoir levels were lower than normal as result of drought. These modifications partially, but not fully, reduced the risk of seismically induced liquefaction.

In 2000, Reclamation identified the potential need for additional dam safety modifications to address other hydrologic, seismic and static risks. The hydrologic risk identified is the risk of any or all of the 11 earthen embankment dams and dikes being overtopped leading to rapid uncontrollable erosion and failure during a Probable Maximum Flood (PMF) event.

In addition to the potential seismic-induced liquefaction of foundation materials at MIAD, it was also determined that modifications would be required to prevent the main dam from sliding along the dam rock foundation contact and deformation of main dam pier and gates elements leading to displacement and/or failure resulting in an uncontrollable breach. Additionally, it was determined that modifications would be required to reduce the static risk of a seepage path developing undetected within select earthen embankment dams and dikes leading also to uncontrollable erosion and subsequent failure.

1.2 Existing Flood Control Operations at the Folsom Facility

There is a high probability of a series of large storm events occurring within the American River Drainage Basin above Folsom Dam. Due to the limited capacity of the reservoir to safely contain these inflow volumes and the Dam to control releases within the safe carrying capacity of the downstream levees, structural modifications are required to reduce the probability of overtopping during a PMF event. Structural modifications are also required to improve the current level of flood damage reduction during lesser flood events.

The following summarizes the basic operational parameters under existing conditions for the Folsom Facility for a PMF or lesser flood event.

The Folsom Dam and Reservoir Water Control Manual (Water Control Manual) of 1987 contains provisions for the current flood control operations at the Folsom Facility (Corps 2005a). Although flood space requirements (i.e., the volume of capacity available within the reservoir facility to temporarily store inflows during major storm events) override all other operational considerations, Reclamation plans normal operations to avoid fluctuations in flow and to maximize water released for hydropower generation whenever possible (Corps 2005a). Management of the reservoir space reserved for flood control is seasonal, as described in the bullets below.

- "From June 1 through September 30 there is no space designated for flood control;
- From October 1 through November 17, the amount of space reserved for flood control increases uniformly until February 7;
- From February 8 through April 20 the flood reservation space is 400,000 AF, which can be reduced after March 15 if basin conditions are dry; and
- From April 21 through May 31, the required flood space decreases uniformly until no flood space is required" (Reclamation 1992 *in* Corps 2005a).

Reclamation generally plans releases to meet flood control storage space requirements by the end of each day. Releases from the dam increase until water levels in the reservoir have dropped low enough to achieve the required storage space for flood control. Reservoir operators must take into consideration several guidelines including those developed by the National Marine Fisheries Service (NMFS). These guidelines require strict release rates (ramping criteria) at certain times of the year under normal operations, to reduce the chances of stranding Chinook salmon and steelhead in the lower American River (Corps 2005a). Under emergency operations flood management becomes the overriding priority.

If inflows to the Folsom Facility reduce the available flood control storage space, then releases must occur. Several conditions restrict the volume and timing of releases from Folsom Dam. The maximum release capacity from Folsom Dam is approximately 570,000 cfs. The normal operational maximum release is termed the "objective release" and is the normal, non-emergency flood management release maximum of 115,000 cfs. This release rate is based on the design capacity of the downstream levees to accommodate a sustained flow along the lower American River.

In an emergency flood event, recent levee modifications allow for releases above 145,000 cfs to a maximum of 160,000 cfs for a short period (approximately three days). Releases above the objective release of 115,000 cfs cannot be increased more than 15,000 cfs or decreased more than 10,000 cfs during any two-hour period up to 160,000 cfs (Corps 2005a).

The existing elevation of the Main Dam spillway sill (i.e., horizontal bottom of the spillway gates) is 418 ft. Release capacity for reservoir water levels below this elevation is limited to the capability of the eight river outlets (24,800 cfs) and three power penstocks (i.e., 8,000 cfs) with a maximum release of approximately 32,800 cfs. Above this elevation, releases can be made through the main spillway of the Main Dam.

Folsom Dam does not have the capacity to release 115,000 cfs until the reservoir is substantially filled (approximately elevation 447 ft with approximately 775,000 AF of impoundment). Under normal reservoir operations with rising inflows, controlled, stepped normal operating releases of up to 115,000 cfs may occur and be maintained to remain within the objective release capacity of the downstream levees. As inflows begin to exceed the 115,000 cfs objective capacity, releases will occur at an increased but still highly controlled and stepped rate increasing to 160,000 cfs. If reservoir inflows continue to exceed 160,000 cfs, releases will be held to 160,000 cfs as long a possible to provide maximum evacuation time, but may be increased at much greater ramping rates up to the maximum release capacity of 570,000 cfs, which is well in excess of the current downstream channel capacity. If inflows exceed the maximum release capacity of 570,000 cfs, overtopping of the dam will occur, leading to erosion and potential uncontrollable catastrophic breach(s) at any earthen embankment dam or dike.

For very large, extreme flood events with required releases above 160,000 cfs, releases are required to match expected inflows. For flows above 160,000 cfs downstream levee failures are expected to occur, resulting in substantial associated flood damage. Evacuation warnings and/or orders would be implemented based on expected flows. For flows above approximately 190,000 cfs, all downstream levees are expected to be overtopped. Releases up to the existing maximum release capacity of 570,000 cfs would induce major flooding with devastating consequences comparable to those of Hurricane Katrina in 2005. Flows above 570,000 cfs into Folsom Reservoir at this point would result in overtopping of the earthen embankments leading to potential embankment failure with additional major consequences.

In addition to flood control operations, Reclamation also has requirements for maintaining water releases that protect downstream fish. The steelhead temperature objectives in the lower American River, as provided by NOAA Fisheries, state:

> "Reclamation shall, to the extent possible, control water temperatures in the lower river between Nimbus Dam and the Watt Avenue Bridge (RM 9.4) from June 1 through November 30, to a daily average temperature of less

> than or equal to 65°F to protect rearing juvenile steelhead from thermal stress and from warm water predator species. The use of the cold water pool in Folsom Reservoir should be reserved for August through October releases."

1.2.1 Reclamation's Interim Operation Agreement with SAFCA

Prior to 1995, authorized flood storage space at the Folsom Facilities was fixed at 400,000 AF above the normal operational pool elevation of 466 ft. In 1995, Reclamation and SAFCA entered into a 5-year Interim Agreement to provide a variable range of flood control storage space of 400,000 to 670,000 AF, depending upon storage conditions in existing reservoirs upstream of Folsom Facility (Corps 2002, Corps 2005a). Upon expiration, the Agreement was extended for 2 one-year periods to 2002. From 2002 until 2004 there was no agreement in place.

The Water Resources Development Act (WRDA) of 1996 directed Reclamation to continue the variable 400,000 to 670,000 AF operation as a temporary flood damage reduction solution until the Folsom Dam Modifications are constructed by the Corps and a comprehensive flood damage reduction plan for the American River Watershed had been implemented (Corps 2005a). The current agreement to continue said variable operation was executed in December 2004 and extends through 2018, unless and until the Corps implements a new water control manual and associated new flood control diagram, which will provide the basis to define new operational requirements that will supersede and replace the existing agreement. Such action is contingent upon completion of appropriate environmental compliance, mitigation, other requirements of WRDA of 1996, and reconciliation of potential conflicts with pre-existing authorities.

The Corps intended to implement a new water control manual and associated new flood control diagram under the Folsom Dam Modification Authorization and/or other relevant authorizations. The Corps has not currently identified a revised plan to implement a new water control manual and associated new flood control diagram based on the current status of the Folsom Dam Modification Authorization and/or other relevant authorizations.

The environmental impact analysis presented in this EIS/EIR addresses the proposed structural modifications to the Folsom Facility only. Construction of any of the Folsom DS/FDR actions in themselves would not substantially alter current overall operations of the Folsom Facility. During construction and upon completion of structural modifications, the current operational parameters as summarized above and defined in appropriate agreements and authorities would remain in effect until either expiration or modification of existing interim operational agreements occurs, a new Flood Management Plan is approved, or new Congressional authorizations are established, directed or mandated.

1.2.2 Updated Flood Management Plan

As directed and/or authorized by Congress, the Corps and Reclamation, under the appropriate agency authorities and agreements, will update the existing Water Control Manual of 1987 or develop a new water plan and control manual. Upon selection of either a preferred joint Folsom DS/FDR alternative or stand-alone dam safety hydrologic risk reduction or flood damage reduction alternatives, the Corps and Reclamation will determine the basis for the updated/new plan based on either existing authorizations, reauthorizations, or new authorizations.

The updated/new plan will analyze weather, basin wetness, precipitation, upstream reservoir storage, and reservoir inflow forecasts to help determine appropriate comprehensive flood control operations procedures as well as include a new water control manual with variable flood storage space of 400,000 to 600,000 AF during flood season on a permanent basis (Corps 2005a). The environmental effects and impacts on water supply, water quality, hydropower, and the other authorized functions of the system of the Updated Flood Management Plan will be evaluated in a separate environmental compliance document. The Water Control Manual will likely go through multiple revisions as the various structural modifications are completed at the Folsom Facility and a Final Updated Flood Management Plan is anticipated in 2009 (Corps 2005a).

This Folsom DS/FDR EIS/EIR generally considers operations affected by proposed structural modifications; however, a detailed analysis of operational impacts cannot be determined at this time. Upon selection of a preferred alternative(s), Reclamation, the Corps, and SAFCA will fully coordinate and address relevant congressional directives to evaluate the existing requirements related to operations and consider possible changes as appropriate. The environmental impacts associated with proposed changes and operational impacts in required supplemental environmental compliance documentation. This required compliance documentation shall be completed in parallel with the Final Updated Flood Management Plan and is anticipated in 2009.

1.3 Federal Agency Objectives

1.3.1 Reclamation's Objectives

Reclamation's core mission is to deliver water for all statutory and contractual purposes, generate power, and perform all other authorized and related programs including Reclamation's Safety of Dams Program. The primary purpose of the Safety of Dams Program is to identify potential issues with existing dams and develop corrective actions to protect public safety, property, the environment and cultural resources. Reclamation's main objective for the Folsom Facility under the Safety of Dams Program is to ensure that the Folsom Facility does not pose unacceptable risks to the public from hydrologic, seismic, and static loading conditions.

Reclamation has identified the need for expedited action at the Folsom Facility to reduce hydrologic, static, and seismic risks under its Safety of Dams Program. The identified risks are among the highest of all dams in Reclamation's inventory and the Folsom Facility is among Reclamation's highest priorities within its Safety of Dams Program.

The hydrologic capabilities of the Folsom Facility must be increased to safely pass the PMF as updated in 2001. This PMF was developed assuming the upstream dams safely pass this flood. The PMF is defined as "the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular drainage area" (Corps 2002). This means that during the most severe storm reasonably possible, the Folsom Facility must have the ability to safely contain and release PMF floodwaters through the dam without failure of the dams or dikes. Recent estimates indicate that a frequency of flood approximately the same size as the PMF would have a recurrence level somewhere between 1 in 7,100 years and 1 in 22,000 years. It is estimated that the PMF volume is nearly fully realized at the 1 in 7,000 recurrence level and additional incremental volume increases are relatively minor to undetectable. The total PMF inflow volume to the Folsom Facility is estimated to be approximately 3.2 million AF over approximately a 5 day (120 hours) period with a peak inflow rate of approximately 906,000 cfs. Currently, the Folsom Facility could safely contain and pass approximately 70 percent of the PMF which would be equivalent in size to a frequency of flood with recurrence levels between 1 in 2,000 years and 1 in 5,000 years.

Reclamation recognizes the consequences of overtopping the facility during a major flood event with an approximate recurrence level greater than 1 in 2,000 years would be catastrophic, with potential Hurricane Katrina-like or greater consequences. Initial overtopping of the facility could occur at any retention feature and, if the structure is earthen, could erode leading to a breach of the retention structure exposing widespread population and property downstream of the structures to this catastrophic flood risk. The potential area of exposure is within both the immediate American River channel area and widespread areas downstream of peripheral Folsom Facility retention structures. Areas in the surrounding cities of Folsom, Granite Bay, Natomas, Roseville, Rocklin, Sacramento and West Sacramento could be significantly affected should a breach occur at Dikes 1 through 6 and the RWD. Areas in the surrounding cities of Folsom, Rancho Cordova, Natomas, Sacramento and West Sacramento could be significantly affected should a breach occur at the Main Concrete Dam, LWD, Dikes 7 and 8 and MIAD.

Reclamation is working closely with the Corps and its partners to integrate Reclamation's objective of expeditious hydrologic risk reduction and the Corps' objective of providing incremental flood damage reduction benefits by optimizing the construction sequencing and excavation of the spillway in conjunction with any needed physical raise of the retention structures. An integral component of the optimization is providing Reclamation the opportunity to integrate interim or permanent measures at the control section to meet the objective of expeditiously reducing the hydrologic risk.

Reclamation has identified other expedited safety of dams risks related to potential seismic and static events. These risks are also significant and expose the populations surrounding the facility to a potential breach leading to catastrophic inundation downstream of various retention structures. These risks are to be reduced in accordance with Reclamation's Public Protection Guidelines, as stand-alone Safety of Dams modification elements of the overall Folsom DS/FDR actions, with optimized integration with Corps flood damage reduction elements, where appropriate.

In the event that portions of the Folsom DS/FDR actions do not proceed as described in this EIS/EIR, Reclamation will identify a stand-alone modification to mitigate this risk in accordance with Reclamation's Public Protection Guidelines. Also, the Corps would re-initiate the planning process for their current flood damage reduction project authorizations.

1.3.2 Corps' Objectives

Flood damage reduction is one of the Corps' many missions. Congress has authorized three projects for the American River Watershed Investigation: Common Features, the Folsom Dam Modification, and the Folsom Dam Raise. As authorized, the projects would increase flood damage reduction to the Sacramento area along the main stem of the American River. The Common Features Project, as further described later in this chapter, will reduce the probability of flooding in Sacramento to 1 in 100 for any given year. The Folsom Dam Modification Project, as authorized, would further reduce the probability of flooding in Sacramento in any one year to 1 chance in 140. Beyond these projects, the Folsom Dam Raise Project, as authorized, would reduce the probability of flooding to approximately 1 in 200 in any given year, which has been identified as the goal of the DWR/Reclamation Board and SAFCA (hereinafter, the "non-federal sponsors"). The objective of the Corps is to provide increased flood damage reduction consistent with Federal planning principles and guidelines.

1.4 Overview of Folsom Dam Safety/Flood Damage Reduction Actions Related to the Joint Federal Project

Many of the Corps' flood damage reduction and Reclamation's dam safety activities planned or underway at the Folsom Facility are independent (stand-alone) projects (i.e., specific to the needs and objectives of each agency). However, there are common actions that could, and should, be taken to address key objectives of both agencies. These actions primarily focus on control of hydrologic function of the American River. Additional hydrologic control is necessary to minimize flooding potential (improve flood damage reduction) along the lower American River and at the same time address the dam safety hydrologic risk to the Folsom Facility (overtopping of the dams and dikes during a PMF or other major flood event).

Beginning in 2004, Reclamation and the Corps established an Oversight Management Group, consisting of senior management from both agencies, to facilitate project coordination. Collaborative activities included a comprehensive value planning effort to identify a joint project that would meet the respective flood damage reduction and dam safety objectives. Congress formalized this effort in the Fiscal Year (FY) 2006 Energy and Water Development Appropriations Act by directing the two agencies to continue progress toward a joint project that satisfactorily addressed the flood and dam safety hydrologic risks posed by the American River watershed and the existing Folsom Facility. This combined effort identified a gated auxiliary spillway, otherwise referred to as the Joint Federal Project (JFP) as the common feature addressing both objectives. The basic characteristics of JFP are summarized as follows:

> Project Description. The JFP at Folsom Dam and Reservoir will consist of six new 23-ft X 33-ft submerged tainter gates at invert (i.e., sill elevation of) 368-ft combined with a concrete-lined auxiliary spillway approximately 170-ft wide and 1,700-ft in length. Gate dimensions and invert elevation may be optimized during design to maximize performance and/or reduce costs. To achieve the objective of expedited feasibility level design, optimization of the spillway design will focus, to the extent feasible, upon varying the invert elevation of the new gates, but if necessary, may include varying the dimensions of the six tainter gates, approach channel or auxiliary spillway. The optimization will seek to improve upon the flood damage reduction objective of at least 1/200 year flood damage reduction (i.e., flood damage reduction sufficient to handle a major storm event of an intensity with the probability of occurring once in 200 years) while continuing to preserve and expedite completion of the dam safety objective of safely passing the PMF.
>
> *Additions.* Additional features to the JFP may be proposed later as mutually determined by participating agencies in order to: (1) achieve a minimum 1/200 year flood damage reduction; or (2) as incrementally justified through appropriate analysis and evaluation. Potential additional features may include a raise of up to 3.5 ft for all embankments, or modification or replacement of the existing service gates or emergency spillway gates. Any additions to the JFP, as justified, will be for flood damage reduction purposes only.

Stand-Alone Projects. Other preferred alternatives selected to address other Reclamation Dam Safety and Security objectives of seismic, static and security risk reduction and the Corps' other related flood damage reduction objectives not specifically addressed in the JFP are separable, stand-alone projects and alternatives to be selected, implemented and managed by the respective agency, although the full suite of possible alternatives and their associated impacts have been comprehensively and collectively addressed in this Folsom DS/FDR EIS/EIR.

This EIS/EIR addresses the effects of implementing a variety of measures that would increase the level of flood damage reduction and dam safety currently offered by the Folsom Facility. The alternatives described in this EIS/EIR include numerous features that address dam safety and security, and flood damage reduction issues. The individual improvement project(s) that are ultimately implemented would likely include joint components reflecting the missions of both agencies. The project would also include other separate, stand-alone dam safety/security and flood damage reduction features previously authorized for completion by the respective agencies. Due to the fact that there are separate authorizations that each agency must follow, this EIS/EIR delineates actions that are dam safety- and security-specific or flood damage reduction-specific from those actions that could be implemented jointly by both agencies.

1.5 Folsom Dam Security Enhancement Project

The purpose of the Folsom Dam Security Enhancement Project (Security Project) is to protect public safety by securing Folsom Dam and its appurtenant structures and other Reclamation facilities, including the Folsom Powerplant, from attack or damage. Folsom Dam has been designated as a National Critical Infrastructure Facility. Any compromise of the facility could result in grave property damage and loss of life.

The objective of the Security Project is to have a completely integrated and centrally-controlled Access Control, Intrusion Detection, Closed Circuit Television (CCTV), and Lighting systems designed, constructed, and turned over to Reclamation in fully operational condition. The objective of the security system is to:

1. Provide a security control center inside of the Folsom Powerplant.

2. Allow Reclamation staff to take digital photographs of personnel and print proximity identification badges, which would be integrated into the system to recognize proximity badges and allow and track access as appropriate.

3. Allow security staff to monitor site conditions via CCTV. The cameras would be remotely controlled and would provide video feed to security personnel. The existing anti-vehicle bollards would be upgraded with fixed CCTV

cameras that would monitor the area directly next to the bollards at Dikes 4, 5, 6, and 7, and MIAD.

4. Prevent unauthorized vehicle access onto Folsom Dam Road, the wing dams, and MIAD.

5. Provide for supplemental lighting for the Main Concrete Dam, spillway gates, shutter structure, and other associated structures.

1.6 Related Projects and Authorizations

Many events, projects, and documents have contributed to the development of the Folsom DS/FDR, including Reclamation's Safety of Dams Program and the Corps' American River Watershed Investigations. The following section presents the history of the Folsom DS/FDR, including existing documents, reports, and projects that have contributed to its development.

1.6.1 The Corps' American River Watershed Studies and Projects

1.6.1.1 1986 American River Watershed Investigation and the 1989 Creation of SAFCA

After the storms in 1986, the Corps led a series of investigations along the American River Watershed and determined that the level of flood damage reduction was severely inadequate. In 1988, the Continuing Appropriations Act (Public Law (P.L.) 100-202) authorized the Corps to begin a feasibility phase study of the American River Watershed Investigation (ARWI) to identify methods to increase flood damage reduction. Congress required the feasibility phase study to be completed on a cost-shared basis with the State of California (Corps 1996).

At the beginning of the process, the State of California entered into an agreement with local agencies interested in acting as project sponsors. In 1989, the City of Sacramento, the County of Sacramento, the County of Sutter, the American River Flood Control District and Reclamation District 1000 created SAFCA through a Joint Exercise of Powers Agreement (SAFCA Undated, Corps 1996). The purpose of SAFCA was to represent local interests during the flood damage reduction planning process (SAFCA Undated, Corps 1996).

1.6.1.2 1991 American River Watershed Investigation Feasibility Report

In 1991, the Corps, the State Reclamation Board, and SAFCA completed a Feasibility Report for the main stem of the American River and Natomas Basin (Corps 2002). This report recommended levee improvements in Natomas and a flood detention dam at Auburn that would store up to 545,000 AF of floodwater (Corps 1996). Auburn Dam was not approved by Congress but levee improvements were authorized in the Department of Defense Appropriations Act of 1993, Section 9159 (P.L. 102-396). Congress also directed additional studies to be conducted to identify other projects for increased flood control including offstream storage capacity along Deer Creek in the Consumnes River watershed, modifying Folsom Dam, and transferring flood control space to an upstream facility (Corps 1996).

1.6.1.3 1995 Folsom Dam Existing Flood Management Plan

In 1992, Section 9159(f)(2) of P.L. 102-396 required the Corps and Reclamation to prepare a flood management plan for Folsom Dam. Completed in 1995, the plan maximizes flood control capacity by improving the stream gage network and flood forecast system. The plan works in conjunction with the existing Folsom Dam and Lake Water Control Manual of 1987.

1.6.1.4 1996 American River Watershed Project Supplemental Information Report and Supplemental EIS/Supplemental EIR

In response to the Department of Defense Appropriations Act of 1993, the Corps, the State Reclamation Board, and SAFCA developed the 1996 Supplemental Information Report (SIR) and Supplemental EIS/Supplemental EIR (SEIS/SEIR). This report provided additional information to the 1991 Feasibility Report. The SIR outlined three flood damage reduction plans to increase flood protection of the Sacramento region: the Folsom Modification Plan, the Folsom Stepped Release Plan, and the Detention Dam Plan (Auburn Dam). Improvement features associated with each plan are identified below.

Folsom Modification Plan

- Adopt a new flood control diagram for Folsom Dam to increase flood storage to 475,000 through 720,000 AF;
- Lower the main spillway, replace five service gates, enlarge eight existing river outlets;
- Modify surcharge storage space by strengthening embankments and other physical features at Folsom Dam to accommodate increased water-surface elevations, replace three emergency spillway gates, implement advanced warning system and flood plan evacuation plan;
- Construct a slurry wall in 24 miles of levees along the lower American River; and
- Strengthen and raise 12 miles of levees on the east side of the Sacramento River between Natomas Cross Canal and the mouth of the American River.

Folsom Stepped Release Plan

- Continue variable flood storage space at Folsom Dam of 400,000 to 670,000 AF;

- Lower the main spillway and replace five new service gates and enlarge eight existing river outlets;
- Modify surcharge storage space by strengthening embankments and other physical features at Folsom Dam to accommodate increased water-surface elevations, replace three emergency spillway gates, implement advanced warning system and flood plain evacuation plan;
- Construct a slurry wall in 24 miles of levees along the lower American River;
- Increase objective release from Folsom Dam from 115,000 to 140,000 cfs and eventually to 180,000 cfs, depending on the estimated magnitude of inflows to Folsom Facility;
- Construct levee, channel, and other improvements along the lower American River in order to convey the increased objective releases;
- Lengthen Sacramento Weir 1,000 ft, widen Sacramento Bypass 1,000 ft, and raise or modify 52 miles of levees at various locations along Yolo Bypass to accommodate increased objective release;
- Strengthen and raise 12 miles of levees on the east side of the Sacramento River between Natomas Cross Canal and the mouth of the American River;
- Environmental/restoration/recreation improvements along lower reach of American River Parkway; and
- Mitigate loss of 157 acres of vegetation.

Detention Dam Plan

- Construct a 508-foot-high flood detention facility with a maximum capacity of 894,000 AF on the North Fork of the American River near Auburn;
- Construct a slurry wall in 24 miles of levees along the lower American River;
- Strengthen and raise 12 miles of levees on the east side of the Sacramento River between Natomas Cross Canal and the mouth of the American River;
- Restore flood storage space of 400,000 AF in Folsom Facility and maintain objective release from Folsom Dam of 115,000 cfs; and
- Mitigate for loss of 1,533 acres by implementing adaptive management plan for planting and resource management on 1,481 acres along North and Middle Forks of the American River and acquire and manage an additional 2,774 acres on Yuba River.

A Record of Decision (ROD) for the 1996 American River Watershed Project SIR and SEIS/SEIR was signed in July 1997.

1.6.1.5 The 1996 Common Features Project

The Detention Dam Plan described above was the National Economic Development (NED) Plan and was the plan submitted to Congress (Corps 2002, Corps 1996). The Detention Dam Plan was rejected by Congress for a second time. In Section 101 of the WRDA of 1996, Congress authorized levee improvement features common to the three plans identified in the 1996 SIR, including installation of slurry walls along the lower American River, levee modifications along the east bank of the Sacramento River downstream from Natomas Cross Canal, installation of streamflow gauges upstream from Folsom Facility, and modifications to a flood warning system of the lower American River (Corps 2002). This project is referred to as the “Common Features” project. The WRDA of 1996 also authorized the continued reoperation of Folsom Dam to achieve additional flood storage space. Construction of these features is ongoing (Corps 2002).

1.6.1.6 The 1999 Folsom Dam Modification Project

The Folsom Modification Plan of the 1996 SIR included two key features: increasing the release capacity of the dam through modification of the eight existing river outlets, and modifying the use of surcharge storage through physical and operational changes to increase flood storage capacity and maintain the objective release of 115,000 cfs (Corps 2001). This plan would take approximately six years to complete and originally required lowering the reservoir during construction.

In 1995, before the 1996 SIR was completed, a spillway tainter gate at Folsom Dam failed (Corps 2001). Reclamation spent several years working to fix the problems resulting from the gate failure, but the Folsom Modification Plan project was delayed because of public concerns over the closing of Folsom Dam Road during construction. In response to this, SAFCA prepared an Information Paper on two additional plans to the Folsom Modification Plan that would reduce traffic and other construction effects (Corps 2001). The 1998 report entitled Folsom Dam Modification Report, New Outlets Plan, presented two new alternatives to enlarge existing outlets, add five new outlets to the emergency spillway and construct a new emergency spillway stilling basin.

Although the “Common Features” project was authorized under WRDA in 1996, Section 101 of WRDA of 1999 authorized the design and construction of the Folsom Modification Plan as it was described in the 1996 SIR and modified by SAFCA's 1998 Folsom Dam Modification Report, New Outlets Plan (Corps 2002). The actual features of the plan authorized for construction included five new sluice ways through the main dam, a new stilling basin, an increase in surcharge elevation, and a reduction in variable storage. These features would be slightly altered in the Corps

2001 Final Environmental Assessment/Initial Study (EA/IS) for the Folsom Dam Modification Project.

1.6.1.7 1999 Modifications to the Common Features Project

In 1999, the Corps developed an Information Paper entitled American River Watershed, California, Information Paper, to provide additional information to the 1996 SIR. In response to this paper, Section 366 of the 1999 WRDA authorized several modifications to the Common Features Project. The scope of work was broadened from the previous Common Features Project and the new modifications included additional strengthening and raising of levees along the American River and Natomas Cross Canal (Corps 2002). The project was intended to reduce flood risk in Sacramento to a 1-in-100 probability in any given year, while waiting for the physical improvements to Folsom Dam that would further reduce the risk (Corps 2005a). This project is currently ongoing.

1.6.1.8 2001 Final EA/IS American River Watershed, Folsom Dam Modification Project

The American River Watershed, California, Folsom Dam Modification Project Final EA/IS was prepared by the Corps for the Folsom Dam Modification Project in August 2001. The document presented alternatives with the following main features:

- Enlarging the eight existing river outlets;
- Reducing the range of flood control storage space from 400,000-670,000 AF to 400,000-600,000 AF;
- Cooperating with Reclamation to update the Folsom Dam Flood Management Plan to take advantage of improved weather forecasting and the new operational capabilities with the modification of the outlets; and
- Completing a revised water control manual for Folsom Dam that modifies the variable flood control space originally instituted by Folsom reoperation (Corps 2002).

The document determined that there would be no significant adverse impacts and a Finding of No Significant Impact (FONSI) and Negative Declaration accompanied the 2001 Final EA/IS (Corps 2005b).

During the finalization of the Folsom Dam Modification Project EA/IS, the Corps also began work on the American River Watershed Long-Term Study. There were several conflicts with the features proposed in the Long-Term Study and those proposed in the Folsom Dam Modification Project. In one particular instance, if the modified use of surcharge was implemented under the Folsom Dam Modification Project, then the Long-Term Study features such as the new emergency spillway tainter gates and dikes would have to be modified again during the Long-Term Study construction. The American River Watershed, California, Folsom Dam Modification Project Final Limited Reevaluation Report of 2001 provided refinements to the design elements of the authorized Folsom Dam Modification Project and updated the costs, benefits, and effects, in order to reduce conflicts with the Long-Term Study.

1.6.1.9 2002 American River Watershed Long-Term Study Final Supplemental Plan Formulation Report EIS/EIR

Section 566 of the WRDA of 1999 (P.L. 106-53) directed the Corps to complete a study for increasing surcharge flood control storage space at the Folsom Dam and Reservoir, with the assumption that there would be no increase in water supply storage (Corps 2002). It also required the Corps to conduct a study of levees on the American and Sacramento Rivers to increase potential flood damage reduction through levee modification.

In February of 2002, the Corps, along with the State Reclamation Board and SAFCA, completed the American River Watershed Long-Term Study Final Supplemental Plan Formulation Report EIS/EIR (LTS EIS/EIR). This document was a supplement to the 1991 Feasibility Report and the 1996 Supplemental Information Report and fulfilled the requirements of Section 566 of the WRDA of 1999. The LTS EIS/EIR evaluated eight alternatives that included various dam raise options, modifications to the Folsom Dam spillway, and stepped release plans. Alternative 3, the Federally-supportable plan, consisted of:

- A 7-ft dam raise, which would raise the maximum design flood pool elevation to 482 ft;
- Widening of the spillway at L.L. Anderson Dam (French Meadows Reservoir) to safely pass the PMF; thus reducing the PMF to the Folsom Facility;
- Replacement of eight tainter spillway gates, modification of spillway bridge piers;
- Extension of the stilling basin;
- Property easements, construction of a new dike, or construction of a new retaining wall at Mooney Ridge; and
- A temporary construction bridge southeast of the dam.

1.6.1.10 2004 Dam Raise Project Authorization

In response to the 2002 LTS, Section 128 of the Energy and Water Development Appropriations Act of 2004 (P.L. 108-137) gave authorization for a 7-ft dam raise to increase reservoir storage and expand the range of storage space allocated for flood control to 495,000 through 695,000 AF (Corps 2005a). The Act also authorized widening the spillway of L.L. Anderson Dam (French Meadows Reservoir), construction of a new permanent bridge downstream of Folsom Dam, and the modification of Folsom Dam's emergency release operation plan to allow for surcharge storage to an elevation of 484.5 ft without overtopping the emergency spillway gates while closed. This project is generally referred to as the "Dam Raise" project.

1.6.1.11 2005 American River Watershed Folsom Dam Modification Project Final EA/IS

Since the preparation of the 2001 Final EA/IS for the Folsom Dam Modification Project, new information and the development of additional projects led to more refinements of the Folsom Dam Modification Project. These refinements included paving access roads and construction of a Corps' resident office. Several actions in the previous 2001 Final EA/IS have been deferred as they are likely to be addressed in other projects (Corps 2005b). The environmental impacts of the Folsom Dam Modification Project refinements were addressed in the American River Watershed, California, Folsom Dam Modification Project Final EA/IS, dated October 2005. A FONSI was issued on October 19, 2005.

1.6.1.12 Folsom Bridge Supplemental EIS/EIR

The Folsom Bridge Project is a part of the Folsom Dam Raise Project. Section 128 of the Energy and Water Development Act of 2004 (P.L. 108-137) authorizes the building of a permanent bridge downstream of Folsom Dam. The Corps released the final Supplemental EIS/EIR for this project in September 2006 (Corps 2006).

1.6.1.13 Folsom Dam Modification and Folsom Dam Raise Projects Post Authorization Change (PAC) Report

This is a report currently being prepared by the Corps documenting recommended changes to Folsom Dam Modification and Folsom Dam Raise authorized projects. It is anticipated that these changes will include: (1) reducing flood risk to areas along the American River generally equivalent to the flood damage reduction intended to be provided by the Folsom Dam Modification Project; and (2) at minimum, retaining opportunities to further flood damage reduction provided by the Folsom Dam Raise Project. It is also anticipated that the recommended changes will include provisions to meet the Reclamation's objective of safely passing the PMF at Folsom Dam.

The updated information to be presented in the PAC report is necessary to accomplish the following:

- Demonstrate consistency of recommended changes with existing Congressional project authorizations;

- Report on changes to project accomplishments and benefits, and Federal interest in the Project; and
- Serve as the basis for a new Project Cooperation Agreement (PCA) between Federal government and non-federal sponsors.

As a companion to the PAC report, Reclamation will prepare a Modification Report. The Modification Report will discuss the feasibility of dam safety improvements at Folsom Dam as part of Reclamation's Nationwide Safety of Dams Program. Besides the Folsom DS/FDR, the Modifications Report will discuss other dam safety actions outside the Folsom DS/FDR. These include structural modifications to improve static and seismic stability.

1.6.2 Reclamation's Safety of Dams

1.6.2.1 MIAD Seismic Issues

In the 1990's, Reclamation, in cooperation with the Corps, began a program to correct the seismic issues previously identified at MIAD. Phase I was initiated in 1990 and involved treatment of the upstream foundation materials of MIAD. Phase II occurred from 1993 to 1994 and involved the treatment of the downstream foundation of MIAD. After Phase II, testing by Reclamation revealed that methods to densify the foundation at MIAD did not fully treat the lower portion of the foundation and the risk of potential liquefaction of the foundation during seismic activity remains great enough to justify further actions (Reclamation 2005).

1.6.2.2 Reclamation's Safety of Dams Program

The Safety of Dams Act (P.L. 95-578) was enacted in 1978, and later amended in 1984 (P.L. 98-404). According to this Act, Reclamation is responsible for identifying potential risks with all existing Reclamation-owned dams. If unacceptable risks are identified, Reclamation is authorized to take corrective actions to reduce these risks. Section 2 of P.L. 98-404 states:

"In order to preserve the structural safety of Bureau of Reclamation dams and related facilities, the Secretary of the Interior is authorized to perform such modifications as he determines to be reasonably required" (Reclamation 2003).

The objective of Reclamation's Safety of Dams Program is "To ensure Reclamation dams do not present unacceptable risk to public safety and welfare, property, the environment, or cultural resources" (Reclamation 2003). The program includes an in-depth risk analysis that is performed on Reclamation dams to identify and address unacceptable risks.

The risk analysis process by Reclamation has several key steps. First, a baseline risk analysis is performed to determine the risks of the existing structure as it is currently operated. Risk from any failure mode is expressed as the product of the loading, likelihood of failure (among the loading categories – static, seismic, or hydrologic), and the consequences. Risk at any facility is the sum of the risk for all the failure modes. Facilities with higher risks have increased justification to take actions to reduce risk (Reclamation 2005). There are generally two different types of baseline risk analysis; the Comprehensive Facility Review (CFR) and the Issue Evaluation Risk Analysis. The CFR, the initial method that was used to evaluate the risks at the Folsom Facility, identified the baseline risks by defining the loading conditions, failure modes, and consequences for seismic, static, and hydrologic load categories.

Due to the risks identified in the CFR conducted in 2000 for the Folsom Facility, an Issue Evaluation Risk Analysis was performed to more rigorously establish the baseline risk. Following this analysis, a risk reduction analysis was performed, where various alternatives were compared to the baseline condition outlined above to evaluate their potential to reduce the identified risks (Reclamation 2003). This step is only taken when the baseline risk analysis indicates that unacceptable risks have been identified and corrective actions are necessary. First, there is a Corrective Action Alternatives Analysis to develop alternatives that could reduce risks to acceptable levels. The effectiveness of the alternatives is generally not quantified at this level. This is followed by an Alternative Evaluation Analysis, which fully examines the alternatives and their ability to reduce risks. At this stage, the risks are quantified using all available information.

The following describes how Reclamation's Safety of Dams risk analysis process has been applied to the Folsom Facility, as outlined in Table 1-1.

Table 1-1
Overview of Reclamation's Safety of Dams Risk Analysis Process[(1)]

Category	***Type***	***Analysis Completed at Folsom Facility?***	***Corresponding Document***
Baseline Risk Analysis	1. Portfolio Risk Analysis	*Ongoing*	
	2.Comprehensive Facility Review	YES, Completed in 2000[(2)]	Completed in 2000.
	3.Issue Evaluation Risk Analysis	Ongoing	
Risk Reduction Analysis	Alternative Identification	YES, Completed in 2005	1) Folsom Dam Safety of Dams - Corrective Action Study Scoping Report, Oct. 2005. 2) Folsom Facility Safety of Dams - Requirements and Concepts, Feb. 2005.
	Alternative Evaluation	Ongoing	1) Project Alternatives Solutions Study (PASS I), Oct. 2005. 2) Project Alternatives Solutions Study (PASS II), April 2006.

[(1)]Source: Reclamation 2003
[(2)]Source: Corps et al. 2006a

1.6.2.3 2000 Comprehensive Facility Review

As part of their Safety of Dams Program, Reclamation completed a CFR and analysis of risk at the Folsom Facility in 2000. Several potential hydrologic, seismic and static failure modes were identified during the review as having a high likelihood of occurring. Hydrologic issues at the Folsom Facility include ability of the Folsom Facility to safely contain and pass a major flood event. Seismic, or earthquake, issues at the Folsom Facility include the instability of the Main Concrete Dam leading to the potential failure of the spillway gates and piers (Reclamation 2005f). The instability of the foundation of MIAD is also a seismic concern because the foundation has been constructed on mine and dredge tailings and could have the potential to liquefy during seismic activity. Static issues, which are those that occur during normal daily operations, include potential seepage and piping of the wing dams and dikes (Reclamation 2005f). Reclamation's Draft Folsom Dam, Safety of Dams Corrective Action Study Scoping Report, October 2005, provides an overview of the various hydrologic, seismic, and static failure modes identified at the Folsom Facility.

Results of Reclamation’s analyses have determined that several of the risks associated with the hydrologic, seismic, and static failure modes are so high, action is required to reduce risk in an expedited fashion. Although the probability of dam and dike failure is low, the consequences of failure are extremely high because of the large downstream population and the volume of water that would be released (Reclamation 2005f).

1.6.2.4 2004 Corrective Action Study

Reclamation began a corrective action study (CAS) in 2004 to develop corrective action alternatives to address all dam safety issues identified in the CFR and the concerns previously identified at MIAD. During development of the CAS, Reclamation worked with the Corps Modification and Raise Projects to share information and develop actions to reduce hydrologic risk (Reclamation 2005). The CAS is currently underway and is scheduled for completion in the Fall of 2006.

1.6.2.5 2005 Folsom Dam Road Access Restriction EIS

On February 8, 2003, Reclamation closed Folsom Dam Road indefinitely pending a final decision through a public involvement process. Reclamation cited national security concerns as the basis for this action. The 2005 Folsom Dam Road Access Restriction EIS outlines the potential impacts of a permanent closure. Considering these impacts, Reclamation’s final ROD was partial road opening conditioned upon security upgrades funded by the City of Folsom.

1.6.3 Folsom DS/FDR

Plans and specifications for the Corps' Folsom Dam Modification Project were prepared in 2003 and 2004, and contractor bids solicited in 2005. The returned bids were nearly three times higher than the government estimate. The high bid estimates were largely due to costly non-standard construction methods that would need to be employed to safely enlarge the existing outlets without taking the reservoir out of service during the construction period.

Consequently, dam operations and performance and alternate structural methods to achieve the flood damage reduction provided by the outlet modifications were reexamined. Subsequent studies also found that modification of the two outboard lower tier outlets was infeasible, and offered only a marginal increase in performance. Because of delays and technical problems associated with implementing the Folsom Dam Modification Project authorized in the WRDA of 1999, and compatibility with the potential to raise Folsom Dam and ongoing dam safety issues at the Folsom Facility, there is now an emphasis on considering these individual projects together, which is the subject of this EIS/EIR.

Reclamation and the Corps had previously been working together to develop alternatives to address the multiple issues at the Folsom Facility, while meeting each agency's objectives. In response to the Folsom Modification bids issue, the agencies initiated a comprehensive value planning process in September of 2005, referred to as the Project Alternatives Solutions Study (PASS). The purpose of the PASS process was to identify potential alternatives for a common project that provided minimum 1/200 year flood damage reduction and addressed the hydrologic risk reduction for the Folsom Facility (Reclamation et al. 2005). The PASS process consisted of three separate phases: PASS I reported in October 2005 identified 5 potential alternatives. Following a detailed examination of the most probable PASS I alternatives, PASS II (April 2006) reported the results of a gated spillway and raise combinations according to very specific criteria established by the Oversight Management Group. The tertiary effort, directed by the Oversight Management Group, focused on maximizing the spillway potential and minimizing the amount of raise required. This PASS II Optimization effort, which further refined the gated spillway alternative to the JFP (as defined in Section 1.4), is the result of this three stage process.

1.6.4 Joint Federal Project Coordination

The Energy and Water Development Appropriations Act of 2006 included language supporting Reclamation's and the Corps' collaboration in determining a joint dam safety and flood damage reduction project. According to Section 128 of the Act:

> "American River Watershed, California (Folsom Dam and Permanent Bridge)-
>
> (a) COORDINATION OF FLOOD DAMAGE REDUCTION AND DAM SAFETY- 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, including a potential auxiliary spillway. In conducting such activities, the Secretaries are authorized to expend funds for coordinated technical reviews and joint planning, and preliminary design activities."

The Folsom DS/FDR EIS/EIR will meet the requirements of the Energy and Water Development Appropriations Act of 2006 by evaluating the JFP and other alternatives that meet Reclamation's dam safety hydrologic objective and the Corps' flood damage reduction objective. In addition, this EIS/EIR evaluates a range of alternatives that address other stand-alone flood damage reduction and dam safety (seismic and static) and security actions at the Folsom Facility.

1.6.5 Related Authorized Projects

Table 1-2 below presents a list of current authorized projects as they pertain to the Folsom Facility. The table includes: (1) projects that are evaluated in this document as part of the Folsom DS/FDR alternatives addressed in this EIS/EIR; and (2) projects that are not evaluated as part of the Folsom DS/FDR alternatives, because they will be completed by their respective agencies independent of the Folsom DS/FDR, but are considered in the EIS/EIR relative to cumulative effects.

1.7 Folsom DS/FDR Purpose and Need and Project Objectives

As described in Section 1.1 above, the Folsom Facility consists of 4 dams and 8 dikes, which impound flows on the American River forming Folsom Reservoir, and is a critical component of the CVP. The Folsom Facility was constructed between 1948 and 1956 by the Corps as a multi-purpose facility operated for flood control, M&I water supply, agricultural water supply, power, fish and wildlife, recreation, and water quality benefits. Upon completion of construction of the dams and dikes, ownership of the Folsom Facility was transferred to Reclamation for operation and maintenance as a financially and operationally integrated feature of the CVP. The Folsom Powerplant construction, which began in 1952 and was completed in 1956, was supervised by Reclamation.

Table 1-2
Related Authorized Projects

Agency	*Project Name*	*Brief Description*	*Authorization*	*Current Document or Report for Project*	*Analyzed in Folsom DS/FDR EIS/EIR*
Corps	Dam Raise	Dam raise of 7 ft to dams and dikes, ecosystem restoration.	Energy and Water Development Appropriations Act of 2004 (P.L. 108-137)	*American River Watershed Long-Term Study (LTS) Final Supplemental Plan Formulation Report EIS/EIR, February 2002*	YES – the types of improvements included in the range of alternatives being considered for the DS/FDR are equivalent to, and would replace, the Dam Raise Project
Corps	Upstream and Downstream Levee Modifications ("Common Features Project")	Strengthening Levees along American and Sacramento Rivers.	1) Department of Defense Appropriations Act of 1993, Section 9159 (P.L. 102-396), 2) Section 101 of the Water Resources Development Act of 1996, 3) Section 366 and 102 of the Water Resources Development Act of 1999 (P.L. 106-53)	*1) 1996 American River Watershed Project Supplemental Information Report,* *2) Corps 1999 American River Watershed, California, Information Paper*	YES - While not included as part of the alternatives being considered for the DS/FDR, the Common Features Project is recognized as a Related Project in the Cumulative Effects analysis
Corps	Folsom Dam Modification Project	Modify existing outlets, create new outlets, modify surcharge storage.	Section 101 (a) (6) of the Water Resources Development Act of 1999 (P.L. 106-53)	*American River Watershed, California, Folsom Dam Modification Project EA/IS, (and 2002 LTS EIS/EIR)*	YES – the types of improvements included in the range of alternatives being considered for the DS/FDR are equivalent to, and would replace, the Modification project
Reclamation	Safety of Dams Corrective Action Study	Potential dam raise, static, seismic, and security fixes, tunnel, new auxiliary spillway.	Safety of Dams Program - P.L. (95-578) November 1978, as amended by P.L. (98-404) August 1984	*Draft Folsom Dam, Safety of Dams Corrective Action Study Scoping Report, October 2005*	YES – the types of improvements included in the range of alternatives being considered for the DS/FDR include dam raise, hydrologic, static, seismic, and security fixes

Both Reclamation and the Corps share in the responsibility of ensuring that the Folsom Facility is maintained and operated under their respective agency's dam safety regulations and guidelines, as defined by Congress. Reclamation is responsible for dam safety, operations, and maintenance at Folsom Dam. Reclamation operates and maintains the Folsom Facility to supply agricultural, M&I water users, hydroelectric power, and recreational opportunities and is responsible for the dam safety program. The Corps is responsible for flood damage reduction capitol improvements and establishing flood operation requirements at Folsom. The Corps provides regulations governing the flood damage reduction operations of the dam by setting release criteria and flood storage requirements during critical seasons.

As a part of their responsibilities, Reclamation and the Corps have determined that the Folsom Facility requires structural improvements to increase overall public safety above existing conditions by improving the facilities' ability to reduce flood damages and address dam safety issues posed by hydrologic (flood), seismic (earthquake), and static (seepage) events and security issues at the facility. These events have a low probability of occurrence in a given year, however due to the large population downstream of Folsom Dam, modifying the facilities is prudent and required to improve public safety above current baseline conditions.

Reclamation has identified the need for expedited action to reduce hydrologic, static, and seismic risks under its Safety of Dams Program and security issues under its Security Program. The identified risks are among the highest of all dams in Reclamation's inventory and the Folsom Facility is among Reclamation's highest priorities within its Safety of Dams Program. Additionally, there is a need to upgrade security infrastructure at the Folsom Facility under Reclamation's Safety, Security and Law Enforcement (SSLE) Program. Reclamation's primary interest for participating in the Folsom DS/FDR is to realize an expedited improvement in overall public protection and cost sharing benefits of a combined project.

The Corps, in partnership with the non-federal sponsors, has determined that Folsom Reservoir does not have sufficient release capacity to adequately manage severe flood flows nor do the downstream levees have sustained capacity to exceed base flood event flows of 145,000 cfs (Corps 2004).

The non-federal sponsors have identified the need to reduce the risk of flooding in the Sacramento area. Due to the number and value of the exposed structures and the size of the population at risk, Sacramento has been identified as one of the most at risk communities in the nation. Consequently, there is a need to expeditiously reduce this risk through interim and permanent flood damage reduction measures. The goal of non-federal sponsors is to achieve at least a 200-year level of flood damage reduction (same as 1/200 year flood damage reduction) for the Sacramento area as anticipated in the Congressionally authorized Folsom Dam Modification and Folsom

Dam Raise Projects. Pursuit of this goal constitutes non-federal sponsors' primary interest for participating in the Folsom DS/FDR actions.

Both Reclamation and the Corps have conducted engineering studies to identify potential corrective measures for the Folsom Facility to alleviate seismic, static, and hydrologic dam safety issues, and flood management concerns. These two federal agencies have combined their efforts resulting in (1) a Joint Federal Project for addressing Reclamation's dam safety hydrologic risk and the Corps' flood damage reduction objectives and (2) other stand-alone flood damage reduction and dam safety actions to be completed by the respective agencies in a coordinated manner. Among the latter are separate, but related, downstream levee projects that are underway to increase flood damage reduction along the lower American River.

1.7.1 Statement of Purpose and Need

There is a need to expeditiously implement engineering measures for the Folsom Facility in order to reduce potential failure due to seismic, static, and hydrologic conditions. There is also a need to incrementally increase minimum flood damage reduction via flood storage capacity and/or reservoir pool release mechanisms. Furthermore, there is a need to implement security improvements at the Folsom Facility consistent with designation as a National Critical Infrastructure Facility. The purpose of the Folsom DS/FDR is to increase overall public safety, ensure the reliability of local power and water supply, and maintain an important recreational resource by: (1) expediting corrective action to address risks identified with the structural integrity of Folsom Dam and appurtenant structures in accordance with Reclamation's Public Protection Guidelines; (2) incrementally improving the flood management capacity of the Folsom facility to meet or exceed the 200-year recurrence level; and (3) upgrading security infrastructure at the Folsom Facility.

1.7.2 Project Objectives

In addition to the underlying purpose of the project above, specific project objectives were developed to meet CEQA guidelines. The CEQA-related project objectives are:

- Expeditiously reduce hydrologic (flooding) risk of overtopping-related failure of any retention structure during a PMF event in accordance with Reclamation's Public Protection Guidelines;

- Expeditiously reduce the risk of structural failure of any retention structure during a potential seismic (earthquake) event in accordance with Reclamation's Public Protection Guidelines;

- Expeditiously reduce the risk of structural failure of any retention structure during a potential static (seepage) event in accordance with Reclamation's Public Protection Guidelines;
- Expeditiously improve the security infrastructure at the Folsom Facility in accordance with Reclamation's Public Protection Guidelines; and
- Expeditiously improve the flood management capacity of the facilities in a manner functionally equivalent to the Corps authorized projects.

1.8 Study Area

The Folsom DS/FDR study area includes the area surrounding the Folsom Facility. The Folsom Facility falls within the borders of Placer, Sacramento, and El Dorado Counties, in the State of California. The study area mainly consists of Federally-owned lands that are currently leased to and managed by the California Department of Parks and Recreation. Figure 1-4 shows the location of the Folsom DS/FDR general study area within central California. Several resource categories have expanded the study area of their impacts analysis to include local roads, highways, and other areas that occur outside the Federally-owned lands.

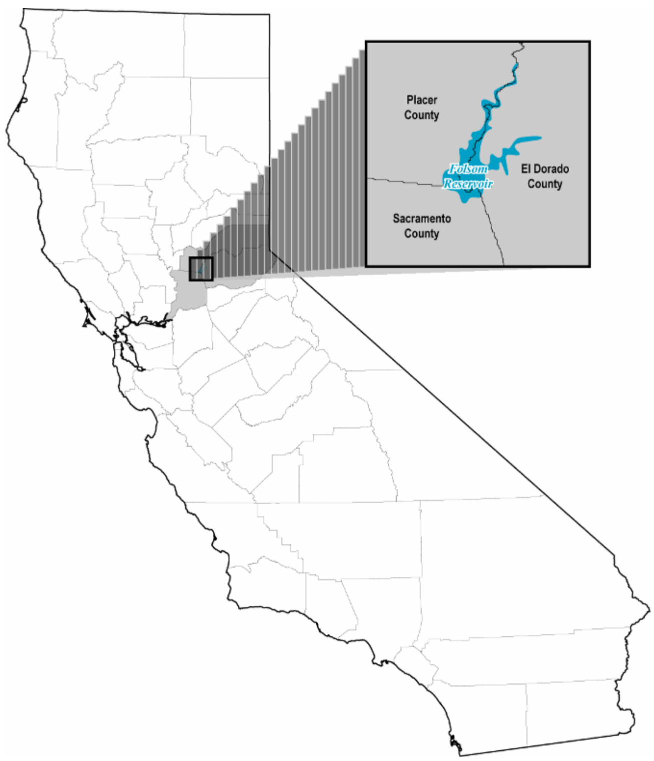

Figure 1-4
Location of Folsom DS/FDR Study Area

The actions evaluated in this EIS/EIR include five project alternatives as well as the alternative of not implementing the Folsom DS/FDR actions, the No Project/No Action Alternative. Direct and indirect effects and cumulative impacts are evaluated, as appropriate, for each resource area.

1.9 Summary of Scoping Activities and Issues

Federal, State, and local agencies, and other interested parties have participated in the NEPA and CEQA process leading to the development of the Folsom DS/FDR alternatives presented in this EIS/EIR. In 2005, Reclamation, the Corps, DWR/Reclamation Board, and SAFCA held three public scoping meetings in the

City of Granite Bay, the City of Folsom, and the City of Sacramento, respectively. The results of these scoping meetings, including comments and concerns raised during the meetings, as well as public comments obtained during the public comment period, are presented in the *Folsom Dam Combined Federal Effort Scoping Meeting Summary Report*, *2006* (See Appendix A). Major issues and concerns raised during the public scoping process include:

- What is the role of each of the agencies and how will the two Federal agencies interact in completing the project?
- What are the major impacts from this project and how will they be mitigated?
- How will traffic be affected?
- What level of safety will the new dam features provide?
- What downstream effects will the new facilities have?
- How will agencies keep the public informed about future meetings and other project updates?
- What will the impacts be on local homeowners during construction?
- What are the recreational, cultural, and natural resource impacts and how will they be mitigated?

1.10 Federal, State, and Local Requirements

The Folsom DS/FDR actions must fulfill or comply with the Federal, State, regional, and local environmental requirements as described below. Chapter 3 provides additional details on regulations specific to each environmental resource, and Chapter 6 provides details on compliance efforts for applicable regulations.

1.10.1 Federal Requirements

1.10.1.1 National Environmental Policy Act

NEPA (42 USC 4321; 40 CFR 1500.1) applies to all Federal agencies and to most of the activities they manage, regulate, or fund that affect the environment. It requires all agencies to disclose and consider the environmental implications of their proposed actions. NEPA establishes environmental policies, provides an interdisciplinary framework for preventing environmental damage, and contains "action-forcing" procedures to ensure that Federal agency decision-makers take environmental factors into account.

NEPA requires the preparation of an appropriate document to ensure that Federal agencies accomplish the law's purposes. The President's Council on Environmental

Quality (CEQ) has adopted regulations and other guidance, including detailed procedures that Federal agencies must follow, to implement NEPA. CEQ regulations, Section 1506.6 includes provisions for public involvement. Agency pursuit of public involvement may include:

- Providing public notice of NEPA-related hearings, public meetings, and the availability of environmental documents;
- Holding or sponsoring public hearings or public meetings;
- Soliciting appropriate information from the public;
- Explaining in its procedures where interested persons can get information or status reports on EISs and other elements of the NEPA process; and
- Making EISs, the comments received, and any underlying documents available to the public pursuant to the provisions of the Freedom of Information Act (5 U.S.C. 552).

Reclamation and the Corps will use this EIS/EIR to comply with CEQ regulations and document NEPA compliance.

1.10.1.2 Federal Endangered Species Act

The Endangered Species Act (ESA) requires that both United States Fish and Wildlife Service (USFWS) and NMFS maintain lists of threatened species and endangered species. “Endangered species” are defined as “any species which is in danger of extinction throughout all or a significant portion of its range”; “threatened species” are defined as “any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (16 U.S.C.A. §1532). Section 9 of the ESA makes it illegal to “take” (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in such conduct) any endangered species of fish or wildlife and most threatened species of fish or wildlife (16 U.S.C.A. §1538). Section 7 of the ESA requires that Federal agencies consult with the USFWS and NMFS on any actions that may directly or indirectly affect a listed species (i.e., a species specifically recognized by USFWS or NMFS as being endangered or threatened), including as related to whether the action may destroy or adversely modify critical habitat. Critical habitat is defined as the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of the ESA, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the Act, upon a determination by the Secretary that such areas are essential for the conservation of the species (16

U.S.C.A. §1532). NMFS' jurisdiction under the ESA is limited to the protection of marine mammals and fishes and anadromous fishes (i.e., fish born in fresh water that migrate to the ocean to grow into adults and then return to fresh water to spawn); all other species are within the USFWS' jurisdiction.

Section 7 of the ESA requires that all Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of habitat critical to such species' survival. To ensure against jeopardy, each Federal agency must consult with the USFWS or NMFS, or both, regarding Federal agency actions. The consultation is initiated when the Federal agency determines that its action may affect a listed species and submits a written request for initiation to the USFWS or NMFS, along with the agency's biological assessment of its proposed action. If the USFWS or NMFS concurs with the action agency that the action is not likely to adversely affect a listed species, the action may be carried forward without further review under the ESA. Otherwise, the USFWS or NMFS, or both, must prepare a written biological opinion describing how the agency action will affect the listed species and its critical habitat.

With respect to the Folsom DS/FDR, a draft biological opinion from USFWS will be obtained prior to completion of the Final EIS/EIR.

1.10.1.3 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) establishes a management system for national marine and estuarine fishery resources. This legislation requires that all Federal agencies consult with NMFS regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect "essential fish habitat." Essential fish habitat is defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The legislation states that migratory routes to and from anadromous fish spawning grounds are considered essential fish habitat. The phrase "adversely affect" refers to the creation of any impact that reduces the quality or quantity of essential fish habitat. Federal activities that occur outside of an essential fish habitat but that may, nonetheless, have an impact on essential fish habitat waters and substrate must also be considered in the consultation process. Under the Magnuson-Stevens Act, effects on habitat managed under the Pacific Salmon Fishery Management Plan must also be considered.

The Magnuson-Stevens Act states that consultation regarding essential fish habitat should be consolidated, where appropriate, with the interagency consultation, coordination, and environmental review procedures required by other Federal statutes, such as NEPA, the Fish and Wildlife Coordination Act (FWCA), the Clean Water Act, and the ESA. Essential fish habitat consultation requirements can be satisfied through concurrent environmental compliance if the lead agency provides

NMFS with timely notification of actions that may adversely affect essential fish habitat and if the notification meets requirements for essential fish habitat assessments.

With respect to the Folsom DS/FDR actions, compliance with this act will be accomplished through consultation with NMFS. Consultation had been initiated at the time of release of this Draft EIS/EIR.

1.10.1.4 Fish and Wildlife Coordination Act

The FWCA (16 USC 661 et seq.) requires Federal agencies to consult with USFWS, or, in some instances, with NMFS and with State fish and wildlife resource agencies before undertaking or approving water projects that control or modify surface water. The purpose of this consultation is to ensure that wildlife concerns receive equal consideration during water resource development projects and are coordinated with the features of these projects. The consultation is intended to promote the conservation of fish and wildlife resources by preventing their loss or damage and to provide for the development and improvement of fish and wildlife resources in connection with water projects. Federal agencies undertaking water projects are required to fully consider recommendations made by USFWS, NMFS, and State fish and wildlife resource agencies in project reports and to include measures to reduce impacts on fish and wildlife in project plans.

With respect to the Folsom DS/FDR, a draft Fish and Wildlife Coordination Act Report (FWCAR) and incremental analysis of potential mitigation have been completed and are included as appendices to this EIS/EIR.

1.10.1.5 Farmland Protection Policy Act and Memoranda on Farmland Preservation

Federal agencies are required to assess the potential effects of proposed Federal actions on prime and unique farmland under the Farmland Protection Policy Act (FPPA) of 1981 and the Memoranda on Farmland Preservation, dated August 30, 1976, and August 11, 1980, respectively. Federal agencies must examine potential effects before taking any action that could result in converting designated prime or unique farmland for nonagricultural purposes. If there are potentially adverse effects on farmland preservation, the Federal agencies may consider alternative actions to lessen those effects. To the extent practicable, Federal agencies may create programs that are compatible with State, local, and private programs to protect farmland. The Natural Resource Conservation Service is responsible for identifying prime or unique farmland that might be affected.

With respect to the Folsom DS/FDR, the potential impacts to farmlands have been addressed within the context of the EIS/EIR analysis, and is presented in Section 3.8.

1.10.1.6 National Historic Preservation Act

The National Historic Preservation Act (NHPA) of 1966, as amended, is the principal legislation that guides cultural resource management for Federal agencies. Section 106 of NHPA requires that Federal agencies take into account the effects of an undertaking on historic properties and provide the Advisory Council on Historic Preservation (ACHP) an opportunity for comment.

The Section 106 review process is described in 36 CFR 800. The five steps in this process include: 1) initiation of the Section 106 process by identifying interested parties and determine an area of potential effect; 2) identify historic properties; 3) assessments of the effects of the undertaking on historic properties; and 4) preparation of an agreement document to resolve adverse effects on historic properties. The ACHP is notified of any adverse effects to historic properties and invited to participate in the agreement document. The Section 106 process requires consultation throughout each phase with the State Historic Preservation Officer (SHPO), Indian tribes, and interested parties.

With respect to the Folsom DS/FDR, consultation with SHPO has been initiated and various cultural resource surveys have been conducted, as described in Section 3.11.

1.10.1.7 Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act of 1899 regulates alteration of (and prohibits unauthorized obstruction of) any navigable waters of the United States. Construction of any bridge, dam, dike or causeway over or in navigable waterways of the U.S. is prohibited without Congressional approval. Construction plans for a bridge or causeway must be submitted to and approved by the Secretary of Transportation, while construction plans for a dam or dike must be submitted to and approved by the Chief of Engineers and Secretary of the Army. Excavation or fill within navigable waters requires the approval of the Chief of Engineers and the Secretary of the Army.

As a cooperating agency with specific responsibilities for completion of portions of the Folsom DS/FDR actions, the Corps will also be responsible for ensuring compliance with this Act.

1.10.1.8 Clean Air Act

The Federal Clean Air Act (CAA) established national ambient air quality standards (NAAQS) in 1970 for six pollutants: carbon monoxide, ozone, particulate matter, nitrogen dioxide, sulfur dioxide, and lead. Areas that do not meet the ambient air quality standards are called nonattainment areas. The CAA requires states to submit a State Implementation Plan (SIP) for nonattainment areas. The U.S. Environmental Protection Agency (USEPA) reviews the SIP and must delineate how the Federal standards will be met. States that fail to submit a plan or to secure approval may be denied Federal funding and/or required to increase emission offsets for industrial expansion. The 1990 Amendments to the CAA established categories of air pollution severity for nonattainment areas, ranging from "marginal" to "extreme." SIP requirements vary, depending on the degree of severity.

The conformity provisions of the CAA are designed to ensure that Federal agencies contribute to efforts to achieve the NAAQS. USEPA has issued two regulations implementing these provisions. The general conformity regulation addresses actions of Federal agencies other than the Federal Highway Administration and the Federal Transit Administration. General conformity applies to a wide range of actions or approvals by Federal agencies. Projects are subject to general conformity if they exceed emissions thresholds set in the rule and are not specifically exempted by the regulation. Such projects are required to fully offset or mitigate the emissions caused by the action, including both direct emissions and indirect emissions over which the Federal agency has some control.

With respect to the Folsom DS/FDR, a General Conformity Determination will be completed prior to issuance of the ROD. Section 3.3 of the EIS/EIR addresses CAA considerations.

1.10.1.9 Executive Order 12898 – Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations," requires that Federal agencies identify and address any disproportionately high and adverse human health or environmental effects of Federal actions on minority and low-income populations and assure that Federal actions do not result directly or indirectly in discrimination on the basis of race, color, national origin, or income. Federal agencies must provide opportunities for input by affected communities into the NEPA process and must evaluate the potentially significant and adverse environmental effects of proposed actions on minority and low-income communities during environmental document preparation. Even if a proposed Federal project would not result in significant adverse impacts on minority and low-income populations, the environmental document must describe how the NEPA process addressed Executive Order 12898.

With respect to the Folsom DS/FDR, an environmental justice evaluation has been completed within the context of the EIS/EIR analysis, and is presented in Section 3.19.

1.10.1.10 Clean Water Act

The objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the waters of the United States. The CWA establishes regulations for the discharge of pollutants into United States waters.

Section 401

Section 401 of the CWA (33 USC 1251 et seq.) requires that proposed actions with federal agency involvement that may result in a discharge of a pollutant into waters of the United States must not violate federal or state water quality standards. In addition, Section 401 states that any applicant for a Federal license or permit to conduct any activity including construction or operation of facilities which may result in discharge to navigable waters must provide the licensing or permitting agency a certification from the state in which the discharge originates stating that the discharge will comply with the applicable provisions of Sections 301 Effluent Limitations, 302 Water Quality Related Effluent Limitations, 303 Water Quality Standards and Implementation Plans, 306 National Standards of Performance, and 307 Toxic and Pretreatment Effluent Standards of the CWA. With respect to the Folsom DS/FDR, Section 401 certification will be completed prior to initiation of construction activities.

Section 402

Section 402 of the CWA requires that all point sources that discharge pollutants into the waters of the United States must obtain a National Pollutant Discharge Elimination System (NPDES) permit. NPDES permits are issued by the state and contain industry specific standards and limits and establish pollutant monitoring and reporting requirements. With respect to the Folsom DS/FDR, NPDES permits will be obtained, as necessary, prior to construction.

Section 404

Section 404 of the CWA requires a permit to be obtained from the Corps for the discharge of dredged or fill material into the waters of the United States. A section 404 permit for the Folsom DS/FDR will be obtained, as necessary, prior to any action involving placement of materials within waters of the United States. Appendix D of this EIS/EIR introduces requirements for the Section 404 permit.

1.10.1.11 Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (MBTA) is the domestic law that implements four international treaties and conventions between the U.S. and Canada, Japan, Mexico, and Russia, providing protection of migratory birds. Each of the conventions protects selected species of migratory birds that are common to both the U.S. and one or more of the other involved countries. This act makes it unlawful for any person to hunt, kill, capture, collect, possess, buy, sell, purchase, import, export, or barter any migratory bird, including the feathers, parts, nests, eggs, or migratory bird products. The MBTA does not protect the habitat of migratory birds. With respect to the Folsom DS/FDR, compliance with the MBTA will be stipulated as part of the construction requirements of the selected alternative. Mitigation measures reflecting compliance with this act are provided in Section 3.5.4.

1.10.1.12 Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970

The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, known as the "Uniform Act" (P.L. 91-646), provides for the uniform and equitable treatment of people displaced from their residences, businesses, farms, and nonprofit organizations as a result of Federal programs and projects. The Uniform Act sets the minimum standards for compensation and relocation assistance for the appraisal and acquisition of real property and sets the minimum standards for relocation advisory services and financial assistance for persons that must relocate as a result of the public acquisition of real property. Any displaced person or entity must be offered relocation assistance services for the purpose of locating suitable replacement property. The Corps, should a raise be implemented as part of a flood damage reduction action, would be responsible for compliance with this act.

1.10.1.13 National Wild and Scenic Rivers Act

The National Wild and Scenic Rivers Act (P.L. 90-542; 16 USC 1271-1287) was established to preserve the free flowing condition and outstanding values of the nation's rivers. Rivers with unique scenery, recreational opportunities, cultural features, or other similar values are designated under this Act. Section 7 of the Act prohibits federal licensing of new hydroelectric developments on all rivers designated under the Act. It also prohibits federal funding or construction of projects that would inhibit the free flowing condition and outstanding values of designated rivers. The Act requires federal agencies to manage each river in a way that protects and enhances the values for which the river was originally designated. The management of each river is based on the level of development at the time of designation. The lower American River is designated a wild and scenic river. The Folsom DS/FDR would not affect flows or the wild and scenic designation of the lower American River.

1.10.2 State Requirements

1.10.2.1 California Environmental Quality Act

CEQA (Public Resource Code 21000 et seq.) is regarded as the foundation of environmental law and policy in California. CEQA's primary objectives are to:

- Disclose to decision-makers and the public the significant environmental effects of proposed activities;
- Identify ways to avoid or reduce environmental damage;
- Prevent environmental damage by requiring implementation of feasible alternatives or mitigation measures;

- Disclose to the public the reasons for agency approval of projects with significant environmental effects;
- Foster interagency coordination in the review of projects; and
- Enhance public participation in the planning process.

CEQA applies to all discretionary activities that are proposed or approved by California public agencies, including State, regional, county, and local agencies, unless an exemption applies. CEQA requires that public agencies comply with both procedural and substantive requirements. Procedural requirements include the preparation of the appropriate environmental documents, mitigation measures, alternatives, mitigation monitoring, findings, statements of overriding considerations, public notices, scoping, responses to comments, legal enforcement procedures, citizen access to the courts, notice of preparation, agency consultation, and State Clearinghouse review.

CEQA's substantive provisions require that agencies address environmental impacts, disclosed in an appropriate document. When avoiding or minimizing environmental damage is not feasible, CEQA requires that agencies prepare a written statement of the overriding considerations that resulted in approval of a project that will cause one or more significant effects on the environment. CEQA establishes a series of action-forcing procedures to ensure that agencies accomplish the purposes of the law. In addition, under the direction of CEQA, the California Resources Agency has adopted regulations, known as the State CEQA Guidelines, which provide detailed procedures that agencies must follow to implement the law.

This EIS/EIR is intended to document compliance with all relevant CEQA guidelines and CEQA requirements, including as related to approvals and actions by SAFCA and DWR/Reclamation Board for improvements under the Folsom DS/FDR.

1.10.2.2 California Endangered Species Act

The California Endangered Species Act (CESA) (Fish and Game Code Sections 2050 to 2097) is similar to the ESA. California's Fish and Game Commission is responsible for maintaining lists of threatened and endangered species under the CESA. CESA prohibits the "take" of listed and candidate (petitioned to be listed) species. "Take" under California law means to "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch capture, or kill." (California Fish and Game Code, Section 86.) Since CDFG may authorize incidental take of listed species pursuant to a CDFG approved Natural Community Conservation Plan (NCCP) (See Section 1.10.2.3, below, for a description of the NCCP Act.). The mitigation measures presented in Section 3.5.4, when implemented, will comply with this act.

1.10.2.3 Natural Community Conservation Planning Act

The Natural Community Conservation Planning Act (NCCPA), California Fish and Game Code, Section 2800, et seq., was enacted to form a basis for broad-based planning to provide for effective protection and conservation of the State's wildlife heritage, while continuing to allow appropriate development and growth. The purpose of natural community conservation planning is to sustain and restore those species and their habitat identified by California Department of Fish and Game (CDFG) that are necessary to maintain the continued viability of biological communities impacted by human changes to the landscape. A NCCP identifies and provides for those measures necessary to conserve and manage natural biological diversity within the plan area while allowing compatible use of the land. CDFG may authorize the take of any identified species, including listed and non-listed species, pursuant to Section 2835 of the NCCPA, if the conservation and management of such species is provided for in an NCCP approved by CDFG. The mitigation measures presented in Section 3.5.4, when implemented, will comply with this act.

1.10.2.4 Porter-Cologne Water Quality Control Act of 1970

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) established the California State Water Resources Control Board (SWRCB) and nine regional water quality control boards (RWQCBs) as the primary State agencies with regulatory authority over California water quality and appropriative surface water rights allocations. The SWRCB administers the Porter-Cologne Act, which provides the authority to establish Water Quality Control Plans (WQCPs) that are reviewed and revised periodically. The Porter-Cologne Act also provides the SWRCB with authority to establish statewide plans.

The nine RWQCBs carry out SWRCB policies and procedures throughout the State. The SWRCB and the RWQCBs also carry out sections of the Federal CWA - administered by USEPA, including the NPDES permitting process for point source discharges and the CWA Section 303 water quality standards program.

WQCPs, also known as basin plans, designate beneficial uses for specific surface water and groundwater resources and establish water quality objectives to protect those uses. These plans can be developed at the SWRCB or the RWQCB level. RWQCBs issue waste discharge requirements for the major point-source waste dischargers, such as municipal wastewater treatment plants and industrial facilities. In acting on water rights applications, the SWRCB may establish terms and conditions in a permit to carry out WQCPs.

To comply with this act, the Folsom DS/FDR will complete a Storm Water Management Plan to control construction-related runoff and submit permit applications for any planned discharge to waters of the state.

1.10.2.5 Airborne Toxic Control Measures

The Airborne Toxic Control Measures (ATCMs) have been developed by the California Air Resources Board (ARB) to reduce the potential health and safety and environmental issues associated with various airborne toxics. The air pollution control and air quality management districts in the State of California are generally the agencies responsible for enforcement of the ATCMs. The ATCM regulations are found in Title 13 (Mobile Sources and Fuels) and Title 17 (All Other Sections) of the California Code of Regulations (CCR).

The Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (See Title 17 CCR Section 93105) contains the requirements for construction operations that will disturb any portion of an area that is located in a geographic ultramafic rock (igneous rock with very little silica content) unit or that has naturally-occurring asbestos, serpentine, or ultramafic rock. Construction or grading operations on property where the area to be disturbed is greater than one acre require an Asbestos Dust Mitigation Plan to be submitted and approved by the air quality management district before the start of construction. The Asbestos Dust Mitigation Plan must be implemented at the beginning and must be maintained throughout the duration of the operation. In order to receive an exemption from this ATCM, a registered geologist must conduct a geologic evaluation of the property and determine that no serpentine or ultramafic rock is likely to be found in the area to be disturbed. This report must be presented to the executive officer or air pollution control officer of the air pollution control or air quality management district, who may then grant or deny the exemption.

The Asbestos Airborne Toxic Control Measure for Surfacing Applications (17 CCR Section 93106) applies to any person who produces, sells, supplies, offers for sale or supply, uses, applies, or transports any aggregate material extracted from property where any portion of the property is located in a geographic ultramafic rock unit or the material has been determined to be ultramafic rock, or serpentine, or material that has an asbestos content of 0.25 percent or greater. Unless exempt, the use, sale, application, or transport of material for surfacing is restricted, unless it has been tested using an approved asbestos bulk test method and determined to have an asbestos content that is less than 0.25 percent. Any recipient of such materials may need to be provided a receipt with the quantity of materials, the date of the sale, verification that the asbestos content is less than 0.25 percent, and a warning label. Anyone involved in the transportation of the material is required to keep copies of all receipts with the materials at all times.

Compliance with this act is discussed in Section 3.6, Soils, Minerals, and Geological Resources.

1.10.2.6 Environmental Justice

State law defines environmental justice in Government Code Section 65040.12(e) as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. Government Code Section 65040.12(a) designates the Governor's Office of Planning and Research (OPR) as the coordinating agency in State government for environmental justice programs, and requires OPR to develop guidelines for incorporating environmental justice into general plans. While there is no existing state requirement that environmental justice be addressed as part of the environmental (CEQA) review for individual projects, Section 3.19 of this EIS/EIR discusses environmental justice considerations associated with the Folsom DS/FDR.

1.10.3 Local Requirements

A number of local requirements relate to the Folsom DS/FDR. The applicability of, and the project's compliance with, those requirements are considered in relevant sections of this EIS/EIR. The following lists such requirements.

Placer County

- Placer County General Plan, August 19, 1994
- Placer County Air Pollution Control District Fugitive Dust and Asbestos Rules

Sacramento County

- Sacramento County General Plan, December 15, 1993
- City of Folsom General Plan, October 31, 1988
- Transportation Management Plan
- Sacramento Metropolitan Air Quality Management District Fugitive Dust and Asbestos Rules

El Dorado County

- 2004 El Dorado County General Plan - A Plan for Managed Growth and Open Roads; A Plan for Quality Neighborhoods and Traffic Relief, July 19, 2004
- El Dorado County Air Quality Management District Fugitive Dust and Asbestos Rules

1.11 Scope of this EIS/EIR

The impact analysis in this EIS/EIR includes all reasonably foreseeable Folsom DS/FDR construction actions that may occur from the time that the Folsom DS/FDR ROD(s) is signed (anticipated May 2007) through the end of the construction period (potentially 2015, depending on funding level and availability).

In addition to the No Action/No Project Alternative, this EIS/EIR presents five action alternatives for implementing the types of improvements contemplated under the Folsom DS/FDR, termed Alternatives 1 through 5. The alternatives incorporate differing measures related to construction actions that could occur at each structure of the Folsom Facility during each phase of construction. This EIS/EIR analyzes the direct, indirect, and cumulative effects of each alternative. Within the evaluation of each alternative, the impacts of each construction action (see Chapter 3) are analyzed separately. The proposed Folsom DS/FDR structural modifications and their associated impacts are addressed to a level of detail considered reasonable and appropriate given existing project design and construction information and current data. It is possible, however, that the future resolution of current uncertainties related to final design, construction contract awarding and post-construction operation may result in changes and refinements to the project characteristics assumed in this EIS/EIR. Such changes and refinements, if material in nature, to the proposed actions may require further analyses, which would be provided in supplemental environmental compliance documentation, as required.

1.12 Scope of Effects Analysis

This EIS/EIR presents the impacts of the five action alternatives described in Chapter 2 and also considers the environmental implications of the No Action/No Project Alternative. The action alternatives incorporate proposed modifications to the 12 structures that comprise the Folsom Facility, borrow material development, processing of materials, stockpiling, and staging area development and use. The resource area analyses (Chapter 3) present the environmental effects of these alternatives to the level of detail possible with the current available information. As indicated above, supplemental environmental analyses may be required in the subsequent review and approval of any project changes or refinements that are material in nature and have the potential to result in environmental effects that are not addressed in this EIS/EIR.

Construction of the improvements under any of the five Folsom DS/FDR alternatives would not take place all at once, but would occur in several construction phases, some of which would overlap. The effects analysis takes into consideration these separate construction phases, which are described in detail in Chapter 2, Project Description and Project Alternatives.

The Folsom DS/FDR agencies recognize that any potential raise of the main dam and dikes could require the construction of numerous small flood damage reduction berms in areas of low elevation. At this stage, details regarding the locations for additional flood damage reduction berms and quantities of materials to construct them are in the formulation stage; therefore, the berms are analyzed at a general, programmatic level in this document. Supplemental documents will be completed, as appropriate.

Additionally, determining the need for, and specific locations of, cofferdams facilitating in-reservoir construction and the specific locations for materials staging and stockpiling related to avoiding impacts to recreation areas is dependent upon the project design and construction specifications that will be developed at future more detailed levels of planning for the selected alternative. As such, a detailed analysis of those types of improvements and construction activities is not possible for this EIS/EIR; supplemental environmental review and documentation will be completed in conjunction with any future discretionary approvals for those improvements, pursuant to the requirements of NEPA and CEQA.

This document addresses reoperation of the Folsom Facility only at a general programmatic level and will not be used to initiate a change to current operations. Structural modification to any of the Folsom Facility requiring operational changes to fully realize project benefits, will not be fully utilized until operations are fully coordinated (i.e., the exact need for, and nature of, changes to the existing operations requirements of the Folsom Facility has been determined by, and between, the affected jurisdictional agencies based on the specific improvements approved as part of the selected Folsom DS/FDR alternative) and addressed in a supplemental EIS/EIR, and a separate ROD allowing such reoperation is signed.

1.13 Decisions to be Made

Reclamation, the Corps, DWR/Reclamation Board, and SAFCA decision-makers will use the Folsom DS/FDR EIS/EIR to help decide on the optimal alternative for meeting the Folsom DS/FDR objectives, based on a full understanding of the environmental consequences of each of the alternatives. Possible decision outcomes are:

- Take no action;
- Select Alternative 1, which includes a fuseplug Auxiliary Spillway, 0-ft raise of the concrete dam and strengthening the crest of key embankment structures;
- Select Alternative 2, which includes a fuseplug Auxiliary Spillway with a tunnel, and a 4-ft raise of all structures;
- Select Alternative 3, which includes a gated Auxiliary Spillway with a potential 3.5-ft parapet wall raise of all structures as incrementally justified for flood damage reduction purposes;
- Select Alternative 4, which includes a gated Auxiliary Spillway and a potential 7-ft raise of all structures as incrementally justified for flood damage reduction purposes; or

- Select Alternative 5, which includes a 17-ft raise of all structures but no auxiliary spillway.
- Select a subset and/or recombination of the alternative features listed above.

1.14 Uses of this Document

Agencies are also expected to use this document as the environmental analysis for:

- Approving permits. The permits anticipated for construction the Folsom DS/FDR actions include:
  - Air quality
  - Water discharge
  - Traffic Plan approval
  - 404 Dredge and Fill of wetlands
- Public review and to solicit public comments;
- Determining the environmentally preferred alternative;
- Helping to identify the Preferred Alternative;
- Developing Reclamation's Modifications Report for submission to the Office of Management and Budget – Reclamation is required to submit this report if the costs for actual construction on Safety of Dams work will exceed $1,250,000;
- Developing the Corps' Post-Authorization Changes (PAC) Report – The Corps is required to submit this document to gain approval for changes made to the previously authorized project addressed in the Corps 2002 Long-Term Study Final Supplemental Plan Formulation Report EIS/EIR and the Folsom Dam Modification Project EA/IS; and
- Obtaining funding (SAFCA).

As indicated above, this document is not intended to initiate any formal change to current operations of the Folsom Facility, nor is it intended to provide the necessary NEPA/CEQA review for authorization of future reoperation of the Folsom Facility. Such reoperation of the Folsom Facility will be addressed in a supplemental EIS/EIR at such time as the proposed changes in operations are fully formulated, analyzed, and coordinated.

1.15 Report Organization

The remaining chapters of this document are as follows:

- **Chapter 2 – Project Description and Project Alternatives -** Chapter 2 describes five action alternatives of the Folsom DS/FDR, plus the No Action/No Project Alternative, and explains how the agencies would complete construction work to address the issues at the Folsom Facility.

- **Chapter 3 – Affected Environment, Impacts Analysis, and Mitigation Measures -** Chapter 3 describes the affected environment, impacts analysis, and mitigation measures for resource areas including: hydrology, water quality, and groundwater, water supply, air quality, aquatic resources, terrestrial vegetation and wildlife, soils, minerals, and geological resources, visual resources, agricultural resources, transportation and circulation, noise, cultural resources, land use, planning, and zoning, recreation, utilities and public services, hydropower, population and housing, public health and safety, Indian Trust Assets, and environmental justice.

- **Chapter 4 – Socioeconomics -** Chapter 4 provides an analysis of the economic effects associated with implementing the Folsom DS/FDR alternatives.

- **Chapter 5 – Cumulative Effects** - Chapter 5 addresses for each alternative the potential cumulative effects associated with the combination of the Folsom DS/FDR alternatives and other proposed projects. This chapter also addresses other topics required by NEPA and/or CEQA, including significant unavoidable impacts, the relationship between short-term uses and long-term environmental changes, and growth inducement.

- **Chapter 6 – Consultation and Coordination** - Chapter 6 describes the persons and agencies consulted in the preparation of this EIS/EIR and provides details on compliance efforts for applicable regulations.

- **Chapter 7 – References** - Chapter 7 provides a list containing a bibliography of documents used in preparation of this EIS/EIR.

- **Chapter 8 – List of Preparers and Contributors -** Chapter 8 provides a list of the individuals from agencies and contractors that performed key roles in the preparation and development of this EIS/EIR.

- **Chapter 9 – Document Recipients -** Chapter 9 identifies the parties to whom this EIS/EIR was provided or received a notification of document availability.

- **Chapter 10 – Glossary** - Chapter 10 provides a list containing the various terminology used in this EIS/EIR.

- **Appendices**

Chapter 2
Project Description and Project Alternatives

2.1 Alternatives Development and Screening Process

2.1.1 Alternatives Formulation

The California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) require that environmental documents identify and analyze a reasonable range of feasible alternatives that could meet the project objectives to varying degrees. In addition, CEQA focuses on alternatives that would avoid or substantially lessen any of the significant effects of the project. NEPA and CEQA also require that a no-project/no-action alternative be analyzed. The Folsom DS/FDR EIS/EIR evaluates 5 action alternatives and a No Action/No Project Alternative.

2.1.2 Alternatives Identification

The range of action alternatives that are assessed in this EIS/EIR were developed from a series of engineering measures addressing both Reclamation's Safety of Dams objectives of hydrologic, seismic, and static risk reduction; and the Corps flood damage reduction objectives. The features of the alternatives were compiled from the documents listed below. These features were presented at public scoping meetings intended to solicit comments and additional alternative details. Appendix A contains a public scoping report summarizing input received during the scoping period for the EIS/EIR.

- American River Watershed Project Final Supplemental EIS/EIR Part I Main Report. Corps, March 1996.
- American River Watershed Project Final Supplemental EIS/EIR Part II Final Supplemental EIS/EIR. Corps, March 1996.
- American River Watershed Long-Term Study Final Supplemental Plan Formulation Report. Corps, February 2002.
- Preliminary Borrow Materials Report for Corrective Action Study. Reclamation, August 2004.
- Folsom Facility – Safety of Dams Requirements and Concepts. Reclamation, February 2005.

- Folsom Dam – Draft Safety of Dams Corrective Action Study Scoping Report. Reclamation, October 2005.
- Folsom Dam Raise and Auxiliary Spillway Project Alternative Solution Study (PASS). Reclamation and Corps, October 2005.
- Folsom Dam Raise and Auxiliary Spillway Project Alternative Solution Study (PASS II). Reclamation and Corps, February 8, 2006.
- Folsom Dam Modifications Limited Reevaluation Report. Corps, 2003.
- Folsom Dam Modifications Environmental Assessment. Corps, 2005
- Environmental Site Assessment Folsom Dam Modification. Corps, 2005.
- Draft American River Watershed Project Folsom Dam Raise, Folsom Bridge Environmental Impact Statement/Environmental Impact Report. Corps, 2006.

2.1.3 Scoping of Alternative Measures and Pre-Screening Process

Teams comprised of Reclamation and Corps engineers and environmental planners participated in a series of engineering scoping meetings to identify, develop, refine, screen, and describe measures that would achieve Reclamation's dam safety and Corps' flood damage reduction objectives. A significant portion of the efforts centered on independent identification of stand-alone dam safety and flood damage reduction alternatives that would serve as a functionally equivalent project to the Corps authorized Folsom Dam Modification and Folsom Dam Raise projects. Additional efforts were focused on developing alternatives to meet both the dam safety and the flood damage reduction objectives.

The alternative development process commenced with the initial identification of a range of stand-alone engineering measures, followed by their further refinement and the identification of alternatives that met both objectives. Each measure was evaluated for its engineering effectiveness and relative environmental benefits and effects. The result of the initial evaluation of engineering measures was the identification of specific measures to be addressed as part of a subsequent feasibility phase. The feasibility phase was used to define the proposed project/action by combining measures into comprehensive alternatives.

Conceptual design measures identified during initial engineering scoping efforts were reduced to those determined by engineering and environmental staff with specific dam safety expertise and environmental planning skills to have the greatest potential to provide practical, implementable, cost effective, and least environmentally damaging aspects of achieving the required project objectives. Because scoping resulted in the identification of a wide range of conceptual measures with multiple design variations, some measures were eliminated that essentially accomplished the same objective of more effective measures. This resulted in a manageable array of representative measures being selected for more detailed evaluation relative to addressing project objectives. Section 2.2.4 provides descriptive details of the measures addressed in this EIS/EIR.

The hydrologic, seismic, static, and flood damage reduction measures evaluated by Reclamation and Corps engineering and planning staff included alternatives that jointly addressed both the dam safety and flood damage requirements, as well as stand-alone alternatives that addressed either specific dam safety or flood damage requirements at the Folsom Facility. A comprehensive list of potential alternatives considered during initial screening, along with a brief comment on why the measure was dropped from further consideration, is presented in the following section.

Reclamation is preparing a Modification Report, which would outline a recommended joint alternative to meet dam safety and flood damage reduction objectives as well as specific, stand-alone dam safety alternative recommendations. There are several potential structural and non-structural measures associated with modifications to the Folsom Facility that have been identified in previous studies which have the potential to benefit flood damage reduction and/or dam safety.

The Corps is preparing a Post Authorization Change (PAC) Report that describes recommended alternatives to address Flood Damage Reduction needs as well as proposed changes to the existing Folsom Dam Modification and Folsom Dam Raise Project authorizations. To help identify recommended changes to the Corp's existing authorizations, the PAC compares four action alternative plans that address the study objectives and constraints for completeness, effectiveness, efficiency and acceptability.

The alternative plans presented in the respective Modification and PAC Reports are encompassed within the alternatives analysis of this EIS/EIR. The scope of this EIS/EIR includes the integration of the majority of the information on the alternatives from both Reclamations' and the Corps' Modification Report and the PAC. The alternatives in this document are joint alternatives which address Reclamations' stand-alone dam safety and security alternatives, as well as the Corps' potential flood damage reduction measures.

2.1.4 Dam Safety and Flood Damage Reduction Measures Evaluated as Part of Alternatives Development

Reclamation and the Corps initiated a comprehensive value planning process in September of 2005, referred to as the Project Alternatives Solutions Study (PASS). The PASS process identified and evaluated a large number of potential measures that would meet the objectives of both agencies responsibilities for the Folsom Facility.

Tables 2-1 through 2-7 summarize the dam safety and flood damage reduction measures evaluated for incorporation into an action alternative. The general rationale for elimination of a measure from further detailed evaluation is summarized in the tables. The measures were evaluated as part of the PASS process. The rationale for elimination is discussed within the PASS documents listed in Section 2.1.2.

The purpose of the PASS process was to identify potential alternatives for a common project that provided minimum 1/200 year flood protection and addressed hydrologic risk reduction for the Folsom Facility. The PASS process consisted of three separate phases: (1) A cursory examination of possible alternatives; (2) completion of PASS, reported in October 2005; and, (3) identification of five potential alternatives. Following a detailed examination of the most probable PASS alternatives during the PASS evaluation, select stand-alone dam safety and flood damage reduction alternatives were evaluated for applicability to jointly address dam safety and flood damage reduction. In this additional scoping process, stand-alone alternatives were combined and/or reformulated to create an initial array of joint alternatives.

Table 2-1
List of Potential Flood Protection and Hydrologic Risk Reduction Measures for Concrete Dam & Embankment Dams/Dikes

Measure No.	***Measure Description***	***Retained for Further Evaluation?***	***Primary Reason for Elimination of Measure[1]***
	Facility Alternatives		
1	Restrict Reservoir Elevation	No	P&N, IF, Not effective
2	Remove Dam and Reservoir	No	P&N, IF, EI
3	Relocate the population	No	IF, EF, Too expensive and not practical
4	Build New Upstream/Down Stream Dam under Corps Authorized Projects	No	IF, P&N, EI, Beyond the scoping study, not authorized under Dam Safety Program or Corps authorized projects
5	Enlarging the Levees Downstream	No	IF, P&N, EI, Beyond the scoping study
	Embankment Alternatives		
	Reinforced Earthfill Wall Raise		
6	Geogrids and soil	No	TF
7	Concrete facings w/ steel straps	No	TF
	Structural Wall Alternatives		
8	Pre-cast Wall	Yes	
9	Concrete Wall (T-wall)[1]	Yes	
10	Jersey Barrier with Earth Raise	No	TF, Earth raise alone is a better alternative
11	Sheet Piles (concrete or steel)	No	TF, IF, Restricts recreation and maintenance access, unsightly, obstructs views, subject to graffiti
12	Earth Raise and Concrete Wall	Yes	

Table 2-1 ***List of Potential Flood Protection and Hydrologic Risk Reduction Measures for Concrete Dam & Embankment Dams/Dikes***			
Measure No.	***Measure Description***	***Retained for Further Evaluation?***	***Primary Reason for Elimination of Measure[1]***
	Crest Raise Alternatives		
13	Soil Cement Raise	No	TF
14	Earth Raise	Yes	
15	Rolled compressed concrete (RCC) Raise	No	Earth raises equally effective at less cost
16	Asphalt Concrete	No	Asphalt cement is more expensive than other materials
	Concrete Dam Outlet Modification Alternatives		
17	Enlarge/Replace Existing Gates	Yes	
18	Enlarge Existing Spillway	Yes	
19	Enlarge Existing Outlets/Construct New Outlets	Yes	
	New Outlet Alternatives		
20	New Auxiliary Spillway	Yes	
21	New Tunnel	Yes	

TF - Technical Infeasibility
EF - Economic Infeasibility
EI - Environmental Impact
IF - Institutional Infeasibility
P&N - Inability to meet Purpose & Need
[1] Source for determination: Folsom Dam Raise and Auxiliary Spillway Project Alternative Solution Study (PASS). Reclamation and Corps. October 2005.

Table 2-2 ***List of Potential Static Risk Reduction Measures for Embankment Dams/Dikes***			
Measure No.	***Measure Description***	***Retained for Further Evaluation?***	***Primary Reason for Elimination of Measure[1]***
1	Downstream (D/S) Overlay	Yes	
2	Cutoff Wall (crest)	No	TF, May damage embankments
3	Vertical Filter	Yes	
4	Vertical Geo membrane	No	TF, Difficult to construct, difficult to verify long-term performance
5	Geo membrane U/S Face	No	May work well on small dikes that typically do not store water
6	Asphalt Up Stream (U/S) Barrier	No	More expensive than other measures
7	Slurry Wall D/S	No	TF, Not a good design
8	Slurry Wall U/S	No	TF
9	Filter Cutoff Combo. (Slurry Wall & Overlay)	No	TF, EI
10	Install Drain on D/S side with outfalls	Yes	
11	Excavate and Overlay	Yes	
12	Horizontal Drains	No	TF, may cause harm to embankment and seepage conditions

TF - Technical Infeasibility
EF - Economic Infeasibility
EI - Environmental Impact
IF - Institutional Infeasibility
P&N - Inability to meet Purpose & Need
[1] Source for determination: Folsom Dam Raise and Auxiliary Spillway Project Alternative Solution Study (PASS). Reclamation and Corps. October 2005.

Table 2-3 ***List of Potential MIAD Seismic Risk Reduction Measures***			
Measure No.	***Measure Description***	***Retained for Further Evaluation?***	***Primary Reason for Elimination of Measure[1]***
1	Downstream Overlay	Yes	
2	Stone Columns	No	TF, Difficult to verify, low confidence
3	Compaction Grouting	No	TF, Difficult to verify, low confidence
4	Compaction Piles	No	TF, Difficult to verify, low confidence
5	Trench Walls	No	TF, Might not cutoff seepage
6	Slurry Walls	No	TF, Might not cutoff seepage
7	Excavate and Replace Foundation	Yes	
8	Permanent Freezing	No	TF, Unproven technique, O&M problems
9	Soil Vitrification	No	TF, Unproven technique
10	New Earth Dam Downstream	No	EI, TF, Similar to Overlay
11	New RCC Dam Downstream	No	TF
12	Replace the Dam in Place	No	EI, TF, Requires cofferdam, effects Res. Operation
13	Replace the Dam in Place with RCC Dam	No	EI, TF, Requires cofferdam, effects Res. Operation
14	Jet Grouting	Yes	
15	Blast Compaction	No	EI, TF, Difficult to verify, low confidence
16	Continuously Dewater	No	TF
17	Reservoir Restriction	No	IF, P&N, Not practical
18	More Downstream Berm	No	EI, TF, Difficult to quantify increase in strength
19	Dynamic Compaction	No	TF, Depth prohibitive
20	Increase Drainage with stone columns	No	TF
21	Wick Drains	No	TF
22	Rockfill Dam Downstream	No	EI, TF, Doesn't adequately address concern
23	Increase Release Capacity	No	EI, TF, IF, P&N, Downstream conditions restrict this (safe channel capacity)
24	Series of Concrete walls in fdn. perpendicular to the crest	No	TF
25	Overlay with RCC foundation	No	TF, similar to others

TF - Technical Infeasibility
EI – Environmental Impact
EF - Economic Infeasibility
IF - Institutional Infeasibility
P&N - Inability to meet Purpose & Need
[1] Source for determination: Folsom Dam Raise and Auxiliary Spillway Project Alternative Solution Study (PASS). Reclamation and Corps. October 2005.

Table 2-4 ***List of Concrete Dam Foundation Wedge Sliding Seismic Risk Reduction Measures***			
Measure No.	***Measure Description***	***Retained for Further Evaluation?***	***Primary Reason for Elimination of Measure[1]***
1	Anchor-Bar Halo	No	TF, EF, May not be necessary, depend on No.2, too expensive for level of risk
2	Instrument the contact (uplift piezometers)	Yes	
3	Drain water loading the wedge	Yes	
4	Adit installed shear keys	No	TF, EF, May not be necessary, depend on No.2, too expensive for level of risk
5	Post-tensioned anchors	No	TF, EF, May not be necessary, depend on No.2, too expensive for level of risk
6	Caisson crossing joint (shear pin)	No	TF, EF, May not be necessary, depend on No.2, too expensive for level of risk
7	Add weight	No	TF, EF, May not be necessary, depend on No.2, too expensive for level of risk
8	Excavate and drift block	No	TF, EF, May not be necessary, depend on No.2, too expensive for level of risk

TF - Technical Infeasibility
EF - Economic Infeasibility
IF – Institutional Infeasibility
P&N – Inability to meet Purpose & Need
[1] Source for determination: Folsom Dam Raise and Auxiliary Spillway Project Alternative Solution Study (PASS). Reclamation and Corps. October 2005.

Table 2-5 ***List of Concrete Dam Foundation Contact Risk Reduction Measures***			
Measure No.	***Measure Description***	***Retained for Further Evaluation?***	***Primary Reason for Elimination of Measure[1]***
1	Post -tensioned anchors	Yes	
2	U/S, D/S Shear Keys	Yes	
3	Toe Block	Yes	
4	Caissons (steel fiber reinforced look at alternative types of reinforcement)	No	TF
5	Downstream Buttress	Yes	
6	Add weight upstream (cantilevered)	No	TF, Not practical.
7	Drainage and monitoring (in conjunction with another alternative)	Yes	
8	Revisit uplift assumptions	No	TF
9	Tie-down at downstream toe (caissons or post tensioned anchors)	No	TF
10	Construction joint Shear Keys	Yes	

TF - Technical Infeasibility
EF - Economic Infeasibility
IF – Institutional Infeasibility
P&N – Inability to meet Purpose & Need
[1] Source for determination: Folsom Dam Raise and Auxiliary Spillway Project Alternative Solution Study (PASS). Reclamation and Corps. October 2005.

Table 2-6
List of Concrete Dam Potential Sliding Along Lift Lines Risk Reduction Measures

Measure No.	***Measure Description***	***Retained for Further Evaluation?***	***Primary Reason for Elimination of Measure[1]***
1	Post-tensioned anchors	Yes	
2	Post-tensioned anchors (composite fiber reinforced)	No	TF
3	Caissons (steel fiber reinforced look at alternative types of reinforcement)	No	TF, Not practical at non-overflow section (may work for overflow sections)
4	Counterfort upper throat of the dam	No	TF, EF, Not practical
5	Put weight on top of dam (this would be isolated during a seismic event)	No	TF, Not practical.

TF - Technical Infeasibility
EF - Economic Infeasibility
IF – Institutional Infeasibility
P&N – Inability to meet Purpose & Need
[1] Source for determination: Folsom Dam Raise and Auxiliary Spillway Project Alternative Solution Study (PASS). Reclamation and Corps. October 2005.

Table 2-7
List of Concrete Dam Potential Gate and Piers Improvement Measures

Measure No.	***Measure Description***	***Retained for Further Evaluation?***	***Reason for Elimination of A Measure[1]***
	Gates		
1	Additional steel plates to flanges of gate arm structural members and/or replace gate arm beams with new members	Yes	
2	Additional bracing	Yes	
3	Box in lower structural members (increase section modulus)	No	EF, Much more costly that Measure No. 1
4	Steel Wrap at Pier ends to mitigate shear failure near trunnion	Yes	
	Piers		
1	Struts across the top of gate openings between piers	Yes	
2	Steel plates for external shear reinforcement	No	TF
3	Steel reinforcing bars and/or post tensioned anchors for pier base stabilization	No	TF
4	Use the bridge as the strut to stiffen piers	Yes	
5	Provide additional internal moment reinforcing with drilled steel columns	No	TF

TF - Technical Infeasibility
EF - Economic Infeasibility
IF – Institutional Infeasibility
P&N – Inability to meet Purpose & Need
[1] Source for determination: Folsom Dam Raise and Auxiliary Spillway Project Alternative Solution Study (PASS). Reclamation and Corps. October 2005.

2.1.5 Alternatives Screening Criteria

Viable measures retained at the completion of the initial PASS process were combined to create preliminary alternatives for further evaluation and screening. Both NEPA and CEQA contain guidance regarding screening to determine which alternatives should be carried forward for detailed analysis. The screening criteria applied to determine which alternatives should move forward are described in the text below. The screening criteria are based on NEPA and CEQA guidance as well as Reclamation guidelines for screening.

- Reclamation (2000)[1] explains, "Examples of reasons for elimination are: (1) failure of the alternative to meet the requirements of the purpose of and need for the action, (2) the alternative cannot be technically implemented, (3) the alternative is prohibitively greater in cost or in environmental impacts than the other alternatives, or (4) the alternative cannot be reasonably implemented."

- CEQA §15126.6 (c) states, "Among the factors that may be used to eliminate alternatives from detailed consideration in an EIR are: (i) failure to meet most of the basic project objectives, (ii) infeasibility, or (iii) inability to avoid significant environmental effects."

Using this guidance, the alternatives were judged based on the following list of screening criteria.

- Ability to meet purpose and need/project objectives: the degree to which an alternative meets elements of the purpose and need/project objectives.

- Technical feasibility: the engineering and technical feasibility of an alternative.

- Institutional feasibility: the ability of an alternative to be implemented within a reasonable timeframe, considering political, regulatory, permitting, and public acceptability constraints.

- Economic feasibility: the ability of an alternative to be funded, given the constraints of the state and federal budgets.

- Environmental impacts: the magnitude of potential environmental effects of an alternative, including biological, physical (air quality, water supply, geology and soils, groundwater, water quality, and visual resources), and social effects.

A last consideration for screening was identification of measures that would be functionally equivalent to the objectives of the Corps authorized Folsom Dam Modification and Folsom Dam Raise projects.

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[1] Draft, not approved as formal guidance.

2.1.6 Alternatives Eliminated as Part of Pre-Screening Process

Several groups of alternatives were eliminated from detailed analysis in this EIS/EIR primarily due to their not meeting basic purpose and need requirements. These alternatives include siting of the Folsom Facility at a new location, restriction of operations of the Folsom Facility, and removal of the Folsom Facility.

2.1.6.1 Siting of a New Folsom Facility

The preliminary identification and screening of measures to consider for alternatives to include in the EIS/EIR did not include evaluation of alternative locations for the Folsom Facility, as otherwise required under Section 15126.6(f) (2) of the State CEQA Guidelines. Based on the importance of the Folsom Facility in supplying water and power to the Central Valley Project, and the fact that the project objectives and statement of purpose and need are very particular to the Folsom Facility, the concept of planning and implementing a replacement facility at an alternative location in order to address the risks was considered infeasible and inappropriate. Given the function, size, location, and regional nature of the Folsom Facility, it is not feasible to consider that a new replacement facility could be constructed elsewhere in a timely manner (i.e., by 2014, which is the completion timeframe for the currently proposed project), notwithstanding the fact that the construction of such a replacement facility would very likely have extensive significant environmental impacts of its own. Although development of the Auburn Dam was suggested as an alternative in the Scoping Process for the Folsom DS/FDR EIS/EIR, completion of that project would not occur anywhere near the timeframe proposed for the Folsom DS/FDR and development of that facility would not address the risk issues particular to the Folsom Facility. Based on the reasons presented above, an alternative location scenario was not carried forth into the EIS/EIR analysis.

2.1.6.2 Restriction of Reservoir Operations

Restriction of reservoir operations (e.g., restricting the reservoir pool to a lower elevation) was considered but eliminated because it would not reduce dam safety or improve flood damage reduction. Evaluation of dam safety seismic, static, and hydrologic risks indicate that the risks remain approximately the same regardless of reservoir surface elevation. Because the basic flood control issue is the inability to safely release the reservoir pool prior to a major storm, the flood damage reduction risk would also remain unacceptably high regardless of reservoir pool elevation.

2.1.6.3 Removal of Folsom Facility

The removal of the Folsom Facility was considered but eliminated as a potential alternative due to the importance of the Folsom Facility to water supply, hydropower, and as recreation facility for the region. At present, no studies have been initiated on how the water and power provided by the Folsom Facility could be replaced if the Folsom Facility were to be removed. Although CalFed is evaluating new water storage projects, these project assume that the Folsom Facility would remain in place and meet its water supply obligations. The loss of the Folsom Facility would have a significant adverse impact to the region's economy and therefore is not being considered as an option to the address the Folsom dam safety and flood damage reduction issues.

2.1.7 Folsom Dam Safety and Flood Damage Reduction Alternatives

The primary outcome of the PASS process was the identification of alternatives that combined dam safety and flood damage reduction measures into overall actions. The initial grouping of alternatives is presented in Table 2-8.

Table 2-8
List of Project Alternatives Addressed in PASS Evaluations

Alternative Name	***Alternative Description***	***Retained for Further Evaluation?***	***Reason for Elimination of Alternative***
Bravo	Interim 500-ft wide fuseplug Auxiliary Spillway (phase 1) to be replaced by 5-gated spillway (phase 2). Replace 8 existing spillway gates on Main Concrete Dam, 5.5-ft raise of Main Concrete Dam and all earthen embankments.	Yes	5.5-ft raise eliminated as technically not necessary; remaining portions of alternative incorporated into DS/FDR alternatives
Delta	Four-gated Auxiliary Spillway. Replace 8 existing spillway gates on Main Concrete Dam, 6.5-ft raise of Main Concrete Dam and all earthen embankments.	Yes	6.5-ft raise eliminated as technically not necessary; remaining portions of alternative incorporated into DS/FDR alternatives; evaluation of the six-gated spillway proved to have superior flood control aspects.
Echo	Six-gated Auxiliary Spillway. Replace 8 existing gates on Main Concrete Dam, 5.5-ft raise of Main Concrete Dam and all earthen embankments,	Yes	5.5-ft raise eliminated as technically not necessary; remaining portions of alternative incorporated into DS/FDR alternatives
Zulu	Permanent 400-ft wide fuseplug Auxiliary Spillway. Upper tier outlet modifications on Main Concrete Dam, replace 8 existing spillway gates, new outlets 5 and 10 and enlarging outlets 6 through 9.3-ft raise of Main Concrete Dam and all earthen embankments.	Yes	9.3-ft raise and installation of new outlets eliminated as technically not necessary; remaining portions of alternative incorporated into DS/FDR alternatives
Juno	Permanent 550-ft wide fuseplug Auxiliary Spillway. Upper tier outlet modifications, new outlets 5 and 10 and enlargement of outlets 6 through 9, enlarging existing outlets 2 and 3, constructing 2 new outlets under the existing emergency spillway flip bucket. 1.5-ft raise of Main Concrete Dam of all earthen embankments.	Yes	1.5-ft raise and installation of new outlets eliminated as technical not necessary; portions of alternative incorporated into DS/FDR alternatives

During further evaluations termed PASS II and PASS II Optimization, further engineering evaluation and optimization of highly probable joint alternatives was accomplished. In parallel, further engineering evaluations of stand-alone dam safety and flood damage reduction alternatives also occurred. PASS II reported the results in April 2006 of a gated spillway and raise combination according to very specific criteria established by a joint agency Oversight Management Group. A tertiary effort, as directed by the Oversight Management Group, was to focus on maximizing the spillway potential and minimizing the height of any raise necessary to meet flood damage reduction objectives. The PASS II Optimization effort further refined the gated spillway alternative to the current description of the Joint Federal Project Auxiliary Spillway, as defined in Section 1.4 and 2.6.

Within the comprehensive range of alternatives presented in this EIS/EIR, additional consideration was made for the development of and potential implementation of stand-alone alternatives in conjunction with a joint alternative, for dam safety, as well as potential additional flood damage reduction alternatives. The flood damage reduction alternative would serve as functional equivalents to the Corps authorized Folsom Dam Modification and Folsom Dam Raise projects. Alternatives 2, 3, and 4 presented in Table 2-9 formed the basis of the Corp's functional equivalency determination.

The range of probable PASS alternatives were refined in parallel with the PASS II evaluation in preparation of this EIS/EIR, in order to identify a comprehensive range of dam safety and flood damage reduction alternatives consisting of probable joint alternatives in combination with probable stand-alone alternatives for further environmental impact analysis, are analyzed within this EIS/EIR, and presented in Table 2-10.

2.2 Project Alternatives

2.2.1 Introduction to Folsom DS/FDR Alternatives

From the various engineering measures determined to best address the screening criteria relative to each Folsom Facility structure, five comprehensive action alternatives were developed. These alternatives incorporate, as a package, the measures necessary to modify the existing Folsom Facility features that are shown in the Project Base Map, Figure 1-1. Overall, it was determined that the five action alternatives would, to varying degrees, meet the purpose and need/project objectives, and are technically, institutionally, and economically feasible. The basic features of the five action alternatives are shown in Figures 2-1 through 2-5. The characteristics of all the alternatives are summarized in Table 2-10 and described in greater detail in Section 2.2.3 through Section 2.2.8 (the No Action/No Project Alternative description is Section 2.2.2). The corrective actions were developed on a structure-by-structure basis; therefore, the project features are described in the same manner. A more detailed description of each engineering measure can be found in Section 2.2.4.

Table 2-9
List of Corps Project Alternatives Addressed in American River Long-Term Study Supplemental EIS (2002)

Alternative Name	*Alternative Description*	*Retained for Further Evaluation?*	*Reason for Elimination of Alternative*
1 No Action	No action to improve dam safety or flood protection beyond existing constructed authorized projects	Yes	Required for analysis to serve as baseline for action alternatives
2 3.5-ft Dam Raise/478-ft Flood Pool Elevation	Strengthening of Main Concrete Dam, lowering of main and existing Auxiliary Spillway crests, replacement of 8 spillway gates, modification of spillway bridge piers, replacement of spillway bridge, extension of stilling basin, and 3.5-ft concrete crest wall on all earthen embankments.	Yes	Elements retained to reflect functionally equivalent measures to potential DS/FDR actions
3 7-ft Dam Raise/482-ft Flood Pool Elevation	Strengthening and raising of Main Concrete Dam, lowering of main and existing Auxiliary Spillway crests, replacement of 8 spillway gates, modification of spillway bridge piers, replacement of spillway bridge, extension of stilling basin, combined 3.5-ft earthen raise and 3.5-ft concrete crest wall on all earthen embankments.	Yes	Elements retained to reflect functionally equivalent measures to potential DS/FDR actions
4 12-ft Dam Raise/487-ft Flood	Strengthening and raising of Main Concrete Dam, lowering of main and existing Auxiliary Spillway crests, replacement of 8 spillway gates, modification of spillway bridge piers, replacement of spillway bridge, extension of stilling basin, combined 8.5-ft earthen raise and 3.5-ft concrete crest wall on all earthen embankments.	Yes	12-ft raise eliminated as technically not necessary; remaining portions retained to reflect functionally equivalent measures to potential DS/FDR actions.
5 Stepped Release to 160,000	No structural modifications. Stepped release from 115,000 to 145,000 cfs, and then stepped to 160,000 cfs emergency release.	No	Does not address Safety of Dams concerns
6 Stepped Release to 160,000 and New Outlets at Folsom Dam	A new outlet to Folsom Dam to increase the early release from 115,000 cfs to 145,000. Release up to 160,000 same as Alternative 5	No	Does not address Safety of Dams concerns
7 Stepped Release to 180,000 cfs	No structural modifications. Stepped release from 115,000 to 145,000 cfs, with emergency release stepped to 180,000 cfs.	No	Does not address Safety of Dams concerns
8 Stepped Release to 160,000 cfs and 7-ft Dam Raise/482-ft Flood Pool Elevation	Combines features of Alternative 3 with features of Alternative 5	Yes	Portions of alternative incorporated into Folsom DS/FDR alternatives per discussion for Alternatives 3 and 5 above

<table>
<tr><th colspan="7">Table 2-10
Summary of Folsom DS/FDR EIS/EIR Alternatives</th></tr>
<tr><th colspan="2">Project Alternatives</th><th>Alternative 1</th><th>Alternative 2</th><th>Alternative 3</th><th>Alternative 4</th><th>Alternative 5</th></tr>
<tr><td colspan="2">Main Alternative Features
Dam Safety & Flood Damage Reduction</td><td>Fuseplug Auxiliary Spillway with No Dam Raise/Embankment Crest Protection</td><td>Fuseplug Auxiliary Spillway with Underlying Tunnel, 4-ft Dam/ Embankment Raise</td><td>JFP Gated Auxiliary Spillway (6STG) with Potential 3.5-ft Parapet Wall Raise</td><td>Gated Auxiliary Spillway (4STG) with 7-ft Dam/ Embankment Raise</td><td>No Auxiliary Spillway, 17-ft Dam/ Embankment Raise</td></tr>
<tr><td colspan="7">All alternatives include the main alternative features above plus seismic and static design elements at Main Concrete Dam and earthen embankment dams/dikes as outlined below</td></tr>
<tr><td colspan="2">Principle Spillway vs. Raise tradeoffs in relation to PMF/FDR and relative outlet elevation</td><td>Maximum PMF capacity w/o raise element, minimal FDR benefit, highest outlet elevation</td><td>Raise required for full PMF capacity plus full FDR benefit with lowest outlet elevation</td><td>No required raise element, Maximum PMF capacity w/ full FDR benefit, lower outlet elevation, potential raise as incrementally justified for FDR only</td><td>Required raise and gate modification elements to pass PMF w/ full FDR benefit with smaller gated spillway, higher outlet elevation</td><td>Raise required to fully contain PMF w/o aux spillway.</td></tr>
<tr><td colspan="7">Existing Main Concrete Dam</td></tr>
<tr><td rowspan="7">Main Concrete Dam</td><td rowspan="3">Concrete Monoliths</td><td>No Dam Raise</td><td>No Dam raise - Existing parapet wall (3.5 ft) sufficient with minor modifications to 4.0 ft</td><td>No Dam raise - Existing parapet wall (3.5 ft) sufficient with minor modifications</td><td>Dam monolith raise - non-overflow sections of dam to 7 ft</td><td>Dam monolith raise – non-overflow sections of dam to 17 ft</td></tr>
<tr><td>Post-tensioned anchors, shear key elements, and/or toe blocks</td><td>Post-tensioned anchors, shear key elements, and/or toe blocks</td><td>Post-tensioned anchors, shear key elements, and/or toe blocks</td><td>Post-tensioned anchors, shear key elements, and/or toe blocks</td><td>Post-tensioned anchors, shear key elements, and/or toe blocks</td></tr>
<tr><td>Foundation drain enhancements</td><td>Foundation drain enhancements</td><td>Foundation drain enhancements</td><td>Foundation drain enhancements</td><td>Foundation drain enhancements</td></tr>
<tr><td rowspan="3">Existing Spillway</td><td>Spillway pier reinforcement comprised of bracing, post tensioned anchors and/or pier wraps</td><td>Spillway pier reinforcement comprised of bracing, post tensioned anchors and/or pier wraps</td><td>Spillway pier reinforcement comprised of bracing, post tensioned anchors and/or pier wraps</td><td>Spillway pier reinforcement comprised of bracing, post tensioned anchors and/or pier wraps</td><td>Spillway pier reinforcement comprised of bracing, post tensioned anchors and/or pier wraps</td></tr>
<tr><td>No spillway bridge improvements</td><td>No spillway bridge improvements</td><td>Potentially modify/replace existing spillway bridge</td><td>Replace existing spillway bridge</td><td>Replace existing spillway bridge</td></tr>
<tr><td>Additional bracing or replacement of structural members to spillway gates</td><td>Additional bracing or replacement of structural members to spillway gates</td><td>Potentially modify as in Alts 1 or 2 or replace 3 emergency gates as incrementally justified for FDR</td><td>Replace all spillway gates as incrementally justified for FDR</td><td>Replace all spillway gates as incrementally justified for FDR</td></tr>
<tr><td>Existing Stilling Basin</td><td>No modifications</td><td>No modifications</td><td>Extend the Stilling Basin 50-75 ft as incrementally justified for FDR</td><td>Extend the Stilling Basin 50-75 ft as incrementally justified for FDR</td><td>No modifications</td></tr>
</table>

Table 2-10 (continued)
Summary of Folsom DS/FDR EIS/EIR Alternatives

Project Alternatives		Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
New Auxiliary Spillway						
New Auxiliary Spillway	Auxiliary Spillway	Maximum width PMF fuseplug spillway w/partially-lined chute	Smaller width PMF fuseplug spillway w/partially- or completely-lined chute	Joint (PMF/Flood damage reduction) 6 STG Auxiliary Spillway w/fully-lined chute, stilling basin, and approach channel	Smaller Gated Auxiliary 4 STG spillway w/fully-lined chute, stilling basin, and approach channel	None
	Control Structure	520-ft wide fuseplug	350- to 400-ft wide fuseplug	6 submerged tainter gates	4 submerged tainter gates	None
	Tunnel	No Tunnel	Tunnel w/3 submerged tainter gates	No Tunnel	No Tunnel	No Tunnel
Existing Embankment Dams/Dikes						
Embankments raise height with incorporation of various seismic and static elements. Increased raise heights assumes increased impacts		None to minimal to accommodate crest protection. No FDR benefit	Low to Moderate to accommodate required for achieving PMF, FDR, freeboard, crest strengthening	Low to Moderate to accommodate required freeboard, crest resurfacing and potential incremental flood surcharge as incrementally justified	Moderate to High to accommodate required PMF, FDR, freeboard, crest resurfacing and freeboard potential incremental flood surcharge as incrementally justified	High to primarily accommodate required incremental flood surcharge and freeboard due to no increase in outlet capacity Requires separately authorized outlet modifications to achieve full FDR
Left Wing Dam		<4 ft earthen raise for crest protection	0.5-ft earthen, 3.5-ft parapet concrete wall	Potential 3.5-ft parapet concrete wall	3.5-ft parapet wall and 3.5-ft earthen raise	17-ft earthen raise
		None	Toe drains	None	Toe drains	Toe drains
		None	None	Training wall between LWD and spillway	Training wall between LWD and spillway	None
		Crest filters in upper portion of dam and along contact with concrete dam	Half-height filters	Crest filters in upper portion of dam and along contact with concrete dam	Full-height filters	Full-height filters

Table 2-10 (continued)
Summary of Folsom DR/FDR EIS/EIR Alternatives

Project Alternatives	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Right Wing Dam	<4 ft earthen raise for crest protection	0.5-ft earthen, 3.5-ft parapet concrete wall	Potential 3.5-ft parapet concrete wall	3.5-ft parapet wall and 3.5-ft earthen raise	17-ft earthen raise
	None	Toe drains	None	Toe drains	Toe drains
	Crest filters in upper portion of dam and along contact with concrete dam	Half-height filters	Crest filters in upper portion of dam and along contact with concrete dam	Full-height filters	Full-height filters
Mormon Island Auxiliary Dam	<4-ft earthen raise for crest protection	4-ft earthen raise	Potential 3.5-ft parapet concrete wall	7-ft earthen raise	17-ft earthen raise
	Toe drains	Toe drains	Toe drains	Toe drains	Toe drains
	Full-height filters	Full-height filters	Full-height filters	Full-height filters	Full-height filters
	Jet grouting downstream foundation	Excavation & replacement of downstream foundation	Jet grouting downstream foundation	Jet grouting downstream foundation	Excavation & replacement of downstream foundation
	Downstream overlay	Downstream overlay	Downstream overlay	Downstream overlay	Downstream overlay
Dikes 1,2 3,7, & 8	No activity	4-ft earthen raise	Potential 3.5-ft parapet concrete wall	7-ft earthen raise	17-ft earthen raise
		Toe drains	None	Toe drains	Toe drains
		No Filter	Full-height filter at Dike 7. Replace filter material removed at Dikes 1-3, 8 for parapet wall construction	Full-height filters	Full-height filters
Dikes 4, 5 & 6	<4 ft earthen raise for crest protection	4-ft earthen raise	Potential 3.5-ft parapet concrete wall	7-ft earthen raise	17-ft earthen raise
	Toe drains	Toe drains	Toe drains	Toe drains	Toe drains
	Full-height filters	Half-height filters	Full-height filters	Full-height filters	Full-height filters

Table 2-10 (continued)
Summary of Folsom DR/FDR EIS/EIR Alternatives

Project Alternatives	*Alternative 1*	*Alternative 2*	*Alternative 3*	*Alternative 4*	*Alternative 5*
Miscellaneous and Overarching Features					
Non-Federal Property Protection	No Action	New embankment protection	New embankment protection	New embankment protection	New embankment protection
		Acquisition of real estate rights (easements or fee title)	Acquisition of real estate rights (easement or fee title)	Acquisition of real estate rights (easement or fee title)	Acquisition of real estate rights (easement or fee title)
Borrow Sites	Auxiliary Spillway Beal's Point	Auxiliary Spillway Tunnel excavation Beal's Point	Auxiliary Spillway Beal's Point	Auxiliary Spillway Beal's Point Granite Bay	Beal's Point Folsom Point D1/D2 L1/L2 Granite Bay
Contractor Use Area – Staging, Material Processing, Concrete Batch Plant	Main Concrete Dam - Concrete Folsom Point - Processing Beal's Point - Processing MIAD - Jet Grout Plant	Main Concrete Dam - Concrete Folsom Point - Processing Beal's Point - Processing Granite Bay - Staging MIAD – Staging	Main Concrete Dam - Concrete Folsom Point - Processing Beal's Point - Processing Granite Bay - Staging MIAD - Jet Grout Plant	Main Concrete Dam - Concrete Folsom Point - Processing Beal's Point - Processing Granite Bay - Processing MIAD - Jet Grout Plant	Main Concrete Dam - Concrete Folsom Point - Processing L1/L2 - Processing Beal's Point - Processing Mooney Ridge - Processing Granite Bay - Processing MIAD – Staging
Disposal Sites	Dike 7 MIAD D1/D2 Folsom Point LWD Beal's Point	Dike 7 MIAD D1/D2 Folsom Point LWD Beal's Point	Dike 7 MIAD D1/D2 Folsom Point LWD Beal's Point	Dike 7 MIAD D1/D2 Folsom Point LWD Beal's Point	Dike 7 MIAD Beal's Point Granite Bay Folsom Point
Other Project Features	Utility relocations	Utility relocations	Utility relocations	Utility relocations	Utility relocations
	Security Upgrades	Security Upgrades	Security Upgrades	No security features associated with the FDR alternatives	No security features associated with the FDR alternatives
	Road relocations	Road relocations	Road relocations	Road relocations	Road relocations
	Haul road construction	Haul road construction	Haul road construction	Haul road construction	Haul road construction
	Excavation blasting	Excavation blasting	Excavation blasting; Underwater blasting and dredging	Excavation blasting; underwater blasting and dredging	Excavation blasting; underwater blasting and dredging

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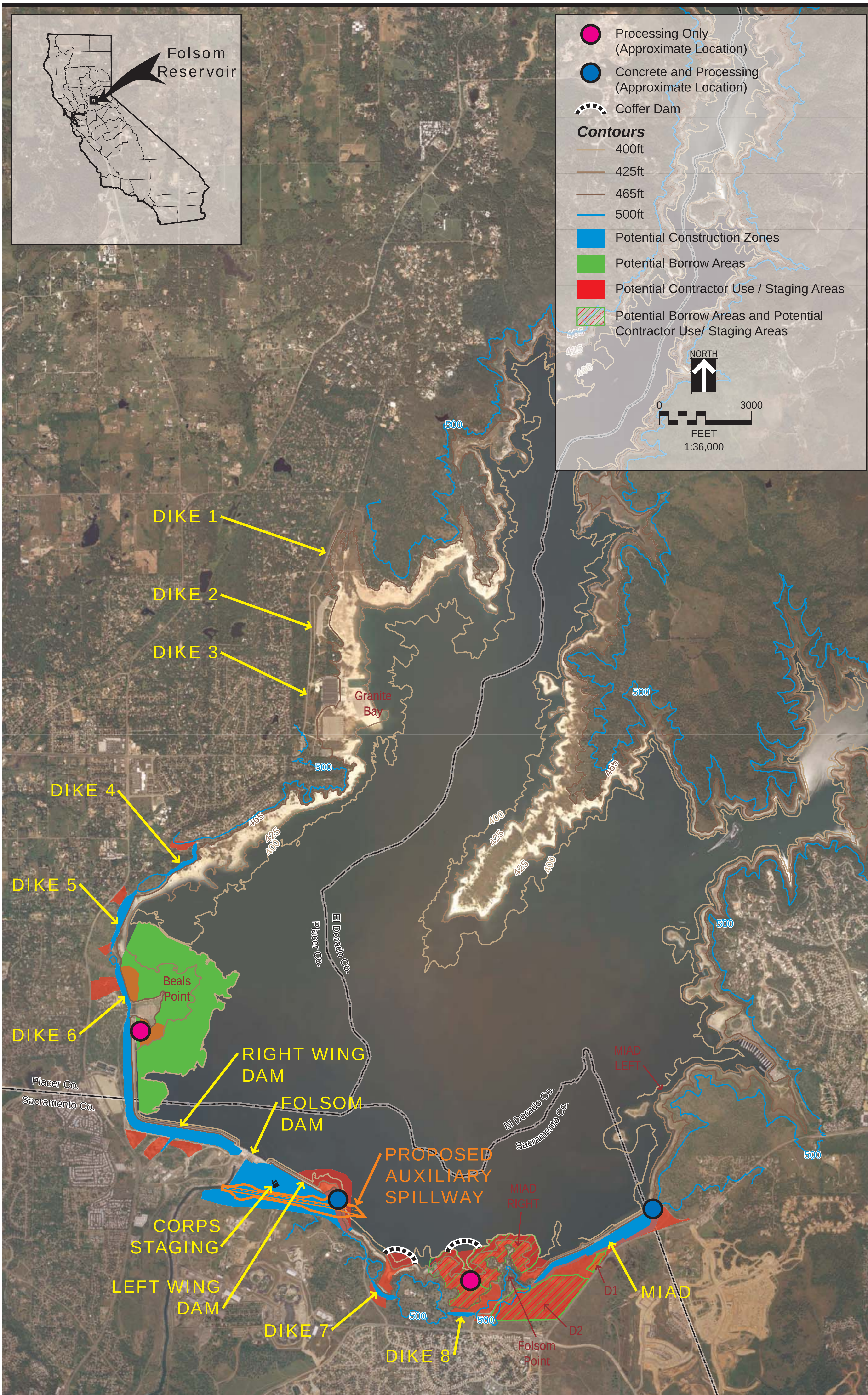

Figure 2-1
Folsom DS/FDR EIS/EIR
Alternative 1

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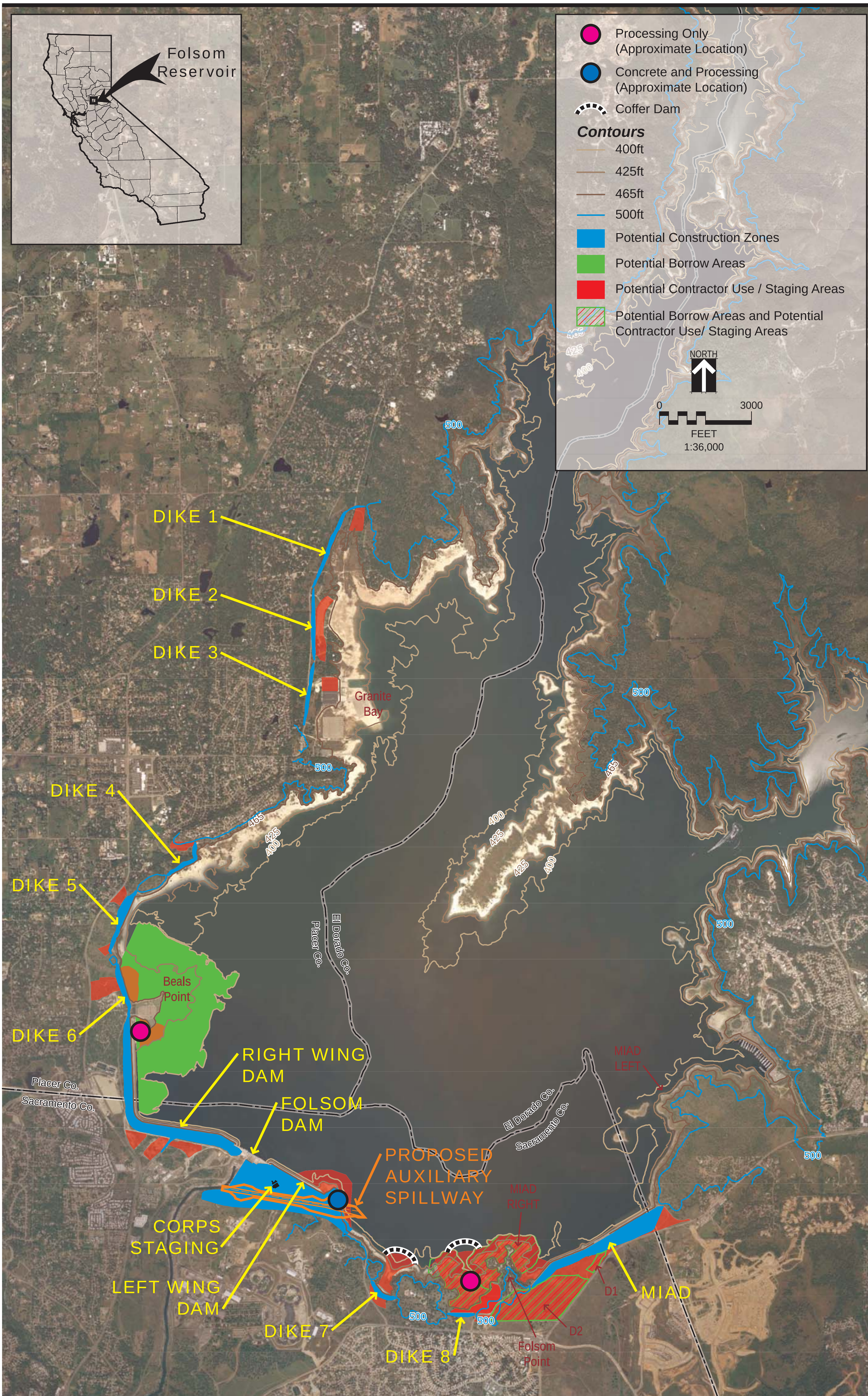

Figure 2-2
Folsom DS/FDR EIS/EIR
Alternative 2

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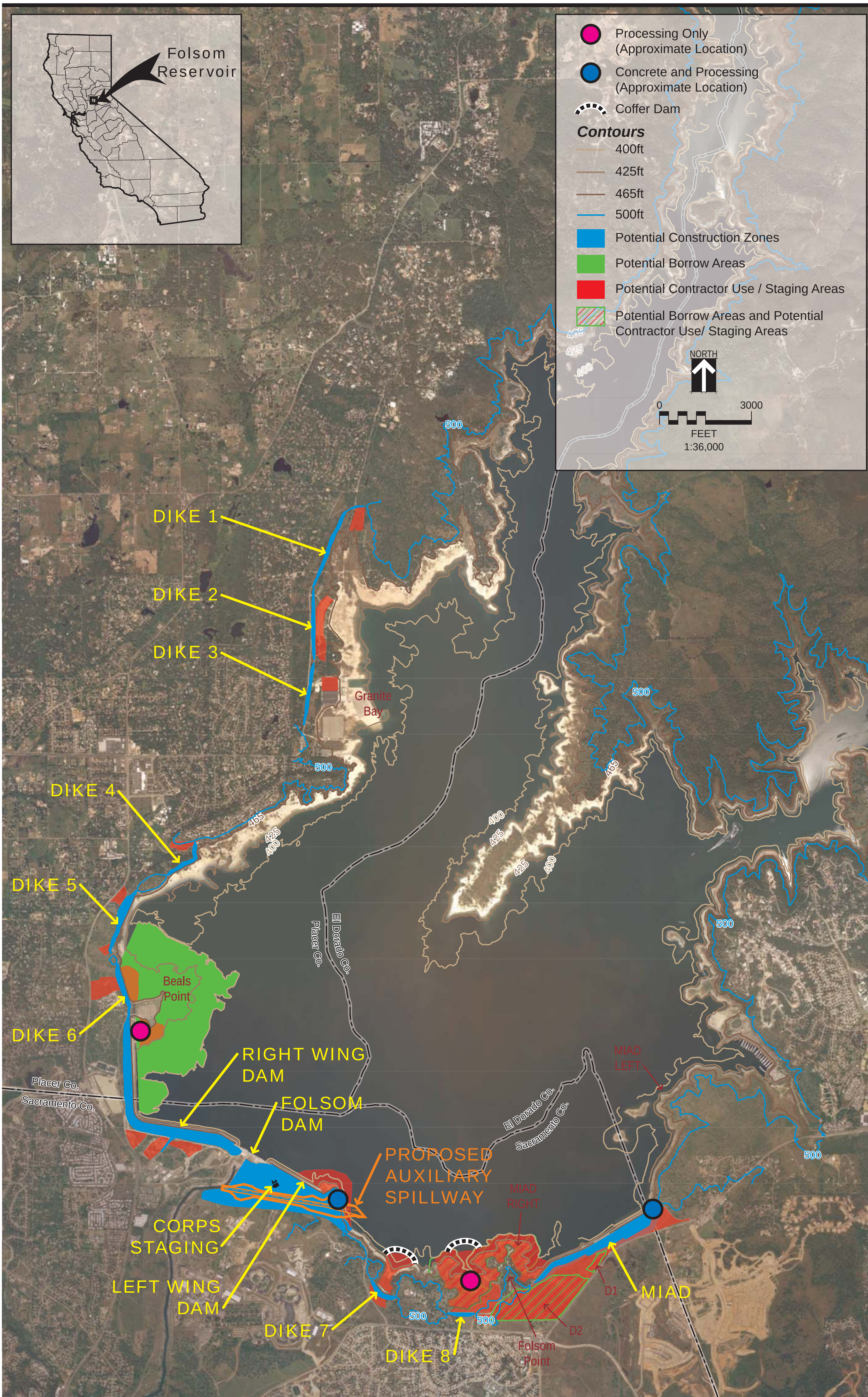

Figure 2-3
Folsom DS/FDR EIS/EIR
Alternative 3

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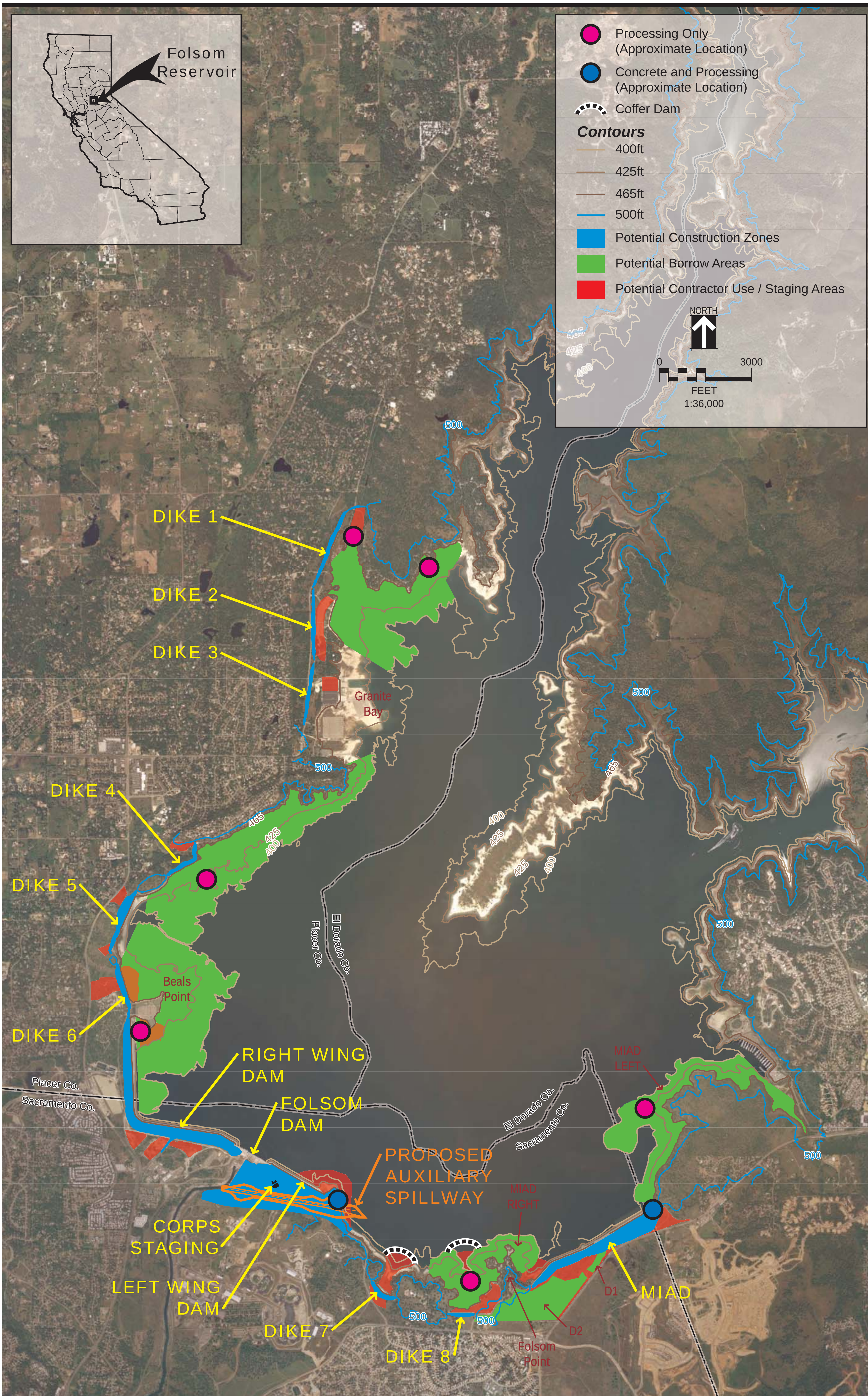

Figure 2-4
Folsom DS/FDR EIS/EIR
Alternative 4

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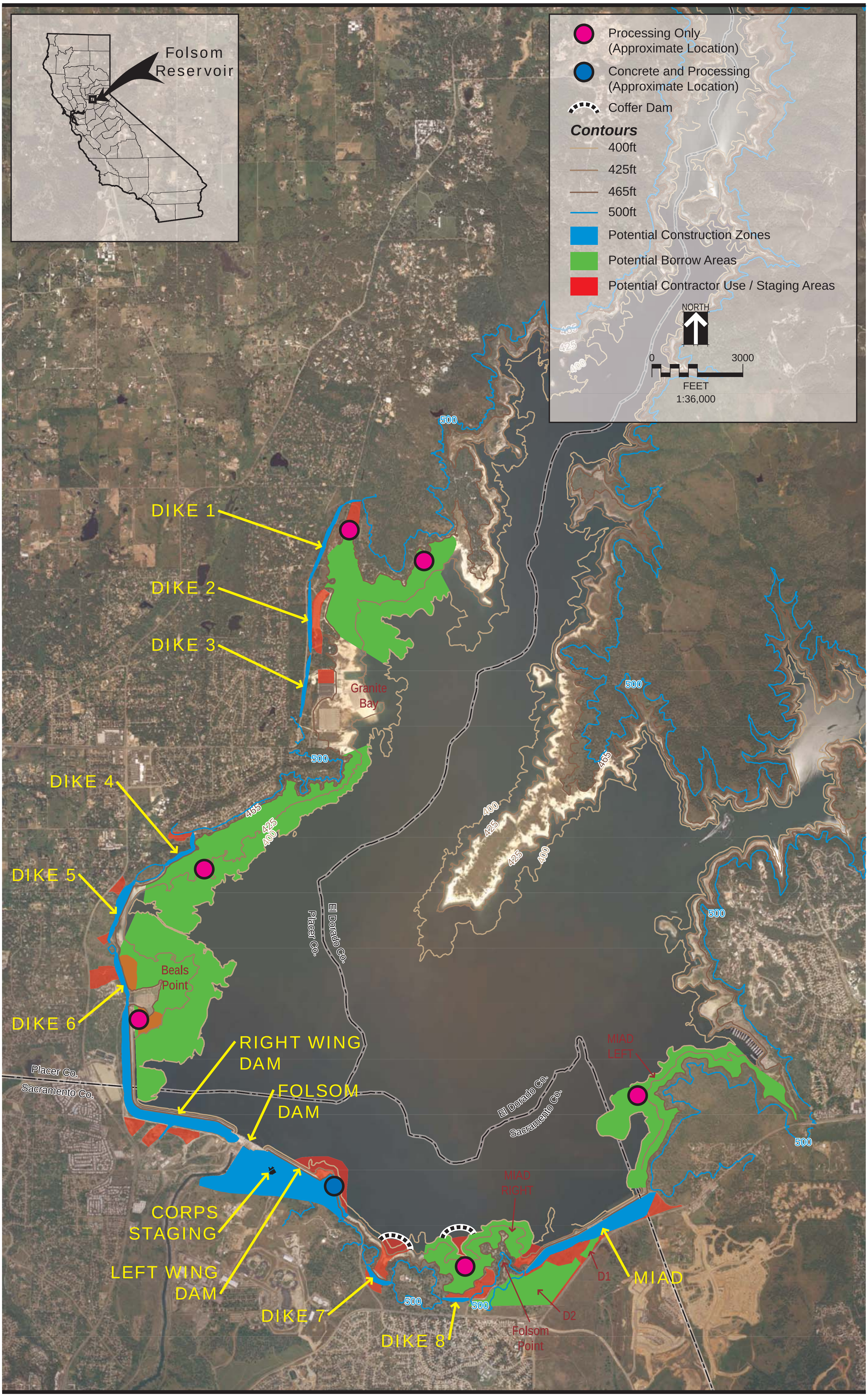

Figure 2-5
Folsom DS/FDR EIS/EIR
Alternative 5

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The various components of the Folsom Facility are located along an 8-mile stretch of the western and southern edges of Folsom Reservoir. Facilities to the east of the LWD are separated from all other facilities to the west and north by the American River and the Main Concrete Dam.

Figure 1-1 provides a base map that illustrates the main features of the Folsom Facility. The existing facilities include the Main Concrete Dam (Folsom Dam), wing dams, MIAD, and the eight dikes. Figures 2-1 through 2-5 show the basic nature and locations of the improvements to those main features as envisioned under each of five action alternatives, as overlaid on the base map. The following describes the color coding scheme used to identify improvements on the figures for the action alternatives.

The approximate alignment for the new Auxiliary Spillway and/or tunnel is outlined in orange. The proposed contractor work areas illustrating the maximum area of consideration for potential effects due to construction are shown in blue. Locations where earthen materials processing and concrete mixing (batch plants) could occur are shown with blue and red dots. Contractor use areas, which could include offices, parking, materials storage, and borrow material stockpiling, are identified by the fuchsia color. The maximum area of consideration for potential borrow sites, within and adjacent to the reservoir, are shown in green.

It is important to note that:

1) The proposed construction, contractor use areas and borrow areas are conservative estimates of the actual area that would be impacted by project construction. The outlined areas reflect the maximum project footprint that was analyzed for potential impacts to all resources. Once all of the potential features of the project have been optimized, the actual area impacted by the project would, in most cases, be much smaller than what was analyzed.

2) The borrow site locations reflect potential construction areas. Borrow would only be taken from these areas if the quantity of borrow material from the Auxiliary Spillway is inadequate for project purposes at the wing dams and dikes. If borrow material is actually required for construction, it is most likely that the only sites that would be developed are located at Folsom Point and MIAD (Alternatives 1, 2, and 3).

The features incorporated into the comprehensive range of alternatives listed in Table 2-10 were developed so that all viable joint and stand-alone dam safety and flood damage reduction alternatives retained during screening could be assessed for environmental effects within at least one alternative.

The two principle ways that alternatives achieve the joint dam safety and flood damage reduction objectives is either by increasing the facilities release capacity, where a higher volume of water is released sooner during an event, and/or if the alternative increases the facilities ability to contain inflows longer, and thereby safely pass the event. The structural modifications described in the proposed alternatives are designed to achieve these objectives.

Optimization of the project measures, and potential “repackaging” of the alternatives, was an ongoing engineering review task being conducted at the time of development of this EIS/EIR. The five action alternatives (Alternatives 1 through 5) presented and evaluated in the Draft EIS/EIR represent a reasonable range of alternatives for the proposed Folsom DS/FDR project, based on the facts, circumstances, and information available at the time. It is very possible, however, that the final project identified in the Record of Decision, as determined through ongoing engineering reviews and concept refinements and through the results of the NEPA and CEQA review processes for this EIS/EIR, would recombine measures taken from two or more of the alternatives. Inasmuch as the analyses presented in this EIS/EIR evaluate, to varying degrees, the improvements currently envisioned under each alternative on both an individual basis and a collective basis (i.e., examining the impacts particular to the key components of each action alternative as well as disclosing the overall collective impacts of the alternative), it is likely that the environmental consequences of a potential hybrid alternative would have, to some degree, already been addressed within the Draft EIS/EIR. Any such "repackaging" of the alternatives would be examined in light of the analysis presented in this EIS/EIR to determine whether the potential associated environmental impacts have been sufficiently addressed and disclosed in accordance with the requirements of NEPA and CEQA. That review would determine the extent to which the components of the preferred alternative, be it one of the original five action alternatives or some combination thereof, have been sufficiently addressed so as to allow decision-makers to proceed with an approval action (i.e., issuance of a ROD). The review would also determine whether supplemental environmental documentation is necessary and, if so, define the nature, scope, and timing of such additional environmental review specific to those components that were not yet adequately addressed. This evaluation and determination process would be conducted in accordance with the requirements of NEPA and CEQA, as appropriate.

2.2.2 Corps Folsom Dam Flood Damage Reduction Related Alternatives

Table 2-11 presents a listing of projects, some of which are included under the Corps Folsom Dam Modification and Folsom Dam Raise Project Authorizations that are not a part of the Folsom DS/FDR EIS/EIR.

Table 2-11 Folsom Area Projects Addressed by Corps in Other Planning/Environmental Disclosure Documents		
Corps Project Feature	***Corps Project Activity***	***Documents***
Main Concrete Dam	Existing outlet modifications Addition of 2 new outlets	Folsom Dam Modification Environmental Assessment/Initial Study 2001 Folsom Dam Modification Limited Reevaluation Report, 2003 Folsom Dam Modification Environmental Assessment /Initial Study 2005
Ecosystem Restoration	Temperature Control Shutters	American River Watershed, California Long-Term Study, 2002
	Ecosystem Restoration	American River Watershed, California Long-Term Study, 2002
Miscellaneous	New Folsom Bridge and approach	American River Watershed, California Long-Term Study, 2002

As mentioned, the Folsom Dam Modification Project was authorized in the WRDA 1999. The authorized plan included the elements of the Folsom Modification Plan described in the 1996 SIR, as modified in the SAFCA Information Paper *Folsom Dam Modification Report*, *New Outlets Plan* of 1998. Because the project authorized in WRDA 1999 differed from the plan presented in the 1996 SIR, the Draft *Folsom Modification Project Environmental Assessment/Initial Study* (EA/IS) was prepared in 2001 (2001 EA/IS) to document environmental effects of the authorized elements. At the same time, additional studies were conducted, as directed by WRDA 1999, which were documented in the February 2002 *American River Watershed Long-Term Study Final Supplemental Plan Formulation Report/EIS/EIR* (2002 Long-Term Study).

The Folsom Modification Project originally authorized in the 1999 WRDA would enlarge the Folsom Dam outlet works and improve the use of surcharge storage space. On completion, the project would allow operators to evacuate flood storage space earlier in a flood event in anticipation of the need to store additional water in the reservoir to reduce downstream flood damages. In combination, the outlet and spillway modifications would achieve an objective release capacity of 115,000 cfs earlier than under without-project conditions.

To reconcile differences between the Folsom Dam modification elements presented in the 2001 EA/IS and the 2002 Long-Term Study, the *Folsom Dam Modification Project Limited Reevaluation Report and EA/IS* was prepared in 2003 (2003 LRR).

Proposed changes to the Folsom Modification Project that were identified in the 2003 LRR included the following:

- Construct two new upper tier river outlets (instead of constructing five new outlets)
- Enlarge the four existing upper tier outlets to 9 feet, 4 inches by 14 feet, and the four existing lower tier outlets to 9 feet, 4 inches by 12 feet (instead of enlarging all eight outlets to 6 feet by 12 feet)
- Construct the new stilling basin as previously authorized, but provide additional anchorage for the apron slab

Since preparation of the 2003 LRR, and completion of construction plans for those elements, additional studies and authorization of the Folsom Dam Raise Project have identified further changes to the Folsom Modification Project. Plans and specifications for the Folsom Modification Project were prepared in 2003 and 2004, and contractor bids were solicited in 2005. The returned bids were nearly three times higher than had previously been estimated. This new cost significantly exceeded the PL 99-662 Section 902 authorization and appropriations limit. The high bid estimates were largely due to costly non-standard construction methods that would need to be employed to safely enlarge the existing outlets without taking the reservoir out of service during the construction period. Consequently, dam operations and performance and alternate structural methods to achieve the flood protection provided by the outlet modifications were reexamined.

Subsequent studies to the 2003 LRR found that modification of the two outboard lower tier outlets was infeasible, and offered only a marginal increase in performance. The design has been further refined, consisting of enlarging six river outlets (four upper tier outlets and two lower tier outlets) and constructing two new outlets as a result of hydraulic, geotechnical and structural assessment associated with enlarging the two outside lower tier outlets. Environmental impacts of this plan would be less than disclosed in the 2001 EA/IS, 2003 LRR and 2005 EA/IS, since lower tier construction would be limited to two, rather than four, and thus debris removal and dredging limits would be confined to a smaller area and construction would be accomplished in a shorter amount of time.

Most recently, a gated Auxiliary Spillway has been identified as a viable “functionally equivalent” alternative to outlet modifications. The Auxiliary Spillway is anticipated to be less costly than modifying the Main Concrete Dam outlets because it would not entail the construction risk associated with the outlet modifications. In addition, the material excavated from the Auxiliary Spillway site could be used for static and seismic dam safety improvements proposed by Reclamation.

As authorized, the Folsom Dam Raise Project included modifications to the LL Anderson Dam Spillway for dam safety purposes. Modifications to the LL Anderson

Dam, a non federal, privately-owned and operated dam, located on the Middle Fork of the American River at French Meadows Reservoir, upstream of the Folsom Facility, would involve enlarging the spillway to allow safe passage of the Probable Maximum Flood (PMF). These improvements would reduce the risk of impacts to Folsom Dam of a potential failure of LL Anderson Dam. However, since the initial authorization, modifications to LL Anderson Dam have been dropped from further consideration in the Folsom DS/FDR Action. The Federal Energy Regulatory Commission (FERC) and the owner/operator of the dam (Placer County Water Agency) have agreed to resolve the dam safety issues as a separate project.

2.2.3 Relationship of Safety of Dams and Flood Damage Reduction to the Joint Federal Project

As presented in Chapter 1, Reclamation and the Corps have separate missions related to the function of Folsom Reservoir based upon their federal authorizations. Reclamation is focused on water delivery, power generation, and related programs including dam safety, while the Corps is focused on flood damage reduction. One overlapping issue for dam safety and flood damage reduction is management of the hydrology of the American River watershed. Reclamation’s dam safety concerns focus on preventing overtopping of the dam structures during a major flood event. The Corps’ mission focus is flood damage reduction, which is achieved by controlling releases from the reservoir at levels that maintain the integrity of the downstream levees

Congress has requested that Reclamation and the Corps develop a common solution to the overlapping issues related to Dam Safety and Flood Damage Reduction. Both agencies have identified that a gated Auxiliary Spillway would address both agencies concerns, which is now referred to as the “Joint Federal Project” (JFP). Separate stand-alone dam safety and flood damage reduction alternatives to be independently implemented concurrently by each agency are explicitly distinct from the joint effort although they collectively are analyzed within this EIS/EIR to address the potential cumulative effects at the Folsom Facility. When used in this document, JFP refers specifically to the following:

> The JFP at Folsom Dam and Reservoir would consist of six new 23-ft X 33-ft submerged tainter gates at invert 368 ft combined with a concrete lined Auxiliary Spillway approximately 170 ft wide and 1700 ft in length. Gate dimensions and invert elevation may be optimized during design to maximize performance and/or reduce costs. To achieve the objective of expedited feasibility level design, optimization of the spillway design would focus, to the extent feasible, upon varying the invert elevation of the new tainter gates, but if necessary, may include varying the dimensions of the gates, approach channel or Auxiliary Spillway. The optimization process would endeavor to improve upon the flood damage reduction objective of at least 1/200 year

> flood protection while continuing to preserve and expedite completion of the dam safety objective of safely passing the PMF.
>
> Additional features may be added to the JFP at a later point in the development of the project, if the features are mutually determined to be necessary by participating agencies in order to (1) achieve a minimum 1/200 year flood protection, or (2) as incrementally justified through appropriate analysis and evaluation. Potential additional features may include a raise of up to 3.5 feet for all embankments, or modification or replacement of the existing service gates or emergency spillway gates. Any additions to the JFP, as justified, would be for flood damage reduction purposes only.

Most of the remaining Folsom DS/FDR actions would be implemented separately as stand-alone modifications, by each agency, depending upon their respective Safety of Dams and flood damage reduction authorities. The appropriate level of environmental documentation would be completed before any features not fully described and evaluated in this document are constructed.

2.2.4 Description of the Engineering Measures

This section describes measures that increase the capability of the Folsom Facility to address Safety of Dams hydrologic, seismic, and static concerns, and to better manage floods in order to safely pass the PMF, and lesser floods up to a 1 in 200 year event. This section also describes supplemental measures to provide an integrated security system that includes appropriate physical security components and electronic security systems to provide a complete and useable protection system for the Folsom Facility. These engineering measures include several different structural modification alternatives to upgrade the overall system. It is important to note that the engineering measures described in this section represent the full range of improvements to the Folsom Facility that are reflected in different degrees and combinations within the five action alternatives currently being considered for the Folsom DS/FDR Project. Table 2-10 in the preceding section provides a summary of which measures are included in which action alternative(s), and Sections 2.4 through 2.8, which follow later in this chapter, provide a detailed description of how each action alternative includes a specific combination of measures. The discussion provided below in this section describes the basic nature, design, function, and construction characteristics of each of the measures contemplated within the range of action alternatives. This comprehensive description of all the measures is intended to help the reader better understand how the characteristics of each of the action alternatives compare and contrast, and also helps set the context for understanding how the construction characteristics associated with each alternative relate to the impacts discussion presented in Chapter 3.

The Folsom facilities to be addressed by one or more of the proposed structural modification alternatives includes the Main Concrete Dam, the RWD and LWD, the MIAD, and Dikes 1 through 8 (See Figure 1-1). 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 the historic Blue Ravine river channel, while the earthen dikes serve to contain water at low spots in the topography during periods when the reservoir is at or near capacity.

Not all of the proposed structural modification alternatives are applicable to all Folsom facility structures. Although the alternatives may be similar in nature from structure to structure, each structure is unique unto itself and requires distinct consideration. For example, construction of shear keys or post tensioned anchors would only be applicable to the Main Concrete Dam since it is the only concrete structure. All of the earthen structures, however, could have static and seismic elements that would be similar to all earthen embankment dams/dikes, with slight unique variations due to unique consideration applicable to an individual structure. The basic details of the proposed structural modification alternatives are provided in the text below.

2.2.4.1 Auxiliary Spillway

The current dam spillway and outlets do not have sufficient discharge capacity for managing the predicted PMF and lesser event flood inflows above a 1 in 100 year event. The Folsom Facility has insufficient capacity to safely pass the PMF event, and therefore Reclamation has proposed structural modification alternatives to address increasing discharge capability and/or increasing storage during extreme flood events above the 1 in 200 year event up to the PMF. The Folsom Facility currently can safely release flood flows above 115,000 cfs and below 160,000 cfs for a duration which provides a level of protection provided by downstream levees associated with a 1 in 100 year event. Proposed Flood Damage Reduction structural modification alternatives address increasing discharge capability and/or increasing storage (reservoir surface elevation of 388.6 ft) for extreme flood events above the existing conditions. The proposed features would be able to safely release flood flows above 115,000 cfs and below 160,000 cfs for a longer duration equivalent to a 1 in 200 year event level.

Various combinations of Auxiliary Spillways (fuseplug, fusegate, gated), tunnels and potential dam raises have been considered to address overtopping of the dam during extreme flood events and increase the duration lesser events can be held to releases of 160,000 cfs or below. A new Auxiliary Spillway is the major feature being considered to address the dam safety hydrologic risk of safely passing part or the entire PMF event. One goal of this new structure would be potentially achieving a greater than 1- in 200-year flood protection objective.

The Auxiliary Spillway design alternatives increase the flood control capability of the Folsom Facility by increasing the outflow capacity at lower lake levels, resulting in reduced maximum pool elevations when large flood events occur and proper reservoir operations are followed. The purpose of the Auxiliary Spillway would be to provide better hydrologic control of the reservoir capacity during large flood events. Based on reservoir levels and anticipated and observed reservoir inflows, the Auxiliary Spillway would be used to safely and quickly lower the reservoir level to withstand the expected storm runoff.

In general, all Auxiliary Spillway alternatives would consist of the construction of new spillway on the south abutment and downstream of the LWD. It would include an approach channel on the water side of the control section, a control structure section consisting of either a segmented earthen fuseplug control structure or a gated control structure and a discharge chute to convey water to the river. Beyond the control section, the discharge chute would lead to an energy dissipating structure and exit channel that would channel spillway flows to the river. The principle differences in the various spillways are the type of control structure, the depth and width of the channel, and the length of the approach channel.

Concrete for construction of the Auxiliary Spillway would be produced at an onsite batch plant, with cement and aggregate hauled to the site from Sacramento area commercial suppliers. The discharge chute linings would be either a short lined-chute option, constructed in the upper portion of the spillway, or a fully-lined chute option constructed completely to the river discharge point. The spillway chute would be lined either with roller compacted concrete, or structural, formed, and poured concrete.

The spillway would be constructed in phases to obtain an interim ability to safely pass the PMF as expeditiously as possible followed by incremental phases to achieve the full flood damage reduction objectives.

The Auxiliary Spillway would be constructed by excavating an elongated trench in the area adjacent to and below the LWD. Decomposed granite and surficial soils would be removed and stockpiled using standard construction equipment. The underlying competent rock foundation would be excavated using standard drill and blast techniques. Material excavated from the trench would be utilized as borrow material for the raising and strengthening of earthen structures, particularly MIAD. Excess material would be permanently stockpiled on site.

The spillway chute when complete would convey the spillway discharge to the American River channel without impact to the LWD. It is expected that the excavation of the approach and discharge chutes would be done in multiple stages. The initial stages would include removing common material and some excavation of the rock. A rock plug and/or cofferdam would be used to close off the partially excavated spillway during construction and could be used to partially pass a large flood event should one occur during construction. Subsequent stages would involve excavation of the approach and discharge chutes to the final grade, and the Auxiliary Spillway control structure would be completed. It is anticipated that blasting would be used as the primary means of rock excavation. Construction of the approach channel to the spillway gates could involve underwater blasting, dredging, and barging of material from within the reservoir to the shoreline, where the material would be stockpiled. It is anticipated that the material excavated from the approach chute would be put to beneficial use.

The Auxiliary Spillway would be controlled by either an earthen fuseplug control structure that would meet the dam safety objectives of passing the PMF or submerged tainter gates that would meet both dam safety and flood damage reduction objectives. Features of the fuseplug Auxiliary Spillway and tainter gate spillway are provided in the following sections.

2.2.4.2 Fuseplug Auxiliary Spillway

A control structure consisting of an earthen fuseplug embankment sections would serve as the Auxiliary Spillway control on an interim basis or permanent basis. On an interim basis, the fuseplug Auxiliary Spillway would address Reclamation’s Safety of Dams objective while flood damage reduction elements are being designed and constructed. The fuseplug control structure could serve on a permanent basis if it were to be determined through future analysis that flood damage reduction objectives were met by another alternative or indefinitely deferred. The spillway would be principally excavated and constructed as described above. The fuseplug section would consist of a zoned embankment with an impervious core, an internal coarse shell zone, and erosion protection material would be placed on the upstream face of the fuseplug. The fuseplug control structure would be designed with multiple segments to allow for the progressive passage of smaller floods up to the PMF flow, without affecting the complete fuseplug control structure. The fuseplug embankment sections would be segmented with concrete divider walls to insure that no single segments operational flows would exceed downstream levee capacity. The fuseplug embankment sections would be designed to erode in a controlled manner when the reservoir elevation exceeds the elevation of a pilot channel (by approximately 1 foot) and would be 2 feet below the fuseplug embankment crest.

The fuseplug Auxiliary Spillway alternative with the largest width is identified in Alternative 1. A mostly unlined rock approach channel would extend from the control structure into the reservoir. The last 150 ft of the approach channel would be lined with roller compacted concrete. The 520-ft wide, 400-ft long approach channel would convey water to the control structure. The spillway would have a 520-ft wide control structure at the upstream end of a 1,100-ft long, 520- to 300-ft wide roller-compacted concrete-lined channel. This channel would lead to a 1,700-ft unlined channel discharging into the American River. This alternative fully passes the PMF but provides limited achievement of flood damage reduction objectives. Since the fuseplug alone does not meet the dual objectives, the fuseplug alternative could be implemented on an interim basis as flood elements are further designed and constructed. A fuseplug could also be implemented on a permanent basis if it were to be determined through future analysis that flood damage reduction objectives were better met by other alternative combinations or indefinitely deferred. A smaller fuseplug control structure (approximately 400 feet wide) is considered under Alternative 2 in conjunction with an underlying tunnel and dam raise to achieve both dam safety and flood damage reduction objectives.

The approach channel would have a trapezoidal cross-section, with a flat-bottom at elevation 435 ft. Both unconsolidated (soil and loose rock) and consolidated (bedrock) material would be excavated. For common excavation, it is anticipated that scrapers, bulldozers, and dump trucks would be used. For bedrock excavation, blasting would be required to breakup the material into adequate size for excavation. Blasting would occur above and below the reservoir water line. Within reservoir excavation would be accomplished by using a dragline. Within reservoir water quality impacts would be mitigated through sediment control actions.

2.2.4.3 Gated Spillway

Another option for the Auxiliary Spillway control section would be the use of mechanical gates (submerged tainter gates) housed in a concrete structure to meet both dam safety and flood damage reduction objectives. Overall, the gated Auxiliary Spillway is similar to other spillway alternatives and would consist of an approach channel on the waterside of the gate, a control structure consisting of six submerged tainter gates, and a concrete-line chute leading to an energy dissipating structure and exit channel. Concrete for construction of the spillway would be produced at an onsite batch plant, with cement and aggregate hauled to the site from Sacramento area commercial suppliers or onsite aggregate. The discharge chute would be fully lined with formed concrete and is inclusive of an energy-dissipating structure (stilling basin) at the river.

The 6 STG gated spillway as proposed in Alternative 3, would have a 190-ft wide control structure at the head of a 1,100-ft long, 190-ft wide concrete-lined channel. The approach channel would be similar to that of the fuseplug spillway, but would be excavated deeper into the bedrock to an elevation of 364 ft. This approach channel and gate would lead to a 1,700-ft concrete-lined channel discharging into the American River. The 6 STG gated Auxiliary Spillway has a discharge capacity of approximately 280,000 cfs at pool elevation 477 ft. Gate dimensions and invert elevation may be optimized during design to maximize performance and/or reduce costs. The gated sections would be designed to allow safe passage of more frequent, smaller flood events and maintain the capability of the structure to safely pass part of or all of the PMF without a dam raise of any height to prevent overtopping the other retention structures. A raise could be included if additional flood damage reduction benefits are incrementally justified as presented in Alternative 3. A smaller, narrower 4 STG spillway is proposed in Alternative 4 which would require a raise of 7 feet to meet both dam safety and flood damage reduction objectives.

The approach channel would have a trapezoidal cross-section, with a flat-bottom at elevation 364 ft. Both unconsolidated (soil and loose rock) and consolidated (bedrock) material would be excavated. For common excavation, it is anticipated that scrapers, bulldozers, and dump trucks would be used. For bedrock excavation, blasting would be required to breakup the material into adequate size for excavation. Blasting would occur above and below the reservoir water line. Within reservoir excavation would be accomplished by using a dragline. Within reservoir water quality impacts would be mitigated through sediment control actions.

2.2.4.4 Concrete Dam Structural Modifications

Foundation, Gate and Pier Improvements
Structural modifications to the existing Main Concrete Dam foundation, exiting gates and gate piers are being considered to reduce dam safety seismic risks. The existing concrete dam spillway gates are proposed for replacement under flood damage reduction objective dam raise options because structural members for the existing gates would be impacted during the passage of large flood releases. To address flood damage reduction objectives for dam raise options, replacement of the existing bridge over the spillway gates on top of the Main Concrete Dam would be raised or replaced.

2.2.4.5 Main Concrete Dam Seismic Improvement Options

The Main Concrete Dam was constructed of concrete monoliths that may have the potential to slide on horizontal lift lines within the dam during a large earthquake event. In addition, evaluation of the dam’s original construction details and stability analysis indicates that the dam monoliths may slide along the dam-foundation contact during a large earthquake. Engineering options being considered to reduce the probability of Main Concrete Dam movement include upper and lower post tensioned anchors, shear keys, and a toe-block. Existing gate and gate pier reinforcement is also required to reduce dam safety seismic risks. Spillway pier reinforcement is comprised of bracing post tensioned anchors and/or pier wraps along with additional bracing or replacement of structural members to the existing spillway gates. No existing spillway bridge improvements are required with these modifications.

Post-Tensioned Anchors in Upper Portion of Dam (Upper Post tensioned anchors)
There are two monoliths on either end of the Main Concrete Dam (monoliths 1 and 28) that may require anchoring within the Main Concrete Dam to prevent earthquake

induced sliding of the concrete blocks. Upper post tensioned anchors would be installed by boring vertical holes within the two monoliths and anchoring the monolith blocks with post tensioned anchors. The design calls for the post tensioned anchors to be 87.5 ft in length, anchored 25 ft below the lift line at approximate elevation 418. The design requires six post tensioned anchors for each monolith for a total of 24 post tensioned anchors. Figure 2-6 illustrates the post-tensioned tendon concept where the connection between concrete lift lines is reinforced.

Lower Post-tensioned anchors

There are eight dam monoliths requiring anchoring to mitigate potential earthquake induced sliding along the foundation contact. Lower post-tensioned anchors would be installed by drilling boreholes at 45-degree angles through the downstream face of the concrete dam monoliths blocks into underlying foundation (i.e., crossing the dam foundation contact). Steel post tensioned anchors passing through the monoliths into the foundation would be anchored into rock foundation with cement grout, which would tie the base of the concrete dam to the foundation. Figure 2-7 illustrates the post-tensioned concept where the connection between concrete and rock foundation is reinforced.

Post-tensioned tendon installation in the Main Concrete Dam would be limited to monoliths 15 through 22. Construction would be performed on work-platforms constructed on the downstream face of the Main Concrete Dam, including excavation of small blockouts on the downstream face of the concrete dam face for tendon installation, followed by drilling diagonally upstream through the monoliths into the foundation. Following drilling, post tensioned anchors would be installed, then anchored with cement grout, followed by tensioning. The remaining drill hole above the anchored portion would then be filled with grout. The blockouts would then be filled with concrete to conform with the original concrete dam face profile. Approximately 50,000 cubic yards of earthen material would be excavated from LWD to enable installation of post tensioned anchors into the lower portions of monoliths 20 through 22. This excavated material would be stockpiled and replaced after post tensioned anchors are installed. Water produced during drilling of the tendon holes would be captured, contained, and disposed of in accordance with the construction water quality permit.

Shear Keys

Shear keys are another option to prevent the sliding of the concrete monoliths along the foundation contact (i.e., dam/foundation contact). For this option, 10-foot diameter tunnels would be excavated along the contact of the foundation and the base of the dam. The tunnels would be backfilled with reinforced concrete to provide the shear resistance along the contact sliding plane. Figure 2-8 illustrates the concept of the shear key.

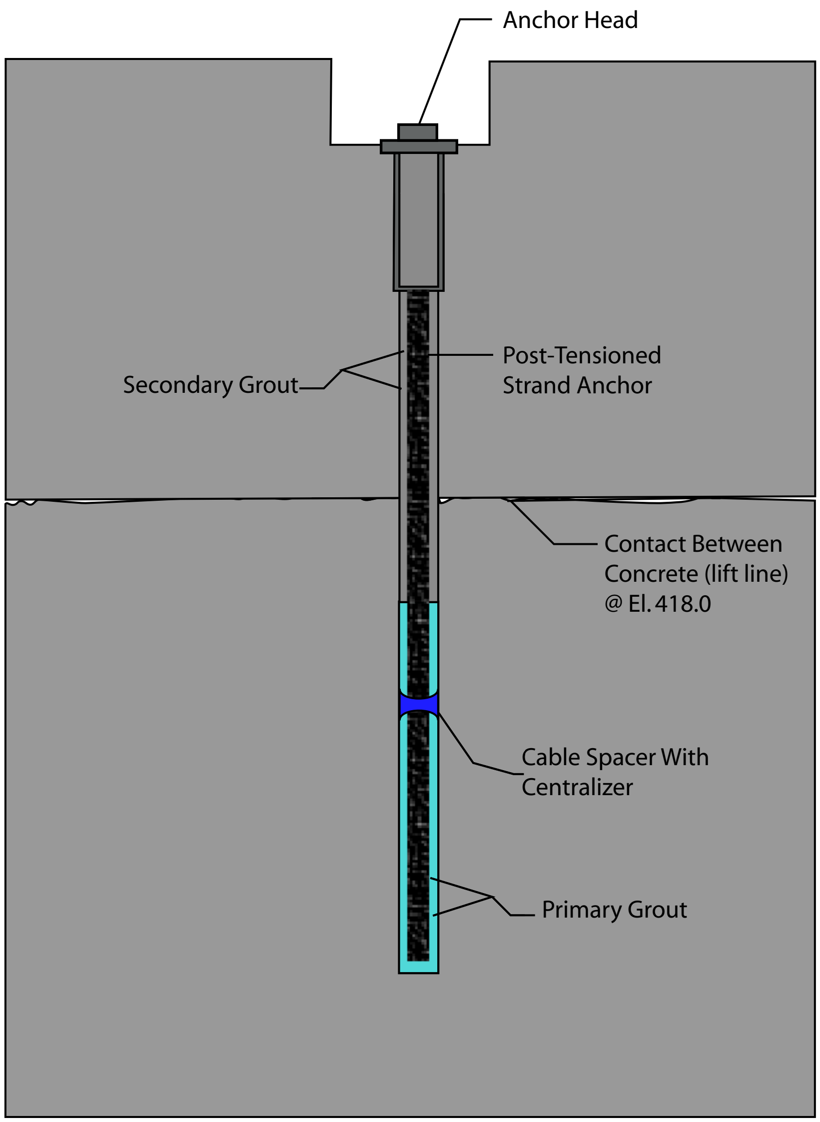

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Figure 2-6
Post-Tensioned Anchors Across Lift Line at El. 418.0

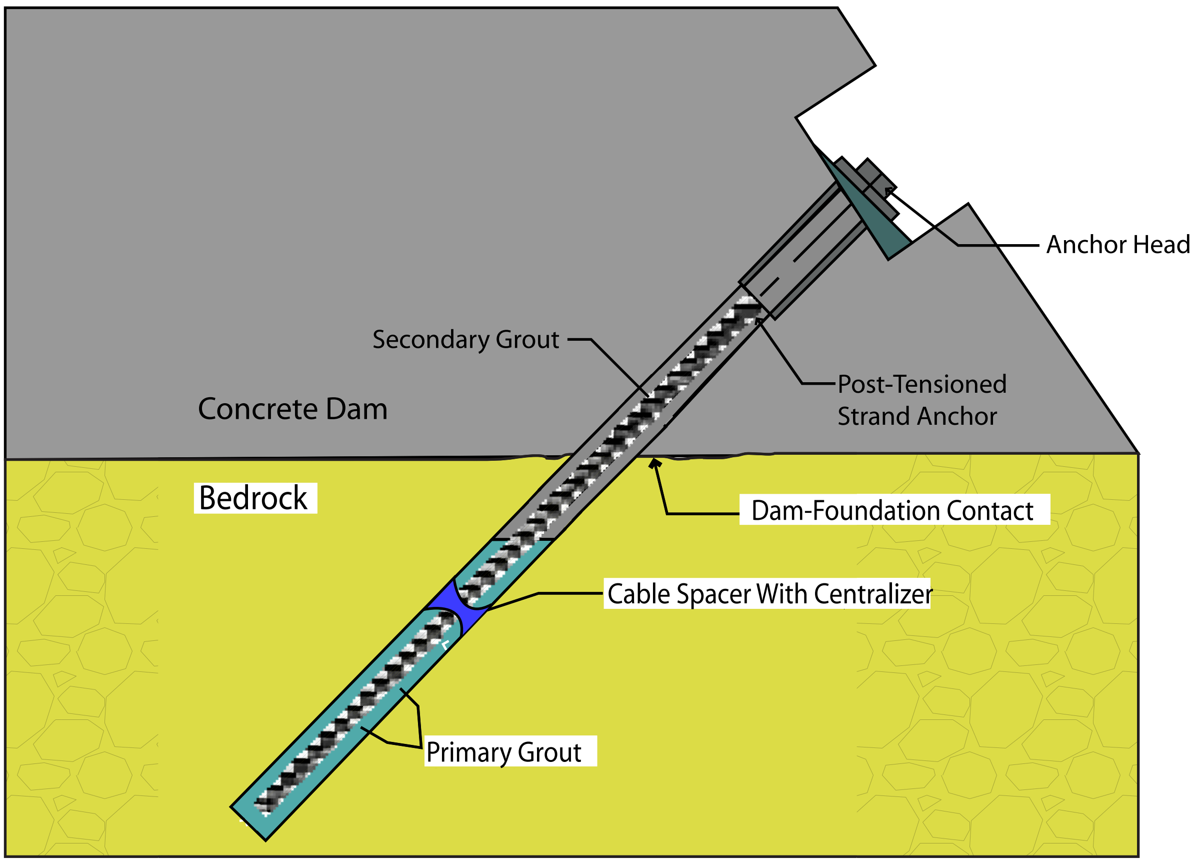
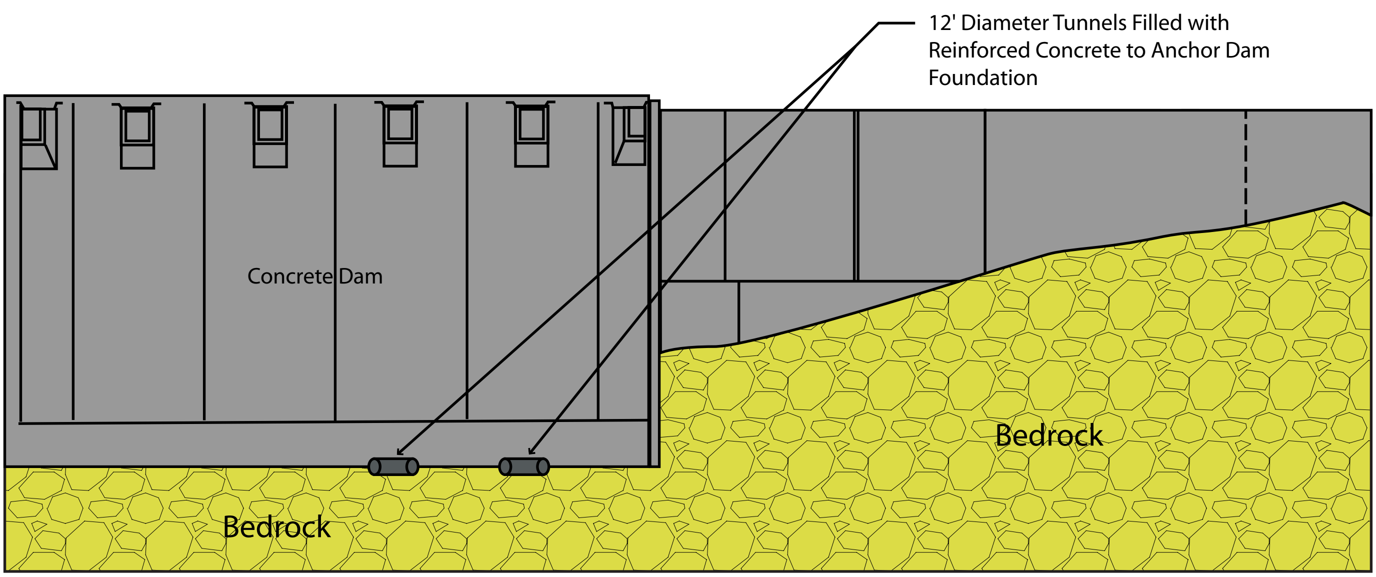


Figure 2-7
Post-Tensioned Anchors Across Foundation Contact



Shear Key Element Concept

Toe Block

A toe block is another option to prevent the sliding of the concrete monoliths along the contact. For this option, a toe block would be excavated along the downstream toe of the dam into the underlying rock foundation. The excavation would be backfilled with concrete to provide the shear resistance along the contact sliding plane.

For the installation of shear keys or toe blocks, the stilling basin would be dewatered, allowing access to the contact between the dam and its foundation. Excavation methods at the dam base would likely include controlled blasting in the foundation rock and mechanical methods for cutting into the concrete. Water used in installation of the shear keys and toe blocks would be captured, contained, and disposed of in accordance with the construction water quality permit.

Contraction Joint Shear Key

A contraction joint or vertical shear key is being considered for the anchoring the vertical contraction joints between dam monoliths 20-21, 21-22, and 22-23. The vertical shear keys would be 3-ft in diameter, vary in length between 100 and 140 ft, and receive vertical and horizontal reinforcement. The contraction joint shear keys would bisect each contraction joint in two locations on the downstream face of the dam and act to tie monoliths 21 and 22 to monoliths 20 and 23. Monoliths 15 through 22 are founded on the channel fault and could slide during a seismic event. The full base of monoliths 15 through 19 and half the base of monolith 20 would be anchored to the foundation. The vertical shear keys would bridge the unbonded vertical contraction joints and allow the adjacent monoliths to help anchor monoliths 21 and 22.

Drainage of Dam Foundation

Foundation drainage improvements could be used to reduce uplift pressures and reduce the risk of sliding of foundation wedge. To accomplish this, additional drains would be drilled from the existing dam drainage gallery between the spacing of the existing drains. Piezometers would be installed to monitor the uplift pressures within the foundation.

Gate and Pier Reinforcement

The spillway gate arms would be either be replaced or reinforced with welded steel plates and additional cross bracing to reduce the potential for a buckling failure during a large earthquake. Spillway piers would be braced with structural members and reinforced with steel wraps and tendons to inhibit pier lateral swaying during an earthquake and/or cable post tensioned anchors would be installed through the pier into the mass concrete of the dam to prevent shearing along the pier base. Also to prevent failure of the spillway piers during a seismic event, a steel plate would be wrapped around the downstream portion of the pier and cross anchored with bolts.

This band, or pier wrap, would carry the gate trunnion stress placed on it should a large magnitude earthquake occur.

2.2.4.6 Existing Stilling Basin

The existing stilling basin was designed so that it could contain hydraulic jump action for flows up to 200,000 cfs and prevent major damage during the existing spillway design flood. Flows above 200,000 cfs would result in hydraulic jump further downstream. Since total releases from the Main Concrete Dam, with existing Auxiliary Spillway, could be increased from the original design discharge of 567,000 cfs maximum to 920,000 under this project, modifications to the stilling basin are warranted. To address this concern, the existing stilling basin would be extended 50-75-ft. downstream as incrementally justified for flood damage reduction.

2.2.4.7 Embankment Raises (Dikes and Wing Dams)

Various combinations of raise heights in conjunction with increased outlet capacity modifications, Auxiliary Spillways (fuseplug, fusegate, gated), and tunnels and have been considered to avoid overtopping the dam during extreme flood events and increase the duration lesser events can be held to 160,000 cfs or below. The existing Main Concrete Dam has a parapet wall 4.0 ft above the crest elevation of the remaining embankment dams/dikes of 480.5. Some minor modifications to gaps along this parapet wall would be needed for raises of 4 feet or less. Significant dam modifications would be required for raises greater than 4 feet.

To temporarily increase the capacity of the reservoir and improve flood damage reduction, all earthen structures could be raised through the placement of additional earthen material, construction of concrete walls, or a combination of the two measures, along the crest of the facilities. The purpose of the raises would be to:

1) Small heights of less than 4 feet to accommodate resurfacing, security and/or crest hardening or small freeboard requirements following other embankment/dike structural modifications or under both safety of dams, security and flood damage reduction objectives as incrementally justified.

2) To provide additional freeboard or surcharge capacity up to greater heights of 7 ft under flood damage reduction objectives as incrementally justified.

3) A maximum raise height of 17 ft was analyzed as an alternative to contain the PMF without any increased discharge capacity from any combination of new or existing spillway, tunnel, and gate or existing outlet modifications. Additional modifications would be required to achieve flood damage reduction objectives.

Several options exist for the raising of existing dikes and wing dams. Embankment raise are described below.

Conventional Earthfill Raise.

The earthfill dikes (Dikes 1 through 8), LWD, RWD, and MIAD would be raised and strengthened using earthen materials similar to their current construction. The cores of the existing dam/dike embankments consist of decomposed granite and have performed well since construction. Soil material required for the dam/dike raises would include shell material (impervious soil and miscellaneous shell soil), coarse filter (slope protection bedding), and slope protection (riprap). Installed within the downstream shell would be a filter zone (see Section 2.2.4.).

The materials for the shell would be produced locally at borrow sites developed on Reclamation property. The materials for filters would most likely be hauled to the site from local commercial sources or produced onsite by processing granitic borrow material obtained during the Auxiliary Spillway excavation or an alternate onsite location. Shell and filter production would involve screening and crushing of excavated rock to sizes meeting the specifications for each of the project sites. Standard earth moving equipment would be used to excavate the material, haul it to processing sites, and then place the material at the project sites.

Earthfill raises would only involve the modification of the crest and downstream face of the structure (see Figure 2-9). Necessary seismic and static elements would also be incorporated into the overall design. An earthfill raise would be accomplished first by stripping a nominal 2-ft of existing cover from the downstream face prior to placement of new material. Stripping would most likely involve the pushing of material down the slope of the embankment by a bulldozer. At the bottom of the embankment, the material would be picked up by a bottom scraper hauler and transported to the storage site.

The material to be replaced on the downstream side would not be required to be impermeable and could be constructed of local materials. Following removal of the 2-ft layer, the raise would be accomplished by building up the downstream slope and raising dam/dike crests through the placement of appropriate soil materials developed at the borrow sites. The existing dam/dike crest would be excavated as necessary to key the new impermeable fill material to impermeable core of the existing embankment. The upstream (reservoir side) face and crest would not be altered below the point of the raise; upstream and downstream erosion protection would be extended to the crest height of the new raise. A slope stability analysis would be conducted to optimize the slope of the downstream dam/dike face.

Placement of additional earthen material would serve two primary functions: (1) the material could be used to raise the elevation of the structures, providing additional hydrologic control and temporary flood storage capacity, and (2) the material would provide additional mass to the existing earthen structures improving their static capabilities.

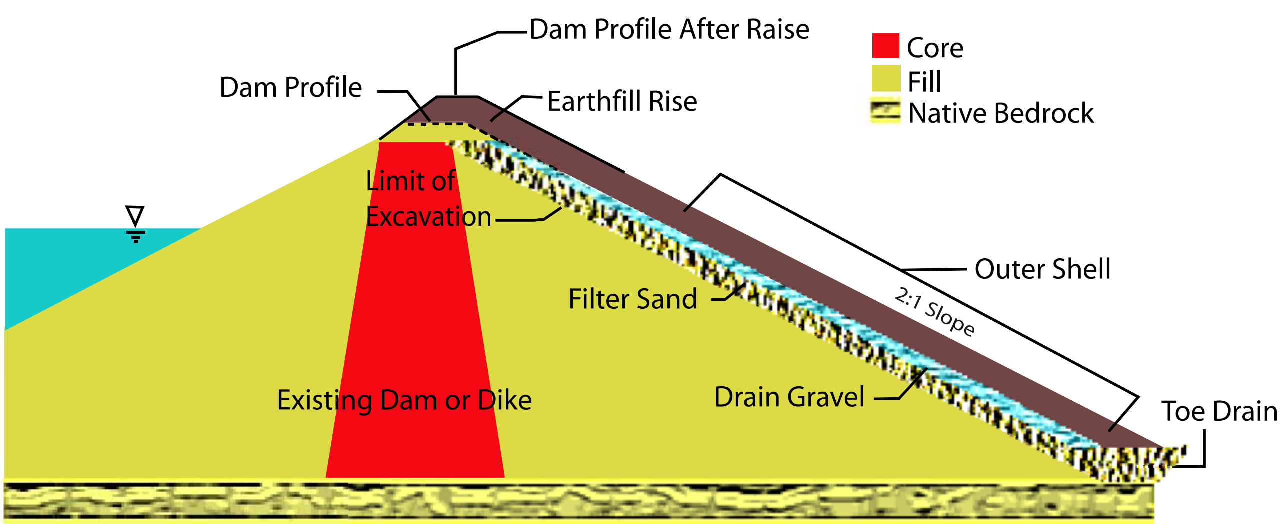


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Figure 2-9
Typical Dike Raise

Reinforced Earth Wall Raise

The reinforced earth wall would consist of a concrete-formed box section constructed adjacent to the upstream and downstream crests of the dikes or wing dams. The walls would be tied together and then backfilled with soil. The whole feature would be keyed into the existing embankment, with a water-stopping element integrated into the embankment core. Concrete for the walls would be mixed at a portable batch plant from cement and aggregate hauled to the site, and then poured into forms at the construction sites. Figure 2-10 illustrates the concept of a reinforced earth wall.

Reinforced Concrete Retaining Wall Raise

A reinforced concrete retaining wall (also termed a parapet wall) with footing embedded in the earthfill of the embankment (See Figure 2-11) 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.

Dual Parapet Concrete Wall

This feature would be similar to the concrete retaining wall except the elevated wall would be constructed along the upstream edge of the dam or dike. A second lower wall would be constructed along the downstream edge to provide edge protection. The parapet wall would be constructed by excavating a portion of the dam or dike crest to place the footing and then replace the material to the proposed earthen material height. Figure 2-12 shows the concept of a dual parapet wall.

Combination Earthen Raise and Concrete Wall

Engineering options involving the raising of the earthen structures could involve the use of both earthen materials and a parapet wall. For example, a 7-ft raise could be accomplished through an initial raise of 3.5 ft using earthen material and a 3.5-ft parapet wall constructed on top of the earthen raise element. Combining the two options reduces the amount of borrow material to be processed and transported and accomplishes the same hydrologic control needed to protect public safety.

2.2.4.8 Filters and Drains

Filters

The existing earthen structures (RWD, LWD, MIAD, and 8 dikes) were constructed of a dense earthen core as the primary feature containing the reservoir, with outer shells protecting the core. However, the shell material for Dikes 1 to 8 is essentially the same as the core material, so these embankments can be considered homogenous dikes. To better control seepage and piping (movement of water through the core that carries soil material), processed material (processed material and gravel) filters are proposed to be constructed within downstream portions of the earthen structures. The filters would be constructed by first excavating and stockpiling a portion of the outer

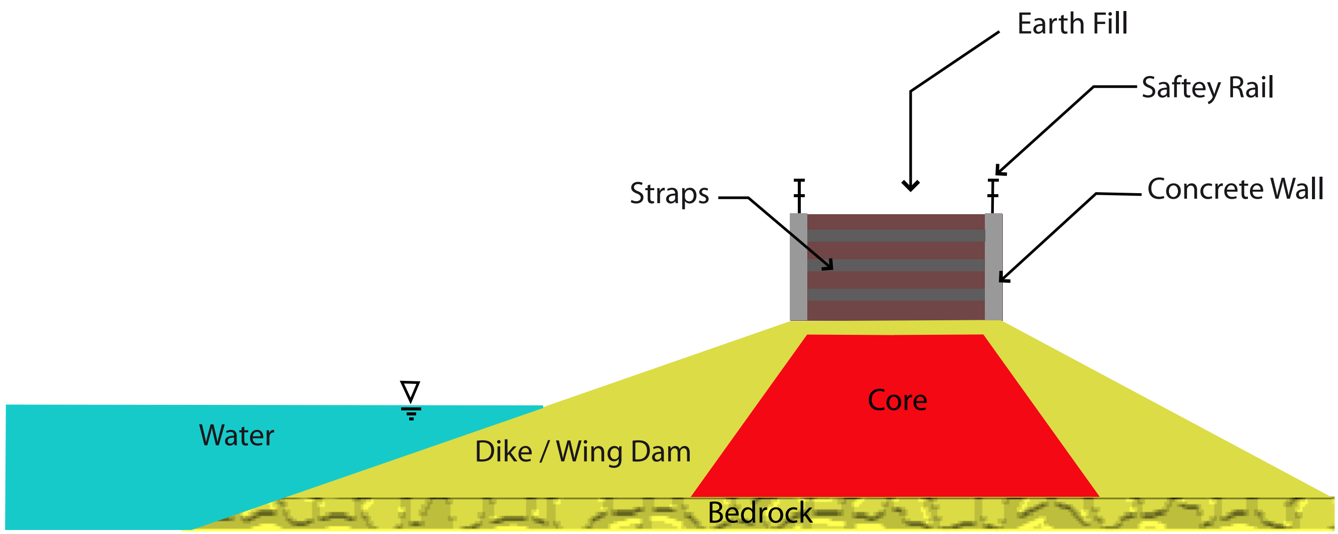

Figure 2-10
Reinforced Earth Wall

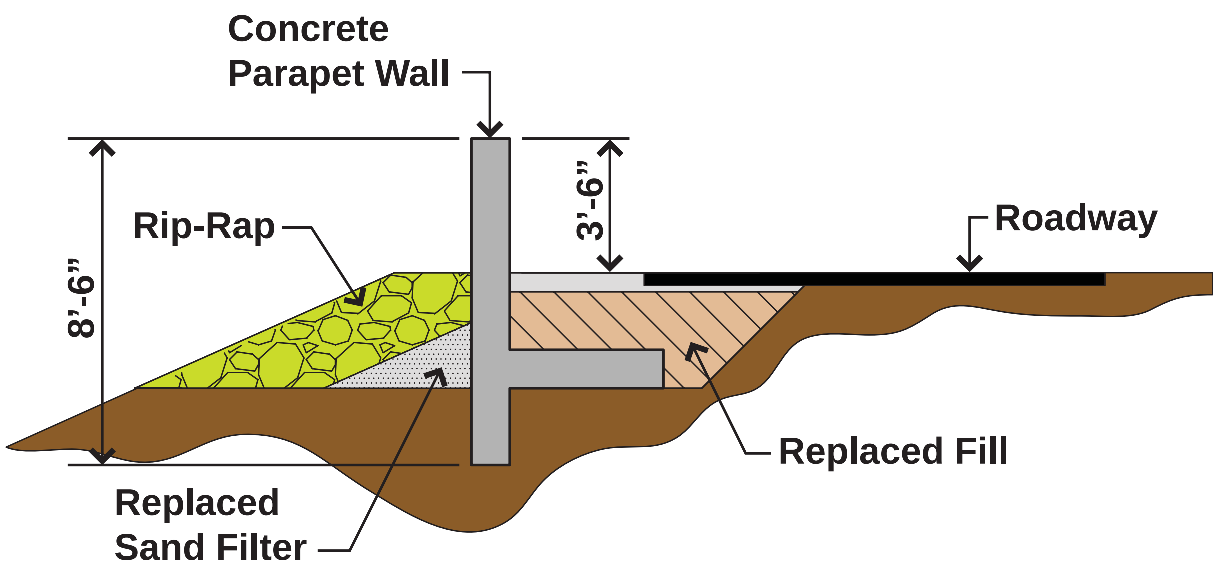

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Figure 2-11
3.5 foot Raised Flood Wall

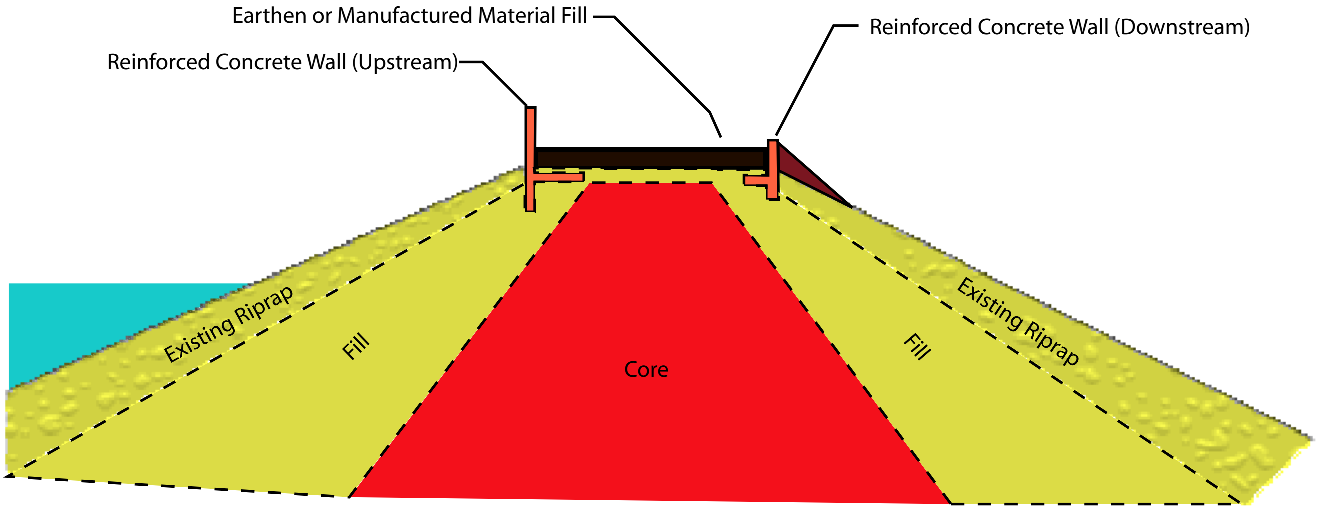

Figure 2-12
Dual Parapet Wall

shell, placing a layer of processed material with a specific gradation over the exposed slope of the earthen structure, and then replacing the outer shell. Processed material for construction of the filters would either come from a local (Sacramento area) commercial source or it would be manufactured on site using granitic material taken from borrow sites. Competent granite rock at Beal's Point and Granite Bay has shown promise as a processed material source for filter material.

Any water collected by the filter would be carried to the toe of the earthen structure for discharge away from the dam through the toe drain. The processed material filters would reduce the risk of failure of the embankments by piping.

Two alternatives for types of filters are being considered for the downstream face. The full-height filter would extend upward from the downstream toe of the facility to the crest of the dam or dike. The half-height filter would extend from the downstream toe to half the vertical distance to elevation 466 ft.

Due to concerns about piping along the embankment interface with the concrete dam, filter zones are required along these contacts. This would be accomplished by excavating a portion of the outer zones of the LWD and RWD so that filter material could be placed against the core materials of these dams. The filter zones would provide protection against both static and seismic loading conditions.

Crest Filters and Toe Drains

At the LWD and RWD, filter zones are required only in the upper portion of the dams. Processed material filter zones would be constructed from the crest to an elevation 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.

2.2.4.9 MIAD Seismic Fixes

Part of MIAD is constructed over an historic river channel, Blue Ravine. This portion of the dam, towards the left end of the dam, is at risk of significant deformations should the foundation of the dam liquefy during a severe earthquake event. Two design alternatives, in conjunction with a downstream overlay, are being considered to prevent these deformations from occurring. The alternatives to address the downstream lower zones of liquefiable foundation material are jet grouting and excavation and replacement of the material at the downstream toe. Another alternative to be constructed in conjunction with one of the downstream alternatives is the construction of a downstream overlay to address the upstream liquefiable foundation material. Figure 2-13 shows the cross section of the dam with the unstable liquefiable zones proposed for treatment.

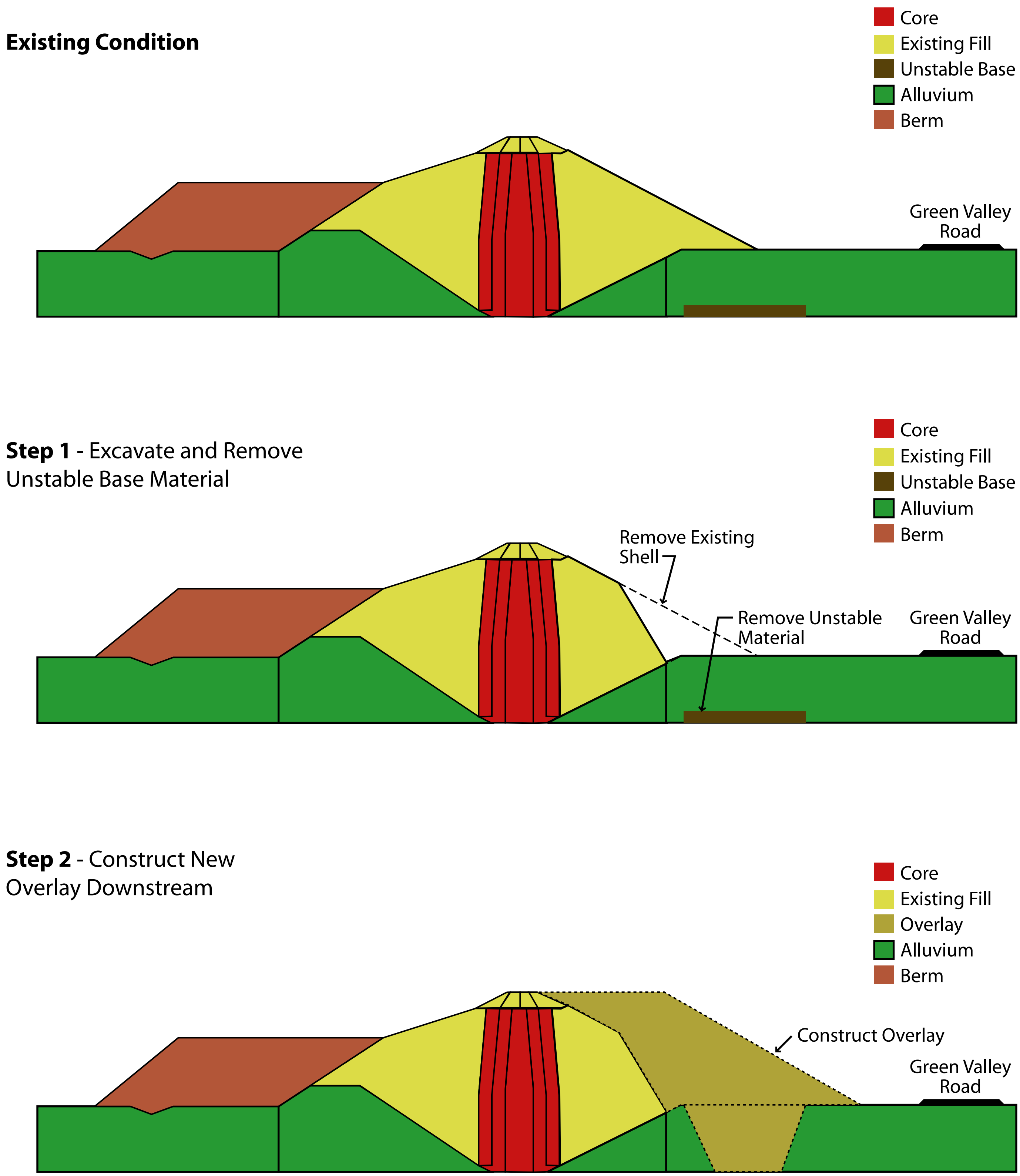

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Figure 2-13
Mormon Island Auxiliary Dam Excavate and Replace Concept

Jet Grouting

Jet grouting is a method of increasing the strength of weak or loose materials in the foundation of structures or dams. In the case of MIAD, significant densification of the downstream foundation has previously been accomplished with the use of stone columns. The jet grouting would be used to increase the shear strength of the lower foundation that is still susceptible to liquefaction. Jet grouting consists of drilling to the lower zone to be strengthened, and injecting a grout mixture through a rotary nozzle that once sets up, solidifies the material to the foundation. It is anticipated that the grout would be mixed at the site of MIAD. The cement and other components for the grout would be transported to the site from local suppliers in the Sacramento area. Figure 2-14 provides conceptual illustrations of jet grouting. Upon completion of the Jet grouting the downstream overlay would be constructed.

Excavate and Replace

The second option to address MIAD downstream foundation seismic issues is the removal and replacement foundation material. This would involve the removal of the downstream outer dam shell materials and excavation of the downstream foundation alluvium at the toe of the embankment down to the rock foundation contact. These materials would be stockpiled, processed, and supplemented, as required prior to compacted replacement into the foundation.

The unsuitable structural (liquefiable) material would be removed down to the rock foundation and replaced with high strength material (Figure 2-13). This would include cement-modified soil to provide the high strength. Suitable materials excavated as part of the foundation removal would be stockpiled locally for reuse in rebuilding the foundation and shell. Non-suitable soils would be disposed of within the boundaries of Folsom Reservoir. Compacted soils would be placed on top of the high strength material prior to reconstructing the shell. Following foundation replacement, the outer shell of the dam would be reconstructed. As part of shell reconstruction, a full-height filter and a gravel drainage zone would be installed and integrated into the overlay construction.

Dewatering of the historic river channel would be necessary in order to excavate and replace the foundation materials. The water pumped from the foundation would be tested for turbidity, released to a settling pond, and discharged in accordance with the project’s water quality control permit.

Downstream Overlay

An additional component of the structural modifications proposed at MIAD would be to increase the mass of MIAD by placing an overlay over the downstream side (Figure 2-13). Although the upstream toe of MIAD was treated with dynamic compaction in the 1990s, the lower portion of MIAD was too deep to have been effectively treated by that procedure. Therefore there still is some risk for large

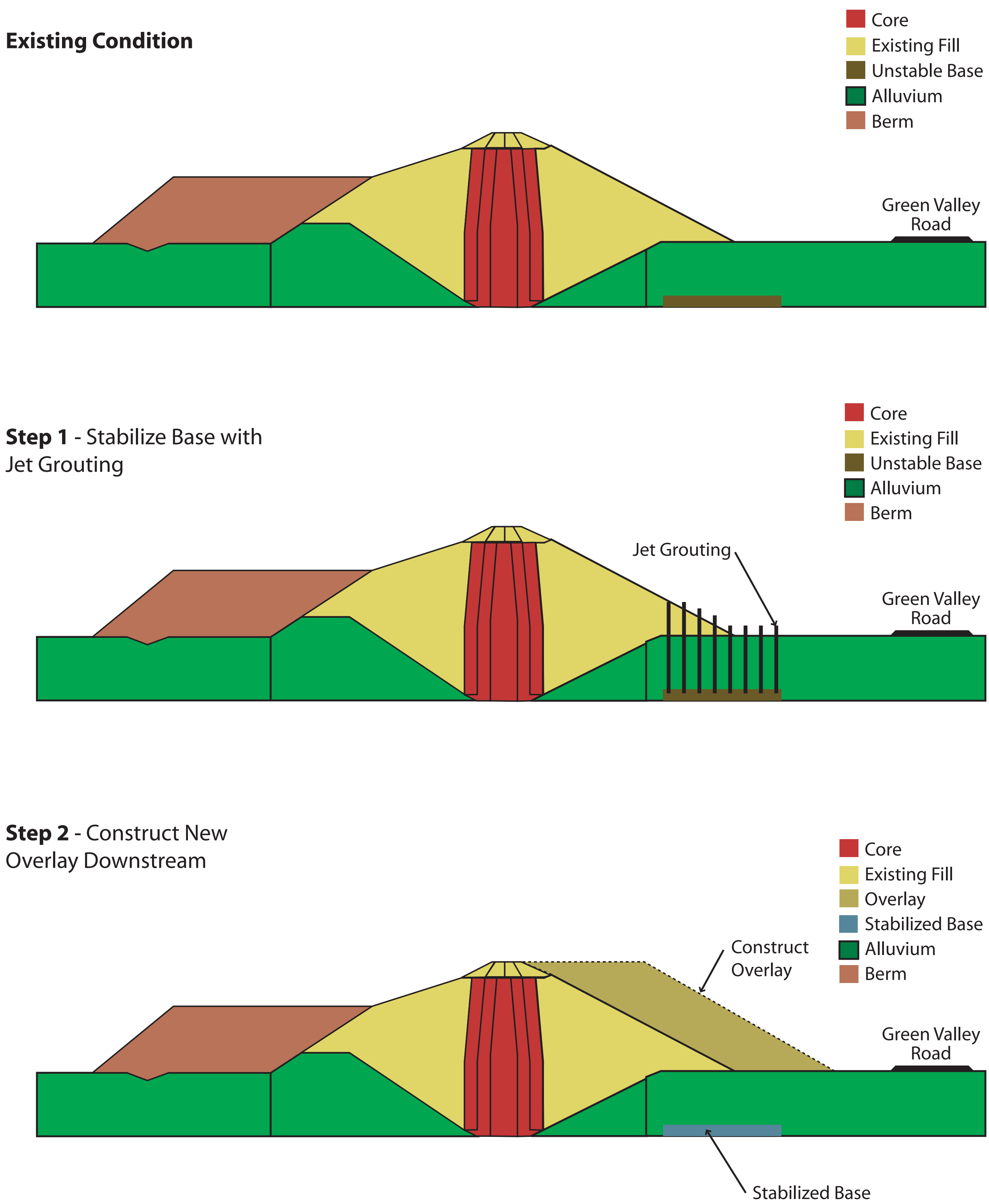

Figure 2-14
Mormon Island Auxiliary Dam Jet Grouting of Unstable Base Material Concept

sliding or deformation to occur due to upstream liquefaction. Because the presence of the reservoir makes it difficult to treat the upstream toe, a downstream overlay is being proposed. The downstream overlay would not prevent upstream sliding and deformation, but it would afford MIAD with adequate mass to withstand a seismic event.

The overlay would be accomplished following either jet grouting or replacement of the downstream foundation by widening the crest and downstream portion of the dam with large quantities of soil material. The most likely source of material would be that excavated from the site of the proposed Auxiliary Spillway. The material would be processed at a local facility, stockpiled, and then transported to MIAD for placement as the overlay. The material would be compacted as it is placed and would extend the downstream slope of MIAD to near Green Valley Road. The overlay would also incorporate the installation of a processed material filter zones. The purpose of the overlay is strictly for seismic and static concerns, and would not provide additional hydrologic control.

2.2.4.10 New Embankment/Dike Construction

All of the alternatives involving modifications of the existing flood storage pool elevations and/or raise of the Folsom Facility could result in a temporary increase in the reservoir water elevation over existing conditions during periods of maximum flood flows into the reservoir. These conditions are expected to occur at a frequency of hundreds to thousands of years. The actual level and duration of inundation is dependent on the modification alternative.

Increasing the reservoir flood storage pool would have the potential to flood property beyond the existing boundaries of Folsom Reservoir at locations with elevations that are below any potentially revised flood pool elevation.

A new embankment or other containment alternative, or obtaining flood easements, may be necessary in order to protect adjacent properties from flooding during these rare occurrences. The potential number of new embankments ranges from zero for the no-raise alternative, to an estimate of 45 new embankments around the lake perimeter under the 7-ft raise alternative. The potential number of new embankments required for raises above 7 ft has not been determined.

2.2.4.11 Miscellaneous Construction

Miscellaneous construction involves:

- <u>Construction of staging, materials processing, and contractor work areas (See Figures 2-1 through 2-5)</u>
  - <u>Corps Main Concrete Dam Staging</u> – The Corps would stage its project activities using the dam staging site developed under the Folsom Mods

Project authorization. This would include contractor's offices, parking, and storage of materials.

- Folsom Point – Folsom Point would be the main staging area along the reservoirs southern edge. Folsom Point would include contractor's offices, parking, staging of material, and processing and stockpiling of borrow materials, as well as other staging area-related activities. Borrow development from the MIAD, D1/D2, and Folsom Point areas would be staged at Folsom Point. The majority of the Folsom Point recreation area would most likely be used to support activities related to improvements planned for the LWD, Dikes 7 and 8, and MIAD.

- Beal's Point – Beal's Point would be the primary staging area along the western edge of the reservoir. Beal's point would include contractor's offices, parking, staging of material, processing and stockpiling of borrow materials, and concrete production, as well as other staging area-related activities. The southern portion of Beal's Point would be used as a staging area to support construction activities in the area. Beal's Point would support improvements to Dikes 4, 5, 6, and the RWD. Beal's Point could also support development of a borrow site. The Beal's Point staging area would be occupied during the period required to completion construction on the RWD; Dikes 4, 5, and 6.

- Granite Bay – The Granite Bay staging area would support the development of a borrow site at Granite Bay, as well as the construction at Dikes 1, 2, and 3. Activities at Granite Bay would include contractor's offices, parking, construction, materials storage, borrow material processing and stockpiling, as well as other staging area-related activities. Depending on the features of the alternative and the amount of processed material quantities required for filters, the utilization of the Granite Bay staging area could be minimal during the period of work on Dikes 1, 2, and 3. Under the earthen raise alternatives, the Granite Bay staging area would be occupied until adequate borrow and processed material was produced and transported to other project sites.

- MIAD – The MIAD staging area would support the jet grouting option as well as the excavate and replace option. It would include a contractor office, parking materials storage, and a portable concrete batch mixing plant. The MIAD staging area would be utilized through completion of the placement of the downstream overlay.

- Main Concrete Dam Overlook Parking Lot – The overlook parking lot staging area would include contractor offices and parking, materials storage, and a concrete mixing plant. This area is currently inaccessible to the public and would be occupied for the duration of the entire project.

- Development of borrow sites –Borrow sites could be developed, if required, on Reclamation property upstream and downstream of the Folsom Facility.

  The number and extent of borrow sites to be developed would be dependent on how much material the construction of the selected alternative requires, the types of material that can utilized from the Auxiliary Spillway excavation, the amount and types of earthen material available at each borrow site, proximity to proposed work, and the ability of local commercial suppliers to meet project needs. The projected amounts of borrow material available at each identified site is included in the descriptions below.

  - Auxiliary Spillway – Excavation at the Auxiliary Spillway site would produce between 2 and 4.2 million cubic yards of rock depending on the alternative. The majority of all on site borrow would be considered from this site and all other sites would be considered supplemental as needed. This material would be processed locally (screened and crushed) prior to transport to MIAD, D1/D2, or the Dike 7 stockpile site.

  - D2 – the D2 borrow site is within federal property outside of the reservoir, south of MIAD. This area contains one of the better sources for impermeable (clay-like soil) materials for raising and strengthening the cores of all earthen facilities. It could be developed to support construction of the MIAD downstream overlay. Staging, including a materials processing facility, could occur within the D2 borrow site area.

  - MIAD Right Abutment (Folsom Point) – This borrow site is adjacent to Folsom Point. Borrow at this location would be processed at Folsom Point (screened and crushed) prior to being stockpiled within the Folsom Point and Dike 7 areas.

  - Granite Bay – Borrow material development would occur along the low water shoreline north of the Granite Bay recreation site. The amount of material to be excavated varies by alternative but current estimates identify 913,000 cubic yards of earthen material available at the site. Excavated material would be processed at portable facility located at Granite Bay which would include screening for sizing and crushing to produce overlay material and processed material. Borrow material would be temporarily stored at the processing facility site prior to transport to project sites.

  - Beal's Point – Borrow material development would occur along the low water shoreline opposite the Beal's Point recreation area and to the north, along the shore line below Mooney Ridge. The amount of material to be excavated varies by alternative, with estimates identifying 1,250,000 cubic yards of earthen material available at this site. Excavated material would be processed locally including screening for sizing and crushing to produce overlay material and processed material. Processed material would be washed to remove fine-grained (silt-sized) material. Borrow material would then be temporarily stored at the processing facility site prior to transport to the various project sites.

- MIAD Left Abutment (Brown's Ravine) – This borrow site is located along the in reservoir shoreline north of MIAD. Borrow at this location would be transported to Folsom Point for processing.

- D1 – the D1 borrow site is within federal property outside of the reservoir, south of MIAD. This area would be developed to support construction of the MIAD downstream overlay. Staging, including a materials processing facility, would occur at D2.

- Filter Material Production – Filter material may be developed from excavated and processed granite or decomposed granite. The material would be crushed, ground, and screened on-site, in mills to produce materials with the proper properties and gradations for filters. At the processing plant site, the material would be crushed, screened and washed repeatedly to remove over-sized particles until the proper sizing is achieved. The processed material would be transported via conveyor belt to a temporary stockpile location while the waste material would be dewatered under the proper conditions prior to transportation to a structure for placement, or a permanent stockpile. Filter material would be developed at the Beal's Point and Granite Bay material production sites.

- Development of stockpile sites – Stockpile sites for temporary storage of raw or processed borrow material would be established adjacent to each processing facility. The major exception would be the Dike 7 stockpile site, which could receive material from the Auxiliary Spillway excavation. In reservoir sites may require construction of a coffer dam within the reservoir, behind which stockpile material would be placed. In some instances, stockpiles would be temporarily used as processing site platforms. This is most likely to occur at Beal's Point, Folsom Point, Dike 7, and at the Overlook Parking lot. Following processing the borrow material would be removed for placement at the dikes, wing dams, and MIAD.

- Additional Explorations and Investigations – All areas identified within the project footprint as probable construction areas, contractor use areas, and borrow stockpile and/or disposal sites, may require additional geotechnical exploration or other investigation prior to construction to provide valuable information for final designs. This work could include drilling, test pits, trenches, test excavations, blasting, dewatering, unwatering, test constructions and expedited remediation activities.

- Disposal of excess materials – Depending on the alternative, the excavation of the Auxiliary Spillway site could result in between 1 and 2.5 million cubic yards of excess material not needed for dike reconstruction or the MIAD overlay. This material may be permanently disposed of at Beal's Point, Folsom Point, at Dike 7, at D1/D2, and/or on MIAD as additional overlay, or utilized to fill areas in-reservoir to create additional space for staging, stockpiling, and other construction activities.

  Dredging and excavation of approach chute – The length of the approach channel, or the approach chute varies from 300-ft to 900-ft, depending on the alternative. The majority of the construction required to excavate the approach channel would take place in the wet. It is assumed that the work would require a barge or floating platform to work from, a crane, dredging equipment, containment measures, and another barge or suitable method of transporting the excavated material.

  Material would be excavated from the lakebed mechanically until refusal. The substrate would be removed mechanically with a clamshell, suction dredge, or another suitable method. Once the material cannot be removed with a clamshell, or other means, the excavation would require controlled blasting. The majority of the blasting would take place under water. The material that is excavated by blasting would be placed on a barge or floating platform, with containment in place to reduce or eliminate sedimentation. All material excavated from the reservoir would be transported to a containment area onshore, where the material would dry. Once the material dries, it would either be processed, stockpiled for future use, or transported to a disposal area.

  Previous exploration by Reclamation has shown that there is a thin layer of sediment on top of weathered bedrock within the chute alignment. Reclamation and the Corps do not anticipate problems with water quality and sedimentation due to the minimal amount of sediment that would need to be removed. Construction methods would comply with all water quality regulations and would be fully permitted before construction starts. Best management practices and the employment of silt curtains, or other containment methods would reduce the impacts to less than significant.

  The sediments within the chute alignment are known to contain elemental mercury from historic mining operations, as well as other metals from historic activities or geology in the American River drainage. The screening level for mercury was obtained from the California Central Valley Regional Water Quality Control Board. This standard of 0.2 mg/kg is intended to define the fractional portion of the mercury that can easily be re-suspended and stay in suspension. Of the 18 samples that were collected by Reclamation in 2006, only two reached the threshold of 0.2 mg/kg hg The mean of all sites was 0.16 mg/kg

Of all the samples analyzed for metals, no results met or exceeded any of the sediment standards, and as a result would be suitable for unconfined aquatic disposal.

Sediment containing mercury would be temporarily suspended during construction, but the amount of material that would be suspended is assumed to be minimal. Reclamation and the Corps would be required to minimize the amount of material that is suspended in order to meet water quality standards. The majority of the material that would be suspended would drop out of suspension almost immediately. Unless releases are being made from the outlets, the majority of the rest of the material should fall out of suspension within Folsom Reservoir. Any material that stays suspended would be minor and would not represent a hazard or significantly impair water quality.

During construction, a detailed water quality monitoring plan would be implemented to ensure that the dredging would be conducted without adversely impacting the waters in the vicinity of the municipal water intake. Routine water samples would be taken at the start and completion of each dredging or controlled blasting period. If turbidity readings exceed predetermined values, corrective actions would begin immediately to correct any construction-related problems. If necessary, dredging operations would be shut down until values at the monitoring site return to acceptable levels.

In-reservoir fill – There are several locations within the reservoir that could be enhanced for construction purposes with the placement of material excavated from the Auxiliary Spillway site. In order to avoid the majority of recreation impact at the Beal's Point area, the area south of the parking lot would be elevated to the level of the parking lot. This area would be used for staging, stockpiling and potentially for processing materials. Fill material would also be used at Folsom Point for the same purposes.

Material would also be placed at the Observation Point area adjacent to the LWD to create more space for construction activities. A need has also been identified for material to be added to this area to reconfigure the topography in order to facilitate the eventual movement of water to the new Auxiliary Spillway.

The area upstream of Dike 7 would be used as a permanent stockpile area. Up to 400 cubic yards of material would be placed immediately upstream of the dike.

In order to avoid or eliminate water quality impacts during the placement of material within the reservoir, best management practices would be employed. If at all possible, material would be placed in the dry. Silt curtains or other physical methods would also be employed to reduce to eliminate water quality issues during construction.

- <u>Development of internal roadways</u> – To reduce construction traffic on city streets and to allow the use of oversized construction equipment, internal haul roads would be developed. The approximate routes of the construction roads are shown on Figure 2-15. The internal roadways would be sized to allow passage of oversized equipment. The crests of the wing dams and MIAD would be included as part the internal road network. Given the space limitations of the crests, one way traffic may be required. The internal haul roads routes being considered include:

  - <u>Beal's Point to Granite Bay</u> – This route would be used for construction at Dikes 4 and 5, access below Mooney Ridge, and Dikes 1, 2, and 3. The route would also allow transport of borrow material from Granite Bay to the RWD.

  - <u>RWD</u> – The RWD dam route would allow transport of material to the right abutment of the Main Concrete Dam.

  - <u>Dam Staging to Folsom Point</u> – A construction haul road would be constructed from the Auxiliary Spillway site to a Dike 7 stockpile site and then on to Folsom Point. This would allow for transportation of materials between these project facilities. The haul road would only be available when the reservoir was well below capacity. The use of this haul route would also necessitate re-initiation of consultation with the Service due to potential impacts that are not be accounted for in this document.

  - <u>Folsom Point to Brown's Ravine</u> – This haul route could involve use of the MIAD crest as a construction road. Material from the MIAD left abutment borrow site would be transported to Folsom Point for processing.

  - <u>Folsom Point to D1/D2 Borrow sites</u> – This haul route would transport materials to Folsom Point.

- <u>External Haul Roads</u> – Equipment, materials and supplies, and hauling of materials from the west to east side construction sites would be conducted on city streets. The primary proposed construction traffic routes are shown in Figure 2-16. Typical materials to be hauled on city streets include cement and aggregate, processed material, reinforcement steel, and general supplies.

- <u>Construction Equipment</u> – The following types of construction equipment would be used to excavate, haul, stockpile, and place earthen material and concrete.

  - <u>Drill rigs</u> – For installation of blasting agents for the excavation of the granitic rock foundation. Drill rigs would also be used for preconstruction geotechnical exploratory work by the Corps and Reclamation.

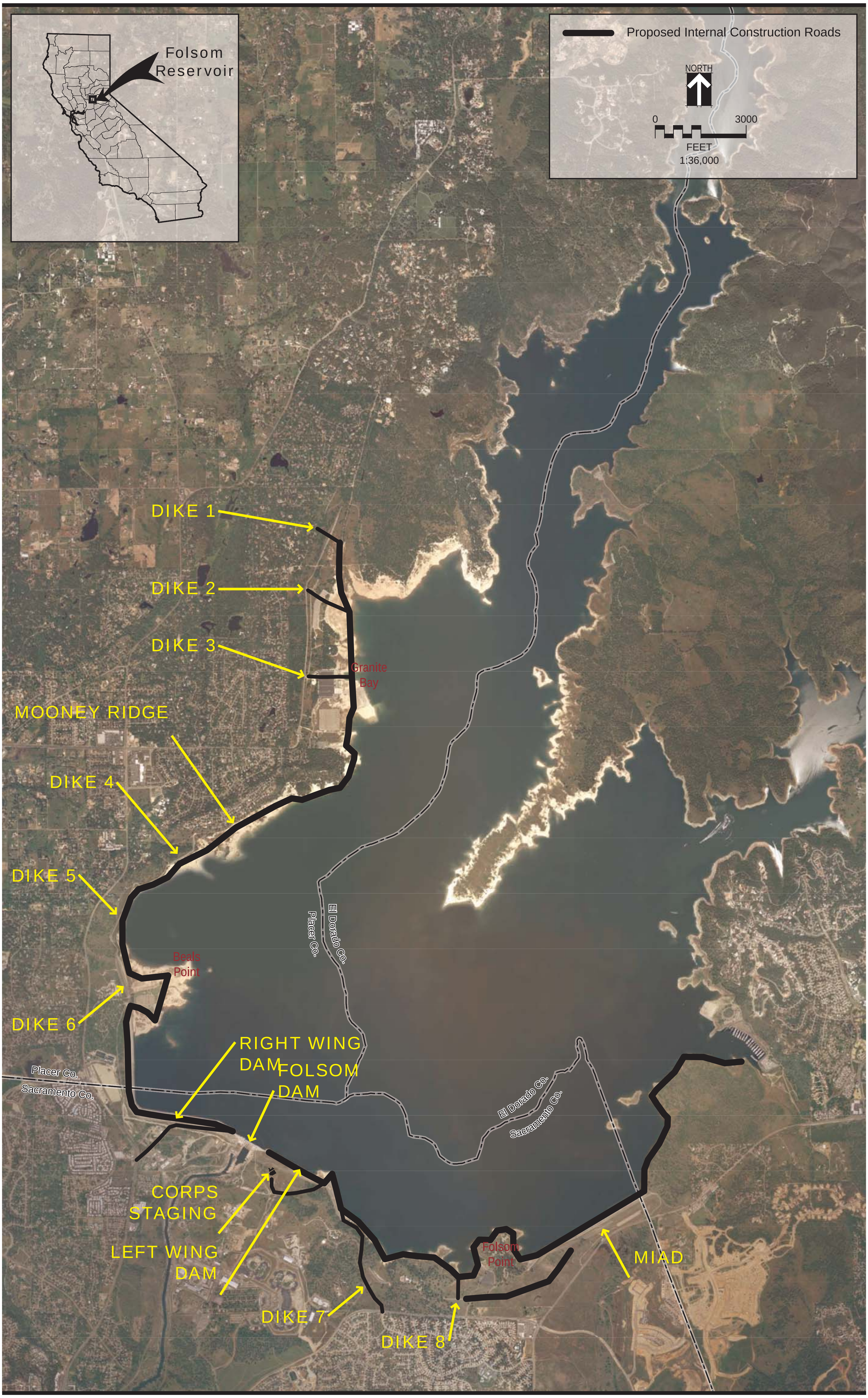

Figure 2-15
Folsom DS/FDR
Proposed Internal Construction Roads

CDM

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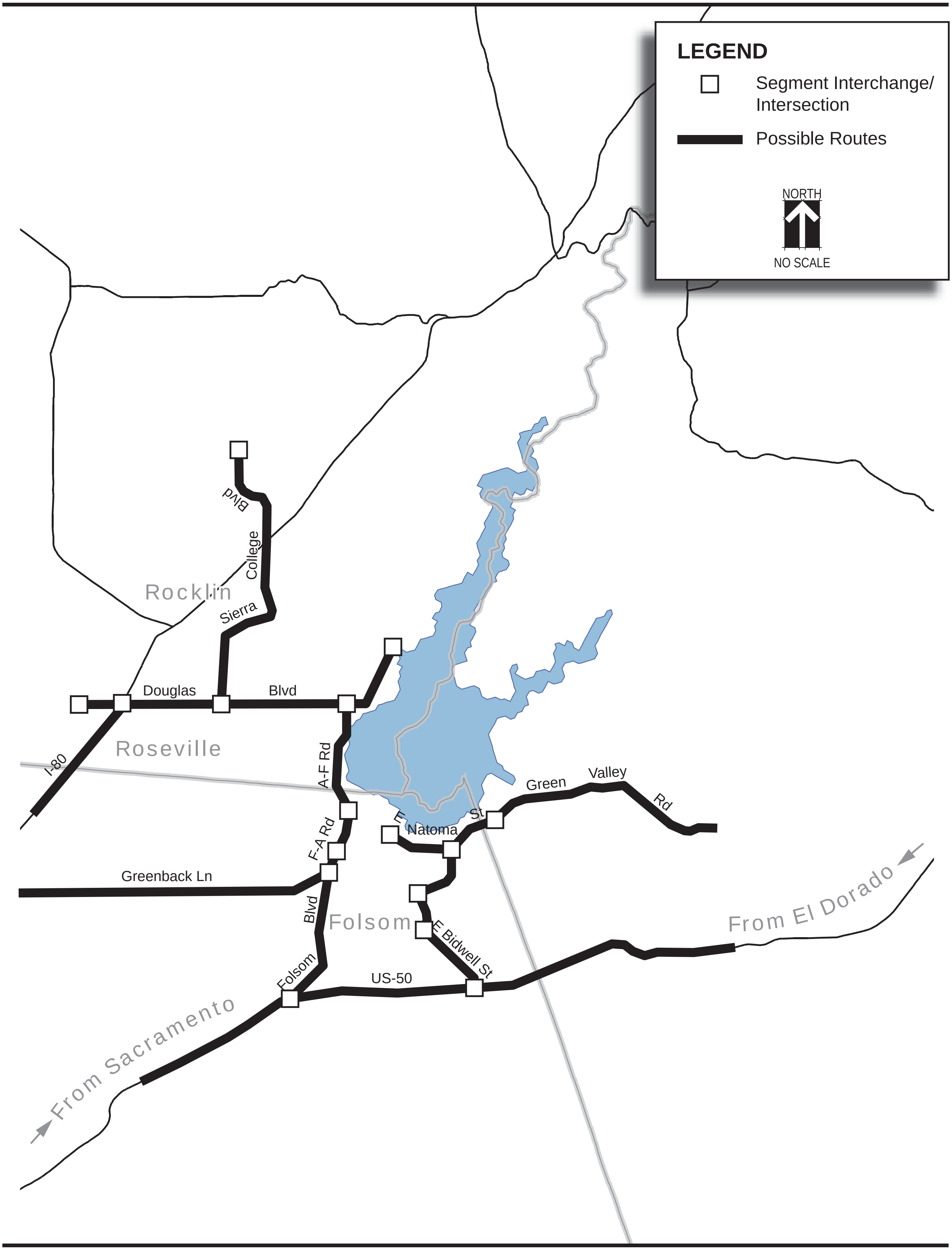

Figure 2-16
General Folsom DS/FDR Area Transportation Routes

CDM

- Crawler tractors (bull dozers) – For earth movement and stockpiling, and pushing bottom excavators.

Bottom excavators – For excavation of ripped, stripped, or other loose material for transport to stockpiles.

- Rippers – For breaking up weathered rock foundation and blasted material in preparation for excavators.
- Excavators and Loaders – For excavation and truck loading of excavated materials.
- Graders – For haul road construction and maintenance, site restoration.
- 30-cy haul truck – For within reservoir hauling of excavated materials to processing plants and from processing plants to stockpile areas.
- 20-cy haul trucks – For hauling of materials on city streets and between Folsom processing, staging, and work sites.
- All terrain crane – For placement of forms, pre-cast walls, reinforcement steel, and other heavy materials.

2.2.4.12 Existing American River Operations

Congress authorized the Corps to construct major portions of the American River Division. The American River Basin Development Act of 1949 subsequently authorized it to be owned, operated and maintained by Reclamation and financially and operationally integrated into the Central Valley Project (CVP). The American River Division includes facilities that provide conservation of water in the American River for flood control, fish and wildlife protection, recreation, protection of the Delta from intrusion of saline ocean water, irrigation and municipal and industrial (M&I) water supplies, and hydroelectric power generation. Initially authorized features of the American River Division included Folsom Dam, Lake, and Powerplant***;*** Nimbus Dam and Powerplant; and Lake Natoma.

Current flood control requirements and regulating criteria are specified by the Corps and described in the Folsom Dam and Lake, American River, California Water Control Manual (Corps, 1987). Flood control objectives for Folsom require that the dam and lake are operated to:

- Protect the City of Sacramento and other areas within the lower American River flood plain against reasonable probable rain floods.

- Control flows in the American River downstream from Folsom Dam to existing channel capacities, insofar as practicable, and to reduce flooding along the lower Sacramento River and in the Delta in conjunction with other CVP projects.

- Provide the maximum amount of water conservation storage without impairing the flood control functions of the reservoir.

- Provide the maximum amount of power practicable and be consistent with required flood control operations and the conservation functions of the reservoir.

From June 1 through September 30, no flood control storage restrictions exist. From October 1 through November 16 and from April 20 through May 31, reserving storage space for flood control is a function of the date only; with full flood reservation space required from November 17 through February 7 and is fixed at 400,000 acre-feet. Beginning February 8 and continuing through April 20, flood reservation space is a function of both date and current hydrologic conditions in the basin.

If the inflow into Folsom Reservoir causes the storage to encroach into the space reserved for flood control, releases from Nimbus Dam are increased. Flood control regulations prescribe the following releases when water is stored within the flood control reservation space:

- Maximum inflow (after the storage entered into the flood control reservation space) of as much as 115,000 cfs but not less than 20,000 cfs when inflows are increasing.

- Releases would not be increased more than 15,000 cfs or decreased more than 10,000 cfs during a 2-hour period.

- Flood control requirements override other operational considerations in the fall and winter period. Consequently, changes in river releases of short duration may occur.

In February 1986, the American River Basin experienced a significant flood event. Folsom Dam and Reservoir moderated the flood event and performed the flood control objectives, but with serious operational strains and concerns in the lower American River for the overall protection of the communities in the floodplain areas. A similar flood event occurred in January 1997. Since then, significant review and enhancement of lower American River flooding issues has occurred and continues to occur. A major element of those efforts has been the SAFCA sponsored Interim Flood Control Plan Diagram for Folsom Reservoir (Interim Flood Operations).

Since 1996, Reclamation has operated according to Interim Flood Operations criteria, which reserves a variable 400,000 to 670,000 acre-feet of flood control space in Folsom Reservoir and a combination of upstream reservoirs during the flood season. The Interim Flood Operations plan, which provides additional protection for the lower American River, is implemented through an agreement between Reclamation and SAFCA. The terms of the agreement allow some empty reservoir space in Hell Hole, Union Valley, and French Meadows to be treated as if it were available in Folsom. The interim operations plan release criteria are generally the same as the 1987 Corps plan, except the interim operations plan diagram may prescribe flood releases earlier than the Corps plan. The Interim Flood Operations plan diagram also relies on Folsom Dam outlet capacity to make the earlier flood releases with out restrictions. The outlet capacity at Folsom Dam is limited to up to 32,000 cfs based on lake elevation. In general, the interim operations plan provides flood protection from the 1 in 100 year design flood up from 1 in 80 year design flood protection realized by the existing Corps plan for communities in the American River floodplain.

Required flood control space under the Interim Flood Operations plan diagram would begin to decrease on March 1. Between March 1 and April 20, the rate of filling is a function of the date and available upstream space. As of April 21, the required flood reservation is about 225,000 acre-feet. From April 21 to June 1, the required flood reservation is a function of the date only, with Folsom storage permitted to fill completely on June 1.

The Interim Flood Operations agreement between SAFCA and Reclamation is set to expire in 2018 and was intended to provide a temporary interim flood damage reduction benefit until such time that the Corp's outlet modification project was completed.

<u>Without Project Conditions</u> – As described above, prior to 1995 authorized flood storage space was fixed at 400,000 acre-feet above the normal operational pool elevation of 466 feet. In 1995, Reclamation and SAFCA entered in to an 5 year Interim Agreement to provide a variable range of flood control storage space of 400,000 to 670,000 acre-feet, depending upon storage conditions in existing reservoirs upstream of Folsom Facility. Upon expiration, the agreement was extended for 2 one year periods to 2002. From 2002 until 2004 there was no agreement in place.

The Water Resources Development Act (WRDA) of 1996 directed Reclamation to continue the variable 400,000 to 670,000 acre-feet operation and enter into an agreement with SAFCA until a comprehensive flood damage reduction plan for the American River Watershed has been implemented. The current agreement to continue said variable operation was executed in December 2004 and is scheduled to expire in 2018, unless and until the Corps implements a new water control manual and associated new flood control diagram, which would provide the basis to define new operational requirements that would supersede and replace the existing agreement. Completion of a new flood control diagram and a water control manual is contingent upon completion of the appropriate level of environmental compliance, the requirements of WRDA 1996, and the reconciliation of potential conflicts with pre-existing authorities.

The Corps intended to implement a new water control manual and a new flood control diagram for the Folsom Dam Modification Project, or another relevant authorization associated with flood damage reduction at the Folsom Facility. The Corps has not identified a plan to implement a new water control manual and flood control diagram based on the current status of the Folsom Dam Modification Authorization and/or other relevant authorizations. However, the Corps has initiated efforts to address a new flood control manual and water control plan for the current joint effort. The Corps has estimated that the new documentation to address the current dam safety and flood damage reduction action would be available in 2012. The new documentation would be in place well before the any new features would be fully constructed or operational.

Construction of any of the Folsom DS/FDR actions would not significantly alter current Folsom Facility operations. During construction and upon completion of structural modifications current operational parameters as summarized above and defined in appropriate agreements and authorities would remain in effect until the current flood operations agreement expires, or a new Flood Management Plan is developed and implemented, or if there are new Congressional authorizations, directives or mandates.

The Corps and Reclamation as directed by, and/or authorized by Congress, and under the appropriate agency authorities and agreements would update the existing Water Control Manual of 1987 or develop a new water plan and control manual. Upon selection of either a preferred joint Folsom DS/FDR alternative or stand-alone dam safety hydrologic risk reduction or flood damage reduction alternatives, the Corps as the lead agency, in cooperation with Reclamation, would determine the basis for the updated/new plan. Decisions would be based on existing authorizations, or reauthorizations, or new authorizations.

The updated/new plan would analyze weather, basin wetness, precipitation, upstream reservoir storage, and reservoir inflow forecasts to help determine appropriate comprehensive flood control operations procedures. The environmental impacts on all pertinent aspects of the human environment, and the natural environment would be evaluated in a separate environmental compliance document. The Water Control Manual would likely go through multiple revisions as the various structural modifications are completed at the Folsom Facility, but it is expected that a Final

Updated Flood Management Plan and Flood Control Manual would be completed before construction on the Folsom DS/FDR project is completed.

This Folsom DS/FDR EIS/EIR generally considers operations affected by proposed structural modifications; however, a detailed analysis of operational impacts cannot be determined at this time. Upon the selection of a preferred alternative(s), Reclamation, the Corps, SAFCA, and the DWR/Reclamation Board would fully coordinate and address relevant congressional directives to evaluate the existing requirements related to operations and consider possible changes as appropriate. The environmental impacts associated with proposed changes and operational impacts required for supplemental environmental compliance documentation. The required compliance documentation shall be completed in parallel with a Final Updated Flood Management Plan and Water Control Manual, and is anticipated to be completed in 2010.

<u>Fish and Wildlife Requirements in the Lower American River -</u> The minimum allowable flows in the lower American River are defined by the State Water Resources Control Board (SWRCB), and Decision 893 (D-893), which states that, in the interest of fish conservation, releases should not ordinarily fall below 250 cfs between January 1 and September 15 or below 500 cfs at other times. D-893 minimum flows are rarely the controlling objective of CVP operations at Nimbus Dam. Nimbus Dam releases are nearly always controlled during significant portions of a water year by either flood control requirements or are coordinated with other CVP and State Water Project (SWP) releases to meet downstream Sacramento-San Joaquin Delta Water Quality Control Plan requirements and CVP water supply objectives.

Power regulation and management needs occasionally control Nimbus Dam releases. Nimbus Dam releases are expected to exceed the D-893 minimum flows in all but the driest of conditions. Until such an action is presented to and adopted by the SWRCB, minimum flows would be limited by D-893. Releases of additional water are made pursuant to Section 3406 (b)(2) of the Central Valley Project Improvement Act (CVPIA).

Water temperature control operations in the lower American River are affected by many factors and operational tradeoffs. These include available cold water resources, Nimbus release schedules, annual hydrology, Folsom power penstock shutter management flexibility, Folsom Dam Urban Water Supply Temperature Control Device (TCD) management, and Nimbus Hatchery considerations. Shutter and TCD management provide the majority of operational flexibility used to control downstream temperatures.

During the late 1960s, Reclamation designed a modification to the trashrack structures to provide selective withdrawal capability at Folsom Dam. Folsom

Powerplant is located at the foot of Folsom Dam on the right abutment. Three 15-foot-diameter steel penstocks for delivering water to the turbines are embedded in the concrete section of the dam. The centerline of each penstock intake is at elevation 307.0 feet and the minimum power pool elevation is 328.5 feet. A reinforced concrete trashrack structure with steel trashracks protects each penstock intake.

The steel trashracks, located in five bays around each intake, extend the full height of the trashrack structure (between 281 and 428 feet). Steel guides were attached to the upstream side of the trashrack panels between elevation 281 and 401 feet. Forty-five 13-foot steel shutter panels (nine per bay) and operated by the gantry crane, were installed in these guides to select the level of withdrawal from the reservoir. The shutters were initially installed in a 1-7-1 configuration which allowed some flexibility to maintain lower American River temperature requirements during power releases. The shutter panels were modified by SAFCA to a 3-2-4 configuration in the early 1990s to improve their performance in conjunction to the interim operation of Folsom Dam and Reservoir.

The current objectives for water temperatures in the lower American River address the needs for steelhead incubation and rearing during the late spring and summer, and for fall-run Chinook spawning and incubation starting in late October or early November.

The steelhead temperature objectives in the lower American River, as provided by National Oceanic and Atmospheric Administration (NOAA) Fisheries, state:

> "Reclamation shall, to the extent possible, control water temperatures in the lower river between Nimbus Dam and the Watt Avenue Bridge (RM 9.4) from June 1 through November 30, to a daily average temperature of less than or equal to 65°F to protect rearing juvenile steelhead from thermal stress and from warm water predator species. The use of the cold water pool in Folsom Reservoir should be reserved for August through October releases."

Prior to the ESA listing of steelhead and the subsequent Biological Opinions on operations, the cold water resources in Folsom Reservoir were used to lower downstream temperatures in the fall when fall run Chinook salmon entered the lower river and began to spawn. The flexibility once available is now gone because of the need to use the cold water to maintain suitable summer steelhead rearing conditions. The operational objective in the fall spawning season is to provide 60°F or less in the lower river, as soon as available cold water supplies can be used.

A major challenge is determining the starting date at which time the objective is met. Establishing the start date requires a balancing between forecasted release rates, the volume of available cold water, and the estimated date at which time Folsom Reservoir turns over and becomes isothermic. Reclamation would start providing suitable spawning temperatures as early as possible (after November 1) to avoid temperature related pre-spawning mortality of adults and reduced egg viability. Releases would be balanced against the possibility of running out of cold water and increasing downstream temperatures after spawning is initiated and creating temperature related effects to eggs already in the gravel.

A temperature control management strategy must be developed that balances conservation of cold water for later use in the fall, with the more immediate needs of steelhead during the summer. The planning and forecasting process for the use of the cold water pool begins in the spring as Folsom Reservoir fills. Actual Folsom Reservoir cold water resource availability becomes significantly more defined through the assessment of reservoir water temperature profiles and more definite projections of inflows and storage. Technical modeling analysis of the projected lower American River water temperature management can begin. The significant variables and key assumptions in the analysis include:

- Starting reservoir temperature conditions
- Forecasted inflow and outflow quantities
- Assumed meteorological conditions
- Assumed inflow temperatures
- Assumed Urban Water Supply TCD operations

A series of shutter management scenarios are then incorporated into the model to gain a better understanding of the potential for meeting both summer steelhead and fall salmon temperature needs. Most annual strategies contain significant tradeoffs and risks for water temperature management for steelhead and fall-run salmon goals and needs due to the frequently limited cold water resource. The planning process continues throughout the summer. New temperature forecasts and operational strategies are updated as more information on actual operations and ambient conditions is gained. This process is shared with the American River Operations Group (AROG).

Meeting both the summer steelhead and fall salmon temperature objectives without negatively impacting other CVP project purposes requires the final shutter pull be reserved for use in the fall to provide suitable fall-run Chinook salmon spawning temperatures. In most years, the volume of cold water is not sufficient to support strict compliance with the summer temperature target at the downstream end of the compliance reach (Watt Avenue Bridge) and reserve the final shutter pull for salmon or, in some cases, continue to meet steelhead objectives later in the summer. A strategy that is used under these conditions is to allow the annual compliance location water temperatures to warm towards the upper end of the annual water temperature design value before making a shutter pull. This management flexibility is essential to the annual management strategy to extend the effectiveness of cold water management through the summer and fall months.

The goal is to maintain the health of the hatchery fish while minimizing the loss of the cold water pool for fish spawning in the river during fall. This is done on a case-by-case basis and is different in various months and year types, Temperatures above 70°F in the hatchery usually mean the fish need to be moved to another hatchery. The real time implementation needs for the CVPIA Anadromous Fish Restoration Program (AFRP) objective flow management and SWRCB D-1641 Delta standards from the limited water resources of the lower American River has made cold water resource management at Folsom Lake a significant compromise coordination effort. Reclamation consults with the U.S. Fish and Wildlife Service (USFWS), NOAA Fisheries, and the California Department of Fish and Game (CDFG) using the B2IT process (see CVPIA discussion below) when making the difficult compromise decisions. In addition, Reclamation communicates and coordinates with the AROG on real time decision issues.

CVPIA 3406(b)(2) operations on the Lower American River **-** Actual minimum flows below Nimbus Dam would be determined in accordance with the Department of the Interior Decision on Implementation of Section 3406 (b)(2) of the CVPIA (Appendix A). Instream flow objectives below Nimbus Dam for October through April would be based on recommendations of USFWS, NOAA Fisheries, and CDFG pursuant to annual B2IT coordination.

Hydropower Operations - Folsom Powerplant contains three generating units, which have a maximum powerplant operating capability of 198,000 kW. Maximum powerplant release is 8,603 cfs.

Nimbus Dam backs up Lake Natoma, controlling flow fluctuations from Folsom Powerplant. Nimbus Powerplant is housed within the dam and includes two generating units with a maximum powerplant operating capability of 17,000 kW. Maximum powerplant release is 5,100 cfs.

2.2.4.13 Security Features

To provide the necessary level of security, Reclamation would install an appropriate level of access controls, intrusion detection, supplemental lighting and Closed Circuit television (CCTV) components throughout the Folsom Facility.

- Security Features Overview - One of the objectives of this project is to have a completely integrated security system. The system would be designed, constructed, and turned over to Reclamation in a fully operational condition. The intent of the security system is to:
    - Security Control Center - Provide a security control monitoring center within the existing facility.

- Access Control - Allow the Bureau of Reclamation to issue access control cards to authorized personnel that would allow controlled access as appropriate.

- Security Cameras - Allow security personnel to monitor site conditions via CCTV. These improvements require the construction of 30-ft steel towers on concrete foundation bases on each end of Dikes 4, 5, 6, and 7, and MIAD. There would be two sizes of foundations for the steel towers; 5-ft- x 5-ft x 5-ft and 7-ft x7-ft x 7-ft. Once installed the cameras would be able to only monitor critical access control devices.

- Prevent unauthorized vehicle access to critical areas on the project - The system would allow controlled access to authorized vehicles along all vehicle access points throughout the project.

- Observation Post - Retrofit/remodel and upgrade the existing enclosed observation post on top of Folsom Dam.

- Supplemental Lighting – The upgrades would provide supplemental lighting for the Main Concrete Dam, spillway gates, shutter structure, and all associated structures.

• Location of Security Components - The installation of physical and electronic security components would take place on several features of the Folsom Dam complex. Specifically the project would augment security on the left and right ends of MIAD, and Dikes 4, 5, 6, 7, and 8. There would also be work on top of the dam as well as the Beal’s Point portion of the Folsom SRA.

The new security system would provide sufficient access control and parallel monitoring capability. The key system components include:

- Vehicle Barrier at Dike 4
- Vehicle Barrier at Dike 5
- Vehicle Barrier at Dike 6
- Vehicle Barrier at Right Wing Dam
- Concrete Gravity Dam (Main Concrete Dam)
- Vehicle Barrier at Left Wing Dam
- Vehicle Barrier at Dike 7
- Vehicle Barrier at Dike 8
- Vehicle Barrier at Mormon Island Dam

Dam Observation Post – The existing observation post located on Folsom Dam would be upgraded, retrofitted, and remodeled to provide a more efficient and functional viewing location for security personnel.

- Installation of Security Measures

  The following is a breakdown of the security installation measures by location.

  - Installation at the East Gate of the Dam

    - Vehicle barrier (existing)
    - Two stop lights – 2 four-ft tall mono poles
    - Four lights – 2 mono poles with directional floodlights
    - One camera – mounted on 1 stoplight mono pole
    - Two 30-ft mono poles mounted on concrete pedestals

  - Installation at the West Gate of the Dam

    - One vehicle barrier (bollards, or pipe gates)
    - Two stop lights – two 4-ft tall mono poles
    - Four lights – twp mono poles with directional floodlights
    - One camera – mounted on 1 stoplight mono pole
    - Two 30-ft mono poles mounted on concrete pedestals

  - Installation at the Folsom Dam Complex Entrance

    - One 30-ft mono pole mounted on concrete pedestal
    - One camera mounted on one stoplight pole
    - One vehicle barrier

  - Installation at MIAD

    - One Camera – Barrier gate on the left abutment
    - One camera – Barrier gate on the right abutment
    - One camera – Barrier gate on the right abutment (Camera would monitor controlled access points)
    - Two 30-ft tall truss-type steel camera towers – Located at each the left and right abutment
    - One vehicle barrier (bollards, or pipe gates)

  - Installation at Dike 7

    - One 30-ft tall truss-type steel tower for communication system – Installed to avoid impacts to wetlands
    - One 20-ft tall truss-type steel tower for camera – located at barrier gate location
    - Communication shed
    - One fixed camera
    - One vehicle barrier (bollards, or pipe gates)

- Installation at the Folsom Pumping Plant

    - One camera – installed on existing pole

- Installation at the Left Wing Dam

    - One camera monitoring the access control points along the LWD and the RWD
    - One 30-ft truss-type tower – constructed at the left end of the concrete section of Dam

- Installation at the Right Wing Dam

    - One camera monitoring the access control points of the LWD and the RWD
    - One 30-ft truss-type tower – constructed at the right end of the concrete section of Dam

- Installation at Beal's Point Recreation Area

    - One 30-ft truss-type tower – Constructed at the southern edge of the public parking area adjacent to the RWD, or another area that does not impact recreation
    - Two cameras monitoring the access control points of Folsom Dam and the Right Wing Dam

- Installation at Dike 4

    - Two 30-foot truss-type towers - One each constructed at each barrier gate location
    - One camera installed on each tower monitoring access control points
    - One vehicle barrier (bollards, or pipe gates)

- Installation at Dike 5

    - Two 30-foot truss-type towers - One each constructed at each barrier gate location.
    - One camera installed on each tower monitoring access control points
    - One vehicle barrier (bollards, or pipe gates)

- Installation at Dike 6

    - Two 30-foot truss-type towers - One each constructed at each barrier gate location

  - One camera installed on each tower monitoring access control points.
  - One vehicle barrier (bollards, or pipe gates)

- Closed Circuit Television System - The system would provide information that would allow guards to monitor site conditions.

  - Closed circuit cameras - Cameras would be located at Dikes 4, 5, 6, and 7 and MIAD. One additional camera would be located within the Beal's Point recreational area.

- Vehicle Barriers Folsom Dam Road - The Bureau of Reclamation has installed vehicle barriers on either end of the concrete portion of Folsom Dam Road. Required signage would be installed to inform motorist of the barrier system and instruct them to request access to the roadway.

- Power for all Security and Communication Components - It would be necessary to provide power to all security components. All work would be on Reclamation property in areas that minimize or avoid habitat impacts. Due to the complexity of coordinating the overall large-scale construction at several locations within and around the reservoir, it is not efficient to predetermine all of the alignments that would be required to provide necessary power to the security components. The known alignments are listed below. All alignments are subject to reasonable adjustments to accommodate project needs.

  It may be necessary to provide an interim source of power to the security components on the dikes as permanent power would require coordination with the upgrades to the dikes.

  - Earth Embankment Dams - The original plan for providing power to the security system at the earth embankment dams was to utilize solar panels. Unfortunately the climate of the Folsom area and extended duration of cloudy or foggy days significantly impacted the effectiveness of this system. Consequently, there are now two plans being evaluated for providing permanent power to the controlled access locations:

    - Underground Power: Trenching along the top of the earth embankment dikes and placing underground power along the trench to the controlled access locations. This plan has potential negative impact on the integrity of the embankment dams. Major reconstruction of the embankment dams is currently in design under the Safety of Dams Project. It is possible that underground power may be incorporated into that reconstruction effort.

    - Overhead Power: Concrete poles would be placed approximately 300-feet apart at the downstream toe of the earth embankment dams with typical overhead power lines utilized to bring permanent power to the controlled access locations.

- Right and Left Wing Dams - There are currently two plans for providing permanent power and camera communication signal to the existing vehicle barriers located on Folsom Dam Road atop the Right and Left Wing Dams. Each plan would terminate at the existing concrete dam where exposed conduit would then be installed directly onto the face of the dam to the elevator tower.

- The two plans being evaluated for providing power and communication to the vehicle barriers are:

  - Underground Power: Trenching along the east (upstream) shoulder of the road and continue along the roadway to the interface with the concrete portion of Folsom Dam, where a camera tower would be installed. The conduit would then be installed in an existing utility tunnel going across Folsom Dam Road to the downstream face of the dam.

  - Above ground power: Conduit would be installed along the backside of the existing guardrail located along Folsom Dam Road. This exposed conduit would terminate at the concrete portion of the dam and continue as previously described.

- Folsom Dam Industrial Area - The current plan is to provide permanent power to facilities located within the Folsom Dam Complex from the existing power transfer facilities located within the Folsom Dam Industrial area.

• Power Alignments

  - The alignment for power to Dikes 4-6 begins at the left barrier of Dike 6, and runs along the downstream face of the embankments of Dikes 6, 5, and 4, terminating at the right abutment of Dike 4. Power lines would either be trenched along the toes of the structures or installed utilizing 30-ft high concrete poles along the tops of the embankment structures at 300-ft intervals, or 30-ft poles at 300-ft intervals at some distance from the toe of the structures.

  - A second trench would be excavated and conduit installed from the existing vehicle barriers located on the RWD embankment. This trench would be excavated along the east (upstream) shoulder of the road and continue along the roadway to the interface with the concrete portion of Folsom Dam, where another camera tower would be installed. The conduit would then be installed in another excavated trench going across Folsom Dam Road to the downstream face of the dam. Exposed conduit would then be installed directly onto the face of the dam to the elevator tower where a hole would be drilled and the conduit run into the Elevator Tower. Instead of trenching, conduit may be fixed to the back of the existing guardrails.

- A third trench would be excavated and conduit installed from the existing elevator tower south along Folsom Dam Road. This conduit would be installed along the upstream face of the dam up to the end of the concrete section of the dam then a trench would be excavated along the upstream side of the existing roadway. This trench and conduit would continue south along Folsom Dam Road to the Overlook Parking Area and tie into a camera located on a 30-foot tall tower to be installed at the Overlook Parking Area. Instead of trenching, conduit may be fixed to the back of the existing guardrails.

- Staging Areas - Overnight staging would take place in several potential locations that have been identified for the overall project, or other areas downstream of the dam in vacant areas on Reclamation property. During construction, equipment would be staged on the dam road, or other paved areas. It may also be necessary to stage some equipment in the Overlook Parking Area. Staging would occur in previously identified areas for the Joint Federal Project. Staging areas would be located adjacent to the embankments, and would be used to store power poles, and all of the equipment required to construct this piece of the project, including, but not limited to portable restrooms, and a temporary construction office. Two or more contractors working on related or unrelated project work may use staging areas concurrently.

- Gates and Vehicle Barriers – Folsom Dam Road - Folsom Dam Road is approximately 2.3 miles in length and crosses over the LWD, the concrete gravity dam and a portion of the RWD. In order to prevent unauthorized access of large vehicles, Reclamation has installed vehicle barriers at either end of Folsom Dam.

- Project Lighting - Additional lighting would be installed for the Main Concrete Dam, spillway gates, shutter structure, and all dikes. Appropriate lighting would be installed to support monitoring of the barrier system.

2.3 No Action/No Project Alternative

The No Action Alternative serves, under NEPA, as the baseline against which the action alternatives are compared to determine the level of impacts. The No Action Alternative "represents a projection of current conditions to the most reasonable future responses or conditions that could occur during the life of the project without any action alternatives being implemented" (Reclamation 2000). For the purposes of the No Action Alternative, the “life of the project” (i.e., construction work on Folsom Facility) is 8 years from late 2007 through mid-2014.

Under NEPA, No Action has two interpretations. The first “may be thought of in terms of continuing with the present course of action until the action is changed” (CEQ 2006). The second includes cases where the proposed action would not take place and environmental effects of not taking action are compared to effects from taking action. The Folsom DR/FDR No Action Alternative uses both interpretations of No Action.

Under CEQA, the "no project" alternative should describe the existing conditions, as modified by "what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services." (State CEQA Guidelines, Section 15126.6(e)). If the project is other than a land use plan or regulatory plan, for example a development or improvement project on an identifiable property, the "no project" alternative is the circumstance under which the project does not proceed. Here the discussion would compare the environmental effects of the property remaining in its existing state against environmental effects which would occur if the project is approved.

Because of the current level of risk, Reclamation has determined that no significant risk reduction benefit is obtained by altering operations in order to avoid the hydrologic risks associated with the Folsom Facility. Therefore, the No Action/No Project Alternative includes continuing with the current Folsom Dam and Lake Water Control Manual of 1987. However, under the No Action/No Project scenario, the current hydrologic, seismic, static, and flood management risks would go unabated into the future. Additionally, the action alternatives include various construction measures that would not occur under the No Action/No Project Alternative. The No Action/No Project Alternative consists of the environmental effects of not implementing construction on the Folsom DR/FDR.

Finally, the No Action/No Project Alternative takes into account changes in the future such as land use changes; therefore, this alternative is often also called the Future Without Project Alternative. The period of analysis for this project is the construction window of 2007-2014. Future Without Project conditions for the No Action/No Project Alternative would take into account future changes within this period of analysis. Future-Without-Project conditions include the following projects planned to be implemented by other agencies during the period:

- Construction of a new, permanent Folsom Bridge by the Corps.

2.4 Alternative 1

Alternative 1 includes a fuseplug Auxiliary Spillway with no dam or embankment raise; crest reinforcement for selected the RWD, LWD, MIAD, and selected dikes; along with additional seismic and static design elements at the Main Concrete Dam and selected embankments. Alternative 1 and its features reflect a stand-alone Safety of Dams alternative which addresses only hydrologic, seismic, and static concerns.

Although the wing dams, MIAD, and some dikes may be subject to an minimal increase in height as part of crest reinforcing, resurfacing and protection of some of the structures, the height increase relates to the need to protect the structural integrity of the facilities during a PMF, seismic or static event, and not to increase temporary flood storage capacity, as would be accomplished by the other alternatives.

Alternative 1 includes the features summarized in Table 2-12. Table 2-13 provides the estimate quantities of materials required to construct the alternative.

Table 2-12
Features of Alternative 1

Feature	***Project Component***
Main Concrete Dam	• No Dam raise • Post-tensioned anchors, shear key elements, and or toe blocks • Foundation drain enhancements • Significant pier reinforcement • No spillway bridge improvements • Minor to moderate spillway gate Improvements
Auxiliary Spillway	• PMF -520-ft wide fuseplug, partially-lined spillway
Left and Right Wing Dams	• ≤4-ft earthen raise crest protection • Crest filters in upper portion of dam and along contact with concrete dam
Mormon Island Auxiliary Dam	• ≤ 4-ft earthen raise for resurfacing, reinforcement and/or crest protection • Toe drains • Full-height filters • Jet grouting downstream foundation • Downstream overlay
Dikes 1, 2, 3, 7, & 8	• No activity
Dikes 4, 5 & 6	• ≤ 4-ft earthen raise for resurfacing, reinforcement and/or crest protection • Toe drains • Full-height filters
Non-Federal Property Protection	• No activity
Staging and Site Development	• Utility and Road Relocations • Haul Road Construction • Borrow Site and Staging Area Development • Stockpiling and Borrow Material Processing • Concrete Batch Plant and Jet Grout Processing

Table 2-13 ***Estimated Quantities – Alternative 1***						
Embankment Feature	***Estimated Quantities (cy)***					
	Excavation	***Shell Material***	***Slope Protection***	***Filter***	***Asphalt Pavement***	***Concrete***
Main Concrete Dam	50,000	0	0	0	0	25,000
Auxiliary Spillway	3,152,000	55,000	1400	14,700	1,100	124,809
Right Wing Dam	306,640	227,259	0	65,495	2,000	0
Left Wing Dam	97,075	66,128	0	20,662	600	0
MIAD	235,300	905,000	0	333,000	1,520	0
Dike 1	0	0	0	0	0	0
Dike 2	0	0	0	0	0	0
Dike 3	0	0	0	0	0	0
Dike 4	11,757	3,719	0	15,311	460	0
Dike 5	70,984	99,332	0	31,202	600	0
Dike 6	26,311	14,520	0	18,340	430	0
Dike 7	0	0	0	0	0	0
Dike 8	0	0	0	0	0	0
TOTALS	**3,950,067**	**1,370,958**	**1,400**	**498,710**	**6,710**	**149,809**

Each of the project components is described in greater detail in the following sections.

2.4.1 Main Concrete Dam

Under Alternative 1, there would be no raise to the concrete dam, and minor to moderate improvements to the spillway gates and significant improvement to the spillway piers. The major activity under Alternative 1 would be installation of post tensioned anchors, shear key, or toe block elements. A staging area would be developed near the dam for contractor office and parking, materials storage, and for a concrete batch plant. Cement and aggregate would be hauled to the staging area from local Sacramento area suppliers. Standard construction equipment would be used to install the elements of Alternative 1.

2.4.2 Stilling Basin

There would be no modifications to the existing stilling basin under Alternative 1. However, the stilling basin would need to be dewatered to allow installation of shear keys and toe blocks.

2.4.3 Fuseplug Auxiliary Spillway

The fuseplug Auxiliary Spillway would be a 520-ft wide, fuseplug control structure, with a partially-lined chute. The spillway site would be developed by excavating up to 3.2 million cubic yards of material. The material would be placed in haul trucks and taken to a processing plant site at the overlook parking area, Folsom Point and/or Beal's Point. At the processing plant site, the material would be screened and crushed to size required to reinforce the shells of MIAD, the wing dams, and the dikes.

Following processing, the material would be hauled to Dike 7, Folsom Point, or MIAD for stockpiling.

The fuseplug Auxiliary Spillway for the partially lined chute option would have a 520-ft wide control structure at the head of a 1,100-ft long, 520- to 300-ft wide roller compacted, concrete-lined channel. This channel would lead to a 1,700-ft unlined channel discharging into the American River. The fuseplug control structure would be designed with multiple embankment sections to allow passage of progressively larger floods up to helping pass the PMF. To construct the control structure, it may be necessary to place a cofferdam or rely on a rock plug within the reservoir area near the approach channel entrance to preclude reservoir water from flooding the work site during periods of maximum reservoir water storage.

2.4.4 Left and Right Wing Dams

The LWD and RWD would be subject to similar static and hydrologic treatments. The existing shell would be stripped to allow placement of new filters. To provide drainage control, crest filters would be installed on the downstream side to a depth between 20 and 40 ft. In order to prevent piping along the interface of the wing dams with the Main Concrete Dam, processed material filters would also be installed along the embankment, concrete contact. Construction of the filters would involve removal of a portion of the outer shell and stockpiling the material. Processed material from either a local commercial source or manufactured from local granitic material would be placed in a layer across the excavated face of the dike. The excavated shell material would then be replaced and recompacted. Earthen material for the LWD would be taken from one of the nearby stockpiles. Earthen material for the RWD would be taken from the Beal’s Point borrow and processing site.

2.4.5 Mormon Island Auxiliary Dam

MIAD would undergo several treatments to address seismic, static, and hydrologic concerns. To address the seismic concerns related to the foundation of MIAD, jet grouting would be used to solidify the base. Staging for the work on MIAD would occur on site. A mobile concrete production plant would be used to mix the grout material. Pilot holes, drilled into the cobbles present at the base of MIAD, would be used as access points to inject grout. Raw cement to produce the grout would be trucked to the site from Sacramento area commercial sources.

To address static concerns, full-height filters and drains would be installed. The filters would be installed in the same manner as the dikes. A layer of shell material would be excavated for the placement of a layer of filter processed material. The shell material would be replaced, following by additional shell material.

The downstream overlay would be constructed using borrow material obtained from one of the local storage sites (Auxiliary Spillway excavation material) or D2 borrow site. The material would be transported locally for placement at MIAD. Additional shell material would be added to MIAD to increase its mass (static) and to raise the height to address hydrologic concerns. Increasing the height of MIAD would prevent it from being over topped during extreme runoff events from the upper American River watershed. MIAD would not be raised to increase the flood storage capacity of Folsom Reservoir.

2.4.6 Dikes 1, 2, 3, 7, and 8

There would be no dam safety improvement activities conducted for Dikes 1, 2, 3, 7, and 8 under Alternative 1.

2.4.7 Dikes 4, 5, and 6

Dikes 4, 5, and 6 would be subject to similar static and hydrologic treatments, with construction practices similar to that of the wing dams. The existing shell would be stripped to allow placement of new filters. In addition to construction of toe drains the dikes would be upgraded with full-height filters. Construction work for Dikes 4, 5, and 6 would be staged at Beal’s Point, which would include a materials processing plant to screen and crush granitic materials to sizes adequate for construction of shell material. Borrow for placement of additional shell material would be developed at the Beal’s Point borrow site.

2.4.8 Non-Federal Property Protection

There would not be a need for non-government property protection actions under Alternative 1 as there would be no raise in reservoir surface elevation from existing conditions.

2.4.9 Staging and Site Development

The staging areas being considered for Alternative 1 are as follows:

Granite Bay Staging and Borrow
Staging at Granite Bay would not be required under Alternative 1.

Beal’s Point Staging and Borrow
Staging at Beal’s Point would include a materials processing plant. Borrow developed at Beal’s Point would be processed at a local screening and crushing plant. It is anticipated that borrow development along the reservoir shoreline would be to 30 ft below existing surface. Borrow material would be stored locally prior to use at Dikes 4, 5, and 6, and the RWD.

Main Concrete Dam Overlook Parking Lot Staging
A construction office, parking, materials storage, and a concrete batch plant would be staged near the Main Concrete Dam, extending the area into the reservoir. Fill from the Auxiliary Spillway excavation would be use to accomplish the fill. The

Main Concrete Dam staging area would also be used to support all construction activities related to the Auxiliary Spillway. A mobile processing plant to screen and crush materials excavated from the Auxiliary Spillway site would be placed at the overlook parking. Material processed at this location would be hauled to the Dike 7 materials stockpile site, Folsom Point, or MIAD.

Folsom Point Staging

A contractor work area, construction materials and equipment storage, and borrow material storage would occur at Folsom Point. A crushing plant could also be set up to process materials from the Auxiliary Spillway.

MIAD Staging

A staging site would be constructed near MIAD to support the production of grout (concrete batch plant) and placement of the downstream overlay, as well as other construction-related activities.

D2 Borrow Site

Soil with low permeability properties would be excavated at the D2 borrow site for use at all structures subject to an earthen raise.

Dike 7 Borrow Material Storage

Borrow material excavated from the Auxiliary Spillway site could be temporarily stored at Dike 7, within the reservoir, or downstream of the structure. A temporary cofferdam may be constructed using borrow material at the 400-ft contour when the reservoir is at its lowest water elevation. Borrow material would then be placed behind the cofferdam for storage until it is needed.

Internal Haul Routes

Internal haul routes would be used as described in Section 2.2.4.

2.4.10 Alternative 1 Operations

Construction and utilization of the project features in Alternative 1 would not significantly alter current Folsom Reservoir operations in most water years.

Alternative 1 is primarily a stand-alone Safety of Dams alternative, and was designed to pass the PMF and address the seismic and static risks. If the current version of the JFP were not to be expeditiously implemented, Reclamation would independently proceed with this alternative. If this alternative was implemented, it is anticipated that the features would only be operated once every 300 years or greater.

This alternative includes a fuseplug that would be designed to operate in the above scenario. Once the fuseplug has operated, it would be necessary to rebuild the fuseplug to refill the reservoir once the PMF has been passed. It would take approximately one month to rebuild the fuseplug. The materials required to rebuild the fuseplug would be stockpiled onsite.

Downstream Effects –The Auxiliary Spillway with a fuseplug would only operate at a point when over 500,000 cfs was already being released downstream through the existing spillway. The fuseplug spillway in conjunction with the existing spillway could release a total discharge between 850,000 and 900,000 cfs.

At releases above 160,000 cfs, multiple levee failures would be probable. Above 190,000 cfs, the levees have all been overtopped and the communities downstream have been evacuated. In all probability, all of the gravel in the lower American River would have been mobilized prior to fuseplug operation, and all aquatic habitat including salmonid habitat, would have been fully impacted. Releases associated with this alternative would come at a point where all of the downstream impacts from operations-related actions had already occurred. Therefore, the operation of this feature under Alternative 1 would not result in a notable change to the downstream impacts that would otherwise occur.

2.4.11 Alternative 1 Security Upgrade Features

It would be necessary to hardwire power to all security components. A permanent source of power would be considered first. If it is not possible to install permanent power for whatever reason, it would then be necessary to install a temporary power source. Power would be required to power the cameras, lights, bollards and other equipment on each dike, and the wing dams. If a permanent power source can be constructed from the outset, then there would not be a need for a temporary power source. Temporary power sources would only be utilized until a permanent power source can be constructed.

All work would be on Reclamation property in areas that minimize or avoid habitat impacts. Due to the complexity of coordinating the overall large-scale construction at several locations within and around the reservoir, it is not efficient to predetermine all of the alignments that would be required to provide power to all of the security components.

Power poles, one potential for delivery of permanent power, would be installed downstream of Dikes 4-6, at Dike 7, and at MIAD. The power poles would be installed at a distance, up to 50-ft. from the toe of the structures. In general, the power poles would be placed at 300-ft. intervals, plus or minus 30-ft. Adjustments would be made during construction to accommodate problem areas, structural issues, or other factors that would require a different spacing. The entire project would require approximately 88 poles.

Generators and upgraded solar panels are the two temporary sources of power that are being considered for project purposes. Two to three generators would be required to provide temporary power to Dikes 4-6. Two more generators would be required to provide power to Dike 7 and MIAD. The generators would be running 24 hours a day. The size (horsepower) of the generators has yet to be determined. The generators would be housed to reduce noise impacts, and placed to avoid conflict with the public. The generators would be fenced and or secured in another way to secure the equipment from public access.

If solar panels prove to be the superior alternative, then large enough panels would be employed to power all of the hardware at each of the structures. It may be necessary to utilize a combination of solar panels and generators as a backup system.

Staging would occur in previously identified areas for the DS/FDR actions. Staging areas would be located adjacent to the embankments, and would be used to store power poles, and all of the equipment required to construct this piece of the project, including, but not limited to portable restrooms, and a temporary construction office. Two or more contractors working on related or unrelated project work may use staging areas concurrently.

2.5 Alternative 2

The principle features of Alternative 2 are a fuseplug Auxiliary Spillway with an underlying tunnel, an embankment raise of up to 4 feet along with additional seismic and static design elements at the Main Concrete Dam and select embankments. Alternative 2 and its features reflect both Safety of Dams hydrologic, seismic, and static concerns with a tunnel element to meet flood damage reduction objectives.

The raise component is dependent on assumptions made about the fuseplug spillway width. The alternative as analyzed assumes a narrower fuseplug spillway approximately 350-400 feet wide at the control section. Substitution of the larger fuseplug spillway described in Alternative 1 would reduce the amount of any required raise to that as incrementally justified for flood damage reduction only. If the raise were significantly reduced or eliminated by substitution of the larger fuseplug spillway, the wing dams, MIAD, and some dikes would be subject to only a minimal increase in height as part of reinforcing, resurfacing and protecting the crest of the structures. The height increase relates to the need to protect the structural integrity of the facilities during a PMF, seismic or static event, and not to a need to increase temporary flood storage capacity, which is the reason for a raise in the other alternatives.

Under Alternative 2, there would be a 4-ft raise to all facilities except for the Main Concrete Dam crest. The Main Concrete Dam already has a 4 foot parapet wall. The raise in Alternative 2 has been designed to allow for safe passage of the PMF. The alternative also has the additional required flood surge storage capacity to reach the 1 in 200 event FDR objective. Under this or any alternative with a raise component, the additional storage is for flood control only and not for increasing the storage capacity of the reservoir. Alternative 2 includes the features provided in Table 2-14. Table 2-15 provides the estimated quantities for construction of this alternative. Each of the project components is described in greater detail in the following sections.

Table 2-14
Features of Alternative 2

Feature	Project Component
Main Concrete Dam	• In filling of existing parapet wall gaps across non-overflow section • Post-tensioned anchors, shear key, and/or toe block elements • Foundation Drain Enhancements • Significant spillway pier reinforcements • No spillway bridge improvements • Minor to moderate spillway gate modifications
Auxiliary Spillway	• PMF fuseplug with partially- or fully-lined chute • Control Structure – 350 to 400-ft wide Fuseplug • Tunnel with 3 Submerged Tainter Gates and Fully-Lined Discharge Channel
Left and Right Wing Dams	• 0.5-ft Earthen, 3.5-ft Parapet Concrete Wall • Toe Drains • ½ Height Filters
Mormon Island Auxiliary Dam	• 4-ft Earthen Raise • Toe Drains • Full-height Filters • Excavation and Replacement of Downstream Foundation • Downstream Overlay
Dikes 1, 2, 3, 7 and 8	• 4-ft earthen raise • Toe Drains
Dikes 4, 5 & 6	• 4-ft earthen raise • Toe Drains • Half-height Filters
Non-Federal Property Protection	• New Embankment Protection • Acquisition of Property Rights (easements or fee title)
Staging and Site Development	• Utility and Road Relocations • Haul Road Construction • Borrow Site and Staging Area Development • Stockpiling and Borrow Material Processing • Concrete Batch Plant • Excavation Blasting

Table 2-15
Estimated Quantities – Alternative 2

Embankment Feature	Estimated Quantities (cy)					
	Excavation	Shell Material	Slope Protection	Filter	Asphalt Pavement	Concrete
Main Concrete Dam	50,000	0	0	0	0	25,000
Auxiliary Spillway	3,190,000	55,000	0	14,700	1,100	124,650
Spillway Tunnel	1,656,330		0	0		134,570
Right Wing Dam	268,500	189,500	5,712	94,615	2,550	1,173
Left Wing Dam	371,800	254,400	1,734	90,808	816	367
MIAD	3,815,715	905,000	5,600	333,852	1,520	46,960
Dike 1	10,890	30,000	1,785	870	673	0
Dike 2	8,525	21,000	1,734	840	500	0
Dike 3	6,830	13,500	1,479	730	439	0
Dike 4	8,580	23,000	1,428	1,380	510	0
Dike 5	26,400	94,000	1,887	5,554	551	0
Dike 6	13,750	44,000	1,428	1,673	520	0
Dike 7	7,150	23,000	847	1,451	255	0
Dike 8	4,070	10,500	734	360	224	0
TOTALS	9,438,540	1,953,900	24,,368	546,893	9,658	332,450

2.5.1 Main Concrete Dam

Under Alternative 2, the existing parapet wall would be strengthened to serve as a 4-ft raise to the non-spillway portion of the dam structure; the existing spillway crest height would remain the same. Other dam improvements would be the same as Alternative 1.

2.5.2 Stilling Basin

There would be no modifications to the stilling basin under Alternative 2. However, the stilling basin would need to be dewatered to allow installation of shear keys and toes blocks.

2.5.3 Auxiliary Spillway

The new fuseplug Auxiliary Spillway would be a 350- to 400-ft wide fuseplug control structure, with a partially-lined or fully-lined chute options. Spillway width is ultimately dependent on optimal tunnel discharge capacity and raise component. The spillway site would be developed by excavating up to 3.5 million cubic yards of material (for the spillway and tunnel). The material would be placed in haul trucks and taken to a processing plant site at the overlook parking area.

The fuseplug Auxiliary Spillway (for the partially-lined option) would have a 350- to 400-ft wide control structure at the head of a 1,100-ft long, 350- to 400-ft roller compacted concrete-lined channel, which would narrow to 300 ft in width. This channel would lead to a 1,700-ft unlined channel discharging into the American River. The fuseplug control structure would be designed with multiple embankment sections to allow passage for progressively larger floods up to helping pass the PMF without discharging more than the maximum inflow. To construct the control structure, it may be necessary to place a cofferdam or leave a rock plug within the reservoir area near the approach channel entrance to preclude reservoir water from flooding the work site during periods of maximum storage.

2.5.4 Auxiliary Spillway Tunnel

The main differentiating feature for Alternative 2 would be the construction of an Auxiliary Spillway tunnel. The tunnel would be excavated in an area adjacent to and beneath the proposed Auxiliary Spillway using standard excavation, tunneling and earth moving equipment and handled in the same manner as the Auxiliary Spillway materials.

To construct the tunnel opening and control structure on the waterside of the facility, a cofferdam or rock plug may be constructed to control reservoir water during periods of maximum storage. The tunnel spillway would consist of three 26-ft diameter intakes and tunnels, a 45-ft diameter concrete-lined upstream pressure tunnel, and a 50-ft diameter concrete-lined modified horseshoe downstream tunnel located through the left abutment of the LWD. Flow through the tunnel spillway would be regulated by three 14- by 25-ft submerged tainter gates. In addition, 14- by 25-ft wheel mounted guard gates would be provided upstream of each tainter gate to provide for additional security.

The tunnel would discharge into a spillway chute shared by the fuseplug spillway. The fuseplug spillway would be constructed first and would provide for expedited hydrologic risk reduction for the dam overtopping concern. The initial fuseplug spillway configuration would consist of a 500-ft wide fuseplug (divided into segments) with a crest at elevation of 477 ft. The fuseplug in this configuration would pass the PMF with the existing concrete dam spillway and outlets at a maximum water surface elevation of 477.0 ft. Once the tunnel was completed, the fuseplug width would be reduced to 350-ft and the crest raised to 480-ft.

2.5.5 Left and Right Wing Dams

The LWD and RWD would require similar treatments. To provide drainage control, toe drains and full-height filters would be installed on the downstream side. Additional shell material would be placed in the wing dams to raise their elevation approximately 4 ft. Construction would be similar to that of Alternative 1.

2.5.6 Mormon Island Auxiliary Dam

Under Alternative 2, MIAD would undergo several treatments to address seismic, static, and hydrologic concerns. To address static concerns, toe drains and full-height filters would be installed. The filters would be installed before placement of the final layer of the overlay. To address the seismic concerns related to the foundation of MIAD, the foundation would be excavated from the downstream side to access foundation material. Unstable foundation material would be removed and the downstream foundation rebuilt with high strength compacted fill. As part of reconstruction, a downstream overlay would be built that would raise the height of MIAD by approximately 4-ft. The overlay shell material would be obtained from the Dike 7 storage site, Folsom Point, or MIAD (Auxiliary Spillway excavation material). The material would be transported locally for placement at MIAD.

2.5.7 Dikes 1, 2, 3, 7 and 8

Dikes 1, 2, and 3, adjacent to the Granite Bay staging area, would be subject to a 4-ft earthen raise. Borrow material for constructing the earthen raise to Dikes 1, 2, and 3 would be developed at Granite Bay. Toe drains would be installed at the base of each dike.

Dikes 7 and 8 would receive treatments similar to Dikes 1, 2, and 3. However, because Dike 8 is located along the southern shore of the reservoir, work at Dike 8 would be staged from Folsom Point. Borrow material for the Dike 8 construction would be taken from the closest stockpile area.

2.5.8 Dikes 4, 5, and 6

Dikes 4, 5, and 6 would be subject to a 4-ft earthen raise. In addition to construction of toe drains and placement of more shell material, the dikes would be upgraded with ½-height filters. Construction of the filters would involve removal of a portion of the outer shell and stockpiling the material. Processed material from either a local commercial source or manufactured from local granitic material would be placed in a layer across the excavated face of the dike. Shell material would then be replaced with additional shell material added to accomplish the 4-ft earthen raise. Construction work for Dikes 4, 5, and 6 would be staged at Beal's Point with borrow developed locally.

2.5.9 New Embankments/Flood Easements

The raising of the reservoir pool elevation during a PMF event could potentially flood areas beyond the boundaries of the Folsom Facility. The areas of concern are primarily located along Mooney Ridge, north of Granite Bay, and along the eastern shoreline.

To address the potential flooding issue, the government would either construct additional embankments at locations where developed property was threatened or obtain flood easements for non-developed property. The embankments would be constructed from earthen material excavated at the specific site. Because the details and requirements for the embankments are not known at the time of development of this EIS/EIR, supplemental environmental documentation to describe construction effects would be produced once the details are known.

2.5.10 Staging and Site Development

Four staging areas are proposed to address Alternative 2 construction as follows:

Granite Bay Staging and Borrow

Staging at Granite Bay would include contractor offices and parking, construction materials storage, a borrow material processing (screening and crushing) plant, and borrow materials storage. To develop borrow for raising and strengthening structures (Dikes 1, 2, and 3), granitic material from along the shoreline would be excavated using standard construction equipment. Competent rock foundation at this location has the potential to be crushed into processed material. Excavation up to 50 feet below the existing surface is possible. Excavation of rock foundation would require the use of blasting agents.

Excavated borrow material would be transported locally to the processing plant for screening and crushing and stored locally until used. Processed material produced at

Granite Bay would be transported on internal construction haul roads to Beal's Point or by city streets to Folsom Point/MIAD.

Beal's Point Staging and Borrow

Staging at Beal's Point would be similar to that at Granite Bay, with the exception of the potential for a concrete batch plant. Borrow developed at Beal's Point would be processed at a local screening and crushing plant. It is anticipated that borrow development along the reservoir shoreline would be up to 30 ft below existing surface. Borrow material would be stored locally prior to use at Dikes 4, 5, and 6, and the RWD.

Main Concrete Dam Staging

A construction office, parking, materials storage, and a concrete batch plant would be staged near the Main Concrete Dam. The Main Concrete Dam staging would also be used to support construction of the Auxiliary Spillway.

Auxiliary Spillway

A mobile processing plant to screen and crush materials excavated from the Auxiliary Spillway site could be placed at the overlook parking lot east of the LWD. Material processed at this location would be hauled to Dike 7, Folsom Point, or the MIAD materials storage site.

Folsom Point Staging

A contractor work area, construction materials and equipment storage, and borrow material storage would occur at Folsom Point. A crushing and sorting operation could also be set up at Folsom Point.

MIAD Staging

A contractor work area would be established near MIAD for excavation and shell replacement activities.

D2 Borrow Site

Soil with low permeability properties would be excavated at the D2 borrow site for use at all structures subject to an earthen raise.

Dike 7 Borrow Material Storage

Borrow material excavated form the Auxiliary Spillway site could be temporarily stored at Dike 7, upstream of the structure. A temporary cofferdam would be constructed using borrow material at the 400-ft contour when the reservoir is at its lowest water elevation. Borrow material would then be placed behind the cofferdam for storage until it is needed.

Internal Haul Routes

Internal haul routes would be as described in Section 2.2.4.

2.5.11 Alternative 2 Operations

Construction and utilization of the project features in Alternative 2 would not significantly alter current Folsom Reservoir operations. Alternative 2 is a Flood Damage Reduction alternative, and was designed to pass the PMF. If this alternative was implemented, it is anticipated that the features would be operated as necessary to control flood flows.

Downstream Effects – The fuseplug spillway features of this alternative would only operate at a point when over 500,000 cfs was already being released downstream as described in Alternative 1. The tunnel would provide a significantly lower level of discharge capacity, allowing for the initiation of earlier releases, and maintaining flows at 160,000 cfs or below for duration's equivalent to the 1 in 200 year event. T.

Cumulative Effects – Joint flood releases from the fuseplug spillway and tunnel would be made only during large, rare, infrequent flood events occurring on the order of greater than 1 in 300 years for the fuseplug spillway and tens to hundreds of years for the tunnel. Releases above 160,000 cfs would come at a point in the flood event where the vast majority of the impacts have all ready occurred, as previously described in Alternative 1. Therefore, the cumulative impacts from Alternative 2 would be not be significant.

Reservoir Vicinity Effects – A 4-ft raise could result in a short-term temporary increase in the maximum reservoir pool elevation during extreme flood flow events. This would result in inundation of land surrounding the reservoir and could flood lower elevation areas adjacent to the federal property boundary. The lower elevation areas are primarily in the Mooney Ridge, Granite Bay, and eastern shoreline areas.

Land use actions would be necessary to address the potential for flooding related to a 4 ft raise. Structural or real estate remedies, or a combination of both, would be pursued in cooperation with impacted non-federal property owners. Probable actions in lower elevation areas would include construction of new flood damage reduction berms (and associated access and flood damage reduction structure easements if berms are located on non-federal property) and/or acquisition of flood easements on impacted non-federal parcels. With a 4 ft raise, Reclamation's preliminary planning-level analysis also indicates the acquisition of fee title of approximately four non-federal properties as a possible scenario, including one residential property. In the event that acquisition of fee title of non-federal property is required, impacted property owner(s) will be entitled to fair market value, assistance with replacement housing, and relocation benefits and services in accordance with Public Law 91-646. However, efforts would be made to design and construct flood damage reduction structures that will reduce or eliminate the need for building flood damage reduction berms and/or acquiring real estate rights (easements or fee title), including potential relocation of residents, on impacted non-federal parcels.

2.5.12 Alternative 2 Security Upgrade Features

Delta barriers or swing gates may be installed to achieve the projects goal to upgrade security at each of the structures associated with Folsom Reservoir. This alternative would still require a permanent source of power. Power would be required for the cameras, lights, and other hardware that would be installed. No power would be required for the Delta barriers or the swing gates.

This alternative would employ underground power: Trenching would take place along the top of the dikes and underground power would be placed along the trench to the controlled access locations. This plan has a potential negative impact on the integrity of the embankment dams. Major reconstruction of the embankment dams is currently in design under the Safety of Dams project. It is possible that underground power may be incorporated into that reconstruction effort.

All work would be on Reclamation property in areas that minimize or avoid habitat impacts. Due to the complexity of coordinating the overall large-scale construction at several locations within and around the reservoir, it is not efficient to predetermine all of the alignments that would be required to provide power to all of the security components.

Staging would occur in previously identified areas for the DS/FDR action areas. Staging areas would be located adjacent to the embankments, and would be used to store power poles, and all of the equipment required to construct this piece of the project, including, but not limited to portable restrooms, and a temporary construction office. Two or more contractors working on related or unrelated project work may use staging areas concurrently.

2.6 Alternative 3

Alternative 3 combines four distinct groupings of alternatives for the purpose of analyzing the cumulative effects of the project features, that when combined, meet all of Reclamation's Safety of Dams needs, as well as the Corp's Flood Damage Reduction needs. Specifically, Alternative 3 includes all of the features of the Joint Federal Project, which is strictly defined as gated Auxiliary Spillway structure with a 900-ft. approach, control structure with 6 submerged tainter gates, and a fully lined spillway channel. Alternative 3 also include the Safety of Dams features from Alternative 1, the Corp's Flood Damage Reduction features, and the majority of the Security Upgrade features.

The stand-alone Flood Damage Reduction feature of the alternative – as incrementally justified - is a potential 3.5-ft parapet concrete wall raise to all facilities, except for the concrete dam where the existing 3.5-ft parapet wall would require minor modification to serve as a water barrier. The raise would allow for additional flood surge storage capacity, on a temporary basis, and not for increasing the storage capacity of the reservoir. Alternative 3, which would serve as a functionally equivalent project to the Corps' authorized Folsom Dam Mods and Folsom Dam Raise Projects, includes the features outlined in Table 2-16.

Table 2-16
Features of Alternative 3

Feature	*Project Component*
Main Concrete Dam	• No Dam raise – minor modifications to existing parapet wall (3.5 ft) • Modify/Replace Existing Spillway Bridge • Modify/Replace 3 emergency gates; main spillway/service gate modification • Significant spillway pier modification • Post-tensioned anchors • Shear Key Elements • Toe Blocks • Foundation Drain Enhancements • Stilling Basin Extension (50-75 ft)
Auxiliary Spillway	• Joint (PMF/Flood damage reduction) Auxiliary Spillway w/ Fully-lined Chute and approach channel • Control Structure – 6 Submerged Tainter Gates • The Control Structure incorporates a bridge over the structure • Fully-lined stilling basin
Left and Right Wing Dams	• Potential 3.5-ft Parapet Concrete Wall • Training wall between Left Wing Dam and Auxiliary Spillway • Crest filters in upper portion of dam and along contact with concrete dam
Mormon Island Auxiliary Dam	• Potential 3.5-ft Parapet Concrete Wall • Toe Drains • Full-height Filters • Jet Grouting Downstream Foundation • Downstream Overlay
Dikes 1, 2, 3, 7 & 8	• Potential 3.5-ft Parapet Concrete Wall • Replace filter material removed at Dikes 1-3, 7 & 8 for parapet wall construction
Dikes 4, 5 & 6	• Potential 3.5-ft Parapet Concrete Wall • Toe Drains • Full-height Filters
Non-Federal Property Protection	• New Embankment Protection • Acquisition of Property Rights (easements or fee title)
Miscellaneous	• Utility and Road Relocations • Security Provisions option • Haul Road Construction • Borrow Site and Disposal Site Development • Staging, Borrow Material Processing, Concrete Batch Plant and Jet Grout Processing • Excavation Blasting; Underwater Blasting and Dredging

Each of the project components would be described in greater detail in the following sections.

2.6.1 Main Concrete Dam

Under Alternative 3, there would be minor modifications to the existing upstream parapet wall on the concrete monoliths of the Main Concrete Dam to serve as a water barrier and the equivalent of the parapet wall raise on the other structures. Upgrades could include the addition of rebar and concrete, both to strengthen and increase the height of the structure, as well as other materials to completely seal the parapet. The existing spillway crest height would remain the same.

As a potential enhancement, the three emergency spillway gates would be replaced or modified because structural components of the existing emergency gates would be impacted during passage of large flood releases. When replaced, the new gates would be higher with the tops of the three gates raised to 487.5 ft. The advantage of replacing the emergency gates is to increase the pool elevation (the tops of the three existing emergency spillway gates, when closed, are at elevation 471 feet). This effectively limits the flood control operation to that elevation.

Either a new spillway bridge would be constructed at the top of the piers on the upstream side of the new or modified emergency spillway gates, or the existing spillway bridge would be modified to accommodate the new or modified emergency spillway gates. In addition to modifying or replacing the three emergency gates, the five main spillway/service gates would be modified to reduce seismic risks under Alternative 3. Significant spillway pier modifications would include pier wraps cross bracing with structural members and installation of tendons in the piers. Foundation drain enhancements, post-tensioned anchors, shear key elements, and/or toe blocks would be installed to anchor the concrete structure.

Standard construction equipment would be used to install the project features of Alternative 3. A staging area would be developed near the dam for contractor office and parking, materials storage, a rock crushing plant, and for a concrete batch plant. Cement and aggregate would be hauled to the staging area from local Sacramento area suppliers. If the aggregate cannot be produced onsite, or purchased from a local supplier, then it would be necessary to truck the material in from a longer distance. No alternate sources outside of Sacramento have been identified at this point.

2.6.2 Stilling Basin

The stilling basin would be dewatered, and then extended 50 to 75 ft under Alternative 3 as incrementally justified under flood damage reduction objectives. A new stilling basin would also be constructed to accept full discharge from the proposed Auxiliary Spillway.

The existing stilling basin would be dewatered using pumps. Water would be pumped from the stilling basin into the river channel. Leakage from the dam makes it necessary to pump water out of the stilling basin for the duration of construction in the stilling basin. A fish recovery program would be developed prior to dewatering, and approved by the CDFG.

A small stream from the existing stilling basin cascades towards the river and may encroach on the excavation site of the Auxiliary Spillway stilling basin (described in

Auxiliary Spillway section). A small channel sufficient to handle the drainage flows from the main stilling basin may be excavated through rock. Furthermore, there would be seepage into the excavation channel through fissures in the rock. Depending upon water quality permitting, fissures would be grouted or, if grouting is not an acceptable means of cutting off the fissure flow, then this water would be directed into sumps, filtered, and pumped back into the river.

2.6.3 JFP Auxiliary Spillway

The JFP Auxiliary Spillway would be built adjacent to the LWD (within the current overlook parking lot) and consist of a 900-ft approach channel, a control structure with six submerged tainter gates (each 23 ft wide by 33 ft high), with a sill elevation of 368 ft, and an approximately 170-ft wide by 1700-ft long rectangular chute that leads to an energy dissipation structure and an exit channel. The entire discharge chute would be reinforced-concrete-lined and extend downstream from the control structure southwest at approximately 30 degrees diagonally to the LWD towards the downstream end of the exit channel for the Main Concrete Dam (entering the American River in almost a direct line). The JFP Auxiliary Spillway would be aligned to minimize impact on the approach road for the new permanent bridge at Folsom Dam. A separate hydraulic jump reinforced-concrete-lined stilling basin (265 ft long, 90 ft wide, 66-ft deep) would be constructed for the JFP Auxiliary Spillway at the downstream end of the chute, just upstream from where the Auxiliary Spillway flows re-enter the American River.

The 900-ft long approach channel invert and vertical sides would be reinforced-concrete-lined for a distance of 50 feet upstream from the face of the control structure. The invert elevation for this concrete lining would be at the 368 ft sill elevation for the gates. Most of the approach channel would be excavated in rock to be resistant to erosion. Construction of the approach channel would require underwater blasting, dredging and excavating approximately 250,000 cubic yards of material.

The Auxiliary Spillway site would be developed by excavating approximately 3.5 million cubic yards of material. The material would be placed in haul trucks and taken to a processing plant site on site, at the dam overlook parking lot, or Folsom Point. Some of the material may be utilized as riprap where needed. At the processing plant site, the material would be screened and crushed to sizes required to reinforce MIAD (MIAD overlay), the wing dams, and Dikes 4, 5 and 6. Following processing, the material would be hauled to a given structure for immediate use, or it would be stockpiled, or the material would be stored at Folsom Point, Dike 7, or near MIAD including D2. At Dike 7 and Dike 8/Folsom Point, some of the material may be placed permanently in the reservoir to create staging areas upstream of the structure. These areas would remain once construction is complete. Specifically, the areas north and south of the parking lot at Beal's Point would receive fill material to create staging and stockpiling space. Increasing staging and stockpiling space out of the major traffic and recreation areas would significantly decrease impacts to recreation.

In order to construct the control structure, a rock plug may be left in place, and/or a cofferdam would be placed within the reservoir downstream of the approach channel to preclude reservoir water from inundating the work site during periods of maximum reservoir storage.

2.6.4 Left and Right Wing Dams

Under Alternative 3, the LWD and RWD would be raised 3.5 ft using a parapet concrete wall.

Parapet Concrete Wall – The potential 3.5-ft parapet wall raise for flood damage reduction purposes would involve construction of a reinforced concrete parapet (flood) wall. The parapet wall would be located along the upstream edge of the existing crest for the LWD, RWD, MIAD and Dikes 1 through 8. The approximate length of the parapet wall for each embankment is indicated in Table 2-17.

Table 2-17
Parapet Wall Lengths

Embankment	*Wall Length (ft)*
Left Wing Dam	2,150
Right Wing Dam	6,850
MIAD	4,925
Dike 1	2,600
Dike 2	2,600
Dike 3	1,900
Dike 4	1,400
Dike 5	2,100
Dike 6	1,610
Dike 7	915
Dike 8	910
Total	27,960

Estimated quantities to construct the 3.5-ft parapet wall raise are indicated in Table 2-18. Due to the small volume of concrete placement, an on-site batch plant is not required. Concrete would be locally provided (transit-mix delivery). If justified, the potential parapet wall would be constructed on site at each dike. The number of

Table 2-18 Estimated Quantities – Parapet (Flood) Wall						
Embankment Feature	***Estimated Quantities (cy)***					
	Excavation	***Trenching***	***Riprap***	***Filter***	***Backfill (common)***	***Concrete***
Right Wing Dam	9,894	507	3,552	837	3,920	3,171
Left Wing Dam	3,106	159	1,115	263	1,230	995
MIAD	7,114	365	2,554	602	2,818	2,280
Dike 1	3,756	193	1,348	317	1,488	1,203
Dike 2	5,778	148	2,407	1,681	1,144	926
Dike 3	2,744	141	985	232	1,087	880
Dike 4	2,022	104	726	171	801	648
Dike 5	3,033	156	1,089	257	1,202	972
Dike 6	2,326	119	835	197	921	745
Dike 7	1,322	68	474	112	524	424
Dike 8	1,314	67	472	111	521	421
TOTALS	42,409	2,027	15,557	4,780	15,656	12,665

loads of concrete to complete the entire concrete parapet wall system would be about 1,600, assuming 8 cubic yards per load, or about 5 truck loads for the 40 cubic yards placed every three days. Total time to complete the entire concrete parapet wall system would be about 950 days, or over 2.5 years, although construction duration could be much less if walls are built concurrently at different embankment locations.

Construction of a potential parapet wall would involve the removal and disposal of material necessary to facilitate placement of the wall. Due to the various types of material involved, i.e., riprap, fine and coarse filter materials, road base, asphaltic pavement and common embankment fill, it is anticipated that these materials would be wasted.

There are two actions that would need to be completed to address Safety of Dams and Flood damage reduction concerns at the LWD and RWD. First, the downstream slope of these embankments would be stripped and a new filter installed as described for Dikes 4, 5 and 6. The new filter would be covered by a new shell overlay. Second, the parapet wall would be installed as described in Section 2.2.4. Filter material that is disturbed and removed during placement of the parapet walls on the LWD and RWD would be replaced on the upstream side only of the dam crests and would be followed by the crest filters.

To provide drainage control, crest filters in the upper portions of the LWD and RWD and along contact with the concrete dam would be installed as well as a training wall between the LWD and Auxiliary Spillway. The training wall would be constructed to prevent damage to the LWD from spillway overflow.

The LWD would be constructed from the Main Concrete Dam staging area, with concrete produced locally, and utilizing borrow material stockpiled from the spillway excavation. Material for construction would come from the Dike 7, Folsom Point, or

MIAD stock pile locations. The RWD would be constructed using both the Main Concrete Dam and staging areas located downstream from the RWD, or from the Beal's Point staging areas. Borrow material would be taken from Beal's Point, Dike 7, Folsom Point, or MIAD. The average haul distance is assumed to be approximately 0.5 mile. New riprap and backfill would be imported from a local stockpile. Filter material would be imported from an off-site source, unless it can be produced onsite.

2.6.5 Mormon Island Auxiliary Dam

Under Alternative 3, MIAD would undergo several treatments to address seismic, static, and hydrologic concerns. To address the seismic concerns related to the foundation of MIAD, jet grouting would be used to solidify the base. Work on MIAD would be staged at the site. A mobile concrete production plant would be used to mix the grout material. Pilot holes would be drilled into the cobbles present at the base of MIAD and used as access points to inject grout. Cement to produce the grout would be trucked to the site from Sacramento area commercial sources.

To address static concerns, toe drains and full-height filters would be installed following jet grouting. The filters would be installed in the same manner as at Dikes 4, 5 and 6. Lastly, a layer of shell material transported from a local stockpile (such as Dike 7, D1/D2, or material that was stockpiled previously at MIAD) would be placed over the layer of filter processed material. Shell material may include impervious materials excavated from the D1/D2 borrow site. The shell material would be replaced with additional material creating a downstream overlay.

If needed, a parapet concrete wall would be added to MIAD to raise the height by 3.5 ft. Filter material that is disturbed and removed on the upstream side of the dam crest during placement of the parapet wall on MIAD would be replaced.

2.6.6 Dikes 1, 2, 3, 7 and 8

Dikes 1, 2, and 3, located adjacent to the Granite Bay staging area, would be subject to a potential 3.5-ft parapet wall raise, as described in Section 2.2.4. Filter material that is disturbed and removed on the upstream side of the dike crest during placement of the parapet wall on the dike would be replaced.

Dike 7 and 8 would receive similar treatments as Dikes 1, 2 and 3. However, because these dikes are located along the southern shore of the reservoir, work would be staged from Folsom Point, D2, or MIAD.

2.6.7 Dikes 4, 5 and 6

Dikes 4, 5 and 6 would be subject to a potential 3.5-ft parapet wall raise following placement of toe drains, full-height filters, and replacement of their downstream shells. Construction of the filters would involve removal of a portion of the outer shell and stockpiling the material onsite. Processed material from a local commercial source (or manufactured from local granitic material) would be placed in a layer across the excavated face of the dike. The original shell material would then be replaced. Since the parapet walls would be added after the full-height filters on these dikes, filter material that is disturbed and removed during placement of the parapet walls on these dikes would be replaced.

Construction work for Dikes 4, 5 and 6 would be staged at Beal's Point, or a downstream staging area, which would include a materials processing plant to screen and crush granitic materials to sizes adequate for replacement of shell material. Borrow would be developed at the Beal's Point borrow site.

2.6.8 Non-Federal Property Protection

As a result of a potential 3.5 ft parapet wall raise, residential properties along the boundary of Folsom Reservoir would potentially be subject to temporary flooding during extreme flood events. To address the potential for property damage related to the parapet wall raise, the government would acquire flood easements from each of the property owners potentially affected. Structures to reduce or eliminate the chance that private property is flooded are also being considered. The most likely solutions would be a small embankment, a parapet wall of unknown height, or another type of suitable structure. The need for, location, number, and impacts of new embankments/easements would be addressed in a supplemental environmental document.

2.6.9 Staging and Site Development

The Folsom facilities are located along an 8-mile stretch of the western and southern edges of Folsom Reservoir. Facilities to the east of the LWD are separated from all other facilities to the west by the Main Concrete Dam. If the concrete dam was closed to construction traffic and there is a need to minimize local construction traffic, the project would involve staging near each of the facility groupings. Borrow site development and processing would be located at the Auxiliary Spillway and Beal's Point. However, if the concrete dam was open to construction traffic, the project would involve staging near each of the facility groupings but borrow extraction and processing would occur primarily at the Auxiliary Spillway.

Staging and borrow areas for Alternative 3 are proposed as follows:

Granite Bay Staging

Staging at Granite Bay would be needed for approximately one year for the 3.5-ft parapet wall raise of Dikes 1-3 and would include contractor offices and parking, construction materials storage as well as other routine staging area activities. Material for the 3.5 ft parapet walls would be transported on city streets to the Granite Bay staging area.

Beal's Point Staging and Borrow

Staging areas south and north of Beal's Point would be created in reservoir, utilizing material from the spillway excavation or other excess material, to minimize impacts at this recreation site. Staging facilities would include borrow material processing in addition to activities similar to those at Granite Bay; however, staging would be for a longer duration. Staging at Beal's Point would be for at least four years, if the area was used for processing material. Borrow developed at Beal's Point would be processed at a local screening and crushing plant. It is anticipated that borrow development along the reservoir shoreline would be up to 30 ft below the existing surface. Borrow material would be stored locally prior to use at Dikes 4, 5, and 6, and the RWD.

Main Concrete Dam Staging

A construction office, parking, materials storage, and a concrete batch plant would be staged near the Main Concrete Dam. The Main Concrete Dam staging area would also be used to support construction of the Auxiliary Spillway.

Auxiliary Spillway

A mobile processing plant to screen and crush materials excavated from the Auxiliary Spillway site would be placed at the overlook parking lot east of the LWD, or at Folsom Point. Material excavated from and processed at this location would be hauled to and processed at the Dike 7/Folsom Point, D1/D2, or MIAD materials sites.

Folsom Point Staging

A contractor work area, construction materials and equipment storage, borrow material storage, and a crushing and processing plant would all occur at Folsom Point. The Folsom Point area would be closed to the public for up to six years for staging, materials processing, stockpiling and other staging-related activities.

D1/D2 Borrow Site and/Stockpiling Site

The 3.5-ft raise for MIAD would more than likely require a greater quantity of material than would be produced from the Auxiliary Spillway excavation. Borrow sites would be developed at either or both the D1 and D2 sites, or the Brown's Ravine area for the earthen overlay at MIAD. This material would be processed at Folsom Point prior to transport to MIAD. D1 and D2 would be utilized for stockpiling if it was determined that the project would not move forward with a raise of any height. The sites could also be used to store material if the raise were to be implemented further along in the project schedule.

MIAD Staging and Jet Grout Plant

A staging area would be constructed near MIAD to support production of grout (concrete batch plant), as well as other construction-related activities. The staging area would include, but would not be limited to, areas for contractor and equipment parking, and a contractor's office.

Dike 7 Borrow Material Storage
Borrow material excavated from the Auxiliary Spillway site would be temporarily or permanently stored at Dike 7, D1/D2, or MIAD. A temporary cofferdam may be constructed upstream of Dike 7 using borrow material at the 400-ft contour when the reservoir is at its lowest water elevation. Borrow material would then be placed behind the cofferdam for storage until it is needed.

Permanent and Temporary Material Storage Areas
Several sites have been identified for potential permanent or temporary storage of excavated materials. The primary location would be upstream of Dike 7. Up to 500,000 cubic yards of material may be stored upstream of Dike 7. Beal's Point, Folsom Point, Dike 8, D1, D2 and MIAD have also been identified for the storage of materials. Dike 7, D2, and MIAD are locations where permanent storage of excess material is highly likely.

Internal Haul Routes
As part of site development, internal (i.e., within reservoir boundaries) haul roads would be constructed as needed. Standard construction equipment would be used to cut and fill the construction road. A road base material would form the primary road surface. Internal haul roads would be constructed to connect Beal's Point with Granite Bay, and the LWD with MIAD. Most of the in reservoir haul roads would be 40-ft wide.

Approach Channel Construction
The 900-ft approach channel would require dredging, and underwater blasting to construct. Standard industry techniques would be employed to accomplish this requirement of the project.

The sediments in the area would be analyzed for mercury or other constituent that would be mobilized during construction. Precautions would need to be made to avoid damaging fish in the vicinity of the blasting. Resource agencies would be consulted on the best way to avoid these types of impacts.

2.6.10 Alternative 3 Security Upgrade Features

Under Alternative 3, the security provisions would be the same as for Alternative 1.

2.6.11 Alternative 3 Operations

Under Alternative 3, Folsom Dam would then have four methods of discharging flows from the reservoir: three power penstocks, eight flood control outlets (four upper tier and four lower tier, all 5 ft x 9 ft), five service and three emergency tainter spillway gates set near the main spillway crest, and six submerged tainter gates in the proposed 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.

In general, utilization of the features described in Alternative 3 would involve greater releases earlier in a major hydrologic event that closely match downstream channel capacity. The JFP Auxiliary Spillway would allow the objective release of 115,000 cfs to be achieved sooner in a flood event, and would lessen peak flows for large, infrequent hydrologic events. A maximum flood release of 160,000 cfs, which is the emergency downstream channel capacity, would be made through the Auxiliary Spillway when necessary based on observed and anticipated reservoir inflows. Emergency releases of 160,000 cfs or above would not be made any sooner with the JFP spillway features completed than would occur under the existing condition.

Maximum releases utilizing project features would not be any larger than those allowed under the existing conditions. These earlier flows would conserve flood storage space. In addition, the top of the flood control pool could be raised to increase the flood storage space. The top elevation of the flood space and the release diagram would be specified after the Corps and Reclamation are in agreement on the rate of increase in flows and dam safety freeboard.

It is anticipated that a revised Water Control Manual, and the supporting environmental compliance coordination and documentation would be completed one year prior to completion of construction of the project. However, if this does not occur, the project features would be operated under existing operating criteria. Under this scenario, the same amount of water would ultimately be released with and without the project features (due to operational constraints), but operators would have the ability to release more water sooner in a hydrologic event.

It is recognized that the full flood damage reduction benefits of the JFP spillway would not be fully realized until revision of the Water Control Manual and optimization of operation of the JFP spillway is in place.

<u>Downstream Effects</u> – Downstream impacts would remain the same as the Without Project Conditions. Releases would be made according to the Interim Flood Control Diagram until the new diagram was in place.

<u>Reservoir Vicinity Effects</u> – The need to protect non-government property from short-term temporary flooding and the actions available to the government would be similar those described for Alternative 2.

2.7 Alternative 4

Alternative 4 includes the combined flood damage reduction hydrologic control of the PMF by incorporating the JFP Auxiliary Spillway with 4 (rather than 6) submerged tainter gates. Alternative 4, the 7-ft Dam and Embankment Raise, would provide additional freeboard to all Folsom facilities, providing an additional margin of safety during a PMF event and would provide additional flood storage capacity, temporarily on an as-needed basis. The raise would not be used for additional reservoir water storage capacity. Alternative 4 includes the features presented in Table 2-19. The estimated quantities of materials required to construct Alternative 4 are provided in Table 2-20.

A 7-ft raise could be accomplished two different ways. First, the raise of the embankments could be accomplished using earthen material. Secondly, the raise could be accomplished through a combination of parapet walls and earthen material (essentially combining Alternatives 2 and 3). Each of the project components are described in greater detail in the following sections.

Table 2-19
Features of Alternative 4

Feature	***Project Component***
Main Concrete Dam	• 7-ft Raise to Non-overflow Sections • Post-tensioned anchors, shear key elements, toe blocks • Foundation drain enhancements • Significant spillway pier reinforcement • Replace existing spillway bridge • Spillway gate replacements • Stilling basin extension (50-75 ft)
Auxiliary Spillway	• Joint (PMF/Flood damage reduction) fully-lined spillway • Control structure – 4 submerged Tainter gates
Left and Right Wing Dams	• 3.5-ft earthen raise; 3.5-ft parapet wall raise • Toe drains • Full-height filters
Mormon Island Auxiliary Dam	• 7-ft earthen raise • Toe Drains • Full-height Filters • Jet grouting downstream foundation • Downstream overlay
Dikes 1, 2, 3, 7 and 8	• 7-ft earthen raise • Toe drains • Full-height Filters
Dikes 4, 5 and 6	• 7-ft earthen raise • Toe drain • Full-height filters
Non-Federal Property Protection	• New Embankment Protection • Acquisition of Property Rights (easements or fee title)
Miscellaneous	• Utility and road relocations • Haul road construction • Borrow site and staging area development • Stockpiling and borrow material processing • Concrete batch plant and jet grout processing • Excavation Blasting; Underwater blasting and dredging of material

Table 2-20 Estimated Quantities – Alternative 4						
Embankment Feature	**Estimated Quantities (cy)**					
	Excavation	**Shell Material**	**Slope Protection**	**Filter**	**Asphalt Pavement**	**Concrete**
Main Concrete Dam	50,000	0	0	0	0	25,000
Auxiliary Spillway	3,425,057	58,135	0	14,700	1,100	124,650
Right Wing Dam	268,500	23,000	3,300	71,000	2,000	7,200
Left Wing Dam	370,200	13,500	1,900	22,260	600	4,200
MIAD	235,300	905,000	5,600	246,450	1,520	0
Dike 1	23,000	75,900	4,600	0	900	0
Dike 2	20,400	56,300	4,100	0	960	0
Dike 3	11,800	37,500	2,600	0	660	0
Dike 4	14,200	48,000	3,100	3,060	380	0
Dike 5	40,500	140,700	4,500	53,420	510	0
Dike 6	35,700	98,300	3,200	16,140	450	0
Dike 7	2,400	64,500	1,700	11,520	440	0
Dike 8	4,700	21,500	1,500	6,100	210	0
TOTALS	4,501,757	1,542,235	36,100	444,650	11,030	161,050

2.7.1 Main Concrete Dam

Under Alternative 4, there would be a 7-ft concrete raise to the non-spillway portion of the dam structure and the existing spillway crest elevation would remain the same. Existing spillway gates would be replaced with larger gates because structural members for the existing gates would be impacted during the passage of large flood releases. The proposed gates would be higher with the tops of the three gates raised to 487.5 ft.

The eight existing spillway gates would be replaced with larger gates as part of the 7-ft raise alternative. A new spillway bridge would be constructed at the top of the piers on the upstream side of the new spillway gates to replace the existing bridge. Installation of the larger gates would require modification of the piers to prevent spillway flows from impacting the trunnion tie beams. The piers would not need to be widened. The proposed gates would be taller, and the new trunnions would be out of the flow stream for large floods. Secondly, the tops of the three existing emergency spillway gates, when closed, are at elevation 471 feet. This effectively limits the flood control operation to that elevation. Since it is proposed that the dam be raised to elevation 487.5, it is necessary to replace the existing spillway gates to allow water to be stored against the closed gate up to lake elevation 483 ft. Post tensioned anchors, shear key, or toe block elements would be installed to anchor the concrete structure. Standard construction equipment would be used to install the elements of Alternative 4. A staging area would be developed near the dam for a contractor's office and parking, materials storage, a concrete batch plant, and various construction-related activities. Cement and aggregate would be hauled to the staging area from local Sacramento area suppliers.

2.7.2 Stilling Basin

The stilling basin would be dewatered and extended 50 to 75 ft under Alternative 4.

2.7.3 4-Gate Auxiliary Spillway

The Auxiliary Spillway would be the same as under Alternative 3.

2.7.4 Left and Right Wing Dams

Under Alternative 4, the LWD and RWD would be raised 7-ft using earthen material. Construction would be similar to that described for Alternative 2 except full-height filters would be installed prior to placement of the earthen material

2.7.5 Mormon Island Auxiliary Dam

Under Alternative 4, MIAD would be subject to seismic, static, and hydrologic concerns in the same manner as Alternative 1.

2.7.6 Dikes 1, 2, 3, 7, and 8

Dikes 1, 2, and 3, adjacent to the Granite Bay staging area, would be subject to a 7-ft earthen raise. Borrow material for constructing the earthen raise would be developed at Granite Bay or Beal’s Point. Toe drains would be installed at the base of each dike to address static concerns.

Dikes 7 and 8 would receive treatments similar to Dikes 1, 2, and 3. However, since the dikes are located along the southern shore of the reservoir, work would be staged from Folsom Point. Borrow material for their construction would be taken from the Dike 7 stockpile area, D1/D2, MIAD, or materials that were stockpiled at Folsom Point.

2.7.7 Dikes 4, 5, and 6

Dikes 4, 5, and 6 would be subject to a 7-ft earthen raise. In addition to the construction of toe drains and the placement of more shell material, the dikes would be upgraded with full-height filters. Construction would be the same as described for Alternative 2.

2.7.8 New Embankments/Property Acquisitions

The raising of the reservoir pool elevation during a PMF event would have the potential for flooding areas beyond the boundaries of the Folsom Facility. The primary areas of concern are located along Mooney Ridge, north of Granite Bay, and along the eastern shoreline. The requirements for new embankments/flood easement are still under evaluation. A supplemental document would be required should Alternative 4 be selected.

2.7.9 Staging and Site Development

To construct Alternative 4, four staging areas (Granite Bay, Beal's Point, Overlook Parking Lot, Folsom Point) and two support areas (Main Concrete Dam and MIAD) would be proposed. Use of these areas would be the same as Alternative 2. Haul routes would be as presented in Section 2.2.4.

2.7.10 Alternative 4 Security Upgrade Features

Under Alternative 3, the security provisions would be the same as for Alternative 1.

2.7.11 Alternative 4 Operations

Alternative 4 would provide Folsom Dam with four methods of discharging flows from the reservoir: three power penstocks, eight flood control outlets (four upper tier and four lower tier, all 5 ft x 9 ft), five service and three emergency tainter spillway gates set near the main spillway crest, and four submerged tainter gates in the Auxiliary Spillway.

In general, utilization of the features described in Alternative 4 would involve greater releases earlier in a major hydrologic event that closely match downstream channel capacity. The Auxiliary Spillway would allow the objective release of 115,000 cfs to be achieved sooner in a flood event, and would lessen peak flows for large, infrequent hydrologic events. A maximum flood release of 160,000 cfs, which is the emergency downstream channel capacity, would be made through the Auxiliary Spillway when necessary based on observed and anticipated reservoir inflows. Emergency releases of 160,000 cfs or above would not be made any sooner with the project features completed than would occur under the existing conditions.

Maximum releases utilizing project features would not be any larger than those allowed under the existing conditions. These earlier flows would conserve flood storage space. In addition, the top of the flood control pool could be raised to increase the flood storage space. The top elevation of the flood space and the release diagram would be specified after the Corps and Reclamation are in agreement on the rate of increase in flows and dam safety freeboard.

It is anticipated that a revised Water Control Manual, and the supporting environmental compliance coordination and documentation would be completed one year prior to completion of construction of the project. However, if this does not occur, the project features would be operated under existing operating criteria. Under this scenario, the same amount of water would ultimately be released with and without the project features (due to operational constraints), but operators would have the ability to release more water sooner in a hydrologic event.

It is recognized that the full flood damage reduction benefits of the alternative would not be fully realized until revision of the Water Control Manual and optimization of operation of the JFP is in place.

Downstream Effects – Downstream impacts would remain the same as the Without Project Conditions. Releases would be made according to the Interim Flood Control Diagram until the new diagram was approved.

Reservoir Vicinity Effects – The need to protect non-government property from short-term temporary flooding and the actions available to the government would be similar to those described for Alternative 2, except for the following:

- More potentially impacted parcels due to the 7-ft raise height. Additional acquisition of flood easements and/or larger flood damage reduction berms (and associated flood damage reduction structure and access easements acquired if berms are located on non-Federal property).
- Potential acquisition of fee title of approximately nine non-federal properties, including approximately six residential properties.

2.8 Alternative 5

Alternative 5 would safely accommodate the PMF event by using the Main Concrete Dam spillways, including some overtopping of the center portion of the concrete dam, and increasing the flood surcharge without the need for an Auxiliary Spillway. The increased capacity would be used only to address flood damage reduction/dam safety considerations and not to increase the permanent storage capacity of Folsom Reservoir. Alternative 5 would include the features presented in Table 2-21. The estimated quantities of materials required to construct Alternative 5 are provided in Table 2-22. Each of the project components are described in greater detail in the following sections.

2.8.1 Main Concrete Dam

Under Alternative 5, there would be a 17-ft raise to the non-spillway portion of the dam structure; the existing spillway crest elevation would remain the same. Existing spillway gates would be replaced with larger gates because trunions for the existing gates would interfere with the passage of large flood releases. The proposed gates would be higher with the tops of the three gates raised to 487.5 ft. A new spillway bridge would be constructed at the top of the piers on the upstream side of the new spillway gates. Other features would be similar to Alternative 4.

2.8.2 Stilling Basin

There would be no change to the stilling basin under Alternative 5.

Table 2-21
Features of Alternative 5

Feature	Project Component
Main Concrete Dam	• 17-ft raise to non-overflow section • Post-tensioned anchors, shear key elements and/or toe blocks • Foundation drain enhancements • Replace existing spillway bridge • Spillway gate replacements • Gate and pier reinforcement • No change to stilling basin
Auxiliary Spillway	• None
Left and Right Wing Dams	• 17-ft earthen raise • Toe drains • Full-height filters
Mormon Island Auxiliary Dam	• 17-ft earthen raise • Toe drains • Full-height filters • Excavation and replacement of downstream foundation • Downstream overlay
Dikes 1, 2, 3, 7 and 8	• 17-ft earthen raise • Toe drains • Full-height filters
Dikes 4, 5 and 6	• 17-ft earthen raise • Toe drains • Full-height filters
Non-Federal Property Protection	• New Embankment Protection • Acquisition of Property Rights (easements or fee title)
Other Project Features	• Utility and road relocations • Haul road construction • Borrow site and staging area development • Stockpiling and borrow material processing • Concrete batch plant

Table 2-22
Estimated Quantities – Alternative 5

Embankment Feature	Estimated Quantities (cy)					
	Excavation	Shell Material	Slope Protection	Filter	Asphalt Pavement	Concrete
Main Concrete Dam	50,000	0	0	0	0	25,000
Auxiliary Spillway	0	0	0	0	0	0
Right Wing Dam	156,000	1,900,000	28,400	74,600	10,500	0
Left Wing Dam	66,000	590,000	9,400	23,900	31,000	0
MIAD	932,300	1,130,000	126,150	221,150	1,520	0
Dike 1	44,000	210,000	13,600	16,500	3,700	0
Dike 2	61,000	175,000	17,400	22,000	2,200	0
Dike 3	70,000	160,000	17,300	21,300	2,500	0
Dike 4	25,000	127,000	7,400	7,400	2,000	0
Dike 5	48,000	350,000	10,000	10,000	2,200	0
Dike 6	24,000+	190,000	7,400	7,400	2,000	0
Dike 7	14,500	105,000	4,600	10,200	1,050	0
Dike 8	26,000	75,000	9,600	13,000	950	0
TOTALS	1,516,800	5,012,000	94,700	537,650	63,400	25,000

2.8.3 Auxiliary Spillway

The Auxiliary Spillway would not be a component of Alternative 5.

2.8.4 Left and Right Wing Dams

Under Alternative 5, the LWD and RWD would be raised 17-ft using earthen material. Construction would be similar to that of Alternatives 2, 3, and 4.

2.8.5 Mormon Island Auxiliary Dam

Under Alternative 5, MIAD would undergo several treatments to address seismic, static, and hydrologic concerns, in the same manner as Alternative 2. The existing foundation would be excavated to remove potential unstable river cobble and then replaced with more competent material. To address static concerns, toe drains and full-height filters would be installed. A layer of existing shell material would be excavated and replaced with a layer of processed filter material. The original shell material would then be replaced, followed by the addition of more shell material creating the overlay. See Alternative 2 for more details.

2.8.6 Dikes 1, 2, 3, and 8

Dikes 1, 2, 7 and 8 would be subject to a 17-ft earthen raise in the same manner as Alternative 4.

2.8.7 Dikes 4, 5 and 6

Dikes 4, 5 and 6 would be subject to a 17-ft earthen raise in the same manner as Alternative 4.

2.8.8 New Embankments/Property Acquisitions

The raising of the reservoir pool elevation during a PMF event would have the potential to flood areas beyond the boundaries of the Folsom Facility. The primary areas of concern are located along Mooney Ridge, north of Granite Bay, and along the eastern shoreline. The requirements for new embankments/flood easement are still under evaluation. A supplemental document would be required should Alternative 5 be selected.

2.8.9 Staging and Site Development

Staging and site development would be the same as described for Alternatives 2, 3, and 4. Internal haul routes would be the same as described in Section 2.2.4.

2.8.10 Alternative 5 Security Upgrade Features

Under Alternative 5, the security provisions would be the same as for Alternative 1.

2.8.11 Alternative 5 Operations

Alternative 5 has been maintained and carried through the entire NEPA process because it is the only alternative that could contain and then pass the PMF without a spillway. The 17-ft raise was designed to contain to contain the design flood and pass it without overtopping the downstream levees. Variations in releases utilizing project features would not be any larger than those allowed under the existing conditions. In addition, the top of the flood control pool would be raised significantly to increase the flood storage space. Alternative 5 would allow significantly larger timeframe for the evacuation of downstream communities.

Downstream Effects – Downstream impacts would remain the same as the Without Project Conditions. Releases would be made according to the Interim Flood Control Diagram.

Reservoir Area Effects – The need to protect non-government property from short-term temporary flooding and the actions available to the government would be the similar to those described for Alternative 2 except for the following:

- More potentially impacted parcels due to the 17 ft raise height. Additional acquisition of flood easements and/or larger flood damage reduction berms (and associated flood damage reduction structure and access easements acquired if berms are located on non-Federal property).

- 45 parcels potentially affected by acquisition of fee title, including 37 possible residential relocations.

- The acquisition of fee title and residential relocations of some impacted non-federal parcel(s) under Alternative 5 is probably unavoidable**.**

2.9 Construction Sequencing and Other Construction Details

Project staging, area development, borrow development, and facility construction would be phased over an 8-year period. Not all activities would occur at the same time, with the most significant risk issues being addressed first. A preliminary proposal for project sequencing is presented in Table 2-23.

The priorities for project sequencing would be to initiate work on those facilities providing the greatest risk reduction benefit. This strategy would incrementally improve dam safety and flood damage reduction benefits until the final project feature was constructed. The phased construction approach also allows for development and implementation of specific manageable “work packages” addressing both construction logistics and federal budgetary considerations. The work packages would be accomplished through the issuance of separate construction bids. Each work package would be sized to optimize meeting project objectives and priorities along with the availability of on-site and off-site materials necessary to construct the phased project feature.

Table 2-23
Folsom Project Generalized Sequencing of Construction

	Construction Year							
Project Feature	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***
Folsom Point Staging	X	X	X	X	X	X	X	X
Auxiliary Spillway Excavation	X	X	X	X				
Auxiliary Spillway Construction				X	X	X	X	X
MIAD Jet Grouting	X	X	X					
MIAD Overlay				X	X			
Beal's Point Staging		X	X	X	X	X	X	X
Beal's Point Borrow Development		X	X	X				
Dikes 5 & 6 Construction		X						
LWD Construction						X	X	
RWD Construction			X	X	X			
Dikes 7 & 8 Construction							X	X
Granite Bay Borrow Development							X	X
Dikes 1, 2, 3, 4 Construction							X	X
Main Concrete Dam Seismic Upgrade					X	X	X	X
Main Concrete Dam Gates Reinforcement							X	X
Security Features	X	X	X	X	X	X	X	

2.10 Environmental Commitments

The following environmental commitments would be implemented where applicable, in association with construction activities for the Folsom DS/FDR. These measures are consistent with the impact analyses and mitigation measures for those impacts presented in Chapter 3 of this EIS/EIR. The environmental commitments section was developed by Reclamation and the Corps; however, the commitments would be implemented by each agency in accordance with each agency's policy, guidance, and authorities. Final determination by the federal agencies on actual mitigation measures will be specified in the Record of Decision (ROD).

2.10.1 Develop and Implement a Worker Environmental Awareness Program

Construction contractor and subcontractor personnel will be required to participate in and comply with an environmental awareness program provided by Reclamation and the Corps. This program would include, but is not limited to (1) awareness regarding federal, state, and local environmental laws and regulations and permits, as well as the penalties for noncompliance with environmental requirements and conditions: (2) special-status species, as well as their habitats; (3) required avoidance areas; (4) environmental commitments, mitigation, compensation, and restoration. A member of the contractor's management staff would participate in the training sessions to discuss the contractor's environmental commitment plans. If deemed necessary, after the completion of each training session, each employee would be required to sign a statement indicating that he/she has received the training.

2.10.2 Obtain and Implement the Conditions of the Environmental Permits

Reclamation and the Corps will obtain their respective required state and federal permits, unless the contractor will be required to obtain some of the permits, for the Folsom DS/FDR actions and will comply with all conditions included in those permits. Where appropriate, the permit conditions would be incorporated into the project engineering plans and specifications. These permits would include, but may not be limited to, the following:

- Section 176 of the Clean Air Act,
- Section 404 of the Clean Water Act,
- Section 402 of the Clean Water Act. National Pollutant Discharge Elimination system permit,
- Section 401 of the Clean Water Act, Water Quality Certification,
- Section 7 of the federal Endangered Species Act, and
- Section 106 of the National Historic Preservation Act.

2.10.3 Designate Work and Exclusion Zones

Reclamation, the Corps and/or their construction contractor(s) would ensure that construction equipment and associated activities would be confined to the designated work zone in areas that support sensitive resources. The designated work zone would be fenced to clearly delineate the zone as well as keep unauthorized entry into the exclusion zone during construction.

Exclusion zones would be delineated in the field by qualified biologists and fenced at the appropriate or required distance. All fences would have signs attached that identify each area as an *Environmentally Sensitive Area*. The fencing would be installed before construction activities begin and would be maintained throughout the construction period.

During the environmental education program, construction personnel would be informed about the importance of avoiding ground-disturbing activities outside of the designated work zone. During construction, the constructions monitors and resource monitors would ensure that construction equipment and associated activities avoid any disturbance of sensitive resources outside the designated work zones (e.g., riparian zones, including root zones under drip lines, wetlands, springs, and seeps). Environmental monitors would conduct surveys, as appropriate for threatened and endangered species and special-status species. The Plans and Specifications for each agency would include the following or similar measures:

- Use and storage of construction equipment would be confined to within the designated contractor use area limits.
- Existing roads and access points would be used to the extent possible to minimize disturbance to wildlife and their habitats.
- Staging areas, borrow material sites, parking locations, stockpile areas, and storage areas would be clearly marked and monitored.
- To the extent feasible, these facilities would be located outside of sensitive habitats.

2.10.4 Dewatering of the Stilling Basin

The contractor responsible for dewatering the stilling basin would prepare a fish removal and recovery plan that would be reviewed by a qualified fish biologist. A fish removal and recovery plan would be developed in conjunction with CDFG and USFWS in advance of dewatering the stilling basin. During dewatering and construction, the Corps, in consultation with CDFG and USFWS, would ensure that a qualified biologist is on site to implement a fish rescue operation. Fish would be removed in accordance with the CDFG and USFWS approved fish removal and recovery plan.

Fish would be counted and recorded by species. All fish would be released in the live channel downstream of the construction area unless it is determined these fish are downstream migrants that should be released downstream of the affected areas.

2.10.5 Implement Environmental Timeframes

When possible and practicable, habitat removal would occur during the non-breeding season and at times when protected species are not present. Construction activities that could adversely affect nesting birds and their habitat would be limited to the nonbreeding period, per the Migratory Bird Treaty Act.

2.10.6 Develop an Environmental Mitigation, Monitoring, Restoration Plan

As part of the environmental commitments, Reclamation and the Corps would develop a Mitigation Monitoring, and Reporting Plan (MMRP) that would describe the environmental commitments, mitigation, and reporting requirements of the Folsom DS/FDR Action. The document would be developed through coordination with the state and federal agencies responsible for oversight of the Folsom DS/FDR Action. This plan would provide detailed information on how each mitigation measure would be implemented and monitored during the preconstruction, construction, and post-construction periods, as is required. The plan would contain the following documents to be implemented during the construction phase:

- Stormwater pollution prevention plan (SWPPP) (including specific erosion control and site reclamation measures),
- Spill prevention and countermeasure plan,
- Habitat mitigation plan, including a wetland and riparian mitigation and monitoring plan,
- Migratory Bird Treaty Act compliance program, and
- Environmental compliance monitoring program.

General information describing each plan is provided in the following sections.

2.10.6.1 Stormwater Pollution Prevention Plan

Reclamation and the Corps and /or their construction contractor(s) would prepare and implement a SWPPP as part of the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activities (General Permit). The SWPPP would include measures to minimize erosion and sediment transport. It would include:

- Best management practices (BMPs) (e.g., sediment containment devices, protection of construction spoils, proper installation of cofferdams);
- Site restoration;
- Post-construction monitoring of the effectiveness of BMPs;
- Contingency measures;
- Details about contractor responsibilities;
- A list of responsible parties; and
- A list of agency contacts.

Contingent upon the conditions and the type of construction, measures in the plan may include, but are not limited to:

- Avoiding work or equipment operation in water during in-reservoir activities by constructing cofferdams and diverting all water around construction sites;
- Conducting all construction work according to site-specific construction plans that minimize the potential for sediment input to the aquatic system, including constructing silt barriers immediately downstream of the construction site and minimizing disruption of the reservoir bed at and adjacent to the construction site;
- Using sedimentation fences, hay bales certified as weed-free, sandbags, water bars, and baffles as additional sources of protection for waters, ditches, and wetlands;
- Identifying all areas requiring clearing, grading, revegetation, and recontouring and minimizing the areas to be cleared, graded, and recontoured;
- Storing construction borrow and excavated material out of the reservoir (above the ordinary high-water mark) and protecting receiving waters from these erosion source areas with sedimentation fences or other effective sediment control devices;
- Grading spoil sites to minimize surface erosion; and
- Covering bare areas with mulch and revegetating all cleared areas with appropriate native, noninvasive species.

The Central Valley Regional Water Quality Control Board (CVRWQCB) would monitor compliance with the NPDES General Permit. An application for a waste discharge permit would be filed with the CVRWQCB, and compliance with the monitoring and reporting requirements for project construction is necessary.

2.10.6.2 Spill Prevention and Countermeasure Plan

Before construction begins, Reclamation and the Corps and/or their construction contractor(s) would prepare a spill prevention and countermeasure plan (SPCP) that includes strict on-site handling rules to keep construction and maintenance materials out of drainages and the waterway. Goals of this plan would be to:

- Prevent contamination of streamside soil and the water course from cement; concrete or concrete washing; asphalt; paint, or other coating materials; oil or cleanup procedures;
- Clean up spills immediately and notify the CVRWQCB immediately of any spill and cleanup procedures;
- Prepare, prior to construction, a spill control and response plan and restrict the volume of petroleum products allowed on site to the volume that can be addressed by the spill control and response measures included in the plan;
- Provide staging and storage areas outside the stream zone for equipment, construction materials, fuels, lubricants, solvents, and other possible contaminants;

- Store hazardous substances in staging areas at least 100 feet from the reservoir normal high water mark and other water surfaces;
- Perform refueling and vehicle maintenance at least 100 feet from receiving waters
- Minimize equipment operations in flowing water and remove vehicles from the normal high-water area before refueling and lubricating; and
- Inspect equipment to ensure that seals prevent any fuel, engine oil, or other fluids from leaking.

The measures listed above would be implemented, as appropriate, to prevent contamination, clean up spills, provide staffing and storing areas, and minimize equipment operations in flowing water. The State Water Board would monitor compliance with these measures and the SPCP.

2.10.6.3 Habitat Mitigation Approach

Reclamation and the Corps, in consultation with USFWS and CDFG, would mitigate permanent and temporary habitat impacts associated with the Folsom DS/FDR actions on or offsite with appropriate habitat mitigation. Permanent impacts associated with the Folsom DS/FDR actions would be compensated for based on the Fish and Wildlife Coordination Act Report (FWCAR). The mitigation approach for permanent impacts presented herein includes consideration of the FWCAR requirement for compensation needs for seasonal wetland, riparian, chaparral, oak/pine woodland and upland (oak woodland) habitats.

The Folsom DS/FDR MMRP would address those actions that would avoid and minimize adverse effects and mitigates the loss of habitat on site to the extent possible.

2.10.6.4 Wetland and Riparian Mitigation and Monitoring Plan

Reclamation and the Corps, in consultation with USFWS and CDFG, would prepare and implement as part of the MMRP, a wetland and riparian mitigation plan to mitigate impacts on wetlands subject to Corps 404 jurisdiction in the Folsom DS/FDR action area. The plan would provide the Corps and USFWS with sufficient information to determine the adequacy of the proposed mitigation and to issue a Section 404 permit. The Corps would approve the plan prior to project construction activities that affect the Corps jurisdictional areas in the project area.

The plan would be prepared to meet the specifications and mitigation requirements pertaining to Corps jurisdictional areas specified in the Final FWCAR prepared for the project.

To the degree required, a plan would also be provided to the state Water Board to determine the adequacy of the proposed mitigation with respect to water quality and to issue a Section 401 water quality certification for the project.

The goal of the mitigation effort is to avoid and minimize adverse effects on wetland and riparian habitat, as well as replace the acreage, function, and values of wetlands and riparian habitat permanently affected by the project. To support this goal, the wetland and riparian mitigation plan would meet the following objectives:

- Provide compensatory mitigation for permanent impacts;
- To the extent practicable, provide in-kind replacement of habitat;
- Restore habitats that have been temporarily affected by Folsom DS/FDR actions from construction to predisturbance conditions if appropriate;
- Integrate concerns for special-status species (e.g., valley elderberry longhorn beetle; vernal pool fairy shrimp) into the mitigation design to the degree practicable; and
- If possible, design the mitigation wetlands so that, once established, they would require no maintenance.

Reclamation and the Corps would submit a performance monitoring report to the Corps regulatory branch at the end of each monitoring year. The report would summarize monitoring methods, results, progress toward meeting the final performance standards, and corrective actions taken.

2.10.6.5 Migratory Bird Treaty Act Compliance Program

Reclamation and the Corps and/or their construction contractor(s) would implement the following mitigation measures as practical for all project construction:

1. Known or potential nesting and roosting sites, such as live trees with cavities and all snags and stumps, would be avoided to the extent practicable.
2. Nests of raptors or any other bird would be managed per the Migratory Bird Treaty Act.
3. To the extent possible, construction activities that could adversely affect nesting birds and rearing of young would be avoided during the period between September 1 and February 1, per the Migratory Bird Treaty Act.
4. If possible, habitat providing nesting cover for birds, such as grassland, chaparral, oak woodland, and riparian that must be removed for construction purposes, would be removed between September 1 and February 1 prior to construction.
5. Construction sites would be monitored for bird nesting activity during the breeding season to the extent possible.
6. If disturbance of a nest with eggs or young appears unavoidable, or nesting activity such as incubation of feeding of young may be affected, a project contact at USFWS and CDFG would be consulted before disturbance occurs.
7. If potential nesting habitat can not be avoided during the breeding season, a project contact at USFWS and CDFG would be consulted before disturbance occurs.

2.10.6.6 Environmental Compliance Monitoring Program

Reclamation and the Corps would develop an environmental compliance construction monitoring program to ensure that the mitigation measures and compensation measures identified in the Folsom DS/FDR EIS/EIR are implemented in an appropriate and timely manner. As part of this construction monitoring program, the need to have qualified biologists, environmental resource specialists, or archeologists to monitor construction activities near environmentally sensitive area, including areas that support threatened, endangered, and special-status species; migratory bird nesting; woody riparian vegetation; wetlands and perennial drainage crossings; and cultural sites, would be addressed.

Construction monitors would be responsible for regular preconstruction surveys, staking resources, on-site monitoring, clearing equipment and vehicle staging areas, documentation of violations and compliance, coordination with construction inspectors, and post-construction documentation. Resource monitors would be responsible for various activities, which may include monitoring work zones and communicating regularly with construction inspectors to ensure that barrier fencing, stakes, required setback buffers, and all other measures are maintained.

The roles and responsibilities of the resource monitors and other individuals on the project compliance documentation, and the elements of the environmental compliance monitoring program would be clearly outlined in the implementation plan.

2.10.7 Transportation

The lead construction agency would develop a traffic management plan for all public roads within the recreation areas where both public and construction traffic occur. The plan would include measures such as flagmen and appropriate signage. The traffic plan would be submitted to the appropriate entities, or included in the Plans and Specifications for construction. An appropriate mile per hour speed limit would be imposed in all public areas close to construction. Construction crews and traffic would utilize internal haul routes, to the extent practical.

2.10.8 Air Quality

Reclamation and the Corps would develop an Air Quality Compliance Plan for approval by the Sacramento Metropolitan Air Quality Management District (SMAQMD) outlining compliance with air quality regulations for the Folsom DS/FDR actions. The plan would demonstrate that heavy-duty (> 50 horsepower) 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 NO_x reduction and 45 percent particulate reduction compared to the most recent CARB fleet average at time of construction. The plan would include a comprehensive inventory of all off-road construction equipment, equal to or greater than 50 horsepower, 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 production year, and projected hours of use or fuel throughput for each piece of equipment. The inventory would be updated and submitted monthly throughout the duration of the project, except that an inventory shall not be required for any 30-day period in which no construction activity occurs. At least 48 hours prior to the use of subject heavy-duty off-road equipment, Reclamation and the Corps shall provide SMAQMD with the anticipated construction timeline including start date, and name and phone number of the project manager and on-site foreman.

The Air Quality Compliance Plan would also describe all air quality mitigation measures and actions taken to comply with the requirements. The Plan would include a discussion of locations for points of compliance and monitoring necessary to demonstrate compliance with air quality regulations.

2.10.9 Noise Abatement

Reclamation and the Corps would develop a Noise Abatement Plan addressing the measures to reduce construction noise levels at sensitive receptor locations. Included in the plan would be the proposed noise monitoring locations, discussion of noise mitigation measures, and a construction contact phone number for the local populace to present noise issues.

2.10.10 Recreation

Reclamation and the Corps would continue to coordinate with DPR to identify opportunities to, avoid significant recreation impacts at FLSRA. If significant recreation impacts cannot be avoided, the agencies would work within their guidance and authority to provide mitigation for these impacts. Final determination by the federal agencies on actual mitigation measures will be specified in the ROD. Potential mitigation measures could include but are not limited to the measures listed below.

All construction-related damages to recreation facilities would be replaced in kind by the appropriate agency, in accordance with policy and guidance.

The lead construction agency, would post signage and public announcements to inform the public of construction activities, facility closures at Folsom Point, and potential increased crowding and waiting times at Beal’s Point and Granite Bay.

Construction, borrow and staging areas would be sited as far away from recreation areas as practical in order to minimize recreation impacts, as determined by the lead construction agency. When a staging area cannot be moved or relocated, appropriate measures would be taken for noise and safety considerations.

Borrow development, staging and construction activities would be re-contoured by the lead constructing agency, as appropriate, to pre construction conditions, or to contours which do not pose a safety hazard.

After all construction activities are complete at Beal's Point, Folsom Point, or Granite Bay, all disturbed recreation areas and facilities would be restored as closely as possible to pre-construction conditions.

The lead construction agency would include in the plans and specifications, if appropriate, a plan to ensure that the entrance stations at Beal's Point, Folsom Point and Granite Bay would meet public safety and traffic requirements during construction.

Construction hours would be scheduled to minimize impacts during peak recreation use periods, holidays, and special events, as practical.

The lead construction agency would develop a traffic management plan for all public roads within the recreation areas where both public and construction traffic occur. The plan would include measures such as flagmen and appropriate signage. The traffic plan would be submitted to the appropriate entities, or included in the Plans and Specifications for construction. An appropriate mile per hour speed limit would be imposed in all public areas close to construction. Construction crews and traffic would utilize internal haul routes, to the extent practical.

Suitable detours would be established, with appropriate signage, for any bike, equestrian, or pedestrian trails that are interrupted by construction, per agency guidance and policy. Public service announcements would also be distributed and posted to inform the public of route changes.

Any damage to existing improved trails from construction would be repaired in kind after construction is completed by the lead construction agency, per agency policy and guidance.

2.11 Environmentally Preferred Alternative

Table 2-24 provides a relative comparison of impacts among the five Folsom DS/FDR action alternatives. Aggregated in this table are the resource impacts evaluated in Chapter 3, which provide the basis of comparison among the alternatives. The four major categories used to assess relative impacts include the degree the alternative meets the Purpose and Need, and effects to physical resources, natural resources, and sociological resources. The two major factors related to the Purpose and Need are dam safety and flood damage reduction. The physical resources category incorporates the air quality, noise, water quality/supply, and geology/soils effects resulting from each alternative. In natural resources, the effects on aquatic, vegetation, and wildlife resources are evaluated for each alternative.

Sociological resources were characterized the impacts of each alternative on cultural resources, land use, recreation, transportation, and public utilities.

Table 2-24
Comparison of Alternatives and the Environmentally Preferred Alternative

Evaluation Category	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**
Purpose and Need	5	4	1	2	3
Physical Resources	1	3	2	4	5
Natural Resources	1	3	2	4	5
Sociological Resources	1	2	3	4	5
Total	**8**	**12**	**8**	**14**	**18**

Rankings within each resource category are based on a relative scale of 1 through 5. A score of 1 indicates the alternative that best meets the Purpose and Need of the five action alternatives and/or the alternative with the least impact(s) for that resource category. A score of 5 represents the alternative that least meets the Purpose and Need or for that resource category having the largest adverse impact(s). The total score for each alternative represents the sum of the resource category rankings for the alternative, with the lowest scores indicating the environmentally preferred alternative.

The No Action Alternative is the least environmentally damaging of all the alternatives, but the No Action Alternative does not meet any of the requirements in the Purpose and Need for the Folsom DS/FDR actions. Based on the comparative analysis, Alternatives 1 and 3 scored equally as the environmentally preferred alternative. Under Alternative 1, there would be fewer overall physical, natural, and sociological resources impacts due to the more limited actions taken for the majority of dikes. However, the fuseplug Auxiliary Spillway has been designed for dam safety purposes only to operate for a PMF or extreme flood event to maintain the integrity of the Folsom Facility, and not to minimize flood damage reduction. The JFP spillway fully addresses the Purpose and Need with slightly more impacts. Therefore, Alternative 3 is the Environmentally Preferred Alternative.

2.12 Areas of Controversy and Unresolved Issues

This section presents aspects of the Folsom Joint Federal Project that could not be addressed in detail in this EIS/EIR. The issues described below require greater detail development or better definition before they can be incorporated into the detailed environmental analysis. Some of the areas discussed herein may need to be addressed in supplemental environmental documents.

- Auxiliary Spillway Approach Channel Dredging and Barging of Dredge Material – Portions of the Auxiliary Spillway approach channel would be excavated using a barge mounted dredge, with the spoils placed on barges. In order for the impacts of dredging and barging to be fully described, the following details would need to be developed.
    - Size of barges and types of tug boats
    - Shore/docking facilities, location, and sizing
    - Mechanisms for dredging, loading, and off-loading materials
    - Seasonality and expected volume of barge traffic
    - Dewatering and placement of dredged materials
- Cofferdams – The potential requirement of cofferdams for construction of the Auxiliary Spillway inlet, the storage of borrow material, and for the expansion of staging areas is introduced in this EIS/EIR and is analyzed at a programmatic level. However, in order to fully disclose impacts of the cofferdams, details are required as to:
    - Type of dam
    - Dam construction materials
    - Restoration of cofferdam site after it is not longer required
- New Embankments/Flood Easement Requirements – Each alternative that involves increasing the reservoir's water surface elevation would need additional measures to retain reservoir water. The general locations of new embankments have been identified and are evaluated on a programmatic level in this EIS/EIR. What has not been determined is the number of dikes required for each alternative, size of the dikes, construction methods, access for maintenance, etc. If an alternative with a raise feature is identified as the Proposed Project, then the analysis of the new embankments would need to be conducted and reported in a supplemental environmental compliance document.

- Extension of Dike 1 for Hydrologic Dam Safety. Recent evaluation of effectiveness of Dike 1 to retain reservoir water during an extremely large flood event, under existing conditions, indicates that Dike 1 may not be able to retain the reservoir at its location. Extension of Dike 1 may be warranted. Details regarding its extension were not available at the time of development of this EIS/EIR. Effects of the project would be discussed in a supplemental document by the Corps.

Chapter 3
Affected Environment, Impacts Analyses, and Mitigation Measures

Introduction

This chapter presents an assessment of the environmental impacts associated with each of the six alternatives currently being considered for the Folsom DS/FDR, specifically the No Action/No Project Alternative and the five action alternatives described in Chapter 2. This chapter describes the existing physical environment at and about the Folsom DS/FDR site, and delineates the potential impacts that may result from construction of the various improvements proposed under each alternative. Also included is a discussion of mitigation measures, as well as a description of potential cumulative effects associated with implementation of the Folsom DS/FDR and other projects nearby.

Organization of the Chapter

Each of the 19 environmental topics addressed in this chapter is discussed in a separate section using a common organization, as follows:

- The **Affected Environment/Existing Conditions** subsection discusses the affected environment within a defined geographic area (i.e., Area of Analysis) relative to the Folsom DS/FDR site, and includes an overview of pertinent environmental regulations (i.e., Regulatory Setting) and a description of the existing conditions (i.e., Environmental Setting).

- The **Environmental Consequences/Environmental Impacts** subsection presents the analysis of impacts associated with implementation of each alternative. The subsection begins with an explanation of the assessment method(s) used to identify and address potential impacts and then presents the basis and criteria for determining whether the potential impacts are significant. The need for determining whether or not a potential impact is significant is particular to the requirements of CEQA, and provides the basis for subsequently determining, under CEQA, whether mitigation of that impact is warranted (i.e., under CEQA, impacts determined to be less than significant do not require mitigation). Under NEPA, there is not the same emphasis to determine whether the impact is significant or not, but rather the focus is on disclosing the overall nature and magnitude of environmental impacts associated with each of the alternatives considered, which, when compared amongst and between the individual alternatives, will assist decision-makers in choosing a course of action. The impacts analysis presented in this chapter of the Folsom DS/FDR joint

EIS/EIR serves to meet the requirements of both NEPA and CEQA. The analysis presented herein discloses and compares the environmental impacts associated with each of the alternatives, identifies those impacts that are considered significant, and provides recommended mitigation measures where appropriate. The analysis presented in this chapter also meets the requirements of both NEPA and CEQA relative to the baseline from which impacts are measured. Under NEPA, the environmental impacts of each action alternative are measured against the environmental conditions that would otherwise occur if no action was taken (i.e., the impacts of each action alternative are measured from the conditions anticipated for the No Action Alternative). Under CEQA, the impacts of a proposed project are measured against the environmental conditions that currently exist. In the case of the Folsom DS/FDR, no notable changes in existing environmental conditions are anticipated to occur under the No Action Alternative because no substantial improvements to the Folsom Facility are expected to occur under that scenario (see Chapter 2). As such, the impacts associated with each action alternative as measured from the No Action Alternative would be the same as measured from existing conditions.

- The **Comparative Analysis of Alternatives** subsection is based on the conclusions of the analysis described above and focuses on how certain impacts associated with the subject environmental topic are greater, less, or the same between the individual alternatives.

- The **Mitigation Measures** subsection provides recommended mitigation measures based on the results and conclusions of the impacts analysis.

- The **Cumulative Effects** subsection addresses the impacts of the project in conjunction with past, present, and probable future projects (under CEQA), or reasonably foreseeable future projects (under NEPA), in or near the area. In general, the environmental impacts of the project may be individually minor, but collectively significant when considered in conjunction with other projects or other environmental effects of the project. Of particular note relative to CEQA is whether the project's contribution to such impacts is cumulatively considerable. Chapter 5 provides the more detailed explanation of how cumulative effects are addressed in this EIS/EIR, and describes the other projects, which in conjunction with the proposed Folsom DS/FDR, form the basis of the cumulative projects. Those other projects include: (1) construction of the New Folsom Bridge downstream of the Folsom Main Concrete Dam; (2) the Future Redundant Water Supply Intake and Pipeline for Roseville, Folsom, and San Juan Water District, which is a new 84-inch-diameter inlet water pipe connected to the proposed Auxiliary Spillway side approach channel; (3) the Folsom Dam Road Closure, which occurred in 2003; (4) the L.L. Anderson Dam, which will widen the spillway of French Meadows Reservoir; (5) the Lower American River Common Features Project, which includes a number of levee stabilization projects; (6) the

Long-Term Reoperation of Folsom Dam and Reservoir, which would provide for reoperation of Folsom Reservoir, the specifics of which would be defined and addressed as part of a separate future EIS/EIR; and (7) the Sacramento Municipal Utility District 230 kV Transmission Line Relocation, which calls for relocation of existing electricity transmission lines and towers due to the construction of the New Folsom Bridge.

3.1 Hydrology, Water Quality, and Groundwater

This section discusses the effects that construction of any of the Folsom DS/FDR alternatives may have on hydrology, water quality, groundwater resources, and jurisdictional wetlands in the construction area.

3.1.1 Affected Environment/Existing Conditions

This section describes the hydraulic features and hydrologic conditions, including the groundwater setting and jurisdictional wetlands, in the construction area. Existing hydrologic conditions and groundwater resources potentially affected by the alternatives are also identified in this section, along with regulatory settings and regional information pertaining to hydrologic and groundwater resources in the area of analysis.

3.1.1.1 Area of Analysis

The area of analysis for this section includes Folsom Reservoir and the area surrounding the reservoir. Lake Natoma is evaluated as a receiving body of water in regards to water quality impacts.

3.1.1.2 Regulatory Setting

Federal Regulations

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the U.S. and gives the USEPA the authority to implement pollution control programs such as setting wastewater standards for industries (USEPA 2002). In certain states such as California, the USEPA has delegated authority to state agencies.

Section 303(d) of the 1972 CWA requires states, territories and authorized tribes to develop a list of water quality-impaired segments of waterways. The list includes waters that do not meet water quality standards necessary to support the beneficial uses of that waterway, even after point sources of pollution have installed the minimum required levels of pollution control technology.

The law requires that these jurisdictions establish priority rankings for water on the lists and develop action plans, called Total Maximum Daily Loads (TMDLs), to improve water quality (USEPA 2002). A TMDL is a tool for implementing water quality standards and is based on the relationship between pollution sources and in-stream water quality conditions. The TMDL establishes the allowable daily pollutant loadings or other quantifiable parameters (e.g., pH or temperature) for a waterbody and thereby provides the basis for the establishment of water quality-based controls. These controls should provide the pollution reduction necessary for a waterbody to meet water quality standards. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation for establishment of TMDLs for each waterbody must include a margin of safety to ensure that the waterbody can be used for the purposes the State has designated. Additionally, the calculation also must account for seasonal variation in water quality (USEPA 2002).

Sedimentation/siltation impacts are the primary water quality parameters of concern with construction of the alternatives. The lower American River and Folsom Reservoir are not listed on the Central Valley Regional Water Quality Control Board (CVRWQCB) 2002 303(d) list of water quality impaired segments for sedimentation/siltation. Therefore, there has not been a TMDL developed for this area concerning sediment impacts.

Water quality of waters of the United States subjected to a discharge of dredged or fill material is regulated under Section 401 of the CWA. These actions must not violate federal or state water quality standards. Specifically in the State of California, the applicable Regional Water Quality Control Board (RWQCB) administers Section 401 and either issues or denies water quality certifications depending upon whether the proposed discharge or fill material complies with applicable State and Federal laws. In addition, policies and regulations governing the protection of the beneficial uses of the State's water resources must also be followed.

In addition to complying with state and federal water quality standards, all point sources that discharge into waters of the United States must obtain a National Pollutant Discharge Elimination System (NPDES) permit under provisions of Section 402 of the CWA. In California, the State Water Resources Control Board (SWRCB) and RWQCBs are responsible for the implementation of the NPDES permitting process at the state and regional levels, respectively.

The NPDES permit process also provides a regulatory mechanism for the control of non-point source pollution created by runoff from construction and industrial activities, and general and urban land use, including runoff from streets. Projects involving construction activities (e.g., clearing, grading, or excavation) involving land disturbance greater than one acre must file a Notice of Intent (NOI) with the CVRWQCB to indicate their intent to comply with the State General Permit for Storm Water Discharges Associated with Construction Activity (General Permit). The General Permit establishes conditions to minimize sediment and pollutant loadings and requires preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP) prior to construction. The SWPPP is intended to help identify the sources of sediment and other pollutants, and to establish Best Management Practices (BMPs) for storm water and non-storm water source control and pollutant control.

The CWA also requires that a permit be obtained from the USEPA and the Corps when discharge of dredged or fill material into wetlands and waters of the United States occurs. Section 404 of the CWA requires the USEPA and Corps to issue individual and general permits for these activities. When performing its own civil works projects, the Corps does not issue itself these permits, rather, the Corps must apply the guidelines and requirements of Section 404 as stated in Corps regulations.

The federal Safe Drinking Water Act (SDWA) was established to protect the quality of drinking water in the United States. This law focuses on all waters actually or potentially designated for drinking use, whether from above ground or underground sources. The SDWA authorized the USEPA to establish water quality standards and required all owners or operators of public water systems to comply with primary (health-related) standards. State governments, which assume this power from the USEPA, also encourage attainment of secondary standards (nuisance-related). Contaminants of concern in a domestic water supply are those that either pose a health threat or in some way alter the aesthetic acceptability of the water. These types of contaminants are currently regulated by the USEPA as primary and secondary maximum contaminant levels (MCLs). As directed by the SDWA amendments of 1986, the USEPA has been expanding its list of primary MCLs. MCLs have been proposed or established for approximately 100 contaminants.

The federal Surface Water Treatment Rule (SWTR) became effective on June 19, 1989. The California Surface Water Treatment Rule (California's SWTR), which implements the federal SWTR within the state, became effective in June 1991. The California SWTR satisfies the following 3 specific requirements of the SDWA:

- Establishes criteria for determining when filtration is required for surface waters;
- Defines minimum levels of disinfection for surface waters; and
- Addresses *Giardia lamblia*, viruses, *Legionella*, turbidity, and heterotrophic plate counts by establishing treatment techniques in lieu of MCLs due to high treatment costs and technological requirements in measuring these contaminants.

State Regulations

The Porter-Cologne Water Quality Control Act of 1970 established the SWRCB and nine RWQCBs within the State of California. These groups are the primary state agencies responsible for protecting California water quality to meet present and future beneficial uses and regulating appropriative surface rights allocations. The preparation and adoption of water quality control plans, or Basin Plans, and statewide plans, is the responsibility of the SWRCB. State law requires that Basin Plans conform to the policies set forth in the California Water Code beginning with Section 13000 and any State policy for water quality control. These plans are required by the California Water Code (Section 13240) and supported by the Federal CWA. Section 303 of the CWA requires states to adopt water quality standards which "*consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses.*" According to Section 13050 of the California Water Code, Basin Plans consist of a designation or establishment for the waters within a specified area of beneficial uses to be protected and water quality objectives to protect those uses. Adherence to Basin Plan water quality objectives protects continued beneficial uses of waterbodies.

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 Code Federal Regulations [CFR] 131.20).

One significant difference between the State and Federal programs is that California's Basin Plans establish standards for groundwater in addition to surface water. The Basin Plans include provisions to prevent degradation and require clean up of groundwater quality problems. These provisions address local problems such as underground storage tanks and associated issues. Basin Plans also address groundwater degradation due to elevated nitrate and salt concentrations caused by leaching from nearby urban developments, agricultural fields, confined animal feeding operations, and municipal sources.

Basin Plans are adopted and amended by regional water boards under a structured process involving full public participation and State environmental review. Basin Plans and amendments thereto, do not become effective until approved by the SWRCB and regulatory provisions must be approved by the Office of Administrative Law (OAL). Adoption or revision of surface water standards is subject to the approval of the USEPA. It is the intent of the SWRCB and the RWQCBs to maintain Basin Plans in an updated and readily available edition that reflects the current water quality control program. This is accomplished by reviewing water quality standards for each Basin Plan every three years.

The CVRWQCB Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (CVRWQCB Basin Plan) regulates waters of the state located within the area of analysis for the Folsom DS/FDR. The CVRWQCB Basin Plan covers an area including the entire Sacramento and San Joaquin River basins, involving an area bound by the crests of the Sierra Nevada on the east and the Coast Range and Klamath Mountains on the west. The area covered in the CVRWQCB Basin Plan extends some 400 miles, from the California – Oregon border southward to the headwaters of the San Joaquin River.

Local Regulations

General Plans for El Dorado, Placer, and Sacramento Counties each have provisions aimed at protecting local water resources for future and current use. The El Dorado County General Plan establishes a county-wide water resources program to conserve, enhance, manage, and protect water resources and their quality from degradation. These objectives consist of the following: ensuring an adequate quantity and quality of water is available; protection of critical watersheds, riparian zones, and aquifers; improvement and subsequent maintenance of the quality of both surface water and groundwater; wetland area protection; utilization of natural drainage patterns; and encouraging water conservation practices including re-use programs for applicable areas such as agricultural fields (El Dorado County 2004).

The Placer County General Plan's main goal pertaining to local water resources states that the natural qualities of its streams, creeks and groundwater should be protected and enhanced. To accomplish this goal, the County has enacted policies such as requiring various setbacks and easements from sensitive habitat areas or creek corridors, requiring mitigation measures for developments encroaching waterbodies, implementing BMPs to protect streams from runoff during construction activities or due to agricultural practices, and protecting groundwater resources from contamination (Placer County 1994).

The Conservation Element of Sacramento County's General Plan contains measures to implement water conservation and to protect surface water supplies, surface water quality, and groundwater resources. Specific goals include the following: conjunctive use of surface water and groundwater to ensure long-term supplies exist for residents while providing recreational and environmental benefits; protecting surface water quality for both public use and support of aquatic environment health; maintaining quality and quantity of groundwater for the benefit of humans and the natural environment; and promoting water conversation and reuse measures.

Besides the three individual Counties' General Plan stipulations, groundwater in the construction area may also be regulated by local groundwater management plans and county ordinances. These plans typically involve provisions to limit or prevent groundwater overdraft, regulate transfers, and protect groundwater quality. Assembly Bill 3030 (AB3030), Water Code Section 10750 (commonly referred to as the Groundwater Management Act) encourages local water agencies to establish local Groundwater Management Plans. Subsequent legislation has amended this chapter to make the adoption of a management program mandatory if an agency is to receive public funding for groundwater projects, creating an incentive to implement plans. The act lists various elements that should be included within the plans to ensure efficient use, good groundwater quality, and safe production of water (State Water Code, Section 10753).

Beneficial Uses

Beneficial uses are critical to water resource management in California. State law defines beneficial uses of California's waters that may be protected against quality degradation to include (but not limited to) "...domestic; municipal; agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves" (Water Code Section 13050(f)). Protection and enhancement of existing and potential beneficial uses are primary goals of water quality planning. Significant points concerning the concept of beneficial uses are:

- All water quality problems can be stated in terms of whether there is water of sufficient quantity or quality to protect or enhance beneficial uses (Regional Water Quality Control Board Central Valley Region (RWQCB) 1998).
- Beneficial uses do not include all of the reasonable uses of water. For example, disposal of wastewaters is not included as a beneficial use. This is not to say that disposal of wastewaters is a prohibited use of waters of the State; it is merely a use, which cannot be satisfied to the detriment of beneficial uses. Similarly, the use of water for the dilution of salts is not a beneficial use although it may, in some cases, be a reasonable and desirable use of water (RWQCB 1998).
- The protection and enhancement of beneficial uses require that certain quality and quantity objectives be met for surface and ground waters (RWQCB 1998).
- Fish, plants, and other wildlife, as well as humans, use water beneficially.

3.1.1.3 Environmental Setting

This section describes the hydrology and hydraulic features, water quality, groundwater setting, and jurisdictional wetlands within the construction area.

Hydrology

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 Reservoir. Figure 3.1-1 shows the hydrology of Folsom Reservoir including tributaries and streams.

Folsom Dam and Reservoir is a multipurpose water project constructed by the Corps and operated by Reclamation as part of the Central Valley Project (CVP). At an elevation of 466 feet above mean sea level (msl), Folsom Reservoir is the principal reservoir on the American River impounding runoff from a drainage area of approximately 1,875 square miles. Folsom Reservoir has a normal full-pool storage capacity of approximately 975,000 acre-feet, with a seasonally designated flood management storage space of 400,000 acre-feet. An interim agreement between the SAFCA and Reclamation provides variable flood storage ranging from 400,000 to 670,000 acre-feet.

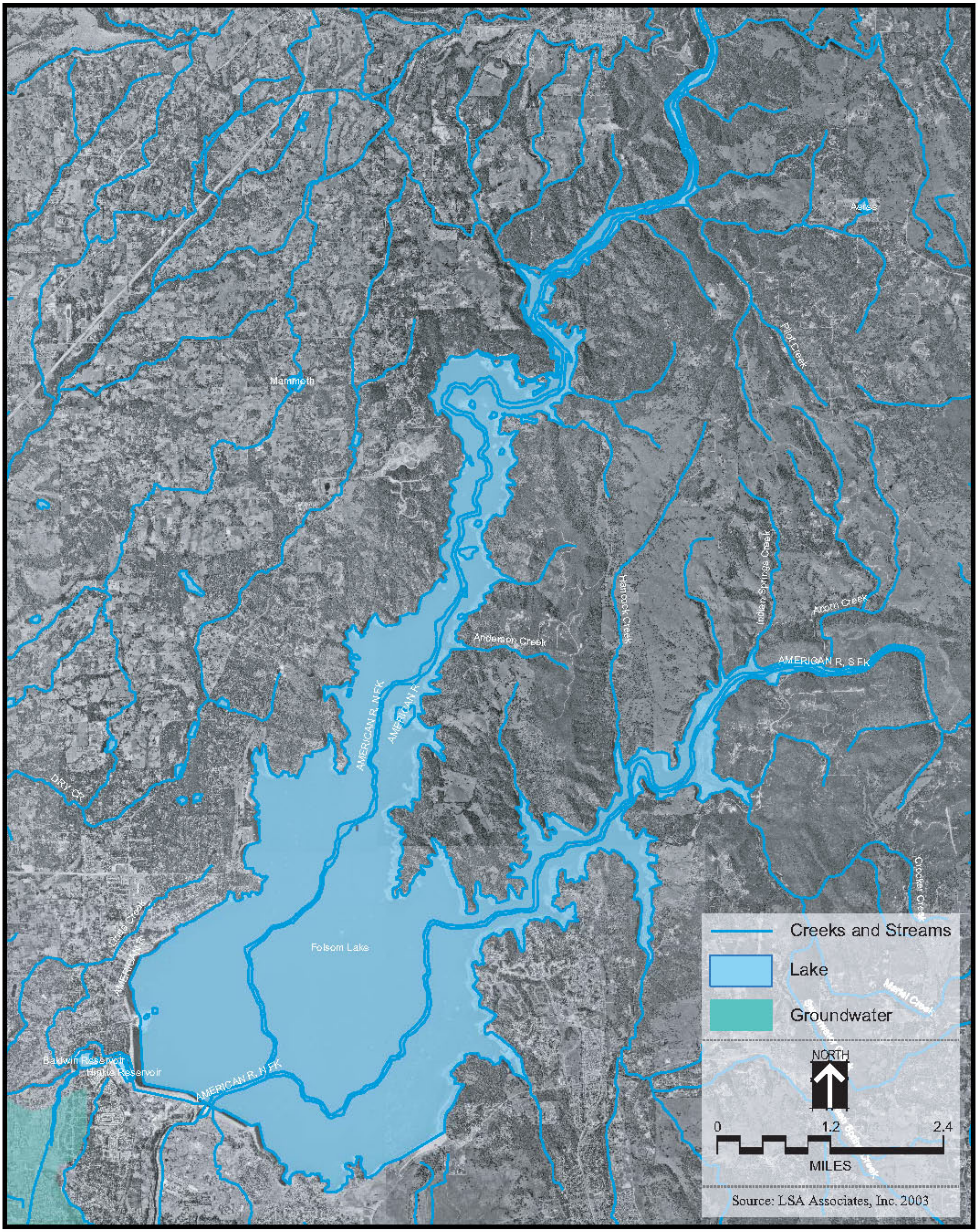

Figure 3.1-1
Hydrology of Folsom Reservoir

CDM

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 Reservoir's available storage. Approximately 40 percent of the runoff from the watershed results from snowmelt.

Lake Natoma is downstream of Folsom Dam and serves as an afterbay to Folsom Reservoir. Formed and controlled by Nimbus Dam, the lake is operated to re-regulate the daily flow fluctuations created by the Folsom Powerplant. Consequently, surface water elevations in Lake Natoma may fluctuate between four and seven feet daily. Lake Natoma has a storage capacity of approximately 9,000 acre-feet and a surface area of 500 acres. Nimbus Dam, combined with Folsom Dam, regulates water releases to the lower American River.

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 north and south banks for approximately 13 miles from the Sacramento River to the Mayhew drain on the south and to the Carmichael Bluffs on the north.

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 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.

During a flood event with a 1 in 2 chance of occurring in any 1 year (e.g., 2-year recurrence interval), flows would be expected to reach 25,000 cfs under existing conditions and 40,000 cfs if unregulated. Flows during flood events with between a 1 in 18 and 1 in 120 chance of occurring in any 1 year would peak at approximately 115,000 cfs under existing conditions and would range between 160,000 cfs and 375,000 cfs if unregulated.

Water Quality

As stated above, snowmelt and precipitation from the upper American River Watershed discharges water into Folsom Reservoir. In general, runoff from the relatively undeveloped watershed is of very high quality, rarely exceeding the State of California's water quality objectives (Wallace, Roberts, and Todd et al. 2003). The following beneficial uses have been defined by the CVRWQCB for Folsom Reservoir and Lake Natoma: 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 (RWQCB1998). Water quality within Folsom Reservoir and Lake Natoma is generally acceptable to meet the beneficial uses currently designated for these waterbodies. However, in the past, occasional taste and odor problems have occurred in municipal water supplies diverted from Folsom Reservoir. Blue-green algal blooms that occasionally occur in the reservoir due to elevated water temperatures were identified as the cause of these problems.

Water Quality Data for Construction Area

This section presents data describing general water quality parameters including pH, turbidity, dissolved oxygen (DO), total organic carbon (TOC), nitrogen, phosphorus, electric conductivity, total dissolved solids (TDS), and fecal coliform for Folsom Reservoir.

The minimum, maximum, and average levels of pH, turbidity, DO, TOC, nitrogen, phosphorous, and electric conductivity within Folsom Reservoir are presented in Table 3.1-1. All of the data were 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; and 101 samples were taken for electric conductivity (Larry Walker Associates, 1999).

Table 3.1-1 ***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)	2.0	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

Source: Larry Walker Associates 1999; N/A – Not Available

Table 3.1-2 presents the minimum, maximum, and average levels of pH, electric conductivity, DO, turbidity, TOC, nitrogen, phosphorus, and TDS within Folsom Reservoir. The pH, electric conductivity, DO, and turbidity data were collected on June 28, 2005; a total of 47 samples were taken. The TOC data were collected on June 11, 2003; a total of 6 samples were taken. The nitrogen, phosphorus, and TDS data were collected over a 13-month period from February 2001 to February 2002; 5 samples were taken for each of these parameters.

Table 3.1-2 ***Water Quality Parameters Sampled at Folsom Reservoir – 2001 to 2005***			
Water Quality Parameter	***Minimum***	***Maximum***	***Average***
pH (standard units)[1]	6.60	8.23	6.94
Turbidity (NTU)[1]	1.0	126.9	8.4
DO (mg/L)[1]	4.95	7.93	6.88
TOC (mg/L)[2]	1.5	1.8	1.6
Nitrogen (mg/L)[3]	<0.050	0.110	0.062
Total Phosphorus (mg/L)[3]	<0.010	<0.050	0.0212
TDS (mg/L)[3]	39	44	41.8
Electric Conductivity (µS/cm)[1]	32.5	61.6	46.2

Sources: Reclamation 2005d[1]; MWH 2003[2]; Wallace, Roberts and Todd et. al. 2003[3]

Fecal coliform bacteria levels within Folsom Reservoir are presented in Table 3.1-3. 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, Roberts and Todd et al. 2003).

Table 3.1-3 Folsom Reservoir Coliform Sampling – 2001 to 2003 Fecal Coliform Concentrations (MPN/100mL)			
Site	***Minimum***	***Maximum***	***Geometric Mean***
Granite Bay[1]	2	300	9
Beal's Point[1]	2	900	18
Folsom Dam[2]	2	30	12.2

Sources: Reclamation 2003[1]; Wallace, Roberts, and Todd et. al. 2003[2]
MPN: Most Probable Number

In general, water released from Lake Natoma is of good quality and meets California Basin Plan standards. Table 3.1-4 summarizes water quality data in Lake Natoma from February 2001 to February 2002.

Table 3.1-4 Water Quality Parameters Sampled at Lake Natoma – 2001 to 2002				
Water Quality Parameter	***Units***	***Minimum***	***Maximum***	***Average***
Fecal Coliform	MPN/100mL	4	300	75
Nitrate & Nitrite as N	mg/L	<0.050	0.08	0.05
Total Phosphorus as P	mg/L	<0.010	0.18	0.05
Tot. Dissolved Solids	mg/L	34	39	36.6
Mercury (dissolved)	µg/mL	<0.005	<0.005	<0.005
MTBE	µg/mL	<3	<3	<3

Source: Wallace, Roberts and Todd et. al. 2003

Water Quality Objectives for Construction Area

The CVRWQCB Basin Plan defines specific water quality objectives that should be attained in order to protect and maintain the beneficial uses of Folsom Reservoir as described above. As indicated prior, although not required under the CWA, the CVRWQCB Basin Plan also presents objectives for all groundwater in the Sacramento and San Joaquin River Basins. Groundwater regulations do not encompass as many constituents as surface water in the CVRWQCB Basin Plan, but do include bacteria, chemical constituents, radioactivity, tastes and odors, and toxicity.

The following section presents surface water objectives for bacteria, TDS, DO, turbidity, and pH, and groundwater objectives for bacteria for the construction area. Although data from Folsom Reservoir were previously presented for various parameters, only bacteria, TDS, DO, turbidity, and pH are discussed in relation to their particular water quality objectives as stated in the CVRWQCB Basin Plan.

There are no available groundwater data associated with the construction area; therefore, only the groundwater quality objective for bacteria is presented below.

Bacteria
The CVRWQCB Basin Plan has established fecal coliform bacteria standards for Folsom Reservoir that are twice as rigorous as other waters designated for water contact recreation. For Folsom Reservoir, the fecal coliform concentration is based on a minimum of not less than five samples for any 30-day period, should not exceed a geometric mean of 100 Most Probable Number (MPN)/100 ml, nor should more than ten percent of the total number of samples taken during any 30-day period exceed 200/100 ml. For groundwater used for municipal or domestic supply, the fecal coliform most probable number should be less than 2.2/100 ml over any seven-day period. As indicated in Table 3.1-3, the geometric mean for bacteria for all three surface water locations is below the water quality objective of not exceeding 100/100 ml.

Total Dissolved Solids
Total dissolved solids in Folsom Reservoir should not exceed 100 mg/l (90th percentile) as per the CVRWQCB Basin Plan. TDS data are acceptable in the reservoir as shown in Table 3.1-2 which indicates levels are between 39 and 44 mg/L.

Dissolved Oxygen
For Folsom Reservoir, the CVRWQCB Basin Plan requires the monthly median of the mean daily DO concentration should not fall below 85 percent of saturation in the main water mass, and the 95th percentile concentration should not fall below 75 percent of saturation. In addition, the DO concentrations should not be reduced below 7.0 mg/l at any time in waters designated to support cold water ecosystems and spawning, reproduction and/or early development beneficial uses, or 5.0 mg/l in water designated to support warm water ecosystems. Data in Table 3.1-2 indicate that DO levels from samples taken from Folsom Reservoir between 2001 and 2005 are minimum 4.95 mg/L and maximum 7.93 mg/L.

Turbidity
Turbidity should be less than or equal to 10 Nephelometric Turbidity Unit (NTUs) in Folsom Reservoir, except for periods of storm runoff according to the CVRWQCB Basin Plan. Average turbidity readings as shown in Table 3.1-2 are 8.4 NTU, below CVRWQCB Basin Plan objectives. The Folsom DS/FDR could increase sedimentation in Lake Natoma from construction activities. Water quality samples from January 2001 through June 2002 in Lake Natoma show turbidity readings ranging from 0.5 NTU to 5.0 NTU with most of the readings between 1.0 NTU and 4.0 NTU, well within the Basin Plan objectives.

pH

The CVRWQCB Basin Plan states that pH levels should not be less than 6.5 nor above 8.5. In fresh waters with designated cold water or warm water habitat beneficial uses, changes in normal ambient pH levels should not exceed 0.5 (RWQCB 2004). All pH data are within objectives as presented in Table 3.1-2. From 2001 to 2005 in Folsom Reservoir, minimum pH was 6.60, maximum pH was 8.23, and average pH was 6.94.

As indicated by the above data, water quality in Folsom Reservoir meets the requisite Basin Plan objectives. Sedimentation/siltation within local tributaries due to construction is one of the primary potential water quality concerns. Construction activities also have the potential of releasing hazardous or other chemicals into surrounding waters, thus impacting water quality.

Other Water Quality Issues

Abandoned Mines

An old abandoned chromium mine exists on the Peninsula just north of Flagstaff Hill. The Pillikin Mine contained the largest known chromite deposit in the Sierra Nevada. The mine began ore production during World War I and became inactive in April of 1955 (El Dorado County Public Library website 2002).

Four abandoned limestone quarries also exist north of the Peninsula. The Alabaster Cave quarries are located approximately one mile east of Rattlesnake Bridge, just five miles south of Auburn at an elevation above 600 ft. These quarries were owned by various companies and were mined from the 1860s until the 1950s (El Dorado County website 2003, Perazzo 2006).

Both mines are located well above the elevation of the reservoir and would not cause any water quality effects with the implementation of any of the Folsom DS/FDR alternatives. According to Reclamation, there has never been any detection of chromium in the water tested (Sherer 2006c).

Mercury and Metals

The sediments in Folsom Reservoir may contain elemental mercury and metals from historic mining or those naturally occurring within the bedrock of the American River drainage. Mercury is toxic to both aquatic life and human health.

Groundwater

Folsom Reservoir is located at the eastern edge of the Sacramento Valley Groundwater Basin, in the North American and South American subbasins. The area surrounding Folsom Reservoir primarily consists of bedrock formations of the Sierra Nevada foothill complex. Although groundwater is not a major resource in the vicinity of the Folsom DS/FDR site, small amounts of groundwater are typically found in granitic fissures and cracks. Figure 3.1-2 indicates the areas where groundwater exists around Folsom Reservoir and Lake Natoma. 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.

Because fractured aquifer systems are typically low yielding, surface water sources are primarily used for drinking water or irrigation water sources rather than wells. However, a few groundwater wells are being used to provide water within the construction area. These wells are located at Rattlesnake Bar, the Peninsula campground and boat launch, Nimbus Flat residences, and Shadow Glen stables (Wallace, Roberts, and Todd et al. 2003).

Jurisdictional Wetlands

Regulated or jurisdictional waters include all adjacent wetlands in addition to navigable waters, interstate waters, and their tributaries. Therefore, any discharge of dredged or fill material into these jurisdictional wetlands would also be subject to compliance under Section 404 and 401 of the CWA. Project construction related to impacts to jurisdictional wetlands would be subject to regulations stated within these permits.

Seasonal wetlands and freshwater marshes exist in the construction area typically within or adjacent to streams, swales, or other drainages. Furthermore, groundwater upwelling is creating a wetland near Dike 5 on the western side of the reservoir.

For more specific information on wetlands found in the construction area, including recent acreage estimates of various wetlands and vegetative and terrestrial community composition, see Section 3.5, Terrestrial Vegetation and Wildlife, and Appendix C.

Mormon Island Wetland Preserve

The Mormon Island Wetland Preserve contains a series of wetlands that exist downstream of MIAD, above and below Green Valley Road. Reclamation completed a literature review of prior investigations into the connectivity between the reservoir and the wetlands. In the 2006 report entitled *MIAD Hydrogeology Draft Report*, Reclamation determined that data collected throughout the downstream foundation area suggests no reservoir connection to local groundwater levels (Reclamation 2006b). There does, however, appear to be a hydraulic connectivity in the dredged alluvium downstream of MIAD in the area between the dam toe and the preserve.

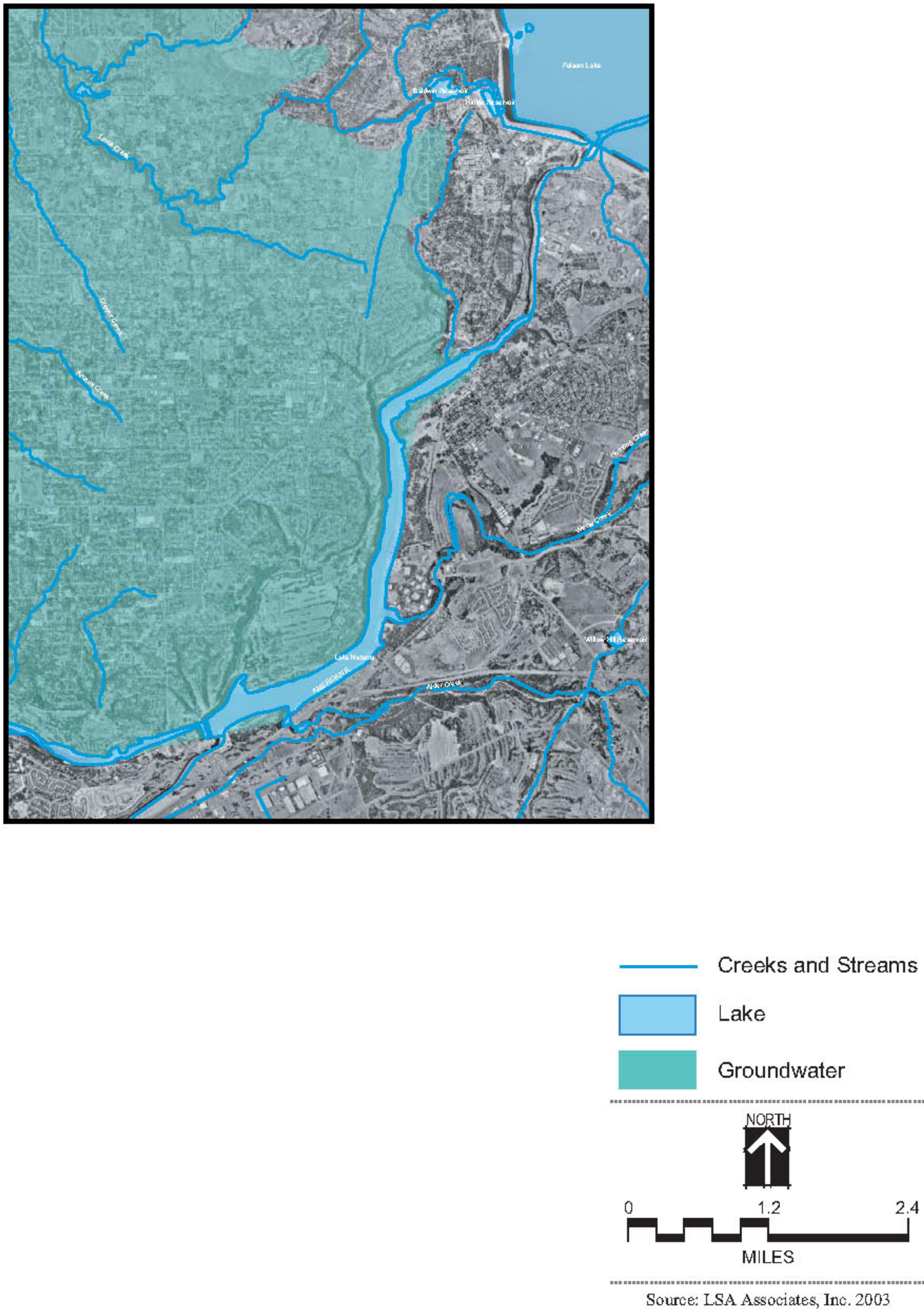

Figure 3.1-2
Groundwater Surrounding
Folsom Reservoir and Lake Natoma

CDM

Additionally, it is believed that the water source for the wetlands located in the north-central part of the preserve, just south of Green Valley Road, could be from seepage of the MIAD embankment. The source of this seepage is not the reservoir but a combination of bank storage of precipitation and seepage via joints in the foundation bedrock. This seepage collects in a drain and then eventually flows through a culvert under Green Valley Road and into the preserve (Reclamation 2006b). The source of water in the preserve in an area of deciduous trees in the dredged alluvium is believed to originate from the higher hillsides to the east due to release of bank storage and surface water runoff following precipitation events (Reclamation 2006b).

3.1.2 Environmental Consequences/Environmental Impacts

In this section, the assessment methods, significance criteria, and effects of the alternatives on surface water and groundwater resources, water quality conditions, and jurisdictional wetlands in the vicinity are evaluated. In regards to wetlands, this section focuses on the hydrologic effects to wetlands due to construction activities. Additional information on jurisdictional wetland impacts, specifically loss of wetland areas and habitat quality, are described in Section 3.5, Terrestrial Vegetation and Wildlife.

3.1.2.1 Assessment Methods

Potential impacts associated with each alternative were assessed through a qualitative evaluation. Information presented in the existing conditions as well as construction practices and materials, location, and duration of construction were evaluated during the assessment process.

3.1.2.2 Significance Criteria

Based on CEQA Guidelines, effects on hydrologic resources and water quality conditions would be significant if construction would:

- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam;
- Violate any water quality standards or waste discharge requirements or substantially degrade water quality; or
- 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.

Additionally, thresholds of significance for wetland resources under CEQA have been used in the following evaluation. Impacts were significant if they would:

- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

Section 3.5 contains additional thresholds of significance under CEQA for biological resources related to wetlands and riparian habitat, their related impacts and associated mitigation measures.

3.1.2.3 Environmental Consequences/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

<u>The No Action/No Project Alternative would not result in increased dam safety and flood damage reduction.</u>

The No Action/No Project Alternative assumes no action would be taken by any agency. If modifications to Folsom Dam are not completed to improve dam safety and flood damage reduction, public safety would be at risk due to the potential of dam and dike failure associated with seismic, static, and hydrologic concerns. Without the Folsom DS/FDR, the reservoir does not have sufficient capacity to safely contain and release large amounts of flood water. This could result in flood-related loss of life, economic losses, and infrastructure damage.

This impact would be potentially significant. Based on the analysis presented above, it is anticipated that the environmental impact of the No Action/No Project Alternative (i.e., future environmental conditions if no action is taken relative to the Folsom DS/FDR) would exceed the significance criteria defined herein. However, unlike a significant impact associated with an action alternative, no mitigation can be required for significant impacts associated with the No Action/No Project (i.e., within the regulatory framework of NEPA and CEQA, a project applicant cannot be required to mitigate the impacts that would result from taking no action). As such, the impact identified above for the No Action/No Project Alternative is considered to be significant, adverse, and unmitigable.

Environmental Consequences/Environmental Impacts of Alternative 1

<u>Construction of Folsom Facility modifications would degrade water quality.</u>

Construction of Folsom Facility modifications associated with Alternative 1 would result in impacts to water quality caused by earth moving operations, storage and handling of construction materials on site, and operation and maintenance of construction equipment and vehicles.

Soil erosion associated with excavating material and re-grading would transport sediment into local tributaries or directly into the reservoir thus affecting water quality. Significant earth moving operations would occur at sites immediately adjacent to Folsom Reservoir as part of Alternative 1. Approximately 5.8 million cubic yards of earthen material would be handled as part of construction. Earthen material would be removed from the Beal's Point borrow and processing site adjacent to the reservoir up to depths of 30 feet to construct improvements to the Right Wing Dam and Dikes 4, 5, and 6. Additionally, the excavated soils with low permeability that exist at the D2 borrow site would be used for reinforcement of the MIAD core material under Alternative 1.

During haul road construction and use, sediment would be transported directly into local tributaries or directly into the reservoir. Internal haul road construction includes alignments within the reservoir boundary between Beal's Point and the Right Wing Dam, and the Left Wing Dam and MIAD. The primary road surface would consist of an earthen road base material. Other general construction materials including solvents, paints, waste materials, and oil and gas associated with operation and maintenance of construction equipment present on-site would introduce hazardous or toxic materials and silt and debris into surrounding waters. All of the elements and factors presented above could contribute to degradation of water quality in receiving waters as part of construction of Alternative 1.

This impact would be potentially significant. Mitigation Measures HWQ-1 through HWQ-3 and HWQ-9 would reduce impacts to a less than significant level.

Construction of Folsom Facility modifications would subject population to risk of dam or embankment failure.

Construction of Folsom Facility modifications associated with Alternative 1 would occur during times that the structures retained water. This could risk the integrity of the structures. However, all construction work would occur on the downstream side and would not involve the core of the structures. Therefore, there would be no potential for facility failure impacts to local population.

No impact due to risk of facility failure during construction.

Jet grouting at the downstream foundation of MIAD would affect water quality.

Under this alternative, the agencies would jet grout portions of the foundation of MIAD at the toe of the downstream embankment to reduce seismic risks. The jet grout is a stabilizer, usually a neat cement grout, which would be injected at high pressures into the subsurface alluvium. When the jet grout is injected, the potential exists for the grout to migrate through the spaces between alluvial rocks and gravels. The migration of grout into source waters or into the wetlands area would alter water quality.

The curing of jet grout in the subsurface and in the waste pits at the surface would have the potential of producing alkaline water of pH 12. Many biological processes, such as reproduction, cannot operate in alkaline waters. Elevated pH levels can also lead to increased nutrient loading.

Mercury and other metals, historically found in the dredged alluvium deposits, could also be released due to jet grouting processes and subsequent generation of slurry waste materials. These metals could potentially mobilize and move downstream, adversely affecting water quality and aquatic life.

This impact would be potentially significant. Mitigation Measures HWQ-4 through HWQ-8 would reduce impacts to a less than significant level.

Jet grouting at the downstream foundation of MIAD would reduce the water source for a portion of the wetlands.

Alternative 1 would require jet grouting the downstream foundation at MIAD. As discussed in Section 3.1.1.3, one water source for a portion of the wetlands downstream of MIAD could be seepage from the MIAD embankment. Jet grouting would solidify materials at the foundation and could reduce seepage, thereby resulting in a reduction in water to a portion of the wetlands in the preserve.

This impact would be potentially significant. Mitigation Measure HWQ-5 would reduce impacts to a less than significant level.

Construction actions would cause effects to groundwater or groundwater supplies.

With the exception of the potential groundwater effects due to jet grouting at MIAD, construction activities would not affect groundwater resources. Mitigation measures for jet grouting (HWQ-4 through HWQ-8) will be employed to minimize groundwater effects due to jet grouting.

This impact would be potentially significant. Mitigation Measures HWQ-4 through HWQ-8 would reduce this impact to a less than significant level.

Construction actions would cause mobilization of mercury and metals into the water column in the reservoir.

Construction of the Auxiliary Spillway and construction activities at MIAD could lead to the mobilization of sediment into the water column or released into the American River downstream. Reclamation completed sediment sampling to determine if it would be a hazard to downstream aquatic life if allowed to flow downstream. Results of the sediment chemical analyses are presented in Appendix J. In 2006, Reclamation sampled a total of 18 sites and none of the samples exceeded the threshold for mercury of 0.2 mg/kg. Additionally, of all the samples analyzed for metals, no results met or exceeded any of the sediment standards and, as a result, would be suitable for unconfined aquatic disposal. However, mitigation measures would be implemented to prevent any potential mobilization of sediment.

This impact would be potentially significant. Mitigation Measures HWQ-12 and HWQ-13 would reduce this impact to a less than significant level.

Excess material placed in the reservoir would cause adverse water quality effects.

Excess material excavated from the auxiliary spillway site that does not meet the specifications for shell or filter may be placed in areas inside the reservoir. If this material is placed within or near the water line, erosion could occur from wave action or runoff and could increase turbidity in the reservoir. This could also introduce soluble pollutants associated with the materials into the water column or could lead to a release of insoluble pollutants if materials are place in deeper locations. During the placement material in the reservoir, there may also be temporary water quality impacts resulting from the dripping and leakage of fuels and oils from the use of construction equipment along the shoreline.

This impact would be potentially significant. Mitigation Measures HWQ-1 through HWQ-3, HWQ-9, and HWQ-14 would reduce impacts to a less than significant level.

Construction of Alternative 1 would not affect downstream water quality.

Alternative 1 is primarily a stand alone Dam Safety alternative and was designed to pass the Probable Maximum Flood and address the seismic and static risks. The Main Concrete Dam will retain all of its current capabilities. If this alternative was implemented, it is anticipated that the features would only be operated once every 300 years or greater. The fuseplug and Auxiliary Spillway would only operate at a point when over 500,000 cfs was already being released downstream through the existing spillway. The fuseplug spillway in conjunction with the existing spillway could release a total discharge between 850,000 and 900,000 cfs.

All operations-related impacts would have already occurred downstream before the fuseplug would operate. All habitat within the Lower American River Parkway and the river channel itself would already be adversely impacted. Therefore, this alternative would not have significant downstream water quality impacts.

This alternative would not have adverse impacts to the coldwater pool or downstream temperatures (water quality). The fuseplug would be reconstructed as soon as the event has passed. Stockpiles of the material required to rebuild the fuseplug would be available for this purpose. Timely replacement of the fuseplug would ensure that there are no adverse water quality impacts to the coldwater pool, or downstream conditions.

Downstream impacts from reservoir operations and flood releases would be less than significant for Alternative 1.

Environmental Consequences/Environmental Impacts of Alternative 2
Construction would degrade water quality.

Similar to Alternative 1, construction-related activities associated with Alternative 2 related to earth moving operations, storage and handling of construction materials on site, and operation and maintenance of construction equipment and vehicles could impact water quality within the reservoir or small local tributaries that discharge directly into the reservoir.

Soil erosion associated with excavating material and re-grading may transport sediment into local tributaries or directly into the reservoir, thus affecting water quality. Earth moving operations would occur adjacent to Folsom Reservoir as part of Alternative 2, and approximately 11.9 million cubic yards of material would be handled. With the exception of boring the Auxiliary Spillway tunnel, similar activities would occur as part of Alternative 2 as for Alternative 1. However, the potential for erosion would be increased as part of Alternative 2 due to the potential earthen raises of all dikes, wing dams and MIAD.

The potential water quality impacts of Alternative 2 are primarily related to haul road construction and use, storage and handling of construction materials, and operation and maintenance of equipment. All of these activities could contribute to degradation of water quality during construction.

This impact would be potentially significant. Mitigation Measures HWQ-1 through HWQ-3 and HWQ-9 would reduce impacts to a less than significant level.

Dewatering at the downstream foundation of MIAD would reduce the water source for a portion of the wetlands.

Dewatering around the area of the downstream foundation at MIAD would be required prior to excavation of the foundation. Because there is likely a hydraulic connectivity in the dredged alluvium downstream of MIAD in the area between the dam toe and the preserve, dewatering could reduce water levels in the area of the preserve.

This impact would be potentially significant. Mitigation Measure HWQ-10 would reduce impacts to a less than significant level.

Actions to excavate and replace the downstream foundation of MIAD would reduce the water source for a portion of the wetlands.

Alternative 2 would involve excavation and replacement of the downstream foundation at MIAD. As discussed in Section 3.1.1.3, one water source for a portion of the wetlands downstream of MIAD is likely seepage from the MIAD embankment. Excavation and replacement of the MIAD foundation with high strength material including cement-modified soil could reduce seepage. The water source for the wetlands in the preserve could be reduced.

This impact would be potentially significant. Mitigation Measure HWQ-5 would reduce any impacts to a less than significant level.

Construction actions would cause effects to groundwater or groundwater supplies.

With the exception of the potential groundwater effects due to excavation and replacement of the downstream foundation at MIAD, construction activities would not affect groundwater resources. Mitigation Measure HWQ-10 will be employed to minimize groundwater effects.

This impact would be potentially significant. Mitigation Measure HWQ-10 would reduce this impact to a less than significant level.

Construction actions including in-reservoir dredging would cause adverse water quality effects from mercury and metals in the reservoir.

Impacts would be similar to those described above for Alternative 1.

This impact would be potentially significant. Mitigation Measure HWQ-12 would reduce this impact to a less than significant level.

Excess material placed in the reservoir would cause adverse water quality effects.

Impacts would be similar to those described above for Alternative 1.

This impact would be potentially significant. Mitigation Measures HWQ-1 through HWQ-3 and HWQ-9 would reduce impacts to a less than significant level.

Construction of Alternative 2 would affect downstream water quality.

Alternative 2 is a Flood Damage Reduction alternative and was designed to pass the Probable Maximum Flood. Under this alternative, it is anticipated that the features would be operated infrequently to pass the design flood. The principle features of Alternative 2 would include a fuseplug Auxiliary Spillway with an underlying tunnel and a raise of up to 4 feet.

The fuseplug spillway features of this alternative would only operate at a point when over 500,000 cfs was already being released downstream, as described in Alternative

1. The tunnel would provide a substantially lower level of discharge capacity, allowing for the initiation of earlier releases, and maintaining flows at 160,000 cfs or below for duration's equivalent to the 1 in 200 year event.

All operations-related impacts would have already occurred downstream before the fuseplug would operate. All habitat within the Lower American River Parkway and the river channel itself would already be adversely impacted. Therefore, this alternative would not have significant downstream impacts to water quality.

Alternative 2 would not have adverse impacts to the coldwater pool, or downstream temperatures (water quality). The fuseplug would be reconstructed as soon as feasible once the event has passed. Stockpiles of the material required to rebuild the fuseplug would be available for this purpose. Timely replacement of the fuseplug would ensure no adverse water quality impacts to the coldwater pool, or downstream conditions.

Construction and utilization of the features in Alternative 2 would not substantially alter current Folsom Reservoir operations and, in general, would decrease downstream hydraulic impacts during a severe storm event.

Downstream impacts from reservoir operations and flood releases for Alternative 2 would be less than significant.

Environmental Consequence/Environmental Impacts of Alternative 3

Construction would degrade water quality.

Construction-related activities associated with Alternative 3 related to earth moving operations, storage and handling of construction materials on site, and operation and maintenance of construction equipment and vehicles could affect water quality within the reservoir or small local tributaries that discharge directly into the reservoir. In addition, the construction involved with extending the Stilling Basin under Alternative 3 poses further water quality impacts due to the dewatering processes necessary to complete this work.

Soil erosion associated with excavating material and re-grading may transport sediment into local tributaries or directly into the reservoir, thus affecting water quality. Under Alternative 3, 3.6 million cubic yards of material would be handled. Similar activities would occur as part of Alternative 3 as was described above for Alternative 2, including the potential construction of new embankments in low elevation areas to retain water temporarily stored during emergency flood flow events. In addition, excavation activities would occur at either or both the D1 and D2 sites to develop borrow sites for use in strengthening the core of MIAD.

Similar water quality impacts would exist as part of Alternative 3 as was described above for Alternatives 1 and 2 regarding haul road construction and use, storage and handling of construction materials, and operation and maintenance of equipment. All of these factors could contribute to degradation of water quality in receiving waters as part of construction of Alternative 3.

This impact would be potentially significant. Mitigation Measures HWQ-1 through HWQ-3 and HWQ-9 would reduce impacts to a less than significant level.

Jet grouting at the downstream foundation of MIAD would affect water quality.

This impact would be similar to Alternative 1.

This impact would be potentially significant. Mitigation Measures HWQ-4 through HWQ-8 would reduce impacts to a less than significant level.

Jet grouting at the downstream foundation of MIAD would reduce the water source for a portion of the wetlands.

This impact would be similar to Alternative 1.

This impact would be potentially significant. Mitigation Measure HWQ-5 would reduce impacts to a less than significant level.

Construction actions including in-reservoir dredging would cause adverse water quality effects from mercury and metals in the reservoir.

Alternative 3 would involve construction activities within the reservoir, including dredging, to construct the approach channel to the Auxiliary Spillway. Impacts would be similar to Alternative 1.

This impact would be potentially significant. Mitigation Measures HWQ-12 and HWQ-13 would reduce this impact to a less than significant level.

Excess material placed in the reservoir would cause adverse water quality effects.

Impacts would be similar to those described above for Alternative 1.

This impact would be potentially significant. Mitigation Measures HWQ-1 through HWQ-3, HWQ-9, and HWQ-14 would reduce impacts to a less than significant level.

Dewatering of the Stilling Basin would affect water quality downstream in Lake Natoma and the lower American River.

The water quality of the Stilling Basin is generally good and comparable to the water quality of Folsom Reservoir. Previous dewatering of the basin in 2004 by the Corps did not result in any downstream impacts. Best management practices would be employed when dewatering occurs. It is not expected that this action would result in any downstream water quality impacts.

This impact would be less than significant.

<u>*Construction of Alternative 3 would not affect downstream water quality.*</u>

Under Alternative 3, Folsom Dam would have four methods of releasing flows from the reservoir: three power penstocks, eight flood control outlets (four upper tier and four lower tier, all 5 ft x 9 ft), tainter/radial spillway gates set near the main spillway crest (five service and three emergency), and six submerged tainter gates in the proposed Auxiliary Spillway. In general, utilization of the features described in Alternative 3 would involve greater releases earlier in a major hydrologic event that closely match downstream channel capacity.

The JFP Auxiliary Spillway would allow the objective release of 115,000 cfs to be achieved sooner in a flood event, and would lessen peak flows fore large, infrequent hydrologic events. A maximum flood release of 160,000 cfs, which is the emergency downstream channel capacity, would be made through the Auxiliary Spillway when necessary based on observed and anticipated reservoir inflows. Emergency releases of 160,000 cfs or above would not be made any sooner with the JFP spillway features than under existing conditions.

Variations in releases utilizing the Folsom DS/FDR features would not be any larger than those allowed under existing conditions. Under this alternative, the amount of water that would ultimately be released would be the same as existing conditions and the No Action/No Project Alternative (due to operational constraints), but operators would have the ability to release water sooner in a hydrologic event. Features of this alternative would be operated under existing operating criteria; therefore, the implementation of Alternative 3 would not have adverse impacts to downstream water quality.

Downstream impacts from reservoir operations and flood releases for Alternative 3 would be less than significant.

Environmental Consequences/Environmental Impacts of Alternative 4
<u>*Construction would degrade water quality.*</u>

Construction-related activities associated with Alternative 4 pertaining to earth moving operations, storage and handling of construction materials on site, and operation and maintenance of construction equipment and vehicles could impact nearby water quality. In addition, the construction involved with extending the Stilling Basin under Alternative 4 poses further water quality impacts due to the dewatering processes necessary to complete this work.

Soil erosion associated with excavating material and re-grading may transport sediment into local tributaries or directly into the reservoir, thus affecting water quality. Alternative 4 involves earth moving operations adjacent to Folsom Reservoir where 6.5 million cubic yards of material would be handled to construct the new Auxiliary Spillway and raise embankments. Similar activities would occur as part of Alternative 4 as was described above for Alternatives 2 and 3, including the construction of new embankments. In addition, excavation activities would occur at Granite Bay, Beal's Point and other borrow sites (e.g., D1 and D2) to develop borrow for the earthen raise of the facilities.

Similar water quality impacts would occur as part of Alternative 4 as was described above for Alternatives 1 through 3 regarding haul road construction and use, storage and handling of construction materials, and operation and maintenance of equipment. All of these factors could contribute to degradation of water quality in local tributaries or within the reservoir as part of construction of Alternative 4.

This impact would be potentially significant. Mitigation Measures HWQ-1 through HWQ-3 and HWQ-9 would reduce impacts to a less than significant level.

<u>*Jet grouting at the downstream foundation of MIAD would affect water quality.*</u>

This impact would be similar to Alternative 1.

This impact would be potentially significant. Mitigation Measures HWQ-4 through HWQ-8 would reduce impacts to a less than significant level.

<u>*Jet grouting at the downstream foundation of MIAD would reduce the water source for a portion of the wetlands.*</u>

This impact would be similar to Alternative 1.

This impact would be potentially significant. Mitigation Measure HWQ-5 would reduce impacts to a less than significant level.

<u>*Construction actions including in-reservoir dredging would cause adverse water quality effects from mercury and metals in the reservoir.*</u>

Impacts would be similar to those described above for Alternative 3 resulting from construction of the approach channel to the Auxiliary Spillway within the reservoir.

This impact would be potentially significant. Mitigation Measures HWQ-12 and HWQ-13 would reduce this impact to a less than significant level.

Excess material placed in the reservoir would cause adverse water quality effects.

Impacts would be similar to those described above for Alternative 1.

This impact would be potentially significant. Mitigation Measures HWQ-1 through HWQ-3, HWQ-9, and HWQ-12 would reduce impacts to a less than significant level.

Dewatering of the Stilling Basin would affect water quality downstream in Lake Natoma and the lower American River.

The water quality of the Stilling Basin is generally good and comparable to the water quality of Folsom Reservoir. Previous dewatering of the basin in 2004 by the Corps did not result in any downstream impacts. Best management practices would be employed when dewatering occurs. It is not expected that this action would result in any downstream water quality impacts.

This impact would be less than significant.

Construction of Alternative 4 would not affect downstream water quality.

Alternative 4 would provide Folsom Dam with the same four methods of discharging water as Alternative 3. In general, utilization of the features described in Alternative 4 would involve greater releases earlier in a major hydrologic event that closely match downstream channel capacity. The new Auxiliary Spillway would allow the objective release of 115,000 cfs to be achieved sooner in a flood event, and would lessen peak flows fore large, infrequent hydrologic events. A maximum flood release of 160,000 cfs, which is the emergency downstream channel capacity, would be made through the new Auxiliary Spillway when necessary, based on observed and anticipated reservoir inflows.

Emergency releases of 160,000 cfs or above would not be made any sooner with the Folsom DS/FDR features than under existing conditions. Variations in releases utilizing Folsom DS/FDR features would not be any larger than those allowed under the existing conditions and the No Action/No Project Alternative. Under this alternative, the amount of water that would ultimately be released would be the same as existing conditions and the No Action/No Project Alternative (due to operational constraints), but operators would have the ability to release water sooner in a hydrologic event. The features would be operated under existing operating criteria; therefore, there would be no adverse impacts to water quality.

Downstream impacts from reservoir operations and flood releases for Alternative 4 would be less than significant.

Environmental Consequences/Environmental Impacts of Alternative 5

Construction would degrade water quality.

Construction-related activities associated with Alternative 5 pertaining to earth moving operations, storage and handling of construction materials on site, and operation and maintenance of construction equipment and vehicles would impact nearby water quality. Dewatering of shallow groundwater would be necessary to complete excavation and replacement of the downstream foundation at MIAD, further increasing the potential for local surface water quality degradation.

Soil erosion associated with excavating material and re-grading would transport sediment into local tributaries or directly into the reservoir, thus affecting water quality. Alternative 5 would involve the greatest amount of borrow excavation within the reservoir because the Auxiliary Spillway would not be built. However, similar activities would occur as part of Alternative 5 for other excavation activities as was described above for Alternatives 1 through 4, but at a greater extent due to the raising of all facilities by 17 ft. Private properties surrounding the reservoir would be protected by construction of new embankments or would be acquired. Construction of the new embankments would pose the same water quality effects as would construction of the main facilities. Similar to Alternative 4, excavation activities would occur at either or both the D1 and D2 sites to develop borrow sites for use in the 17 foot earthen raise at MIAD.

Similar water quality impacts would occur as part of Alternative 5 as was described above for Alternatives 1 through 4 regarding haul road construction and use, storage and handling of construction materials, and operation and maintenance of equipment. All of these factors could contribute to degradation of water quality in local tributaries or within the reservoir as part of construction of Alternative 5.

This impact would be potentially significant. Mitigation Measures HWQ-1 through HWQ-3 and HWQ-9 would reduce impacts to a less than significant level.

Dewatering at the downstream foundation of MIAD would reduce the water source for a portion of the wetlands.

Impacts would be similar to those discussed under Alternative 2.

This impact would be potentially significant. Mitigation Measure HWQ-10 would reduce impacts to a less than significant level.

Actions to excavate and replace the downstream foundation of MIAD would reduce the water source for a portion of the wetlands.

Impacts would be similar to those discussed under Alternative 2.

This impact would be potentially significant. Mitigation Measure HWQ-5 would reduce impacts to a less than significant level.

<u>Actions to excavate and replace the downstream foundation of MIAD would adversely affect groundwater and groundwater resources.</u>

Impacts would be similar to those discussed under Alternative 2.

This impact would be potentially significant. Mitigation Measure HWQ-10 would reduce impacts to a less than significant level.

<u>Construction actions would cause adverse water quality effects from mercury and metals in the reservoir.</u>

Excavation of material from the approach channel could suspend sediment containing mercury in the water column. Fish and invertebrates could be exposed to higher levels of mercury, which could lead to bioaccumulation. Fish in Folsom Reservoir are known to have elevated levels of mercury, many times above background levels. The amount of sediment suspended and mercury methylated would be reduced with water quality mitigation measures and physical means, such as silt curtains.

This impact would be potentially significant. Mitigation Measure HWQ-12 and HWQ-13 would reduce this impact to a less than significant level.

<u>Excess material placed in the reservoir would cause adverse water quality effects.</u>

Impacts would be similar to those described above for Alternative 1.

This impact would be potentially significant. Mitigation Measures HWQ-1 through HWQ-3, HWQ-9, and HWQ-14 would reduce impacts to a less than significant level.

<u>Construction of Alternative 5 would not affect downstream water quality.</u>

The 17 foot raise would be designed to contain a large storm event and pass it without overtopping the downstream levees. Variations in releases utilizing Folsom DS/FDR features would not be any larger than those allowed under existing conditions and the No Action/No Project Alternative. In addition, the top of the flood control pool would be raised to increase the flood storage space. Alternative 5 would allow the reservoir to hold more flood water and would allow a substantially larger timeframe for the evacuation of downstream communities.

Downstream impacts would remain the same as existing conditions and the No Action/No Project Alternative. The implementation of Alternative 5 would not have adverse downstream impacts to water quality. Releases would be made according to the Interim Flood Control Diagram.

Downstream impacts from reservoir operations and flood releases for Alternative 5 would be less than significant.

3.1.3 Comparative Analysis of Alternatives

None of the alternatives would change the hydrology of Folsom Reservoir, but the alternatives could result in better management of hydrologic flows and conditions. Additionally, none of the alternatives would have adverse downstream water quality effects associated with operation because the new features of each alternative would be operated according to existing operating criteria. Potential water quality impacts associated with construction of Alternatives 1 through 5 would be potentially significant. Impacts would be mitigated by implementing Mitigation Measures HWQ-1 through HWQ-12. Besides the No Action/No Project Alternative which would pose no increased threat to hydrologic resources, varying degrees of potential impacts to water quality, water levels, and viability of wetlands are associated with each alternative, as discussed below.

Alternatives 1 and 3 would pose the least potential to impact water resources. This is because both alternatives would have the smallest amount of excavation that would occur during construction, including the least borrow development within the reservoir. The possibility of impacts to water resources would be lower because there is less chance for soil erosion and subsequent transport into the reservoir. Furthermore, less earthmoving and construction equipment would be necessary to perform this work, and associated with it, less operations and maintenance of the equipment, and subsequent storage and handling of construction material.

Jet grouting of the downstream foundation at MIAD would also occur under Alternatives 1, 3, and 4, potentially affecting water quality and potentially reducing the water source for a portion of the wetlands.

Alternative 2 would involve greater potential for water quality impacts than Alternatives 1 and 3 because it requires more construction activities and excavation to occur. Alternative 2 is the only alternative that includes construction of an Auxiliary Spillway tunnel. Alternative 2 would result in a greater potential for impacts than Alternative 1 to water quality due to the increased area of construction and volume of material excavated and related chances for erosion and sedimentation to occur in local tributaries or directly into the reservoir. In addition, while this alternative does not involve jet grouting, dewatering would be required when excavation and replacement of the foundation downstream of MIAD occurs, thus possibly reducing the water source for a portion of the wetlands.

Alternative 3 would have similar potential for impacts to water quality as Alternative 1. Similar to Alternative 1, Alternative 3 would require jet grouting at MIAD which could introduce water quality problems and water source issues for a portion of the wetlands. In addition, under Alternative 3, extending the Stilling Basin would require dewatering with potential water quality impacts as a result of discharge. The potential impacts of Alternative 3 are less than those of Alternatives 4 and 5 because the required earth-moving and excavation quantities are less for Alternative 3 than those for Alternatives 4 and 5.

Alternative 4 would pose greater potential water quality impacts than Alternatives 1 and 3 because it requires more excavation and construction activities. Alternative 4 would result in potential impacts to water resources due to the increased area of construction and volume of material excavated and related chances for erosion and sedimentation to occur in local tributaries or directly into the reservoir. In addition, Alternative 4 requires extending the Stilling Basin, which would require dewatering, as well as jet grouting of the downstream foundation of MIAD. Therefore, additional water quality and wetland impacts could be introduced. The potential impacts of Alternative 4 are less than those of Alternative 5 due to the fact that excavation quantities are less for Alternative 4 than those for Alternative 5.

Alternative 5 would have the greatest overall potential for impacts to water quality, wetlands, and groundwater and surface water levels compared to Alternatives 1 through 4 because it requires the most construction activities and excavation to occur. Additionally, Alternative 5 involves dewatering for both the excavation and replacement of the downstream foundation at MIAD. Alternative 5 has the greatest potential for water quality effects because it involves the largest construction area and the greatest volume of material excavated and dewatering processes. These processes increase the potential for erosion and sedimentation to occur in local tributaries or directly into the reservoir, water levels in both surface water and groundwater to potentially fluctuate, and wetland water sources to be affected.

3.1.4 Mitigation Measures

Implementation of Mitigation Measures HWQ-1 through HWQ-14 would reduce the significant impact on water quality, wetlands, and water levels to a less than significant level. Compliance and evaluation as part of the provisions stated for the various permits discussed below would serve to minimize and mitigate potential hydrologic impacts due to construction activities.

HWQ-1: An NPDES permit will be obtained prior to construction activities, commencing by filing a Notice of Intent (NOI) with the CVRWQCB and preparing a SWPPP. As required under the General Permit, the SWPPP will identify implementation measures necessary to mitigate potential water quality degradation as a result of construction. These measures will include BMPs and other standard pollution prevention actions such as erosion and sediment control measures, proper control of non-stormwater discharges, and hazardous spill prevention and response. The SWPPP will also include requirements for BMP inspections, monitoring, and maintenance.

The NOI indicates the intent to comply with the General Permit which outlines conditions to minimize sediment and pollutant loading.

The following items are examples of BMPs that will be implemented during construction to avoid causing water quality degradation:

- Erosion control BMPs such as use of mulches or hydroseeding to prevent detachment of soil following guidance presented in the California BMP Handbooks – Construction (CASQA 2003). A detailed site map will be included in the SWPPP outlining specific areas where soil disturbance may occur, and drainage patterns associated with excavation and grading activities. In addition, the SWPPP will provide plans and details for the BMPs to be implemented prior, during and after construction to prevent erosion of exposed soils and to treat sediments before they are transported offsite.

- Sediment control BMPs such as silt fencing or detention basins that trap soil particles.

- Construction staging areas designed so that stormwater runoff during construction will be collected and treated in a BMP such as a detention basin.

- Management of hazardous material and wastes to prevent spills.

- Vehicle and equipment fueling BMPs so these activities occur only in designated staging areas with appropriate spill controls.

- Maintenance checks of equipment and vehicles to prevent spills or leaks of liquids of any kind.

As described in Chapter 2, specific staging areas for construction-related activities will be located near the Main Concrete Dam, Granite Bay, Beal’s Point, Folsom Point, and MIAD. Haul roads will be constructed to connect Beal’s Point with Granite Bay, and the LWD with MIAD. Only designated areas and roads will be used during construction processes to minimize water quality impacts.

HWQ-2: Measures to control on-site spills will be included in the SWPPP. In addition to the spill prevention and control BMPs presented above, the SWPPP will contain a visual monitoring program and a chemical monitoring program for pollutants that are non-visible to be implemented if there is a failure of BMPs. Proper storage and handling of materials and equipment servicing will only occur in designated areas. Should a spill occur, appropriate steps will be taken to inform local regulatory agencies as well as implementation of a spill response program as outlined in the SWPPP.

HWQ-3: Permits prepared by the responsible Federal agency will be obtained and abided by as stated in Section 401 and Section 404 of the CWA regarding dredging or filling of waters of the United States, and activities involving discharging into those waters, which include wetlands, respectively. Construction activities related to temporary or permanent alteration of any water body within the construction area will be subject to regulation pursuant to these permits. Compliance under these permit provisions will serve to minimize construction activity impacts on water quality.

HWQ-4: Prior to implementing the full jet grouting action, Reclamation will perform jet grouting tests at MIAD including the monitoring for any grout leakages as well as the testing of groundwater and surface water levels and quality. If Reclamation determines that leakages are expected to occur and could cause adverse water quality effects, they will construct a cutoff wall before they jet grout the foundation at MIAD that will eliminate the migration of the grout, metals released from sediments, and pH 12 water impacts to surrounding waters.

HWQ-5: Reclamation will monitor surface and groundwater levels and water quality prior to, during, and after jet grouting or excavation and replacement of MIAD.

- If any well or wetlands within 200 feet of jet grout construction are found to have an elevated pH, then construction will cease until the pH returns to normal (as determined by pre-construction water quality monitoring).

- If the pH does not return to normal within 30 minutes, then a Reclamation biologist or hazardous materials specialist will be notified.

HWQ-6: If jet grout daylights more than 50 feet from the point of construction, then work will cease until it can be determined that the grout will remain localized.

HWQ-7: During jet grout injection, all wetlands that could be impacted by construction will be visually inspected for the presence of grout every 15 to 30 minutes.

HWQ-8: All temporary jet grout solidification areas will be lined with a material that does not allow the migration of any construction-related materials.

HWQ-9: Guidance will be obtained from the CVRWQCB for testing earthen materials before constructing work area platforms within or adjacent to the reservoir to ensure any potentially associated pollutants will not be introduced into the reservoir that would violate water quality standards or substantially degrade existing water quality. Fill material will be placed in the reservoir during periods of lower water elevation, when possible. Best management practices will be adhered to in order to minimize water quality impacts during the placement of fill in the reservoir.

HWQ-10: Reclamation will monitor groundwater and surface water levels in wetlands downstream of MIAD and within the Mormon Island Wetland Preserve during dewatering of the MIAD foundation for excavation and replacement. If water levels decrease because of dewatering, the water obtained from dewatering will be tested and treated to meet surface water standards prior to being pumped back into the wetlands.

HWQ-11: The Corps will obtain a dewatering permit from CVRWQCB and will implement applicable water quality monitoring during dewatering of the existing Stilling Basin.

HWQ-12: Mitigation measures to minimize water quality impacts due to construction within and along the reservoir shoreline will be developed in consultation with CVRWQCB staff. These measures may include placement of a silt curtain surrounding the construction zone or construction of coffer dams. If appropriate, routine water samples will be collected at the start and completion of each dredging and/or blasting period.

HWQ-13: During the process of dredging material to construct the approach channel for the Auxiliary Spillway, sediment containing mercury will be controlled using a variety of methods, including, but not limited to, silt curtains, silt fences, as well as other BMPs and construction methods approved by the CVRWQCB. Dredged material will be placed on the downstream side of the reservoir in a contained area for drying and processing. The dredged material will then be contained either in the MIAD overlay or transported to a permanent disposal site outside of the reservoir.

HWQ-14: A water quality monitoring plan will be developed for review by the CVRWQCB prior to any in reservoir construction work. The plan will address sampling requirements during dredging, blasting, excavation, and placement of fill within the reservoir. If turbidity readings exceed action level values established by the CVRWQCB, corrective actions will be implemented in accordance with the plan.

3.1.5 Cumulative Effects

This section discusses the cumulative impacts associated with the Folsom DS/FDR. Related past, present, and probable future projects considered in this cumulative discussion are presented in Table 5-1.

Construction would result in increased dam safety and flood damage reduction. This impact would be beneficial and therefore does not require mitigation. For those alternatives that incorporate flood damage reduction as part of their modifications, the Lower American River Common Features Project and Long-Term Reoperation of Folsom Dam and Reservoir have the potential to collectively increase the flood damage reduction in even greater amounts. These projects would culminate in beneficial impacts for flood damage reduction and dam safety.

Construction of the Folsom DS/FDR, in combination with existing and probable future projects, could affect water quality, wetland areas, and groundwater and surface water levels. This cumulative impact would be significant but mitigation such as contained within Mitigation Measures HWQ-1 through HWQ-14 would reduce these impacts to a less than significant level. Folsom DS/FDR construction activities could potentially influence water quality, change the viability of wetlands, and alter groundwater and surface water levels. When combined with construction of the New Folsom Bridge; Future Redundant Water Pipeline for Roseville, Folsom, and San Juan Water Districts; and the Lower American River Common Features Project, there is a possibility that water resources would be affected. However, each project's associated SWPPPs, BMPs, pertinent permits, and appropriate monitoring and testing would ensure that measures are implemented to avoid hydrologic resource impairment including water quality degradation, changing water levels, and detrimental effects to wetlands. This would result in effective mitigation of significant cumulative impacts.

3.2 Water Supply

This section discusses the potential impacts of construction of the various alternatives on water supplies.

3.2.1 Affected Environment/Existing Conditions

This section briefly describes the area of analysis, regulatory setting relevant to this resource, and the existing condition of this resource.

3.2.1.1 Area of Analysis

The area of analysis for this section includes Folsom Reservoir and surrounding counties: El Dorado, Sacramento, and Placer. Additionally, the water supply portion of Folsom Reservoir for both Central Valley Project (CVP) contractors and local water purveyors is also part of the area of analysis.

3.2.1.2 Regulatory Setting

Federal Regulations

Section 10 of the Rivers and Harbors Act of 1899 regulates alteration of (and prohibits unauthorized obstruction of) any navigable waters of the United States. Construction of any bridge, dam, dike or causeway over or in navigable waterways of the U.S. is prohibited without Congressional approval. Construction plans for a bridge or causeway must be submitted to and approved by the Secretary of Transportation, while construction plans for a dam or dike must be submitted to and approved by the Chief of Engineers and Secretary of the Army. Excavation or fill within navigable waters requires the approval of the Chief of Engineers and the Secretary of the Army. Under the reauthorization of the Rivers and Harbor Act of 1937, Reclamation took responsibility for the operation of the CVP. The Act authorized $12 million for construction of the CVP and made the improvement of navigation, regulation, and flood protection on the San Joaquin and Sacramento Rivers the first priority. Reclamation’s primary purpose of supplying water for domestic use and irrigation were second priority and power generation was designated last priority. Reclamation currently manages water contracts and the majority of dams, reservoirs, canals, and other infrastructure connected with the CVP, which includes Folsom Reservoir.

The Central Valley Project Improvement Act (CVPIA) of 1992 amended previous authorizations of the CVP to include fish and wildlife protection, restoration, and mitigation on equal priority with irrigation and domestic uses. The CVPIA reallocated 800,000 acre-feet of CVP water from farmers in the Central Valley for the restoration of fisheries. In dry years 600,000 acre-feet is reallocated. The CVPIA also limited renewed agricultural water contracts to twenty-five years.

State Regulations

DWR and nine California Regional Water Quality Control Boards oversee water service. State regulation of water utilities also encompasses water supply planning and water quality.

DWR manages California's water resources in accordance with several pieces of legislation:

- Urban Water Management Planning Act – This Act addresses water supply availability and requires urban water suppliers to provide an Urban Water Management Plan (UWMP) to DWR every five years.

- Senate Bill (SB) 221 (Keuhl, Chapter 642, Statues of 2001) Certification of Sufficient Water Supply – This Bill requires local agencies to provide written verification that sufficient water supply is available before approving plans for new development.

- SB 610 (Costa, Chapter 643, Statues of 2001) Water Supply Planning – This Bill requires an urban water supplier to include in its UWMP a description of all water supply projects and programs that may be undertaken to meet total projected water use when groundwater is identified as a source of water available to the supplier (DWR 2004).

In addition, DWR is responsible for the development and management of the State Water Project (SWP), including planning, design, construction, operation and maintenance.

The State Water Resources Control Board (SWRCB) oversees the quality of the state's water resources, and ensures proper allocation and beneficial use. The SWRCB's Division of Water Rights administers the permitting and licensure of water rights as well as enforcement and the adjudication of water right disputes (SWRCB 1999).

Local Regulations

The Water Forum Agreement (Agreement) is an agreement among community leaders and water experts in Sacramento County to address anticipated water shortages, environmental degradation, groundwater contamination, threats to groundwater reliability, and limits to economic prosperity if action is not taken (Water Forum 1999). The Agreement provides assurances that as each signatory meets its responsibilities, other signatories will be fulfilling their commitments. One of the main objectives is to "provide a reliable and safe water supply for the region's economic health and planned development to the year 2030" (Water Forum 1999). Elements that directly pertain to water supplies include increased surface water diversions, action to meet customers' needs while reducing diversion impacts in drier years, water conservation, and groundwater management. Neither Reclamation nor the Corps is a signatory to this Agreement.

3.2.1.3 Environmental Setting

Folsom Reservoir is one of the larger facilities of the CVP. The CVP is a network of 20 reservoirs and over 500 miles of major canals that provides approximately 7 million acre-feet to the San Francisco Bay Area as well as to the Central Valley for agricultural, urban, and wildlife uses. Folsom Reservoir consists of approximately 10 percent of the total CVP storage (Reclamation 2005a).

Folsom Reservoir is the largest reservoir in the American River basin. By law, the Folsom Facility is operated as part of the CVP for flood control, irrigation water supply, municipal and industrial (M&I) water supply, hydropower generation, fish and wildlife, navigation and water quality purposes. The dams and dikes impound approximately 977,000 acre-feet; the average monthly storage ranges from 838,100 acre-feet in June to 472,900 acre-feet in November (Reclamation 2005a). Reservoir releases are generally highest from May through September.

Total annual M&I demand for Folsom Reservoir storage is about 140,000 acre-feet (Corps 2002). The reservoir meets the majority of water demands of the City of Roseville, the City of Folsom, the San Juan Water District, and the 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 Reservoir (Reclamation 2005a).

Water is conveyed from Folsom Reservoir to the City of Folsom and California Department of Corrections water treatment plants, and the Corps' Resident Office fire protection system through the Natomas Pipeline. This is a 42-inch above ground pipeline that is approximately 2,800 feet in length. The pipeline exits the dam at Adit 4 to the Folsom standpipe. The San Juan Water District receives its water supply from the same pipe which then delivers water to the San Juan Water District's water treatment plant.

3.2.2 Environmental Consequences/Environmental Impacts

3.2.2.1 Assessment Methods

Potential impacts associated with each alternative were assessed qualitatively. Information presented in the existing conditions as well as the following factors were considered during the evaluation process:

- Reservoir operations during construction;
- Changes to infrastructure that would impact deliveries to local water purveyors; and

- Changes to water supply capacity within the reservoir.

3.2.2.2 Significance Criteria

Under criteria based on the CEQA Guidelines and agency guidance, the Folsom DS/FDR would be considered to have a significant impact on water supply if it would:

- Result in delivery interruptions, reductions, or changes in timing of deliveries to CVP contractors; or

- Result in new or expanded entitlements or other water resources and supplies.

3.2.2.3 Environmental Consequences/Environmental Impacts

The following discussion evaluates impacts associated with each alternative.

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

The No Action/No Project Alternative would not result in adverse effects associated with water supply.

The No Action/No Project Alternative assumes that no action would be taken by any agency and there would be no changes to the existing and future water supply.

The No Action/No Project Alternative would have no effect on water supply resources.

Environmental Consequences/Environmental Impacts of Alternative 1

Alternative 1 would not result in adverse effects associated with new or expanded entitlements or other water resources and supplies.

Alternative 1 would improve the safety of the Folsom Facility, but would not involve the raising of the Folsom Facility for additional flood storage purposes. The storage capacity of the reservoir would remain the same as existing conditions. During construction and post-construction, water allocations to CVP contractors would remain the same as existing conditions.

Alternative 1 would have no adverse effects associated with new or expanded entitlements.

The placement of excess material in the reservoir could reduce storage at Folsom Reservoir.

Under Alternative 1, excess borrow material would be placed in the reservoir. Approximately 65 percent of this material could be placed below the elevation of 466 feet. Assuming a 15 percent void ratio, the excess material placed in the reservoir could reduce storage by approximately 883 acre-feet (See Table 3.2-1).

This impact would be less than significant because it would involve less than one percent of available water storage. Mitigation would not be required.

Table 3.2-1
Decreases in Storage from Excess Material

Alternative	*Excess Material (Cubic Yards)*	*Excess Material (Cubic Feet)*	*Excess Material (Acre-Feet)*	*Assume 65% in Reservoir (below 466ft)*	*Assume 15% Void Ratio*	*Reduction in Storage (Acre-Feet)*
ALT 1	2,579,109	69,635,938	1,598	1,039	155	883
ALT 2	3,629,655	98,000,678	2,249	1,462	219	1,243
ALT 3	3,395,702	91,683,948	2,104	1,368	205	1,163
ALT 4	2,727,600	73,645,195	1,690	1,098	164	934
ALT 5	0	0	0	0	0	0

Source: (Lessard 2006).

Alternative 1 would result in adverse effects associated with the interruption of water supplies to local purveyors.

Reservoir operations during and post-construction would be operated in a manner to ensure that the timing and delivery of water to CVP contractors would not be altered from existing conditions. However, construction of the Auxiliary Spillway would potentially affect local water purveyors during construction. The chute alignment of the Auxiliary Spillway would cross a portion of the Natomas Pipeline. As discussed in Section 3.2.1.3, this raw water pipeline supplies water to the City of Folsom and California Department of Corrections water treatment plants, and the Corps' Resident Office fire protection system. Approximately 300 feet of the pipeline would need to be replaced with an above ground pipeline and would temporarily interrupt water supplies. In order to minimize the amount of time water supplies are interrupted, the above ground pipeline would be constructed prior to disconnecting the 300 foot portion of the existing pipeline for replacement. The interruption of supplies would be for a duration of less than one work day. The chute would be excavated below the above ground pipeline. In addition to the Natomas pipeline, an 8-inch diameter fire protection pipeline and metering station for the Corps' Resident Office would need to be relocated.

This impact would be potentially significant. Mitigation Measure WS-1 would reduce impacts to a less than significant level. All other impacts associated with the interruption of water supplies to CVP contractors would be less than significant.

Environmental Consequences/Environmental Impacts of Alternative 2

Alternative 2 would not result in adverse effects associated with new or expanded entitlements or other water resources and supplies.

Although the proposed raise of the structures at the Folsom Facility would increase the storage capacity of the reservoir, this additional capacity would be used for flood storage, not for additional storage of water supplies. During construction and post-construction, water allocations to CVP contractors would remain the same as existing conditions.

Alternative 2 would have no adverse effects associated with new or expanded entitlements.

The placement of excess material in the reservoir could reduce storage at Folsom Reservoir.

Under Alternative 2, excess borrow material would be placed in the reservoir. Approximately 65 percent of this material could be placed below the elevation of 466 feet. Assuming a 15 percent void ratio, the excess material placed in the reservoir could reduce storage by approximately 1,243 acre-feet (See Table 3.2-1).

This impact would be less than significant because it would involve less than one percent of available water storage. Mitigation would not be required.

The remaining potential water supply impacts are the same as Alternative 1. There would be no impacts associated with expanded entitlements. During construction and post-construction, water allocations and timing of deliveries to CVP contractors would remain the same as existing conditions. However, there could be impacts associated with the interruption of water supplies for water users that rely on the Natomas Pipeline. Mitigation Measure WS-1 would reduce impacts to a less than significant level.

Environmental Consequence/Environmental Impacts of Alternative 3

The placement of excess material in the reservoir could reduce storage at Folsom Reservoir.

Under Alternative 3, excess borrow material would be placed in the reservoir. Approximately 65 percent of this material could be placed below the elevation of 466 feet. Assuming a 15 percent void ratio, the excess material placed in the reservoir could reduce storage by approximately 1,163 acre-feet (See Table 3.2-1).

This impact would be less than significant because it would involve less than one percent of available water storage. Mitigation would not be required.

The potential water supply impacts would be the same as Alternative 2. There would be no impacts associated with new or expanded entitlements. During construction and post-construction, water allocations and timing of deliveries to CVP contractors would remain the same as existing conditions. However, there would be impacts associated with the interruption of water supplies for water users that rely on the Natomas Pipeline. Mitigation Measure WS-1 would reduce impacts to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 4
The placement of excess material in the reservoir could reduce storage at Folsom Reservoir.

Under Alternative 4, excess borrow material would be placed in the reservoir. Approximately 65 percent of this material could be placed below the elevation of 466 feet. Assuming a 15 percent void ratio, the excess material placed in the reservoir could reduce storage by approximately 934 acre-feet (See Table 3.2-1).

This impact would be less than significant because it would involve less than one percent of available water storage. Mitigation would not be required.

The potential water supply impacts would be the same as Alternative 2. There would be no impacts associated with new or expanded entitlements. During construction and post-construction, water allocations and timing of deliveries to CVP contractors would remain the same as existing conditions. However, there would be impacts associated with the interruption of water supplies for water users that rely on the Natomas Pipeline. Mitigation Measure WS-1 would reduce impacts to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 5
The placement of excess material in the reservoir could reduce storage at Folsom Reservoir.

Alternative 5 requires such a large quantity of material for a potential raise to the dams and dikes that it is unlikely to result in a large amount of excess material. Any excess material would be placed at an elevation that would not reduce water storage at Folsom Reservoir.

This impact would be less than significant.

Because an Auxiliary Spillway would not be constructed for this alternative, water supplies would not be interrupted. Similar to Alternative 1, there would be no impacts associated with new or expanded entitlements and timing of deliveries to CVP contractors would remain the same as existing conditions.

3.2.3 Comparative Analysis of Alternatives

None of the alternatives would result in new or expanded entitlements or other water resources and supplies. Under Alternatives 1 through 4, excess material would be placed in the reservoir. Alternative 2 would likely have the most excess material and could reduce storage by approximately 1,243 acre-feet. This would represent less than one percent of the reservoir storage and would be a less than significant impact.

Alternatives 1, 2, 3, and 4 would result in potentially significant impacts associated with the interruption of water supplies to local water purveyors. A portion of the Natomas Pipeline would need to be replaced with an above ground pipeline along the chute alignment of the Auxiliary Spillway. This would temporarily interrupt water supplies to the City of Folsom and California Department of Corrections water treatment plants, and the Corps' Resident Office fire protection system. In addition to the Natomas Pipeline, an 8-inch diameter fire protection pipeline and metering station for the Corps' Resident Office would need to be relocated. The No Action/No Project Alternative and Alternative 5 would not result in any water supply impacts.

3.2.4 Mitigation Measures

Implementation of Mitigation Measure WS-1 would reduce the significant impact on water supply interruption to a less than significant level.

WS-1: As discussed in Section 3.2.2.3, for Alternatives 1, 2, 3, and 4, the relocation of a 300-ft segment of the Natomas Pipeline to an above ground pipeline would temporarily interrupt water supplies to the City of Folsom and California Department of Corrections water treatment plants. The Corps' Resident Office fire protection system would also be affected. These impacts to the City of Folsom and California Department of Corrections will be mitigated through a temporary, scheduled disruption, using a bypass pipeline that will sufficiently meet water demands until construction of the above ground pipeline is complete. The 8-inch diameter fire protection pipeline and metering station for the Corps' Resident Office will need to be relocated prior to construction of the chute alignment of the Auxiliary Spillway.

3.2.5 Cumulative Effects

Of the projects identified in Table 5-1 only the Long-term Reoperation of Folsom Reservoir would potentially affect water supply. Impacts of reoperation are unknown and would be addressed in separate environmental compliance documentation; however, for this cumulative analysis, the impact is assumed to be less than significant after mitigation. Other projects in Table 5-1 would not have any effects on water supplies. The Folsom DS/FDR could potentially reduce reservoir storage by approximately 0 to 1,243 acre-feet which would be considered less than significant. No other known projects would reduce reservoir storage; therefore, the Folsom DS/FDR's incremental contribution to the cumulative condition would be less than significant.

3.3 Air Quality

This section presents the air quality impact analysis conducted for the Folsom DS/FDR alternatives. The analysis includes discussions of the affected environment and existing conditions, significance thresholds, analysis of impacts for each of the Folsom DS/FDR alternatives, mitigation measures, and cumulative effects.

3.3.1 Affected Environment/Existing Conditions

This section describes the area studied in the air quality analysis, as well as the regulatory and environmental setting. The regulatory setting is described in terms of federal, state and local requirements. The environmental setting is described in terms of climate and atmospheric conditions, and air pollutant sources and existing concentrations.

3.3.1.1 Area of Analysis

The air quality impact analysis evaluates the existing conditions and impacts in Sacramento, Placer and El Dorado counties. These three counties share a common boundary point near the center of the Folsom Facility. The Folsom DS/FDR construction equipment, haul trucks, and employee traffic would generate emissions in each of these three counties. As discussed below in Section 3.3.1.2, the general region of concern when analyzing air quality impacts in the Sacramento region also includes Yolo County and portions of Sutter and Solano Counties. Figure 3.3-1 shows the air quality area of analysis.

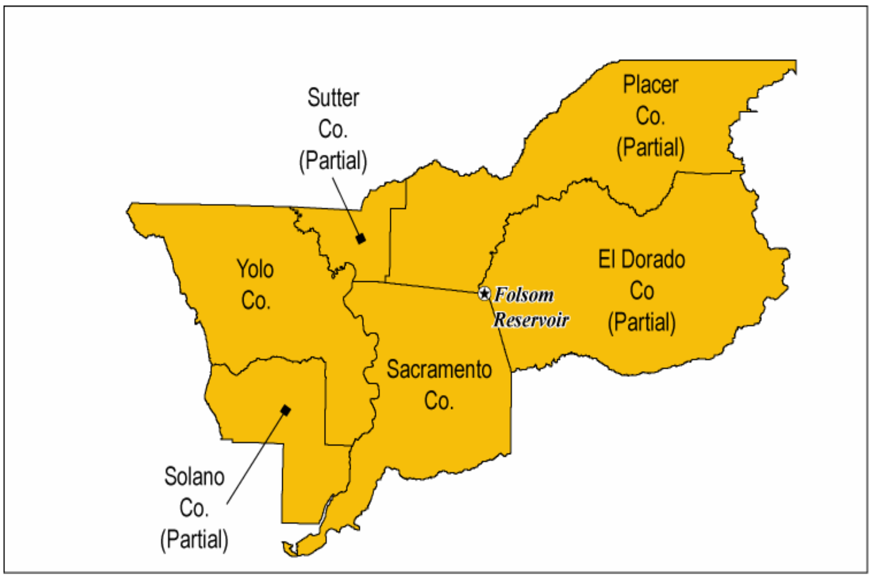

Figure 3.3-1
Air Quality Area of Analysis

3.3.1.2 Regulatory Setting

Air quality management and protection responsibilities exist in federal, state, and local levels of government. The primary statutes that establish ambient air quality standards and establish regulatory authorities to enforce regulations designed to attain those standards are the federal Clean Air Act (CAA) and California Clean Air Act (CCAA).

Air Quality Management at the Federal Level

The federal CAA, as amended in 1990, is currently comprised of six titles:

- Title I – Air Pollution Prevention and Control
- Title II – Emission Standards for Moving Sources
- Title III – General
- Title IV – Acid Deposition Control
- Title V – Permits
- Title VI – Stratospheric Ozone Protection

Titles I and V contain the provisions that typically address construction projects and stationary source emissions. Title I requirements include, among others, requirements (a) to establish National Ambient Air Quality Standards (NAAQS) for air pollutants that protect human health with an adequate margin of safety as well as protect public welfare, (b) to limit emissions from new stationary sources, (c) to prevent significant deterioration of air quality in regions with air quality that is already better than the NAAQS, and (d) to develop State Implementation Plans (SIPs) that establish the steps to be taken to bring areas with air quality that is worse than the NAAQS back into attainment of the NAAQS by mandated attainment dates. As part of Title I, federal agencies cannot engage in, support in any way or provide financial assistance for, license or permit, or approve any activity which does not conform to an approved SIP.

Title V requires that major stationary sources obtain operating permits and pay fees that are based on the quantity of pollutants emitted. Title III of the CAA gives authority to the U.S. Environmental Protection Agency (USEPA) to promulgate regulations that implement the CAA requirements.

National Ambient Air Quality Standards

As required by the Federal CAA, the USEPA has established and continues to update the NAAQS for specific “criteria” air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), inhalable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and lead (Pb). The NAAQS for these pollutants are listed in Table 3.3-1 and represent the levels of air quality deemed necessary by USEPA to protect the public health and welfare with an adequate margin of safety. The health effects associated with these pollutants are summarized in Table 3.3-2.

Table 3.3-1
National and California Ambient Air Quality Standards

		Standard, as parts per million by volume (ppmv)		Standard, as micrograms per cubic meter ($\mu g/m^3$)		Violation Criteria	
Pollutant	**Avg Time**	**California**	**National**	**California**	**National**	**California**	**National**
Ozone (O_3)	8 hours	0.07	0.08	137	157	If exceeded	If exceeded on more than 3 days in 3 years
	1 hour	0.09	N/A	180	N/A	If exceeded	N/A
Carbon monoxide (CO)	8 hours	9.0	9	10,000	10,000	If exceeded	If exceeded on more than 1 day per year
	1 hour	20	35	23,000	40,000	If exceeded	If exceeded on more than 1 day per year
Nitrogen dioxide (NO_2)	Annual	N/A	0.053	N/A	100	N/A	If exceeded
	1 hour	0.25	N/A	470	N/A	If exceeded	N/A
Sulfur dioxide (SO_2)	Annual	N/A	0.03	N/A	80	N/A	If exceeded
	24 hours	0.05	0.14	131	365	If exceeded	If exceeded on more than 1 day per year
	3 hours	N/A	0.5	N/A	1300	N/A	If exceeded on more than 1 day per year
	1 hour	0.25	N/A	665	N/A	If exceeded	N/A
Hydrogen sulfide (H_2S)	1 hour	0.03	N/A	42	N/A	If equaled or exceeded	N/A
Vinyl chloride	24 hours	0.010	N/A	26	N/A	If equaled or exceeded	N/A
Inhalable particulate matter (PM_{10})	Annual	N/A	N/A	20	50	If exceeded	If exceeded
	24 hours	N/A	N/A	50	150	If exceeded	If exceeded on more than 1 day per year
Fine particulate matter ($PM_{2.5}$)	Annual	N/A	N/A	12	15	If exceeded	If exceeded
	24 hours	N/A	N/A	N/A	65	N/A	If exceeded on more than 1 day per year
Sulfate particles	24 hours	N/A	N/A	25	N/A	If equaled or exceeded	N/A
Lead particles (Pb)	Calendar quarter	N/A	N/A	N/A	1.5	N/A	If exceeded
	30 days	N/A	N/A	1.5	N/A	If equaled or exceeded	N/A

Source: CARB 2005.

Table 3.3-2 ***Criteria Pollutants***			
Pollutant	***Characteristics***	***Health Effects***	***Major Sources***
Ozone	A highly reactive photochemical pollutant created by the action of sunshine on ozone precursors (reactive organic gasses and oxides of nitrogen).	• Eye irritation. • Respiratory function impairment.	Combustion sources, such as factories and automobiles, and evaporation of solvents and fuels.
Carbon Monoxide	Odorless, colorless gas that is highly toxic. Formed by the incomplete combustion of fuels.	• Impairment of oxygen transport in the bloodstream. • Aggravation of cardiovascular disease. • Fatigue, headache, dizziness.	Automobile exhaust, combustion of fuels, and combustion of wood in woodstoves and fireplaces.
Nitrogen Dioxide	Reddish-brown gas formed during combustion.	• Increased risk of acute and chronic respiratory disease.	Automobile and diesel truck exhaust, industrial processes, and fossil-fueled powerplants.
Sulfur Dioxide	Colorless gas with a pungent odor.	• Increased risk of acute and chronic respiratory disease.	Diesel vehicle exhaust, oil-powered powerplants, industrial processes.
PM_{10} and $PM_{2.5}$	Small particles that measure 10 microns or less are termed PM_{10} (fine particles less than 2.5 microns are $PM_{2.5}$). Solid and liquid particles of dust, soot, aerosols, smoke, ash, and pollen and other matter that are small enough to remain suspended in the air for a long period.	• Aggravation of chronic disease and heart/lung disease symptoms.	Dust, erosion, incinerators, automobile and aircraft exhaust, and open fires.

The USEPA recently approved changes to the O_3 and PM_{10} NAAQS. In place of the 1-hour ozone standard, the USEPA approved an 8-hour standard of 0.08 parts per million (ppm). In addition to the current PM_{10} standard, the USEPA approved a standard for suspended particulate matter less than or equal to 2.5 micrometers ($PM_{2.5}$). Although these changes have been approved, implementation of the new standards and monitoring of ambient conditions relative to these new standards is an ongoing process.

The Federal CAA requires states to classify air basins (or portions thereof) as either "attainment" or "non-attainment" with respect to criteria air pollutants, based on whether the NAAQS have been achieved, and to prepare air quality plans containing emission reduction strategies for those areas designated as "non-attainment." The Lower Sacramento Valley Air Basin, in which the Folsom DS/FDR is located, is designated as non-attainment for the O_3 NAAQS, and Sacramento County is designated as non-attainment for the PM_{10} NAAQS, as listed in Table 3.3-3.

Table 3.3-3
Federal and State Attainment Status

Pollutant	*State Status*	*Federal Status*
O_3	Nonattainment	Nonattainment, serious for 8-hour average(1)
PM_{10}	Nonattainment	Nonattainment, moderate(2)
$PM_{2.5}$	Attainment	Attainment
CO	Attainment	Attainment/Maintenance
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment

(1) On June 15, 2005, the USEPA revoked the 1-hour ozone standard in lieu of the 8-hour standard.
(2) For Sacramento County only, all other counties in the area are unclassifiable/attainment for the PM_{10} NAAQS.

Sources: SMAQMD 2006a; 40 CFR 81.305; 70 FR 71776; 70 FR 19844; 70 FR 944.

State Implementation Plans

Counties or regions that are designated as federal non-attainment areas for one or more criteria air pollutants must prepare a SIP that demonstrates how the area will achieve attainment of the standards by the federally mandated deadlines. In addition, those areas that have been redesignated as attainment will have maintenance plans that show how the area will maintain the standard.

The currently approved SIP for the O_3 non-attainment area was published in 1994 for the 1-hour O_3 NAAQS. Three progress updates have been published since then, one in 1999, one in 2002, and the latest in 2006. While these SIP milestone and rate-of-progress reports describe the changes in emission inventories that have occurred since the 1994 SIP was developed, the budgets for the O_3 precursors[1] nitrogen oxides (NO_x) and volatile organic compounds (VOC)[2] have not been updated. The next O_3 SIP is currently under development and should be published no later than 2007. This new SIP will need to demonstrate attainment of the 8-hour O_3 NAAQS by 2013. The extent of the non-attainment area for the 8-hour O_3 NAAQS is identified in Figure 3.3-2, and includes all of Sacramento and Yolo Counties, and parts of El Dorado, Placer, Solano, and Sutter Counties.

1 O_3 is a secondary pollutant, meaning that it is not directly emitted from sources, but is formed from atmospheric reactions of the precursor compounds NOx and VOC. NOx and VOC are directly emitted from various mobile and stationary sources. For SIP purposes, NOx and VOC emissions are controlled to reduce the ambient O_3 concentrations.

2 EPA uses the definition of VOC to incorporate those compounds that are sufficiently reactive in the atmosphere to form O_3; the State of California has defined reactive organic gases (ROG) for the same purpose. Although minor variations exist in the definitions of VOC and ROG, for most sources of concern in this document these variations are negligible and the terms are interchangeable.

Figure 3.3-2
Federal 8-Hour Ozone Sacramento Non-attainment Area

On November 30, 2005, USEPA published in the Federal Register (70 FR 71776) its direct final rule approving ten CO Maintenance Plans in California, including the Sacramento Urbanized Area CO Maintenance Plan. This plan provides the CO budgets for the next 10 years that will demonstrate continued attainment of the CO NAAQS.

Although the area is designated as non-attainment for the PM_{10} NAAQS, no approved SIP for PM_{10} currently exists. The area has achieved the PM_{10} NAAQS, but the Sacramento Metropolitan Air Quality Management District (SMAQMD) must request redesignation to attainment and submit a maintenance plan to be formally designated as attainment.

General Conformity
Section 176 (c) of the Clean Air Act (42 U.S.C. 7506(c)) requires any entity of the federal government that engages in, supports, or in any way provides financial support for, licenses or permits, or approves any activity to demonstrate that the action conforms to the applicable SIP required under Section 110 (a) of the Federal CAA (42 U.S.C. 7410(a)) before the action is otherwise approved. In this context, conformity means that such federal actions must be consistent with a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of those standards. Each federal agency must determine that any action that is proposed by the agency and that is subject to the regulations implementing the conformity requirements will, in fact, conform to the applicable SIP before the action is taken. The Folsom DS/FDR is subject to the

General Conformity Rule since it is sponsored and supported by multiple federal agencies.

On November 30, 1993, USEPA promulgated final general conformity regulations at 40 CFR 93 Subpart B for all federal activities except those covered under transportation conformity. The general conformity regulations apply to a proposed federal action in a non-attainment or maintenance area if the total of direct and indirect emissions of the relevant criteria pollutants and precursor pollutants caused by the proposed action equal or exceed certain de minimis amounts, thus requiring the federal agency to make a determination of general conformity. The de minimis amounts for the region covering Folsom Dam are presented in Table 3.3-4.

Table 3.3-4
General Conformity de minimis Thresholds

Pollutant	***Federal Status***	***De minimis (TPY)***
VOC (as an Ozone Precursor)	Nonattainment, serious 8-hour Ozone	50
NO_x (as an Ozone Precursor)	Nonattainment, serious 8-hour Ozone	50
PM_{10}	Nonattainment, moderate	100
CO	Attainment, Maintenance	100

TPY = tons per year
Sources: SMAQMD 2006a; 40 CFR 93.153.

Regardless of the proposed action's exceedance of de minimis amounts, if this total represents 10 percent or more of the area's total emissions of that pollutant, the action is considered regionally significant and the federal agency must make a determination of general conformity. By requiring an analysis of direct and indirect emissions, USEPA intended the regulating federal agency to make sure that only those emissions that are reasonably foreseeable and that the federal agency can practicably control subject to that agency's continuing program responsibility will be addressed.

Direct emissions are those that are caused or initiated by the federal action, and occur at the same time and place as the federal action. Indirect emissions are reasonably foreseeable emissions that are further removed from the federal action in time and/or distance, and can be practicably controlled by the federal agency on a continuing basis (40 CFR 93.152). A federal agency can indirectly control emissions by placing conditions on federal approval or federal funding. An example would be controlling emissions by limiting the size of a parking facility or by making employee trip reduction requirements (USEPA 1994).

The general conformity regulations incorporate a stepwise process, beginning with an applicability analysis. According to USEPA guidance (USEPA 1994), before any approval is given for a proposed action to go forward, the regulating federal agency must apply the applicability requirements found at 40 CFR 93.153(b) to the proposed action and/or determine the regional significance of the proposed action to evaluate whether, on a pollutant-by-pollutant basis, a determination of general conformity is required. The guidance states that the applicability analysis can be (but is not required to be) completed concurrently with any analysis required under NEPA. If the regulating federal agency determines that the general conformity regulations do not apply to the proposed action (meaning the proposed action emissions do not exceed the *de minimis* thresholds and are not regionally significant), no further analysis or documentation is required.

If the general conformity regulations do apply to the proposed action, the regulating federal agency must next conduct a conformity evaluation in accord with the criteria and procedures in the implementing regulations, publish a draft determination of general conformity for public review, and then publish the final determination of general conformity. For a required action to meet the conformity determination emissions criteria, the total of direct and indirect emissions from the action must be in compliance or consistent with all relevant requirements and milestones contained in the applicable SIP (40 CFR 93.158(c)), and in addition must meet other specified requirements, such as:

- For any criteria pollutant, the total of direct and indirect emissions from the action is specifically identified and accounted for in the applicable SIP's attainment or maintenance demonstration (40 CFR 93.158(a)(1)); or

- For ozone or nitrogen dioxide, the total of direct and indirect emissions from the action is determined and documented by the State agency primarily responsible for the applicable SIP to result in a level of emissions which, together with all other emissions in the non-attainment (or maintenance) area, would not exceed the emissions inventory specified in the applicable SIP (40 CFR 93.158(a)(5)(i)(A)); or

- For ozone or nitrogen dioxide, the total of direct and indirect emissions from the action is determined by the State agency responsible for the applicable SIP to result in a level of emissions which, together with all other emissions in the non-attainment (or maintenance) area, would exceed the emissions inventory specified in the applicable SIP and the State Governor or the Governor's designee for SIP actions makes a written commitment to USEPA for specific SIP revision measures reducing emissions to not exceed the emissions inventory (40 CFR 93.158(a)(5)(i)(B)); or

- For ozone or nitrogen dioxide, the total of direct and indirect emissions from the action is fully offset within the same non-attainment (or maintenance) area through a revision to the applicable SIP or a similarly enforceable measure that affects emission reductions so that there is no net increase in emissions of that pollutant (40 CFR 93.158(a)(2)).

Air Quality Management at the State Level

The CCAA substantially added to the authority and responsibilities of the State's air pollution control districts. The CCAA establishes an air quality management process that generally parallels the federal process. The CCAA, however, focuses on attainment of the California Ambient Air Quality Standards (CAAQS) that, for certain pollutants and averaging periods, are more stringent than the comparable NAAQS. The CAAQS are included in Table 3.3-1.

The CCAA requires that air districts prepare an air quality attainment plan if the district violates CAAQS for CO, SO_2, NO_2, or O_3. Table 3.3-3 shows that the Sacramento area is classified as a non-attainment area for the O_3 and PM_{10} CAAQS. No locally prepared attainment plans are required for areas that violate the PM_{10} CAAQS.

The CCAA requires that the CAAQS be met as expeditiously as practicable, but does not set precise attainment deadlines. Instead, the act established increasingly stringent requirements for areas that will require more time to achieve the standards.

The air quality attainment plan requirements established by the CCAA are based on the severity of air pollution problems caused by locally generated emissions. Upwind air pollution control districts are required to establish and implement emission control programs commensurate with the extent of pollutant transport to downwind districts.

Air pollution problems in Sacramento County are primarily the result of locally generated emissions. However, Sacramento's air pollution occasionally includes contributions from the San Francisco Bay Area or the San Joaquin Valley. In addition, Sacramento County has been identified as a source of ozone precursor emissions that occasionally contribute to air quality problems in the San Joaquin Valley Air Basin and the Northern Sacramento Valley Air Basin. Consequently, the air quality planning for Sacramento County must not only correct local air pollution problems, but must also reduce the area's effect on downwind air basins.

The California Air Resources Board (CARB) is responsible for developing emission standards for on-road motor vehicles and some off-road equipment in the state. In addition, CARB develops guidelines for the local districts to use in establishing air quality permit and emission control requirements for stationary sources subject to the local air district regulations.

Air Quality Management at the Local Level

Multiple air quality management districts (AQMDs) and air pollution control districts (APCDs) have jurisdiction over the O_3 and PM_{10} non-attainment areas. Each county in the area has its own AQMD or APCD. The SMAQMD manages air quality in Sacramento County and coordinates with the other districts to develop SIP updates. The other districts most likely to be impacted by the Folsom DS/FDR are the Placer County APCD, El Dorado County AQMD, and Feather River AQMD. The Folsom DS/FDR site may have some operations occurring in Placer and El Dorado Counties as well as Sacramento County. Transportation of sand/gravel for filter material from the Marysville area would require haul trucks to travel through the Feather River AQMD.

In addition to permitting and rule compliance, air quality management at the local level is also accomplished through AQMD/APCD imposition of mitigation measures on project environmental impact reports and mitigated negative declarations developed by project proponents under CEQA. Specific to project construction emissions, CEQA requires mitigation of air quality impacts that exceed certain significance thresholds set by the local AQMD/APCD. In the SMAQMD, the construction significance thresholds are 85 lbs/day for NO_x emissions, and 50 $\mu g/m^3$ for PM_{10} ambient concentrations.

If project construction NO_x emissions exceed 85 lbs/day, then a standard set of construction mitigation measures must be incorporated into the Draft EIR and mitigation monitoring and reporting program (MMRP). The inclusion of these measures allows the applicant to assume a 20 percent reduction in NO_x emissions from construction activities. If the mitigated NO_x emissions still exceed 85 lbs/day, SMAQMD's policy is to charge a mitigation fee of $14,300/ton of excess (greater than 85 lbs/day) NO_x emissions.

3.3.1.3 Environmental Setting

Climate and Atmospheric Conditions

Sacramento County is located at the southern end of the Sacramento Valley, which is bounded by the Coast and Diablo Ranges on the west and the Sierra Nevada on the east. The county is about 50 miles northeast of the Carquinez Strait, a sea-level gap between the Coast Range and the Diablo Range. The prevailing winds are from the south, primarily because of marine breezes through the Carquinez Strait, although during winter the sea breezes diminish and winds from the north occur more frequently.

The area of analysis experiences episodes of poor atmospheric mixing caused by inversion layers. Inversion layers form when temperature increases with elevation above ground or when a mass of warm dry air settles over a mass of cooler air near the ground. Surface inversions (0 to 500 feet) occur most frequently during the winter, while subsidence inversions (1,000 to 2,000 feet) occur most frequently during the summer. Inversion layers limit vertical mixing in the atmosphere, trapping pollutants near the surface.

Existing Air Quality Conditions

The existing air quality conditions for a project area are typically the result of meteorological conditions and existing emission sources in an area.

Emission Sources

Table 3.3-5 presents estimates of existing emissions in Sacramento County. There are two main categories of emission sources in any area: stationary and mobile.

On-road motor vehicles are the major source of VOC, CO, and NO_x emissions in Sacramento County. Other (off-road) mobile vehicles and equipment are the major source of SO_2 emissions, and contribute substantially to VOC, CO, and NO_x emissions. Fugitive dust primarily from construction sites, paved and unpaved roadways, and farming operations is the major source of PM_{10} and $PM_{2.5}$, with substantial contributions from residential fuel combustion (all of these sources are summarized in the Area-Wide Miscellaneous Processes in Table 3.3-5).

Table 3.3-5
Sacramento County 2004 Emission Inventories

		Average Emissions in tons per day (TPD)					
Source Type	**Category**	**VOC/ROG**	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Stationary	Fuel Combustion	0.59	3.02	3.19	0.04	0.93	0.91
Stationary	Waste Disposal	0.24	0.14	0.04	0	0.01	0.01
Stationary	Cleaning and Surface Coatings	5.35	0	0	0	0	0
Stationary	Petroleum Production and Marketing	4.11	0	0	0	0	0
Stationary	Industrial Processes	0.88	0.50	0.28	0.03	1.22	0.59
Area-Wide	Solvent Evaporation	13.45	0	0	0	0.01	0.01
Area-Wide	Miscellaneous Processes	4.17	40.69	3.17	0.16	38.29	11.79
Mobile	On-Road Motor Vehicles	29.30	276.07	54.86	0.46	1.75	1.19
Mobile	Other Mobile Sources	12.06	91.23	25.62	0.54	1.77	1.59
	Total	70.15	411.65	87.16	1.23	43.98	16.09

Source: CARB 2006a.

Monitoring Data – Criteria Pollutants

Air quality data from monitoring stations near the area of analysis are summarized in Table 3.3-6. Because many of the stations do not monitor all pollutants, a distinct set of monitoring stations was chosen for each pollutant that would best represent conditions at the area of analysis, or in the case of ozone, the regional conditions.

Table 3.3-6 ***Summary of Pollutant Monitoring Data in Sacramento***			
Criteria Air Pollutant And Station Location	***Yearly Monitoring Data***		
	2003	***2004***	***2005***
Carbon Monoxide			
Sacramento – Del Paso Manor			
Highest 8-hour concentration (ppm)	4.27	3.15	3.09
Days above CAAQS (1)	0	0	0
Ozone 1-hour			
Sacramento – Del Paso Manor			
1st High (ppm)	0.134	0.11	0.134
2nd High (ppm)	0.132	0.105	0.124
Days above CAAQS (2)	21	6	14
Days above NAAQS	2	0	1
Ozone 8-hour			
Sacramento – Del Paso Manor			
1st High (ppm)	0.113	0.089	0.117
2nd High (ppm)	0.099	0.087	0.109
Days above NAAQS (3)	13	3	10
PM_{10}			
Sacramento – Del Paso Manor			
Highest 24-hour concentration (ug/m^3) (4)	54/55	49/52	59/77
Arithmetic mean (ug/m^3) (4)	20.6/21.8	22.1/22.7	N/A/23.1
Calculated number of days above CAAQS (5)	2	1	5
Calculated number of days above NAAQS	0	0	0
$PM_{2.5}$			
Sacramento – Del Paso Manor			
Highest 24-hour concentration (ug/m^3)	65	51	44
Annual mean (ug/m^3)	12.2	11.5	N/A
Number of days above standard (6)	0	0	N/A

(1) Days above standard = days above 8-hour CAAQS of 9 ppm.
(2) Days above standard = days above 1-hour CAAQS of 0.09 ppm.
(3) Days above standard = days above 8-hour NAAQS of 0.08 ppm.
(4) Different methods of analyzing monitored data for PM_{10} are used by USEPA and CARB; therefore, both data are provided, respectively, separated by "/".
(5) Days above standard = days above 24-hour CAAQS of 50 ppm. Most PM_{10} measurements are taken every 6 days; therefore, the number of days over the 24-hour standard in any year is calculated.
(6) Days above standard = days above 24-hour NAAQS of 65 ppm.

N/A = not available

Source: CARB 2006b

Monitored CO levels have been trending down over the last several years. The downward trend is primarily a result of the use of oxygenated gasoline during the winter CO season. The 8-hour CO CAAQS and NAAQS were last exceeded in the early 1990s. The area has attained the standards since then, and Sacramento County was re-designated an attainment/maintenance area for the CO NAAQS in March 1998.

The 1-hour O_3 CAAQS had been exceeded up to 30 times each year at the individual monitoring stations shown on Table 3.3-6. The recorded 8-hour O_3 concentrations exceeded the NAAQS up to 26 times in 2003. Substantial year-to-year variations in monitored O_3 levels are common. However, no clear trend in O_3 levels is demonstrated by monitoring results from the 1990s through 2004.

The 24-hour and annual PM_{10} and annual $PM_{2.5}$ CAAQS were exceeded during the monitoring period. However, the PM_{10} and $PM_{2.5}$ NAAQS were not exceeded, as shown in Table 3.3-6.

Monitoring Data – Toxic Air Contaminants

Existing toxic air contaminant (TAC) concentrations are presented in Table 3.3-7 for pollutants typically associated with mobile sources. The data were collected at the Roseville monitoring station located at 151 North Sunrise Avenue. Most of the TAC concentration trends for the past three years are either flat or declining. From the concentrations of all TACs monitored at the Roseville station, the estimated lifetime cancer risk for existing conditions (without considering diesel particulate matter) was approximately 112 per million in 2005. The TACs that are the top contributors to this risk level are carbon tetrachloride, benzene, 1,3-butadiene, and formaldehyde.

Table 3.3-7
Summary of Toxic Air Contaminant Monitoring Data in Sacramento (Roseville)

Toxic Air Contaminant	Annual Average (Mean) Concentration		
	2003	2004	2005
Acetaldehyde (ppbv)	0.93	0.87	0.89
Acrolein (ppbv)	2.5 (1)	1.7 (1)	0.43
Benzene (ppbv)	0.363	0.278	0.244
1,3-Butadiene (ppbv)	0.078	0.054	0.051
Ethyl benzene (ppbv)	0.12	0.18	0.11
Formaldehyde (ppbv)	3.23	2.12	2.07
Methyl ethyl ketone (ppbv)	0.07	0.07	0.07
Methyl tert-butyl ether (ppbv)	0.33	0.15(1)	N/A
Styrene (ppbv)	0.05	0.05	0.05
Toluene (ppbv)	0.80	2.15	0.80
meta- and para-Xylene (ppbv)	0.41	0.48	0.32
Ortho-Xylene (ppbv)	0.15	0.15	0.10
Benzo(a)pyrene (ng/m^3)	0.156	0.135	N/A
Benzo(b)fluoranthene (ng/m^3)	0.199	0.167	N/A
Benzo(k)fluoranthene (ng/m^3)	0.091	0.076	N/A
Benzo(g,h,i)perlyene (ng/m^3)	0.270	0.234	N/A
Dibenz(a,h)anthracene (ng/m^3)	0.041	0.034	N/A
Indeno(1,2,3-cd)pyrene (ng/m^3)	0.209	0.154	N/A
Chromium (hexavalent) (ng/m^3)	0.053	0.060	0.058

(1) Reported maximum value.

N/A = not available
ng/m^3 = nanograms per cubic meter

Source: CARB 2006b.

3.3.2 Environmental Consequences/Environmental Impacts

3.3.2.1 Significance Criteria

Ozone Precursor Significance Thresholds

For CEQA analyses, the SMAQMD has established O_3 precursor emission thresholds for NO_x and VOC. The thresholds are based on daily emission rates from both construction and operational conditions. If any of the thresholds shown in Table 3.3-8 are exceeded, then the Folsom DS/FDR action would be considered significant for that pollutant. Only the NO_x construction thresholds are applicable since the Folsom DS/FDR would have no operational emissions once completed.

Table 3.3-8
Ozone Precursor Significance Thresholds

Pollutant	*Pounds per Day*
Construction Oxides of Nitrogen (NO_x)	85
Operational Reactive Organic Gases (ROG)	65
Operational Oxides of Nitrogen (NO_x)	65

Source: SMAQMD 2004

Other Criteria Pollutants

Unlike ozone precursors, other criteria pollutants, such as CO, PM_{10}, and $PM_{2.5}$ do not have daily significance thresholds; rather, the pollutants are compared against the CAAQS (CEQA) and NAAQS (NEPA). A project would have a significant adverse air quality impact if it either causes of an exceedance of a standard (for pollutants in attainment) or makes a substantial contribution to an existing exceedance of an air quality standard (for pollutants in non-attainment). For the purposes of a CEQA evaluation, a "substantial" contribution is defined as five percent or more of an existing exceedance.

Offensive Odors

Specific significance thresholds are not available for offensive odors; however, a project would be considered to have significant adverse air quality impacts if it causes detriment, nuisance, or annoyance to a considerable number of persons. Since the Folsom DS/FDR is not expected to have any short- or long-term impacts associated with offensive odors, no further analysis was conducted.

Toxic Air Contaminants

If the proposed action would emit TACs, such as diesel particulate matter from diesel-fueled construction equipment, then the health risk associated with these compounds must be assessed. The California Air Pollution Control Officers Association (CAPCOA) and CARB have developed TAC health risk assessment (HRA) guidelines that must be followed to judge the impacts associated with TAC emissions. If a complete HRA is not completed, then emissions from mobile and stationary sources may be conservatively considered to be significant and unavoidable. The recommended significance thresholds for TACs include:

- Lifetime probability of contracting cancer is greater than 10 in one million;
- Ground-level concentration of non-carcinogenic toxic air pollutants would result in a Hazard Index of greater than 1.

3.3.2.2 Assessment Methods

This section describes the methodology used to develop the emission inventories and the comparison of the analysis results to the significance thresholds discussed above.

Emission Calculation Methodology
In general, the construction emissions were estimated from various emission models and spreadsheet calculations, depending on the source type and data availability. The CARB Urban Emissions Model (URBEMIS) - Version 8.7 and EMFAC2002 (on-road vehicle emission factor model) were used along with emission factors obtained from USEPA AP-42 and SMAQMD/El Dorado APCD CEQA guidelines. URBEMIS was developed to estimate emissions from a variety of projects such as residential, commercial and industrial developments. However, URBEMIS does not include specific features associated with dam construction and much of the emission calculation relied on other methods to estimate construction emissions. Daily and annual emissions for each year of construction were estimated from appropriate emission factors, number of facilities and features being worked and the associated schedules. The following construction sources and activities were analyzed for emissions:

- On-site demolition and grading (cut/fill) fugitive dust – based on URBEMIS modeling.
- On-site construction equipment and haul truck engine emissions (all pollutants) – based on SMAQMD/El Dorado APCD CEQA guideline emission factors and estimated equipment schedules.
- Off-site haul truck engine emissions (all pollutants) – based on EMFAC2002 and estimated vehicle miles traveled.
- On-site and off-site haul truck fugitive dust emissions for paved and unpaved road travel – based on AP-42 and estimated vehicle miles traveled.
- On-site material processing plants (assumed to be primarily crushing and sorting operations) – based on AP-42 and number of facilities operating simultaneously.

- On-site concrete batch plants – based on AP-42 and number of facilities operating simultaneously.
- On-site blasting emissions – based on methodology provided in the Blue Rock Quarry Draft Environmental Impact Report (Sonoma County 2005) and approximate size of area subject to blasting activity.
- Off-site worker vehicle trips to and from the site, including paved road dust – based on EMFAC2002 (engine emission factors), Midwest Research Institute (MRI 1996, paved road dust emission factors), and estimated vehicle miles traveled.

The following sections provide additional discussion of emission estimation methodologies used for each source group.

On-Site Demolition, Grading, and Asphalt Paving
The URBEMIS model was developed to estimate construction emissions from land development projects. It treats construction in three phases: Phase 1 – demolition, Phase 2 – site grading, and Phase 3 – building construction. For this proposed action, URBEMIS was used for fugitive PM emissions from demolition and grading (earth cut/fill) activities. The earth cut/fill activity is included in URBEMIS Phase 2 –Site Grading, which allows the user to select one of four tiers of detail to calculate fugitive dust emissions. Movement of dam shell material was treated as grading. The volume of shell material for each feature and alternative were estimated in cubic yards per day; therefore, the Low Level tier was selected in URBEMIS for fugitive PM_{10} emission estimations.

On-Site Construction Equipment Engine Emissions
Both the SMAQMD and El Dorado County AQMD developed daily emission rates for construction equipment, which can be found in their CEQA Guides (SMAQMD 2004, El Dorado 2002). The emission factors compared favorably with the CARB OFFROAD model emission factors. The emission factors provided in the SMAQMD/El Dorado AQMD CEQA guidelines are emission rate data (lbs/day) by year for each year up to 2010. For this analysis, it was assumed that the emission factors for 2011 through 2014 were equal to those in 2010. The construction equipment emission rates from the CEQA guidelines are shown in Table 3.3-9.

Table 3.3-9
Construction Equipment Emission Rates (lb/day) for 2007-2014(1)

Equipment Type	*ROG*	*CO*	*NO_x*	*PM_{10}*	*$PM_{2.5}$*
Bore/Drill Rigs					
2007	1.57	13.37	10.85	0.25	0.23
2008	1.88	15.97	12.97	0.30	0.28
2009	2.38	20.21	16.41	0.38	0.35
2010-2014	2.26	19.23	15.61	0.36	0.33
Concrete/Industrial Saws					
2007	1.08	7.97	7.84	0.29	0.27
2008	1.08	8.26	7.44	0.26	0.24
2009	1.08	8.56	7.04	0.23	0.21
2010-2014	1.08	8.86	6.65	0.20	0.18
Cranes					
2007	1.44	12.27	8.37	0.23	0.21
2008	1.44	12.27	8.37	0.23	0.21
2009	1.44	12.27	8.37	0.23	0.21
2010-2014	1.44	12.27	8.37	0.23	0.21
Crawler Tractors					
2007	1.45	10.75	10.58	0.39	0.36
2008	1.45	11.15	10.04	0.35	0.32
2009	1.45	11.55	9.50	0.31	0.29
2010-2014	1.45	11.95	8.96	0.27	0.25
Crushing Proc. Equipment					
2007	2.12	15.69	15.45	0.57	0.52
2008	2.12	16.28	14.66	0.51	0.47
2009	2.12	16.86	13.88	0.45	0.41
2010-2014	2.12	17.45	13.09	0.40	0.37
Excavators					
2007	1.84	15.64	10.67	0.29	0.27
2008	1.84	15.64	10.67	0.29	0.27
2009	1.84	15.64	10.67	0.29	0.27
2010-2014	1.84	15.64	10.67	0.29	0.27
Graders					
2007	1.76	14.98	10.22	0.28	0.26
2008	1.76	14.98	10.22	0.28	0.26
2009	1.76	14.98	10.22	0.28	0.26
2010-2014	1.76	14.98	10.22	0.28	0.26
Off-Highway Tractors/Compactors					
2007	1.84	13.63	13.42	0.49	0.45
2008	1.84	14.14	12.74	0.44	0.40
2009	1.84	14.65	12.05	0.39	0.36
2010-2014	1.84	15.16	11.37	0.34	0.31
Off-Highway Trucks/Water Trucks					
2007	3.60	30.62	20.89	0.58	0.53
2008	3.60	30.62	20.89	0.58	0.53
2009	3.60	30.62	20.89	0.58	0.53
2010-2014	3.60	30.62	20.89	0.58	0.53
Pavers					
2007	1.37	11.62	7.93	0.22	0.20
2008	1.37	11.62	7.93	0.22	0.20
2009	1.37	11.62	7.93	0.22	0.20
2010-2014	1.37	11.62	7.93	0.22	0.20
Paving Equipment					
2007	1.04	7.66	7.54	0.28	0.26
2008	1.04	7.95	7.16	0.25	0.23
2009	1.04	8.23	6.78	0.22	0.20
2010-2014	1.04	8.52	6.39	0.19	0.17

Table 3.3-9
Construction Equipment Emission Rates (lb/day) for 2007-2014[1]

Equipment Type	ROG	CO	NO_x	PM_{10}	$PM_{2.5}$
Rollers					
2007	0.86	7.34	5.01	0.14	0.13
2008	0.86	7.34	5.01	0.14	0.13
2009	0.86	7.34	5.01	0.14	0.13
2010-2014	0.86	7.34	5.01	0.14	0.13
Rough Terrain Forklifts					
2007	0.79	6.70	4.57	0.13	0.12
2008	0.79	6.70	4.57	0.13	0.12
2009	0.79	6.70	4.57	0.13	0.12
2010-2014	0.79	6.70	4.57	0.13	0.12
Rubber Tired Dozers					
2007	3.66	27.11	26.69	0.98	0.90
2008	3.66	28.12	25.33	0.88	0.81
2009	3.66	29.13	23.97	0.78	0.72
2010-2014	3.66	30.14	22.61	0.68	0.63
Rubber Tired Loaders					
2007	1.35	11.52	7.86	0.22	0.20
2008	1.35	11.52	7.86	0.22	0.20
2009	1.35	11.52	7.86	0.22	0.20
2010-2014	1.35	11.52	7.86	0.22	0.20
Scrapers					
2007	3.64	30.96	21.12	0.58	0.53
2008	3.64	30.96	21.12	0.58	0.53
2009	3.64	30.96	21.12	0.58	0.53
2010-2014	3.64	30.96	21.12	0.58	0.53
Signal Boards					
2007	1.72	12.70	12.50	0.46	0.42
2008	1.72	13.18	11.87	0.41	0.38
2009	1.72	13.65	11.23	0.37	0.34
2010-2014	1.72	14.12	10.60	0.32	0.29
Skid Steer Loaders					
2007	0.56	4.78	3.26	0.09	0.08
2008	0.56	4.78	3.26	0.09	0.08
2009	0.56	4.78	3.26	0.09	0.08
2010-2014	0.56	4.78	3.26	0.09	0.08
Surfacing Equipment					
2007	3.77	27.91	27.48	1.01	0.93
2008	3.77	28.95	26.08	0.90	0.83
2009	3.77	29.99	24.68	0.80	0.74
2010-2014	3.77	31.03	23.28	0.70	0.64
Tractors/Loaders/Backhoes					
2007	0.65	4.82	4.74	0.17	0.16
2008	0.65	5.00	4.50	0.16	0.15
2009	0.65	5.18	4.26	0.14	0.13
2010-2014	0.65	5.36	4.02	0.12	0.11
Trenchers					
2007	1.00	8.53	5.82	0.16	0.15
2008	1.00	8.53	5.82	0.16	0.15
2009	1.00	8.53	5.82	0.16	0.15
2010-2014	1.00	8.53	5.82	0.16	0.15

[1]Assumes an 8-hour work day (SMAQMD 2006b).

Sources: SMAQMD 2004; El Dorado 2002.

The emission factors presented in Table 3.3-9 are multiplied by the number of pieces of each equipment type that would be used at each of the Folsom DS/FDR feature sites for each year of the analysis. The year with most construction equipment on site is 2009 for Alternative 1 through 4, and is 2013 for Alternative 5. The peak number of equipment on site per day for the peak year of construction is summarized in Table 3.3-10.

Table 3.3-10
Peak Daily Construction Equipment Counts in Peak Year*

Equipment Type	*Alt 1*	*Alt 2*	*Alt 3*	*Alt 4*	*Alt 5*
Drill Rig	2	5	2	4	3
Dozers	5	6	6	6	6
Rippers/Graders	1	5	5	6	3
Scrapers	14	4	8	5	10
Excavators	2	8	0	6	1
Loaders	4	12	7	11	13
Small Crane	0	3	1	2	0
Compactors	0	4	1	4	1
Off-Highway Trucks	12	6	22	6	9
On-Highway Trucks	12	0	0	0	0
Water Trucks	1	6	4	6	5
Total	**53**	**59**	**56**	**56**	**51**

* The peak year of emissions for Alternatives 1 through 4 is 2009, and for Alternative 5 is 2013.

The construction scheduling estimate for the Folsom DS/FDR is based on a 16-hour work day (two shifts). However, the daily emission rates presented in Table 3.3-9 were developed based in an 8-hour work day (one shift) (SMAQMD 2006b). Therefore, the emissions estimated from the data in Tables 3.3-9 and 3.3-10 must be doubled to account for the second daily work shift. The results section includes this doubling of emissions for on-site construction equipment.

On-Site and Off-Site Haul Truck Engine Emissions and Road Dust

The haul truck engine emissions were calculated based on EMFAC2002 emission factors for heavy duty diesel trucks in Sacramento County and estimates of total vehicle miles traveled per day. The emission factors used in this analysis are presented in Table 3.3-11. The average speed for on-site hauling was assumed to be 15 mph, and the average speed for off-site hauling was assumed to be 30 mph.

Table 3.3-11 Heavy Duty Diesel Truck Emission Factors for Sacramento Valley (g/VMT)						
MPH	***VOC/ROG***	***CO***	***NO_x***	***PM_{10} Total[(1)]***	***SO_2***	***$PM_{2.5}$ Total[1]***
15	1.146	5.076	14.181	0.548	0.021	0.473
30	0.676	2.506	11.147	0.343	0.021	0.285

[(1)]PM_{10} and $PM_{2.5}$ totals include engine exhaust, tire wear, and brake wear.

g/VMT = gallons per vehicle miles traveled

Re-entrained road dust from haul truck travel was estimated for paved and unpaved roads. Paved road dust was estimated using emission factors developed by the Midwest Research Institute (MRI 1996), and unpaved road dust was estimated using emission factors from AP-42 (USEPA 2006). Table 3.3-12 presents the paved road emission factors, and Table 3.3-13 presents the unpaved road emission factors.

Table 3.3-12 Paved Road Re-entrained Dust PM_{10} Emission Factors (g/VMT)			
	Average Daily Trips (ADT)		
Road condition	***High***	***Low***	***Average***
Average conditions	0.37	1.3	0.81
Worst-case conditions	0.64	3.9	2.1

Source: Midwest Research Institute 1996.

Table 3.3-13 Unpaved Road Re-entrained Dust PM_{10} Emission Factors (g/VMT)			
	Silt (%)	***PM_{10}***	***$PM_{2.5}$***
Lowest	0.56	0.4	0.04
Worst	23	10.4	1.04
Mean	8.5	4.2	0.42
Folsom		**5.4**	**0.54**

Sources: USEPA 2006

The Folsom DS/FDR emission factor for unpaved road dust was averaged from the values calculated using the lowest and highest silt contents, which is slightly greater than the one calculated from the mean silt content.

The haul trucks were divided into three groups based on hauling materials and site locations. The long distance group was defined as hauling raw material from Marysville and Prairie City, for which the roundtrip distances were determined from Google™ Maps. The off-site group included trucks hauling materials from local sites to the dam area, which assumed that all roundtrips were within 15 miles. Both exhaust emissions and re-entrained dust from paved roads were calculated for the two groups of hauling trucks above. The third group was defined as trucks hauling materials internally on-site, mostly on unpaved roads. The round trip distances were determined between 0.5 and 6 miles based on the site map, depending on individual construction activity and site location. The round trip distances for each group were summarized in Table 3.3-14.

Table 3.3-14
Haul Truck Trip Distances and Paved vs. Unpaved Road Ratios

Haul Truck Group	*Roundtrip Distance (miles)*	*Exhaust Emissions*	*Paved/Unpaved Road Dust*
Marysville/Prairie	106/30	Calculated	All paved road
Off-site Material Haul	15	Calculated	All paved road
On-site Internal Haul	0.5 – 6	Calculated	95% unpaved vs. 5% paved roads

On-Site Material Processing Plant Dust

On-site materials processing was assumed to be crushing and sorting. Emissions were estimated using the AP-42 emission factors summarized in Table 3.3-15, with an estimated materials processing facility achieving a maximum production rate of 5,000 tons per day. The emissions were calculated as the total of each process emission assuming the total material handled was subjected to all steps listed in Table 3.3-15.

In developing the emission inventories for materials processing, it was assumed that prime power would be obtained from the electric utility grid, and that diesel engines would <u>not</u> be used for prime movers/generators. It was also assumed that wet suppression of plant dust would be required as a condition of obtaining an air quality permit; therefore, the Folsom DS/FDR design would include emission controls in the materials processing plants.

Concrete Batch Plant Dust

Concrete batching emissions were estimated using AP-42 emission factors and summarized in Table 3.3-16 (USEPA 2006). The maximum daily production rate was estimated to be 300 cubic yards. Since the emission factor is in pounds per ton of concrete produced, the production rate in cubic yards per day was converted to tons per day with a concrete density of 4,946 lbs/cubic yard, resulting in 742 tons per day concrete production. The composition ratio of the aggregate, sand, and cement materials in the concrete was estimated to be 6:3:1.

As with materials processing, it was assumed that prime power in the concrete batch plants would be obtained from the electric utility grid, and that diesel engines would <u>not</u> be used for prime movers/generators. It was also assumed that wet suppression of plant dust would be required as a condition of obtaining an air quality permit; therefore, the Folsom DS/FDR design would include emission controls in the concrete batch plants.

Table 3.3-15 ***Materials Processing Emission Factors (lbs per ton of material)***		
Source	***Total PM_{10}***	***Total $PM_{2.5}$***
Tertiary Crushing	0.0024	ND
Tertiary Crushing (controlled)	0.00054	0.00010
Fines Crushing	0.0150	ND
Fines Crushing (controlled)	0.0012	0.000070
Screening	0.0087	ND
Screening (controlled)	0.00074	0.000050
Fines Screening	0.072	ND
Fines Screening (controlled)	0.0022	ND
Conveyor Transfer Point	0.00110	ND
Conveyor Transfer Point (controlled)	4.6×10^{-5}	1.3×10^{-5}
Wet Drilling – Unfragmented Stone	8.0×10^{-5}	ND
Truck Unloading -Fragmented Stone	1.6×10^{-5}	ND
Truck Unloading – Conveyor, crushed	0.00010	ND

Source: USEPA 2006.

Table 3.3-16 ***Concrete Batch Plant PM_{10} Emission Factors (lbs ton of concrete)***		
Batch Plant Source	***Uncontrolled***	***Controlled***
Aggregate transfer	0.0033	ND
Sand transfer	0.00099	ND
Cement unloading to elevated storage silo (pneumatic)	0.46	0.00034
Cement supplement unloading to elevated storage silo	1.10	0.0049
Weigh hopper loading	0.0024	ND
Mixer loading (central mix)	0.156	0.0055
Truck loading (truck mix)	0.311	0.0263

Source: USEPA 2006.

Air Dispersion Modeling Methodology

This section describes the selection of the air dispersion model and describes the basic input parameters and assumptions used to conduct the dispersion modeling.

Model Selection

In 1991, the American Meteorological Society (AMS) and the USEPA initiated a joint effort to develop a vastly improved air quality model. A committee was formed (AERMIC [the AMS/USEPA Regulatory Model Improvement Committee]) to upgrade the current models which were developed nearly two decades ago. Much progress has occurred in the scientific knowledge of atmospheric turbulence and dispersion and so a need had been recognized to update the regulatory air quality models based on more up-to-date science.

The goal of such an update would be to improve the accuracy of these models. AERMIC chose to focus on the development of a new model, AERMOD (AERMIC's Dispersion Model), for estimating the near-field concentrations from a variety of stationary sources. That is, AERMOD is designed to handle the same source types formerly addressed with the USEPA recommended Industrial Source Complex Model (ISC3), including sources located in various terrain settings.

After sufficient technical review, AERMOD, along with its associated preprocessors (AERMET - the meteorological data preprocessor, AERMAP - the terrain data preprocessor), was submitted to the USEPA's Office of Air Quality Planning and Standards for consideration as a regulatory dispersion model. The model was approved on November 9, 2005 [Federal Register: November 9, 2005 (Vol. 70, Num. 216) Page 68217-68261] to replace ISC3 after a one-year transition period.

AERMOD (USEPA 2004a) was used to predict the impacts from sources during construction. The most recent available model version was used.

AERMOD is capable of handling multiple sources, including point, volume, and area source types. Line sources may also be modeled as a string of volume sources or as elongated area sources. Several source groups may be specified in a single run, with the source contributions combined for each group. The model contains algorithms for modeling the effects of aerodynamic downwash due to nearby buildings on point source emissions. The current version of AERMOD does not include algorithms for modeling depositional effects on particulate emissions.

Source emission rates can be treated as constant throughout the modeling period, or may be varied by month, season, hour-of-day, or other optional periods of variation. These variable emission rate factors may be specified for a single source or for a group of sources. The user may also specify a separate file of hourly emission rates for some or all of the sources included in a particular model run.

The AERMOD model is capable of predicting average hourly impacts using local meteorological data. Lakes Environmental's ISC-AERMOD View modeling interface tool was used to create the inputs and evaluate the output.

Model Options

The regulatory default options (which include the use of Final Plume Rise, Stack-tip Downwash, Buoyancy-induced Dispersion, the model's Calms Processing Routine, Default Wind Profile Exponents, and Default Vertical Potential Temperature Gradients) were used in the model.

Averaging times selected depend on the pollutant modeled, as each pollutant has a regulatory standard with its own averaging time. Only pollutant concentrations were calculated. No deposition was modeled.

AERMOD's rural dispersion processing routines were used. Although there is significant development near the Folsom Facility, the majority of this area is suburban residential, with large areas of undeveloped land. Also, the reservoir's effects must be accounted for, and AERMOD's urban processing routine would be inappropriate for this modeling scenario.

Since construction activities are intermittent (versus continuous), the emission factor feature of AERMOD was used to vary emissions. This allows the modeler to restrict emissions to only times and days when construction would occur. Since a detailed construction schedule was not available, only hour-of-day factors were used.

Since the proposed action is expected to be completed over an 8 year period, only the peak year of each alternative was modeled.

Modeled Pollutants

The particulate matter pollutants (PM_{10} and $PM_{2.5}$) do not have daily significance thresholds. Therefore these pollutants must be modeled and the predicted downwind concentrations compared against the California Ambient Air Quality Standards (CAAQS) and National Ambient Air Quality Standards (NAAQS) to determine if an adverse impact is caused by the Folsom DS/FDR actions.

It is anticipated that NO_x emissions from construction equipment may be substantial for all alternatives. Thus, since the NO_x emission inventories were above the construction significance threshold, modeling of NO_x was performed for comparison to the nitrogen dioxide (NO_2) CAAQS.

Emissions of SO_2 are expected to be extremely low, due to the use of ultra low sulfur diesel (15 ppm) fuel on the proposed action. Therefore, modeling of SO_2 was not conducted.

Emissions of CO from construction equipment and heavy duty diesel trucks are typically not a cause of CO nonattainment. With the continued reduction in CO emissions from on-road vehicles due to state regulation, CO concentrations in the region are now better than the CO CAAQS and NAAQS. Therefore, dispersion modeling of Folsom DS/FDR equipment CO was not conducted.

Source Representation
Emission sources were represented in the AERMOD model as best as possible. Again, AERMOD is capable of handling multiple sources, including point, volume, and area source types. Each actual emission source must be represented as one of the aforementioned types. All sources were modeled as area sources. The emissions of PM_{10} and $PM_{2.5}$ may be dominated by fugitive dust, and were thus modeled as ground based area sources. Emissions of the gaseous pollutants are likely to be dominated by engine exhaust, which was modeled as elevated area sources.

Excavation and Construction Sites
Excavation sites were primarily modeled as area sources. These areas were often represented by irregularly shaped polygons. Emissions were allocated based on the construction schedule, the number and types of equipment expected to be in use at that site, and the area of the site.

Concrete Processing Facilities
Concrete processing facilities (concrete batch plants) were modeled as elevated area sources, with a size of 10 to 20 acres, depending on the amount of activity expected to take place at each plant. These types of facilities often have tall equipment used to mix sand and aggregate and to load the mixture into trucks stationed underneath. Thus, there is a significant vertical dimension to the emissions.

Material/Rock Processing Facilities
Similarly to concrete processing, materials processing (sorting) and rock crushing were modeled as 10 acre area sources.

Roadways
Emissions from roadways located within excavation and construction sites were included as area source emissions with 25 foot widths. Although emissions of this type are often modeled as volume sources, the number of volume sources required to accurately represent the onsite roadways alone would number over 1200, and significantly increase runtimes to an impractical level. It will likely be indiscernible to the results to model the onsite roadways as area sources rather than volume sources.

Variable Emissions
The workday would consist of two 8-hour shifts. Emissions are assumed to occur from 7 AM to (but not including) 11 PM. Thus for dispersion calculations,

emissions were factored by 1.00 during those hours, and 0.0 from 11 PM to (but not including) 7 AM. Although the construction activity would only occur during workdays (Monday through Friday), the model was initially set to process all days of the week for the entire year being modeled. If this conservative approach indicates that impacts may be above the CAAQS or NAAQS, a refinement to remove the weekend emissions may be introduced.

Receptors
The Folsom DS/FDR would encompass the southern and western banks of the Folsom Reservoir. The reservoir itself is roughly 4 miles east-west by 5 miles north-south. Receptor placement and grid selection must be dense enough to assure that the maximum predicted impacts are obtained, yet within the limits of the model's processing capability.

The most appropriate way to accomplish this was by performing two rounds of modeling. The first round used a single Cartesian receptor grid. A coarse 31 x 31 point receptor grid with 500 meter spacing covered an area of 225 square kilometers (approximately 55,600 acres). This grid encompassed areas to about 4 kilometers east of the easternmost work area (MIAD Left Borrow area) and about 4 kilometers west of the westernmost work area (Dike 5). This coarse grid also extended roughly 3.5 kilometers north of the northernmost work area (Dike 1) and 3.5 kilometers south of the southernmost work area (Dike 8). Receptor locations in the reservoir were removed. This grid adequately represent any pollutant dispersion outside the immediate vicinity of any work areas, as well as providing the analysts the general location of the highest concentrations in preparation for the second round of modeling.

The second round of modeling included a fine Cartesian grid of 121 (11x11) receptors spaced 50 meters apart, and centered on the location of the highest concentration value predicted in the first round of modeling. This allowed the analyst to better estimate the highest concentrations without using valuable computer resources and time to model receptors which are irrelevant to the compliance analysis.

Terrain elevations were included at each receptor. Digital elevation model (DEM) data produced by the United States Geological Service (U.S.G.S.) was obtained from Lakes Environmental's online database (www.webgis.com). 7.5-degree data was used for all receptor points. The actual receptor elevations will be chosen using the terrain processor included with the ISC-AERMOD View interface.

Meteorological Data
Proper quality-assured meteorological data is essential to running dispersion models. Data appropriate for input to the AERMOD dispersion model was obtained from the Lakes Environmental WebMet site (Lakes 2006), unless specific meteorological data

is provided by SMAQMD. The WebMet site data for Sacramento is from the Sacramento Executive Airport for surface data and from Oakland International Airport for upper air data. The dispersion analysis was conducted for one year of data.

A wind rose for Sacramento Executive Airport for 1985 is shown in Figure 3.3-3, and is considered to be generally indicative to existing wind characteristics local to the Folsom Facility. The length of each line in a wind rose diagram is proportional to the frequency of wind blowing out of that direction; and the percentage of calm periods is noted at the bottom. The calm periods representing a very stable atmosphere are most commonly observed during early morning hours before the sun heats the ground and the mixing height increases.

Output Options

Tabular output for the highest and second highest predicted concentrations was requested from the model for all pollutants except $PM_{2.5}$; in this case, the eighth highest value was requested to approximate the 98th percentile required by NAAQS for 24-hour averaging. In addition, plot files were requested so that visual depictions of the results can be created.

3.3.2.3 Environmental Consequences/Environmental Impacts

Emission Inventories

Emissions of criteria pollutants and TACs would occur during construction activities at the proposed site. Typical construction activities include demolition, site grading, and Folsom Facility feature construction, all of which would contribute to fugitive dust emissions or on- and off-site diesel exhaust emissions. Since no operational sources are part of the Folsom DS/FDR action, only construction air quality impacts have been analyzed.

Construction impacts were estimated following the methodology described above. Table 3.3-17 provides a summary of peak daily and annual emission rates for VOC, NO_x, CO, SO_2, PM_{10}, and $PM_{2.5}$. In cases where emission factors were only provided for PM_{10}, appropriate CARB PM size profiles were used to estimate $PM_{2.5}$ emissions. Detailed calculation tables that provide emissions by year and by general source categories are included in Appendix E.

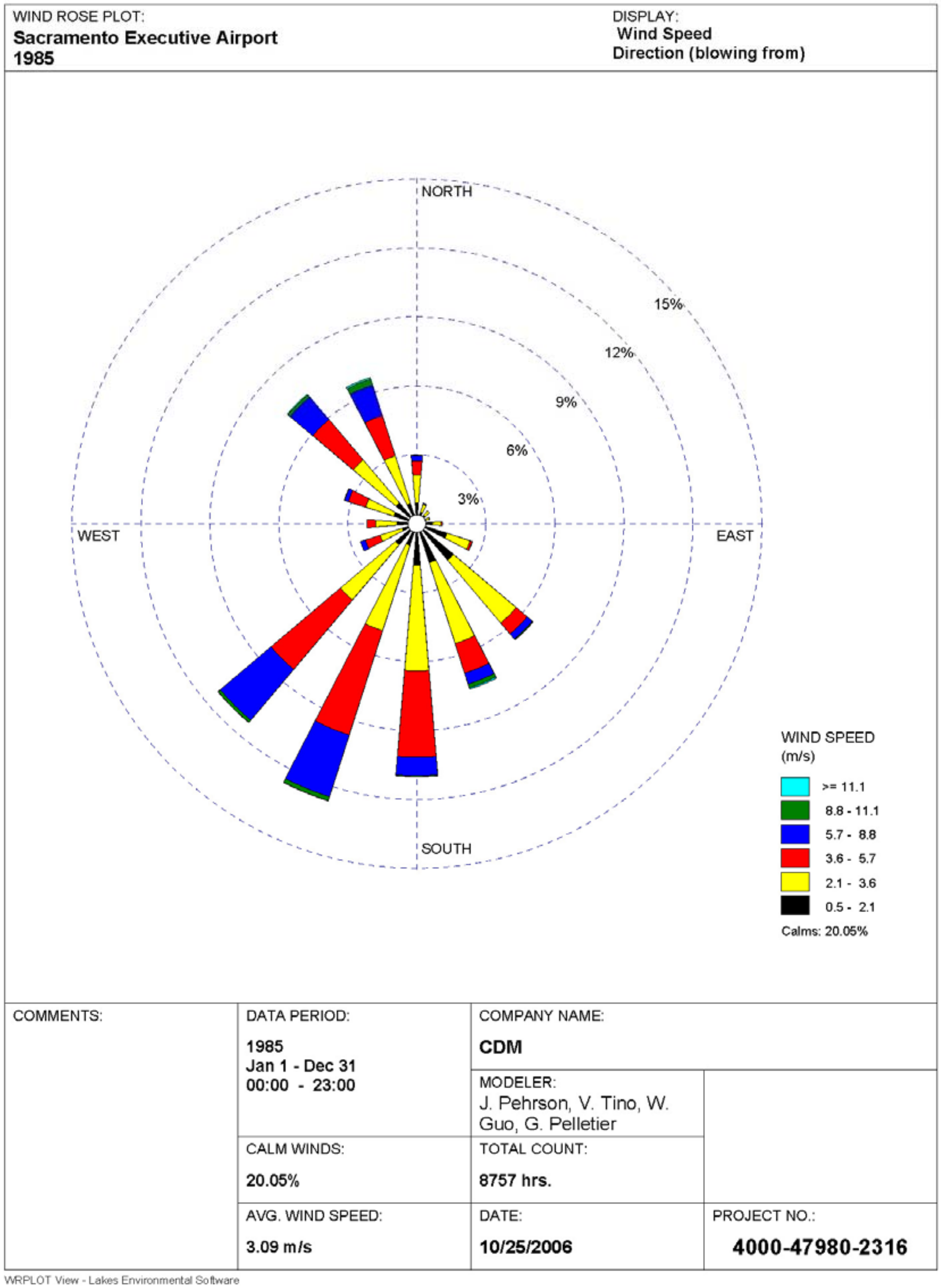

Figure 3.3-3
1985 Wind Rose for Sacramento Executive Airport

Table 3.3-17 *Uncontrolled Construction Emission Inventories*						
Alternative	***VOC***	***NOx***	***CO***	***SO_2*** [(1)]	***PM_{10}***	***$PM_{2.5}$***
	Peak Daily Emissions in lbs/day					
1	207	1,734	1,809	~1.0	2,341	587
2[(2)]	247	1,979	2,151	~1.0	3,874	910
3	306	1,969	2,561	~0.6	2,190	556
4[(3)]	262	1,759	2,127	~0.6	2,688	659
5[(3)]	289	2,057	2,291	~1.0	2,712	669
	Peak Annual Emissions in tons/year					
1	20.5	209.9	293.1	<1.0	239.0	63.5
2[(2)]	24.6	251.8	351.7	<1.0	330.1	83.3
3	32.4	196.9	281.0	<1.0	215.4	56.8
4[(3)]	18.9	116.9	156.9	<1.0	264.8	69.8
5[(3)]	27.2	161.9	228.6	<1.0	267.4	71.5

(1) Ultra-low sulfur diesel fuel (15 ppm S) assumed to be used in all construction equipment.

(2) Alternative 2 VOC, NOx, and CO emissions assumed to be equal to Alternative 1 emissions plus Tunnel Construction emissions. Alternative 2 PM_{10} and $PM_{2.5}$ emissions estimated from ratio of peak daily material quantities moved for Alternative 2 relative to Alternative 1 (for daily emissions) and from ratio of equipment-hours per year for Alternative 2 relative to Alternative 1 (for annual emissions).

(3) PM_{10} and $PM_{2.5}$ emissions for Alternatives 4 and 5 estimated from ratio of peak daily material quantites moved for Alternatives 4 and 5 relative to Alternative 1 (for daily emissions), and from ratio of equipment-hours per year for Alternatives 4 and 5 relative to Alternative 1 (for annual emissions).

Based on the general layout of the Folsom DS/FDR construction activities, it is anticipated that 75 to 80 percent of the emissions would occur in Sacramento County, 20 to 25 percent in Placer County, and 1 to 5 percent in El Dorado County. A nominal amount of on-highway haul truck emissions may occur in Yuba County if material is transported from Marysville to the site.

As was discussed in Section 3.3.2, NO_x has a short-term (construction) significance threshold of 85 pounds per day under CEQA. Under the General Conformity Rule, NO_x and VOC each have a 50 tons per year (tpy) de minimis threshold, PM_{10} has a 100 tpy de minimis threshold, and CO has a 100 tpy de minimis threshold. The emission estimates provided in Table 3.3-17 indicate the uncontrolled NO_x emissions would be considered significant for the Folsom DS/FDR under CEQA, and uncontrolled NO_x, PM_{10}, and CO emissions exceed the General Conformity de minimis thresholds for all action alternatives. Unless standard conditions for the Folsom DS/FDR construction would require control of NO_x, PM_{10}, and/or CO emissions, a General Conformity evaluation must be conducted for these pollutants.

The controlled PM_{10} emissions are below the General Conformity de minimis thresholds. Therefore, the Folsom DS/FDR is assumed to conform to any PM_{10} SIP requirements for all action alternatives.

The major source of NO_x emissions are the on-site construction equipment and haul trucks with non-road equipment engines. Control of NO_x emissions from these mobile sources would not be subject to stationary source permitting requirements. Therefore, the control of NO_x from these sources will be considered a mitigation measure under CEQA.

See Section 3.3.4 for a discussion of potentially available mitigation options for mobile construction equipment.

Modeled Ambient Air Quality

Table 3.3-18 summarizes the results of the unmitigated modeling completed for Folsom DS/FDR, and compares the results to the NAAQS. The Sacramento-Del Paso Manor air quality monitoring station was used to estimate the background concentration at the site. The maximum concentration for each given pollutant from the years 2003 to 2005 was selected to estimate existing air quality near Folsom Reservoir.

The NAAQS background concentration for PM_{10} is 59 $\mu g/m^3$ for the 24-hour average. Adding the unmitigated Folsom DS/FDR PM_{10} contributions to this background indicates that PM_{10} concentrations would exceed the current NAAQS standard of 150 $\mu g/m^3$. Additional PM_{10} mitigation measures would need to be implemented during construction.

The NAAQS background concentration for $PM_{2.5}$ is 62 $\mu g/m^3$ for the 24-hour average, which exceeds the current NAAQS standard of 35 $\mu g/m^3$; therefore, the site would eventually be designated as nonattainment for $PM_{2.5}$. The modeled results indicate that the 24-hour NAAQS for $PM_{2.5}$ would be exceeded due primarily to the high background concentration. Additional $PM_{2.5}$ mitigation measures will need to be implemented during construction.

Table 3.3-19 compares the modeled pollutant concentrations with the CAAQS. The background PM_{10} concentrations, as determined for CAAQS comparisons, exceeds the current 24-hour and annual PM_{10} CAAQS. Therefore, adding the Folsom DS/FDR actions would further erode the PM_{10} air quality near the site. The background annual $PM_{2.5}$ concentration, as determined for comparison to the CAAQS, is equal to the $PM_{2.5}$ CAAQS. Thus, any contribution would cause the local concentrations to exceed the $PM_{2.5}$ CAAQS during construction.

Table 3.3-18
Comparison of Modeled Concentrations (Unmitigated Results) to NAAQS

Pollutant	Modeled Concentration					Modeled Concentration with Background[8]				
	Alt 1	Alt 2[1]	Alt 3[2]	Alt 4[1]	Alt 5[1]	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
NO_2										
Annual[3]	8	10	8	4	6	29	31	28	25	27
PM_{10}										
24-Hr[4]	110	***182***	110	126	127	***169***	***241***	***169***	***185***	***186***
Annual[5]	7	10	7	8	8	29	32	29	30	30
$PM_{2.5}$										
24-Hr[6]	13	20	13	15	15	***78***	***85***	***78***	***80***	***80***
Annual[7]	2	3	2	2	2	14	15	14	14	14

(1) Alternative 2, 4 and 5 concentrations estimated from Alternative 1 concentrations multiplied by the ratio of Alternative 2, 4 or 5 emissions to Alternative 1 emissions.
(2) Alternative 3 concentrations assumed to be the same as Alternative 1 concentrations.
(3) Reported concentration of NO_2 shown is 75 percent of the modeled NOx concentration.
(4) The modeled high-8th-high value is reported as the 24-Hour average for PM_{10}.
(5) The annual average PM_{10} NAAQS has been rescinded, effective December 18, 2006 (71 FR 61144).
(6) The modeled high-8th-high value averaged over 3 years is reported as the 24-Hour average for $PM_{2.5}$; this method approximates the 98th percentile. See Appendix E for additional discussion of this methodology.
(7) The maximum annual average over 3 years of meteorological data (1985, 1986, and 1987) is reported as the appropriate annual average for the $PM_{2.5}$ NAAQS.
(8) Sacramento-Del Paso Manor monitoring station used for background concentrations (years 2003, 2004, and 2005):

- NAAQS background concentration for NOx: 20.8 µg/m3 (Annual).
- NAAQS background concentrations for PM10: 59 µg/m3 (24-hr) and 22 µg/m3 (Annual).
- NAAQS background concentrations for PM2.5: 62 µg/m3 (24-hr) and 12.2 µg/m3 (Annual).

Values in ***Bold Italics*** indicate concentrations that exceed the NAAQS.

Table 3.3-19
Comparison of Modeled Concentrations (Unmitigated Results) to CAAQS

Pollutant	**Modeled Concentration**					**Modeled Concentration with Background**[6]				
	Alt 1	**Alt 2**[1]	**Alt 3**[2]	**Alt 4**[1]	**Alt 5**[1]	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**
NO_2										
1-Hr[3]	188	215	188	191	223	378	404	378	381	413
PM_{10}										
24-Hr[4]	110	***182***	110	126	127	***187***	***259***	***187***	***203***	***204***
Annual	7	10	7	8	8	***33***	***36***	***33***	***34***	***34***
$PM_{2.5}$										
Annual[5]	2	3	2	2	2	***14***	***15***	***14***	***14***	***14***

(1) Alternative 2, 4 and 5 concentrations estimated from Alternative 1 concentrations multiplied by the ratio of Alternative 2, 4 or 5 emissions to Alternative 1 emissions.

(2) Alternative 3 concentrations assumed to be the same as Alternative 1 concentrations.

(3) Reported concentration of NO_2 shown is determined from the modeled NOx concentration multiplied by the NO_2-to-NOx ratio obtained from the NO_2-to-NOx versus NOx graph included in Appendix E.

(4) The modeled high-8th-high value is reported as the 24-Hour average for PM_{10}.

(5) The maximum annual average over 3 years of meteorological data (1985, 1986, and 1987) is reported as the appropriate annual average for the $PM_{2.5}$ NAAQS.

(6) Sacramento-Del Paso Manor monitoring station used for background concentrations (years 2003, 2004, and 2005):

- CAAQS background concentration for NOx: 189.9 μg/m^3 (1-Hr).
- CAAQS background concentrations for PM_{10}: 77 μg/m^3 (24-hr) and 26 μg/m^3 (Annual).
- CAAQS background concentrations for $PM_{2.5}$: 12 μg/m^3 (Annual).

Values in ***Bold Italics*** indicate concentrations that exceed the CAAQS.

3.3.3 Significance and Comparison of the Alternatives

As was discussed in Section 3.3.2, NOx has a short-term (construction) significance threshold of 85 pounds per day under CEQA. Under the General Conformity Rule, NOx and VOC each have a 50 tons per year (tpy) de minimis threshold, PM_{10} has a 100 tpy de minimis threshold, and CO has a 100 tpy de minimis threshold. The emission estimates provided in Table 3.3-17 indicate the uncontrolled NOx emissions would be considered significant for this project under CEQA, and uncontrolled NOx, PM_{10}, and CO emissions exceed the General Conformity de minimis thresholds for all action alternatives. Unless standard conditions for Folsom DS/FDR construction will require control of NOx, PM_{10}, and/or CO emissions, a General Conformity evaluation must be conducted for these pollutants.

A comparison of alternatives will need to consider the amount of material moved and the number of pieces of equipment used in the peak day and peak year of construction activity. In the development of alternatives, the details on equipment counts and material moved for Alternatives 1 and 3 were further along at the time of the air quality impact analysis than the details for Alternatives 2, 4 and 5. Therefore, the PM emission inventories for Alternatives 2, 4, and 5 are based on ratios of daily and annual material movement quantities between those alternatives and Alternative 1. The gaseous pollutant emissions for Alternatives 4, and 5 are based on preliminary equipment count information that may not be as detailed as the data obtained for Alternatives 1 and 3. The gaseous pollutant emissions for Alternative 2 were estimated assuming the tunnel construction occurs simultaneously with the same features being worked as with Alternative 1. Thus the peak VOC, CO, and NOx emissions for Alternative 2 are the Alternative 1 emissions plus the tunnel emissions.

The major source of PM (PM_{10} and $PM_{2.5}$) emissions is fugitive dust from on-site construction activities. Comparing PM emissions between alternatives indicates that Alternative 2 has the highest emissions followed by Alternatives 5, 4, 1, and 3. Alternative 2 requires the most on-site material to be moved over a given day and given year, and has the highest on-site material movement requirement of all alternatives, almost 12 million cubic yards. On-site material moved for Alternatives 1, 3, 4, and 5 over the project life total approximately 5.2 million, 5.6 million, 5.8 million, and 7.8 million cubic yards, respectively. Thus materials moved for Alternatives 1, 3 and 4 are similar, thus the PM emissions are expected to be roughly the same. In addition to material moved, the specific construction schedule identifying which features are worked simultaneously, how many work days per feature, and how many years per feature effect the peak daily and annual emissions.

The major sources of VOC, CO, and NOx emissions are the on-site construction equipment and haul trucks with non-road equipment engines. Control of NOx emissions from these mobile sources would not be subject to stationary source permitting requirements. Therefore, the control of NOx from these sources will be considered a mitigation measure under CEQA. Comparing the daily NOx emissions for each alternative indicates Alternatives 5, 2, and 3 have the highest emission levels, with lower emissions for Alternatives 4 and 1. These inventories imply that more equipment is needed on the peak day for Alternatives 2, 3 and 5 than for Alternatives 1 and 4.

Please see Section 3.3.4 for a discussion of potentially available mitigation options for mobile construction equipment.

3.3.4 Mitigation Measures

The emissions of unmitigated NO_x, primarily from off-road construction equipment, would be above the CEQA significance threshold for construction. In addition, unmitigated PM_{10} and $PM_{2.5}$ concentrations would exceed the NAAQS and CAAQS. Finally, unmitigated NO_x, PM_{10}, and CO emissions exceed the General Conformity de minimis thresholds for each year of the Folsom DS/FDR construction. Therefore additional mitigation would need to be applied to the emission sources.

3.3.4.1 Stationary Source Mitigation Options

The stationary sources associated with the Folsom DS/FDR would include the concrete batch plant(s) and material crushing/processing facilities. Because these plants would be subject to air quality permitting by one or more of the local air districts, it is assumed that the following controls will be installed:

- *AQ-1* - Facility power will come from the electric utility grid, not diesel-driven generators and pumps. Using grid power eliminates both the gaseous pollutants associated with diesel engines, as well as diesel particulate matter which is a listed toxic air contaminant in California.

- *AQ-2* - Wet suppression will be used to reduce plant dust emissions. For this analysis, the controlled emissions are based on AP-42 controlled emission factors for batch plants and crushing facilities.

These controls are included as part of the Folsom DS/FDR design for the stationary plants. The emissions for these units will be refined as the design is firmed up for air quality permitting and eventual operation.

3.3.4.2 Mobile Source Mitigation Options

The standard CEQA mitigation measures for construction equipment emissions are (SMAQMD 2004):

- *AQ-3* - The Project Agencies will provide a plan for approval by SMAQMD, demonstrating that the heavy-duty (> 50 horsepower) off-road vehicles to be used in the construction project, including owned, leased and subcontractor vehicles, will achieve a project wide fleet-average 20 percent NO_x reduction and 45 percent particulate reduction compared to the most recent CARB fleet average at time of construction; and

- *AQ-4* - The Project Agencies will submit to the SMAQMD a comprehensive inventory of all off-road construction equipment, equal to or greater than 50 horsepower, that will be used an aggregate of 40 or more hours during any portion of the construction project. The inventory shall include the horsepower rating, engine production year, and projected hours of use or fuel throughput for each piece of equipment. The inventory shall be updated and submitted monthly throughout the duration of the project, except that an inventory shall not be required for any 30-day period in which no construction activity occurs. At least 48 hours prior to the use of subject heavy-duty off-road equipment, the project representative shall provide SMAQMD with the anticipated construction timeline including start date, and name and phone number of the project manager and on-site foreman.

NO_x Mitigation Options

Several mitigation options that may be applicable to mobile construction equipment engines to reduce NO_x emissions are described below. The specific measures to be employed will be based on discussions with the SMAQMD.

- *AQ-5* - Use of emulsified or aqueous diesel fuel. Use of emulsified or aqueous diesel fuel could theoretically be applied to all diesel equipment operating at the site by making this the only diesel fuel purchased for the Folsom DS/FDR action. It is anticipated that equipment fueling would occur onsite with a fuel depot and/or mobile fueling trucks. It is assumed that aqueous diesel fuel would provide a 14 percent reduction NO_x emissions as well as a 63 percent reduction of engine exhaust PM_{10} emissions, consistent with the control efficiencies incorporated in the URBEMIS2002 model.

- *AQ-6* - Use of equipment with engines that incorporate exhaust gas recirculation (EGR) systems. EGR systems would need to be part of the engine design for a substantial portion of the existing construction equipment fleet in the region to be effective. While EGR systems can provide reductions of NO_x, PM_{10}, CO, and VOC emissions, it is not likely that enough available construction equipment have EGR engines to provide any real reductions for the Folsom DS/FDR action. However, the availability of construction equipment with EGR systems will need to be reviewed in detail prior to the final decision to incorporate or drop this option from the MMRP for the proposed action.

- *AQ-7* - Installation of a lean NO_x catalyst in the engine exhaust system. Lean NO_x catalyst filters may be available for construction equipment exhaust. However, these units would need to be certified by CARB before being installed on specific construction equipment engines. In addition, other add-in exhaust filters are not compatible with aqueous diesel fuel. Therefore, aqueous fuel use and lean NO_x catalysts may be mutually exclusive mitigation options. Again, a detailed review of applicable catalysts and compatibility with different fuels will need to be conducted before a final decision can be made to incorporate in or drop this option from the MMRP.

Currently, it is assumed that off-highway 30-yard quarry trucks would be used to move material between the borrow areas and the storage/use sites. Approximately 3,400,000 cu yd of excavated would be moved using these trucks, and emissions from these trucks alone represent approximately 40 percent of the Alternative 1 total ROG, NO_x and CO emissions. Using smaller on-highway haul trucks for this activity would reduce emissions for Alternative 1, but would also increase the schedule for these activities. For this analysis, it is assumed that the on-highway trucks will be used to mitigate the gaseous pollutant emissions from on-site material hauling equipment

Finally, NO_x emissions that exceed 85 lbs/day after installation of control devices and/or implementation of other administrative controls will be subject to a mitigation implementation fee used to control other emission sources in the proposed action region. This fee, currently $14,300 per ton of NO_x in excess of the 85 lbs/day significance threshold represents the final mitigation measure used to reduce the NO_x impact to a level of insignificance.

PM Mitigation Options
Fugitive dust control will be applied to reduce PM_{10} and $PM_{2.5}$ emissions. Typical dust mitigation measures include:

- Wet suppression and soil stabilization
- Wind fencing around active area
- Paving on-site roadways
- Truck wheel washing facilities at site exits onto public roadways
- Maintaining minimum truck bed freeboard or covering haul truck beds

The Folsom DS/FDR will employ some combination of these measures as appropriate for the area and equipment operating on a given feature.

3.3.4.3 Mitigated Emission Inventories

The estimated mitigated emission inventories are presented in Table 3.3-20. These inventories assume that NO_x emissions from off-road equipment are reduced by 20 percent, and that fugitive PM emissions are reduced by 50 percent.

Table 3.3-20
Mitigated Construction Emission Inventories

Alternative	VOC	NOx[(3)]	CO	PM_{10}[(4)]	$PM_{2.5}$[(4)]
	Peak Daily Emissions in lbs/day				
1	207	1,508	1,809	1,372	383
2[(1)]	247	1,704	2,151	2,270	593
3	306	1,629	2,562	1,284	363
4[(2)]	262	1,464	2,124	1,575	430
5[(2)]	288	1,873	2,280	1,589	437
	Peak Annual Emissions in tons/year				
1	20.4	170.8	293.1	140.4	41.7
2[(1)]	24.5	204.9	351.7	193.9	54.7
3	32.8	158.9	281.0	126.5	37.3
4[(2)]	18.9	95.8	156.8	155.6	45.8
5[(2)]	27.1	144.3	228.0	157.1	47.0

(1) Alternative 2 VOC, NOx, and CO emissions assumed to be equal to Alternative 1 emissions plus Tunnel Construction emissions. Alternative 2 PM_{10} and $PM_{2.5}$ emissions estimated from ratio of peak daily material quantities moved for Alternative 2 relative to Alternative 1 (for daily emissions) and from ratio of equipment-hours per year for Alternative 2 relative to Alternative 1 (for annual emissions).

(2) PM_{10} and $PM_{2.5}$ emissions for Alternatives 4 and 5 estimated from ratio of peak daily material quantites moved for Alternatives 4 and 5 relative to Alternative 1 (for daily emissions), and from ratio of equipment-hours per year for Alternatives 4 and 5 relative to Alternative 1 (for annual emissions).

(3) Construction equipment engine NOx emissions assumed to be reduced by 20 percent compared to unmitigated NOx emissions.

(4) Fugitive dust assumed to be reduced by 50 percent compared to unmitigated PM emissions.

NO_x emissions with all feasible mitigation measures and payment of the mitigation implementation fee would be less than significant under CEQA. However the, mitigated NO_x, PM_{10}, and CO emissions associated with the federal action would be greater than the General Conformity de minimis threshold. Therefore, a full NO_x, PM_{10}, and CO conformity evaluation will need to be developed for the preferred alternative (proposed action) before a ROD can be issued for the Folsom DS/FDR.

3.3.4.4 Mitigated Air Dispersion Results

The modeled ambient air quality associated with the mitigated emission inventories are compared to the NAAQS in Table 3.3-21, and are compared to the CAAQS in

Table 3.3-22. These results indicate that the 24-hour $PM_{2.5}$ NAAQS may be exceeded, primarily because the existing background concentrations already exceed the current standard. The mitigated PM_{10} concentrations would be better than the NAAQS for all alternatives, except Alternative 5. However, the PM_{10} and $PM_{2.5}$ CAAQS may be exceeded during construction for all alternatives. Although the exceedances are primarily due to background PM concentrations exceeding the respective CAAQS, this draft analysis concludes that PM_{10} and $PM_{2.5}$ would remain significant under CEQA after mitigation.

Due to the conservative nature of the inventory estimations used in the analysis, it is anticipated that refinement of the estimates will be made when the construction schedule is firmed up. In addition, more current emission factors may be applied in the refinement.

3.3.5 Cumulative Effects

Table 5-1 lists projects considered in the cumulative analysis. Many of the projects, including the New Folsom Bridge, include construction within the study region. Construction of these projects would increase emissions of criteria pollutants, including VOC, NO_x, CO, SO_2, and PM emissions, from onsite construction and transport of materials. If these construction projects are implemented concurrently, the combined cumulative effects would be above CEQA thresholds for air quality emissions and the General Conformity de minimus thresholds. Each project would need to mitigate individual air quality effects, which could decrease overall cumulative effects. However, without consideration of scheduling and sequence of activities, concurrent construction projects within and adjacent to Folsom Reservoir would have significant cumulative air quality impacts.

The effects of the Folsom DS/FDR to air quality would be cumulatively considerable. Additionally, mitigated NO_x, PM_{10} and CO emissions associated with the Folsom DS/FDR would be greater than the General Conformity *de minimis* threshold. Therefore, these incremental effects would be significant under the cumulative condition.

Table 3.3-21
Comparison of Modeled Concentrations (Mitigated Results) to NAAQS

Pollutant	**Modeled Concentration**					**Modeled Concentration with Background**[8]				
	Alt 1	**Alt 2**[1]	**Alt 3**	**Alt 4**[2]	**Alt 5**[2]	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**
NO_2										
Annual[3]	6	6	5	6	7	27	27	26	27	28
PM_{10}										
24-Hr[4]	64	64	45	76	112	123	123	104	135	***171***
Annual[5]	3	3	2	4	5	25	25	24	26	27
$PM_{2.5}$										
24-Hr[6]	9	9	8	9	14	***71***	***71***	***70***	***71***	***78***
Annual[7]	1	1	1	1	2	13	13	13	13	14

(1) Alternative 2 concentrations assumed to be equal to Alternative 1 concentrations.
(2) Alternative 4 and 5 concentrations estimated from Alternative 1 concentrations multiplied by ratio of Alternative 4 or 5 emissions to Alternative 1 emissions.
(3) Reported concentration of NO_2 shown is 75 percent of the modeled NOx concentration.
(4) The modeled high-8th-high value is reported as the 24-Hour average for PM_{10}.
(5) The annual average PM_{10} NAAQS has been rescinded, effective December 18, 2006 (71 FR 61144).
(6) The modeled high-8th-high value averaged over 3 years is reported as the 24-Hour average for $PM_{2.5}$; this method approximates the 98th percentile. See Appendix E for additional discussion of this methodology.
(7) The maximum annual average over 3 years of meteorological data (1985, 1986, and 1987) is reported as the appropriate annual average for the $PM_{2.5}$ NAAQS.
(8) Sacramento-Del Paso Manor monitoring station used for background concentrations (years 2003, 2004, and 2005):

- NAAQS background concentration for NOx: 20.8 µg/m3 (Annual).
- NAAQS background concentrations for PM10: 59 µg/m3 (24-hr) and 22 µg/m3 (Annual).
- NAAQS background concentrations for PM2.5: 62 µg/m3 (24-hr) and 12.2 µg/m3 (Annual).

Values in ***Bold Italics*** indicate concentrations that exceed the NAAQS.

Table 3.3-22
Comparison of Modeled Concentrations (Mitigated Results) to CAAQS

Pollutant	Modeled Concentration					Modeled Concentration with Background[6]				
	Alt 1	**Alt 2[1]**	**Alt 3**	**Alt 4[2]**	**Alt 5[2]**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**
NO_2										
1-Hr[3]	166	166	186	166	206	356	356	376	356	396
PM_{10}										
24-Hr[4]	64	64	45	76	112	***141***	***141***	***122***	***153***	***189***
Annual	3	3	2	4	5	***29***	***29***	***28***	***30***	***31***
$PM_{2.5}$										
Annual[5]	1	1	1	1	2	***13***	***13***	***13***	***13***	***14***

(1) Alternative 2 concentrations assumed to be equal to Alternative 1 concentrations.
(2) Alternative 4 and 5 concentrations estimated from Alternative 1 concentrations multiplied by ratio of Alternative 4 or 5 emissions to Alternative 1 emissions.
(3) Reported concentration of NO_2 shown is determined from the modeled NOx concentration multiplied by the NO_2-to-NOx ratio obtained from the NO_2-to-NOx versus NOx graph included in Appendix E.
(4) The modeled high-8th-high value is reported as the 24-Hour average for PM_{10}.
(5) The maximum annual average over 3 years of meteorological data (1985, 1986, and 1987) is reported as the appropriate annual average for the $PM_{2.5}$ NAAQS.
(6) Sacramento-Del Paso Manor monitoring station used for background concentrations (years 2003, 2004, and 2005):

- CAAQS background concentration for NOx: 189.9 μg/m^3 (1-Hr).
- CAAQS background concentrations for PM_{10}: 77 μg/m^3 (24-hr) and 26 μg/m^3 (Annual).
- CAAQS background concentrations for $PM_{2.5}$: 12 μg/m^3 (Annual).

Values in ***Bold Italics*** indicate concentrations that exceed the CAAQS.

3.4 Aquatic Resources

This section presents potential impacts to aquatic resources from construction of the Folsom DS/FDR alternatives.

3.4.1 Affected Environment/Existing Conditions

3.4.1.1 Area of Analysis

The area of analysis for fisheries and other aquatic (vernal pool[1]) impacts includes the entirety of Folsom Reservoir as well as reaches of the American River and Lake Natoma between Folsom Dam and Nimbus Dam. Fishes residing in Folsom Reservoir use habitat throughout the reservoir and are not restricted to the area of the dam. Impacts that may occur to fish near the dam could affect populations in other parts of the reservoir.

3.4.1.2 Regulatory Setting

Federal

Endangered Species Act of 1973 (16 USC §1531 et seq.; 50 CFR Parts 17 and 222). This act includes provisions for protection and management of species that are federally listed as threatened (FT) or endangered (FE) and designated critical habitat for these species. "Endangered species" are defined as "any species which is in danger of extinction throughout all or a significant portion of its range"; "threatened species" are defined as "any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C.A. §1532). Critical habitat is defined as the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the Act, upon a determination by the Secretary that such areas are essential for the conservation of the species (16 U.S.C.A. §1532). The National Marine Fisheries Service's (NMFS) jurisdiction under the Federal Endangered Species Act is the protection of marine mammals and fishes and anadromous fishes (i.e., fish born in fresh water that migrate to the ocean to grow into adults and then return to fresh water to spawn). The U.S. Fish and Wildlife Service (USFWS) is the administering agency for this authority for terrestrial species (species of animals and plants that live on or grow from the land).

Magnuson-Stevens Fishery Conservation and Management Act. The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) establishes a

[1] Vernal pools are seasonally ponded landscape depressions in which water accumulates because of limitations to subsurface drainage and that support a distinct association of plants and animals.

management system for national marine and estuarine fishery resources. This legislation requires that all Federal agencies consult with NMFS regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect "essential fish habitat." Essential fish habitat is defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The legislation states that migratory routes to and from anadromous fish spawning grounds are considered essential fish habitat. The phrase "adversely affect" refers to the creation of any impact that reduces the quality or quantity of essential fish habitat. Federal activities that occur outside of an essential fish habitat but that may, nonetheless, have an impact on essential fish habitat waters and substrate must also be considered in the consultation process. Under the Magnuson-Stevens Act, effects on habitat managed under the Pacific Salmon Fishery Management Plan must also be considered.

Fish and Wildlife Coordination Act (FWCA).
The FWCA (16 USC 661 et seq.) provides that fish and wildlife resources shall receive equal consideration with other features throughout the planning process of water resources development projects. The FWCA requires Federal agencies to consult with USFWS, or, in some instances, with NMFS and with State fish and wildlife resource agencies before undertaking or approving water projects that control or modify surface water. The purpose of this consultation is to ensure that wildlife concerns receive equal consideration during water resource development projects and are coordinated with the features of these projects. The consultation is intended to promote the conservation of fish and wildlife resources by preventing their loss or damage and to provide for the development and improvement of fish and wildlife resources in connection with water projects. Federal agencies undertaking water projects are required to fully consider recommendations made by USFWS, NMFS, and State fish and wildlife resource agencies in project reports and to include measures to reduce impacts on fish and wildlife in project plans.

State
California Endangered Species Act of 1984 (California Fish and Game Code (CDFG) §2050-2097). This act includes provisions for the protection and management of species listed by the state of California as endangered (SE) or threatened (ST), or designated as candidates for such listing (SC). The act includes a requirement for consultation "to ensure that any action authorized by a state lead agency is not likely to jeopardize the continued existence of any endangered or threatened species or results in the destruction or adverse modification essential to the continued existence of the species" (§2090). Animals of California declared to be endangered, threatened, or rare are listed at 14 CCR §670.5. The administering agency for the above authority is the CDFG.

3.4.1.3 Environmental Setting

Folsom Reservoir inundates approximately 12,000 acres of the North Fork, South Fork, and main stem of the American River. Although the maximum depth of the reservoir is 266 feet just behind Folsom Dam, most of the reservoir is shallower averaging 66 feet in depth. The reservoir has about 85 miles of shoreline. The waters of Folsom Reservoir stratify in the warmer months from April through November, with a layer of warmer water known as the epilimnion sitting on top of a bottom layer of cold water known as the hypolimnion.

Nimbus Dam is located about 6 miles downstream of Folsom Dam and inundates the American River for most of this reach creating Lake Natoma. Anadromous fish, such as Chinook salmon and steelhead can access about 23 miles of the lower American River downstream of Nimbus Dam but do not ascend the river beyond Nimbus Dam. The Nimbus Hatchery was constructed as a mitigation hatchery for the original Folsom Dam project.

Habitat within Folsom Reservoir and Lake Natoma allow for a diverse assemblage of native and introduced fish species to coexist. Folsom Reservoir is managed as a ‘two-story’ fishery, with cold-water fishes such as trout inhabiting the hypolimnion and warm-water fishes such as bass and sunfish inhabiting the epilimnion and shoreline areas. Two cold water fisheries for rainbow trout and Chinook salmon are actively maintained through a stocking program.

Seasonally wet areas outside the reservoir receive water from seeps, drainages and from direct precipitation. Dominant species include pointed rush, Baltic rush, and often scattered willow and cottonwood. During the dry season, these areas support annual upland vegetation such as non-native brome grasses and other forbs. These seasonally wet areas may provide habitat for aquatic invertebrate species. Special-status aquatic invertebrate species with potential to occur are vernal pool fairy shrimp (*Branchinecta lynchi*) and California vernal pool tadpole shrimp (*Lepidurus packardi*).

Fish Species Present in the Folsom Reservoir Area

Native and introduced fishes are present in the Folsom Reservoir area. Native fishes occur primarily as a result of their continued existence in tributaries of Folsom Reservoir and Lake Natoma. Two native species are planted in Folsom Reservoir 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. Some of the introduced fishes may have been unintentionally introduced into Folsom Reservoir over the past 50 years.

Game Fishes

Rainbow trout (Oncorhynchus mykiss)

Rainbow trout habitat use and life history behavior varies depending on where they are found. Most stream-dwelling wild rainbow trout reach sexual maturity in their second or third year and usually spawn between February and June, depending on water temperature and strain. Spawning occurs in streams over gravel, usually in riffles (a section of stream that has shallow, fast-flowing water followed by deep, slow-flowing water) or pool tailouts. The eggs hatch in 15 weeks at 3.5˚C and 11 weeks at 5˚C. Fry (small juvenile fish) emerge from the gravel beginning two to three weeks later, depending upon temperature. Juvenile and adult rainbow trout may migrate into a lake or other downstream areas or remain in the stream defending a small home range. Stream dwelling fish feed mostly on drifting invertebrates, but also eat benthic (pertaining to the bottom of a body of water) invertebrates and terrestrial insects that fall into the water. Rainbow trout in lakes may feed on zooplankton, benthic invertebrates, or small fish. It is generally accepted that temperatures less than 20˚C are suitable for growth. Mortality can occur at temperatures exceeding 27˚C, although some fish may tolerate higher temperatures for brief periods. CDFG stocks juvenile and adult rainbow trout in Folsom Reservoir on a regular basis. Although natural reproduction does occur in the tributaries, stocked trout make up the vast majority of the rainbow trout population in the reservoir (Wallace, Roberts, and Todd et al. 2003).

Chinook salmon (Oncorhynchus tshawytcha)

Prior to the construction of Folsom and Nimbus dams, Chinook salmon migrated through and spawned in the American River where the two reservoirs are now located. Folsom Reservoir is now stocked for angling purposes with fingerling and yearling Chinook salmon from the Nimbus fish hatchery. Juvenile salmon feed largely on zooplankton while in the reservoir. The salmon are first caught at 12 to 14 inches and continue to grow for up to 3 years (Wallace, Roberts, and Todd et al. 2003). Under natural river conditions, these juveniles would smoltify (physiologically change in preparation to entering salt water) and migrate to the ocean. As these stocked fish cannot migrate to the ocean as smolts, it is estimated they experience high stress mortality (Wallace, Roberts, and Todd et al. 2003), although a few individuals may survive to become adults. Chinook salmon require cold water temperatures to spawn and rear. Rearing juveniles prefer water temperatures between 5 and 19˚C. Temperatures greater than 24˚C can lead to mortality in all age classes. Natural spawning occurs in rivers over large gravel. However, although adult salmon have been observed migrating upstream of the reservoir, natural reproduction contributes very little to the population in the reservoir (Wallace, Roberts, and Todd et al. 2003). The lower American River has been designated as Critical Habitat for spring-run Chinook salmon, and steelhead.

Brown trout (Salmo trutta)
Brown trout are native to Europe and western Asia. Peak spawning activity generally occurs in October and November and tapers off in December. Eggs are deposited among gravel in the riffles or pool tailouts of streams. Habitat preferences have a high degree of overlap with rainbow trout. In streams, fry and juvenile brown trout tend to prey on drift organisms and are similar in diet to rainbow trout except they are more piscivorous (eat other fish) as they get larger. In lakes, they feed on zooplankton or macroinvertebrates. Trout greater than 25 cm pursue large prey such as other fish, crayfish, and dragon fly or damsel fly larvae. Preferred water temperatures for brown trout are 12 to 20˚C. Brown trout were introduced to Folsom Reservoir as a game fish but are not currently stocked (Wallace, Roberts, and Todd et al 2003).

Bluegill (Lepomis macrochirus)
Bluegill are native to the eastern United States. They are notable for their ability to thrive in a wide range of environmental conditions. Although they can tolerate water temperatures approaching freezing, they grow best in water from 27 to 32˚C. They are usually found in shallow, slow moving water among beds of aquatic vegetation. Bluegill are highly opportunistic feeders subsisting on all kinds of aquatic invertebrates and small fish. Spawning occurs in spring and summer when water temperatures reach 18 to 21˚C over nests in shallow water.

Redear sunfish (Lepomis microlophus)
Redear are native to the southeastern United States. They prefer relatively deep, sluggish, warm water with abundant vegetation. They grow best in water from 24 to 32˚C. Diet consists mostly of benthic invertebrates, especially snails. Spawning occurs over nests during the summer. Redear mature later than bluegill and often grow quite large.

Green sunfish (Lepomis cyanellus)
Green sunfish inhabit small, warm streams, ponds and lake edges and are incredibly adaptable to extreme environments. They prefer temperatures between 26 to 30˚C and can withstand temperatures at least as warm as 38˚C. They are generally rare in habitats that contain more than three or four other species of fish. Thus, in lakes and reservoirs they are usually only locally abundant in shallow, weedy areas that exclude larger or less tolerant species. They are opportunistic predators on invertebrates and small fish. Spawning activity occurs in spring and summer over fine gravel.

White crappie (Promoxis annularis)
White crappie, another introduced game fish, thrive in lakes, reservoirs, and other slow moving waters. They prefer warmer waters where summer temperatures reach 27 to 29˚C. Diet consists of many varieties of aquatic invertebrates and small fish. White crappie build nests in shallow water and spawning occurs from March through

July. Adult males defend their nests for a short time. Larval young leave the nest to drift in open water and feed on zooplankton.

Black crappie (Promoxis nigromaculatus)
Black crappie are very similar to white crappie in their habitat, spawning and feeding requirements in reservoirs.

Largemouth bass (Micropterus salmoides)
Largemouth bass were introduced to California in 1891 and have since been spread to many waters of the state. They are abundant in farm ponds, lakes, reservoirs and river backwaters where other nonnative fish are abundant as well. Largemouth bass are normally found in warm, shallow (less than 20 feet or 6 m) waters of moderate quality and beds of aquatic plants. They are known to survive in isolated pools during droughts or in polluted waters, due to their ability to withstand adverse water quality conditions. Spawning occurs in spring when water temperatures reach 15˚C. By the time they reach two inches, they feed largely on aquatic insects and fish fry, including those of their own species. Once largemouth bass exceed four inches, they usually subsist primarily on fish. Occasionally, adults prefer crayfish or amphibians. Optimal temperatures for growth are 25 to 30˚C although growth will occur at temperatures ranging from 10 to 35˚C. Largemouth bass are a popular game fish in Folsom Reservoir although they are not actively stocked.

Spotted bass (Micropterus punctulatus)
Spotted bass are native to the Mississippi River drainage. In California reservoirs, they tend to inhabit slow moving waters in the vicinity of tributaries and hide along steep rocky banks. They prey upon a variety of invertebrates and fish. Spawning occurs in spring and early summer at temperatures around 15 to 18˚C over nests built in the bottom substrate.

Brown bullhead (Ameiurus nebulosus)
Brown bullheads are native to a large area of the eastern United States and Canada. They are widely distributed and highly adaptable living in habitats ranging from warm turbid sloughs to clear mountain lakes. In California, they are most abundant in larger bodies of water such as large rivers and foothill reservoirs where they are generally associated with the deeper littoral zone[2] (2 to 5 m), with mats of aquatic vegetation and muddy bottoms. This species tolerates a wide range of temperatures and is able to survive in low dissolved oxygen conditions. Brown bullhead feed largely on insect larvae and fish. Spawning occurs from May through July near aquatic vegetation or large woody debris.

[2] A littoral zone is the area on or near the shore of a body of water.

White catfish (Ictalurus catus)
White catfish are native to the east coast of the United States from the Hudson River south to Florida. They inhabit the bottom of warm, sluggish waters such as reservoirs where temperatures exceed 20˚C during the summer. Diet consists of a variety of aquatic invertebrates and fish. Spawning occurs in June and July over nests on the bottom or in crevices.

Channel catfish (Ictalurus punctatus)
Channel catfish are native to the Mississippi-Missouri River system in the United States and into northeastern Mexico. They prefer to inhabit the bottom of swiftly moving rivers although they can live well in more sluggish habitats. Diet consists of a variety of aquatic invertebrates and fish. Spawning occurs in summer when water temperatures reach 21 to 29˚C. Nests are built in small caves or crevices.

Native Non-Game Fishes
Hardhead (Mylopharodon conocephalus) – CSC
Hardhead are large minnows reaching up to 60 cm in length that are native to the low to mid-elevation foothill streams of central valley and Russian River watersheds. They prefer stream habitats with clear, deep pools and runs but can also subsist in parts of reservoirs. Preferred temperatures are around 24 to 28˚C, which is why hardhead are often found near the surface in reservoir habitats. Diet consists of both plant material and invertebrates. Spawning occurs in April and May over stream gravels. Juveniles rear along edge habitats in covered areas. Hardhead do not tolerate the presence of bass or sunfish. For that reason, they are unlikely to inhabit most parts of Folsom and Natoma lakes. Hardhead are more likely to be found in the tributary arms of Folsom Reservoir, rivers upstream of Folsom Reservoir or in the flowing reaches below Folsom Dam where there are fewer warm water fishes.

Sacramento pikeminnow (Ptychocheilus grandis)
Sacramento pikeminnow are large minnows growing up to a meter in length that are native to low to mid-elevation central valley drainages. They prefer stream and river habitats with deep pools and cover. They generally prefer waters where temperatures reach 18 to 28˚C in the summer. Juveniles feed on aquatic insects while adults are predatory on other fishes. Spawning occurs over gravel riffles or other shallow flowing areas in the spring and early summer. Juveniles rear along edge habitats, moving into deeper water with age. Adults can be sedentary or highly migratory but are usually not found in large reservoirs except near where large tributary streams enter.

California roach (Lavinia symmetricus)
California roach are small minnows native to the Central Valley, Sierra foothills, and some coastal watersheds of California. They can be abundant in small, warm stream habitats where they browse on small benthic invertebrates and algae. They tolerate a greater temperature range (up to 35°C) than other native fishes. Spawning occurs in

spring and early summer when water temperatures exceed 16˚C, when spawning aggregations are formed. Roach are broadcast spawners, scattering eggs and sperm over small gravel substrate. Within the Folsom Reservoir area, roach are more likely to be found in and around small tributary streams than in the reservoirs.

Sacramento sucker (Catostomus occidentalis)
The Sacramento Sucker is a common, widely distributed species in central and northern California. They are most abundant in larger streams and rivers at moderate elevations. Sacramento suckers first spawn at an age of about four to six. Spawning generally takes place in February through June, depending on water temperatures, and may continue into July or August in some systems. In streams, suckers spawn over gravel riffles, whereas in lakes they spawn along shorelines. Larval suckers are found concentrated over detritus bottoms or in emergent vegetation in warm, protected stream margins. Juvenile suckers are found close to the bottom in shallow, low velocity water along stream margins. Suckers forage on algae, diatoms, and some invertebrates. Preferred temperatures are around 20 to 25˚C.

Riffle sculpin (Cottus gulosus)
Riffle sculpin are native to the Sacramento-San Joaquin river basins and are common in fast moving streams with rocky substrate and cover such as boulders or logs. They prefer water less than 25 to 26˚C. Diet generally consists of benthic invertebrates. Spawning occurs from February through April. Riffle sculpins have been identified in the stilling basin below Folsom Dam (Corps 2006b). In the Folsom Reservoir areas they are probably restricted to the flowing reaches below Folsom Dam and the uppermost reaches of Lake Natoma.

Introduced Non-Game Fishes
Threadfin shad (Dorosoma pretenense)
Threadfin shad are in the same family as herring and are native to rivers of the Gulf of Mexico south to Belize. They were introduced to California as a forage fish (a fish planted as food for other more desirable fish species). Threadfin shad inhabit open waters of reservoirs and slow moving rivers and prefer warm temperatures in excess of 22 to 24˚C in the summer. Diet consists almost entirely of plant and animal plankton they filter from the water. Spawning occurs from April through August over any kind of submerged structure. Threadfin shad grow very fast but live only 1 to 2 years.

Wakasagi smelt (Hypomesus nipponensis)
Wakasagi smelt are native to Japan and were introduced to California as forage fish for trout. These small smelt school in the open waters of lakes, reservoirs, and estuaries feeding on plankton. Spawning takes place in April and May and the short life cycle generally only lasts one year. Wakasagi smelt are common in Folsom Reservoir and Lake Natoma. They were the most numerous fish found in the Folsom Dam stilling basin when it was drained several years ago.

Seasonal Aquatic Habitats and Invertebrate Species in the Folsom Reservoir Area

The species discussed in the preceding section occur in permanent waters such as Folsom Reservoir and Natoma Lake or the stilling basin. The following section discusses aquatic invertebrates that can occur in temporary water bodies including seasonal ponds and vernal pools.

Vernal pool fairy shrimp (Branchinecta lynchi) – FT.

Vernal pool fairy shrimp are restricted to seasonal vernal pools (Eng, et al. 1990; Federal Register 1994). The vernal pool fairy shrimp prefers cool-water pools that have low to moderate dissolved solids (Eriksen and Belk 1999). This fairy shrimp is found primarily in the Central Valley and the foothills of the Sierra Nevada in northern California from 10 to 290 meters in elevation (Eng et al. 1990, Eriksen and Belk 1999, Federal Register 1994). Critical habitat has been designated for this species, but includes no land in the Folsom Reservoir area (Federal Register 2003).

Fairy shrimp are adapted for survival in water bodies that are transient and their cysts (protected eggs) can withstand long dry periods. They require cool waters early in the rainy season for hatching and are highly susceptible to contaminants. Dispersal of cysts is thought to occur by animal vectors, including grazing animals or waterfowl.

Evidence of seasonal ponding was observed in August surveys in the vicinity of Dike 2 and south of MIAD, at locations that may be included in the Folsom DS/FDR as contractor use areas. Vernal pool fairy shrimp have been observed less than one mile away from the Folsom Reservoir area (David Murth pers. obs., as cited in LSA 2003). Although the seasonal pools within the study area contain less water than is typical for this species' habitat, the close proximity of the Folsom DS/FDR area to a known occurrence provides at least a low potential for this species to occur.

California Vernal Pool Tadpole Shrimp (Lepidurus packardi) **-** *FE.*

The California vernal pool tadpole shrimp is a small crustacean found in ephemeral freshwater pools. This species inhabits vernal pools ranging in size from 5 square meters to 36 hectares. The water in the pools can be clear to turbid and often has low conductivity, total dissolved solids, and alkalinity (Federal Register 1994, Eng et al. 1990). Temperatures in pools where this tadpole shrimp have been found vary from 3 to 23°C (Gallagher 1996). Vernal pool formations occur in grass-bottomed swales of grasslands, in old alluvial soils underlain by hardpan or in mud bottomed pools (Federal Register 1994). Pools with cobble over hardpan bottoms also serve as habitat (Gallagher 1996). Gallagher (1996) found that the depth, volume, and duration of inundation of a pool were important for the presence of this tadpole shrimp in vernal pools when compared to the needs of other branchiopods (a group of primitive and primarily fresh water crustaceans, mostly resembling shrimp). He found that this species did not reappear in ponds that dried and rehydrated during the study period, while other branchiopod species did. California vernal pool tadpole shrimp needs deeper and longer-lasting pools if they are to persist over a rainy season in which both wet and dry periods occur.

Potential habitat for the vernal pool tadpole shrimp occurs within the Folsom Reservoir area. Because this species requires pools of specific size and inundation duration, potential habitat within the Folsom Reservoir area is limited. However, this species is known to occur in small pools in the Mather Air Force Base vicinity in eastern Sacramento County, and therefore even small pools may supply adequate habitat if inundation is of sufficient duration.

3.4.2 Environmental Consequences/Environmental Impacts

3.4.2.1 Assessment Methods

Potential impacts of the Folsom DS/FDR alternatives were evaluated on a qualitative basis because 1) details regarding specific borrow site actions, internal roadway construction and placement, and types and energy dissipation of explosives were still to be defined at the time of this assessment; 2) there is limited or no data available to quantify population levels of the different species within Folsom Reservoir generally, or at or near potential borrow sites (Figure 2-1); and 3) impact mechanisms are only generally described.

3.4.2.2 Significance Criteria

Impacts would be potentially significant if they would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFG, NMFS, or USFWS;
- Interfere substantially with the movement of any native resident or migratory fish species;
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan;
- Substantially change the diversity or numbers of any aquatic community or species or interfere with the survival, growth, or reproduction, of affected populations;
- Introduce new aquatic species into an area; or,
- Cause substantial deterioration or adverse alteration of existing fish habitat. “Substantial” in this context means a long-term (3 years or more) impact that can

be verified by repeated measurement, or would impact habitat designated as, “Critical Habitat” by NOAA Fisheries for listed anadromous species.

Of these six significance criteria, only the first, fourth, and sixth apply. Folsom and Nimbus Dams effectively stop all fish migration and significance criterion 2 would not apply. The Folsom DS/FDR actions would not conflict with any known conservation plans, or other approved local, regional, or state habitat conservation plan. The Folsom DS/FDR actions would not be introducing new fish species and, therefore, criterion 5 would not apply**.**

3.4.2.3 Environmental Consequences/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

There would be no impacts to aquatic resources under this alternative. Existing conditions would be maintained.

The No Action/No Project Alternative would have no effect on aquatic resources.

Environmental Consequences/Environmental Impacts of Alternative 1

Alternative 1 would have the lowest magnitude of impacts for all activities in comparison to the other alternatives (except for the ‘No Action/No Project’ alternative) due to the relatively smaller amount of borrow material that would be excavated from the reservoir.

Construction of Alternative 1 would not have any downstream impacts that would harm fish, or their habitat.

Alternative 1 is primarily a standalone Safety of Dams alternative, and was designed to pass the Probable Maximum Flood and address the seismic and static risks. The Main Concrete Dam would retain all of its current capabilities. If this alternative was implemented, it is anticipated that the features would only be operated once every 300 years or greater. The fuseplug and Auxiliary Spillway would only operate at a point when over 500,000 cfs was already being released downstream through the existing spillway. The fuseplug spillway in conjunction with the existing spillway could release a total discharge between 850,000 and 900,000 cfs.

All operations-related impacts would have already occurred downstream before the fuseplug would operate. All habitats within the Lower American River Parkway and the river channel itself would already be adversely impacted. Therefore, this alternative would not have significant downstream impacts to fish, or their habitat.

This alternative would not have adverse impacts to the coldwater pool, or downstream temperatures (water quality). The fuseplug would be reconstructed as soon as the event has passed. Stockpiles of the material required to rebuild the fuseplug would be available for this purpose. Timely replacement of the fuseplug would ensure that there are no adverse impacts to the coldwater pool, or downstream conditions. Construction of this alternative would not impact Critical Habitat downstream for listed species.

Downstream impacts from reservoir operations and flood releases would be less than significant for Alternative 1.

Blasting impacts for borrow excavation could harm fish.

Blasting for borrow excavation would occur along the reservoir shoreline and would affect fishes in the reservoir in close proximity (kill, injure, displace, or change the behavior of these fish). The littoral fish community around the proposed borrow areas is mostly composed of exotic warm water fishes such as largemouth bass and sunfish. The only special status species known to be present in the area of analysis is hardhead. This species is most likely to be found in the tributary arms or their upstream rivers and unlikely to be found in the main body of the reservoir. Blasting would unlikely harm any special status fish species.

Direct impacts of blasting on fishes for borrow would be temporary and less than significant; no special-status species would likely be affected.

Blasting impacts for the approach channel could harm fish.

Controlled blasting would also be necessary for the construction of the approach channel to the Auxiliary Spillway. The approach channel for Alternative 1 would be 300 to 500-ft. long, and 500-ft. wide. The last 150-ft would be concrete-lined. Material would be excavated from the lakebed mechanically until refusal. The soil would be removed mechanically with a clamshell, suction dredge, dragline, or another suitable method. Once the material cannot be removed with a clamshell, or other means, the excavation would require controlled blasting. The majority of the blasting would take place under water. The material that is excavated by blasting would be placed on a barge or floating platform, with containment in place to reduce or eliminate sedimentation. All material excavated from the reservoir would be transported to a containment area onshore, where the material can dry.

Appropriate methods would be employed to deter fish from utilizing the footprint for the approach channel prior to blasting. Once blasting has been initiated, it is reasonable to assume the any fish not harmed in the first blast would vacate the general area. Since blasting would follow the removal of sediment in the footprint area, and the area would be highly disturbed, most of the fish would have left the area before any blasting takes place. Impacts to fish habitat from the construction of the approach channel would be significant, but the impacts would be temporary and would only last for the duration of construction.

Blasting impacts to fish within the footprint for the approach channel would be reduced by employing appropriate fish avoidance devices, such as a fishpulser, low frequency sound, high frequency sound, scare charges, or using a bubble curtain.

Direct impacts of blasting on fishes and habitat for the spillway approach would be temporary and less than significant; no special-status species would likely be affected.

Construction of the approach channel could have impacts to water quality.

Previous explorations by Reclamation have shown that there is a thin layer of sediment on top of weathered bedrock within the chute alignment. Reclamation and the Corps do not anticipate problems with water quality and sedimentation due to the minimal amount of sediment that would need to be removed. Construction methods would be required to comply with all water quality regulations and would be fully permitted before construction can begin. Best management practices and the employment of silt curtains, or other containment methods would reduce the impacts to less than significant. Section 3.1 provides additional water quality analysis and mitigation.

The sediments within the chute alignment are known to contain elemental mercury, as well as other metals. Of the 18 samples that were collected by Reclamation in 2006, only two reached the threshold of 0.2 mg/kg for mercury. Of all the samples analyzed for metals, no results met or exceeded any of the sediment standards, and as a result would be suitable for unconfined aquatic disposal.

Sediment containing mercury would be temporarily suspended during construction of the Auxiliary Spillway approach channel, but the amount of material that would be suspending would be minimal. Regardless, Reclamation and the Corps would be required to minimize the amount of material that is suspended in order to meet water quality standards. The majority of the material that could be suspended would drop out of suspension almost immediately. Unless releases are being made from the outlets, the majority of the rest of the material should fall out of suspension within Folsom Reservoir. Any material that stays suspended would be minor and would not represent a hazard or substantially impair water quality.

There are also several locations within the reservoir that could be enhanced for construction purposes with the placement of material excavated from the Auxiliary Spillway. Fill areas would be used for staging, stockpiling and potentially for processing materials. Fill material would be used at the Observation Point area, Beal's Point, Folsom Point, and Dike 7.

In order to avoid or eliminate water quality impacts during the placement of material within the reservoir, best management practices would be employed. If at all possible, material would be placed in a dry area. Silt curtains or other physical methods would also be employed to reduce to eliminate water quality issues during construction.

Reclamation and the Corps would use Best Management Practices for sediment and mercury in order to reduce the impacts to water quality to less than significant.

Direct impacts of blasting and excavation on water quality for the spillway approach would be temporary and less than significant; no special-status species would likely be affected.

<u>*The alternative could result in staging, construction (borrow development), and materials transport impacts.*</u>

Staging operations associated with borrow site excavation would cause an increase in local turbidity as sediment is re-suspended in the water column from blasting activity, excavation, and transport operations. The turbidity increases associated with these activities would cause behavioral and sub-lethal effects on all fish in the localized area. Turbidity increases due to transport or construction staging are likely to be localized in space and time and particles would settle out of the water column a few hours after the cessation of the disturbance. The littoral fish community around the proposed borrow areas is mostly composed of exotic warm water fishes such as largemouth bass and sunfish. The only special status species known to be present in the area of analysis is hardhead. This species is most likely to be found in the tributary arms or their upstream rivers and unlikely to be found in the main body of the reservoir. Construction would not likely harm any special status fish species.

Turbidity increases from construction staging, borrow excavation, and transport would be less than significant, temporary impacts.

<u>*The alternative could result in equipment and transport impacts to fish.*</u>

Borrow site develop to the shoreline coupled with haul roads constructed along the shore line could result in vibration effects to fish inhabiting the shoreline. The expected response of fish would be to swim away from the area of impact. No long-term health impacts would be expected.

Vibration increases along the shoreline from construction equipment and transport would be less than significant, temporary impacts.

Borrow site lighting could attract fish and increase potential for harm from construction activities.

Intense lighting along the shoreline would be needed to facilitate construction and excavation operations after sunset. Zooplankton, aquatic insects, and fish of all life stages can be attracted to intense lighting near the reservoir. Fish attracted to near-shore light sources would be more vulnerable to harm from blasting or activities such as excavation and transport. There is a low probability that special status fish species occur in the areas that would be lighted.

Indirect effects of borrow site lighting would be less than significant.

Construction activities could lead to habitat modification impacts.

Borrow areas would be excavated into the inundation zone to provide rock for construction activities. The borrow areas would be shaped and contoured so that they are gently sloped and would drain completely as the reservoir is operated. When fully contoured, the borrow sites would resemble broad depressions in the new lake bottom (Figure 3.4-1). Maximum depth of the borrow sites would be around 30 feet. Excavation of the borrow sites would increase the average depth of the littoral habitat in the inundation zone and would locally increase the bottom slope, perhaps changing some of the littoral zone to deeper, cold water habitat. Currently the inundation zone consists of a mixture of weathered rock, decomposed granite and other sediment. Only one area near Folsom Point supports vegetation such as willows or cottonwoods. Excavation of the borrow areas would change the substrate of these areas to newly exposed rock. Newly exposed rock substrate is likely to provide less cover for fish and would likely support a reduced assemblage of benthic fauna. Over time, the bare rock substrate of the excavated borrow sites would weather and become more like the pre-disturbed substrate, and vegetation may become reestablished. Eventually the excavated and contoured inundation zone would closely resemble its current state. Benthic substrate changes could cause localized changes in fish and invertebrate species composition. It is unlikely that an overall change in the reservoir fisheries would be detectable.

The changes in benthic substrate and cover resulting from borrow pit excavation would be less than significant, long-term impacts.

Excavation of borrow sites would impact reservoir bathymetry[3]*.*

Excavation of the borrow sites would reduce local bed elevation by as much as 30 ft. This change in topography would change the relative abundance of habitat types

[3] Bathymetry is the measurement of the depth of the water body floor from the water surface; the equivalent of topography, or an underwater elevation model.

available at various reservoir levels. At the high water levels occurring during the spring and early summer, much of the inundation zone is submerged shallow water habitat within the warmer epilimnion. A 30-ft reduction in the bed elevation could result in these areas becoming part of the deeper, cooler water habitat below the epilimnion when the reservoir level is high. Deeper benthic habitat is associated with reduced numbers of warm-water fish and benthic invertebrates in some reservoirs (Keast & Harker 1977), although it can also mean improved habitat suitability for cold water fish such as trout. Any change in benthic habitat as a result of borrow excavation would only be relevant for part of the year since the water level within the reservoir varies so widely. Habitat changes could cause changes in fish species composition within localized areas. It is unlikely that an overall change in the reservoir fisheries would be detectable.

The change in bathymetry of the inundation zone resulting from borrow pit excavation would be a less than significant, long-term impact.

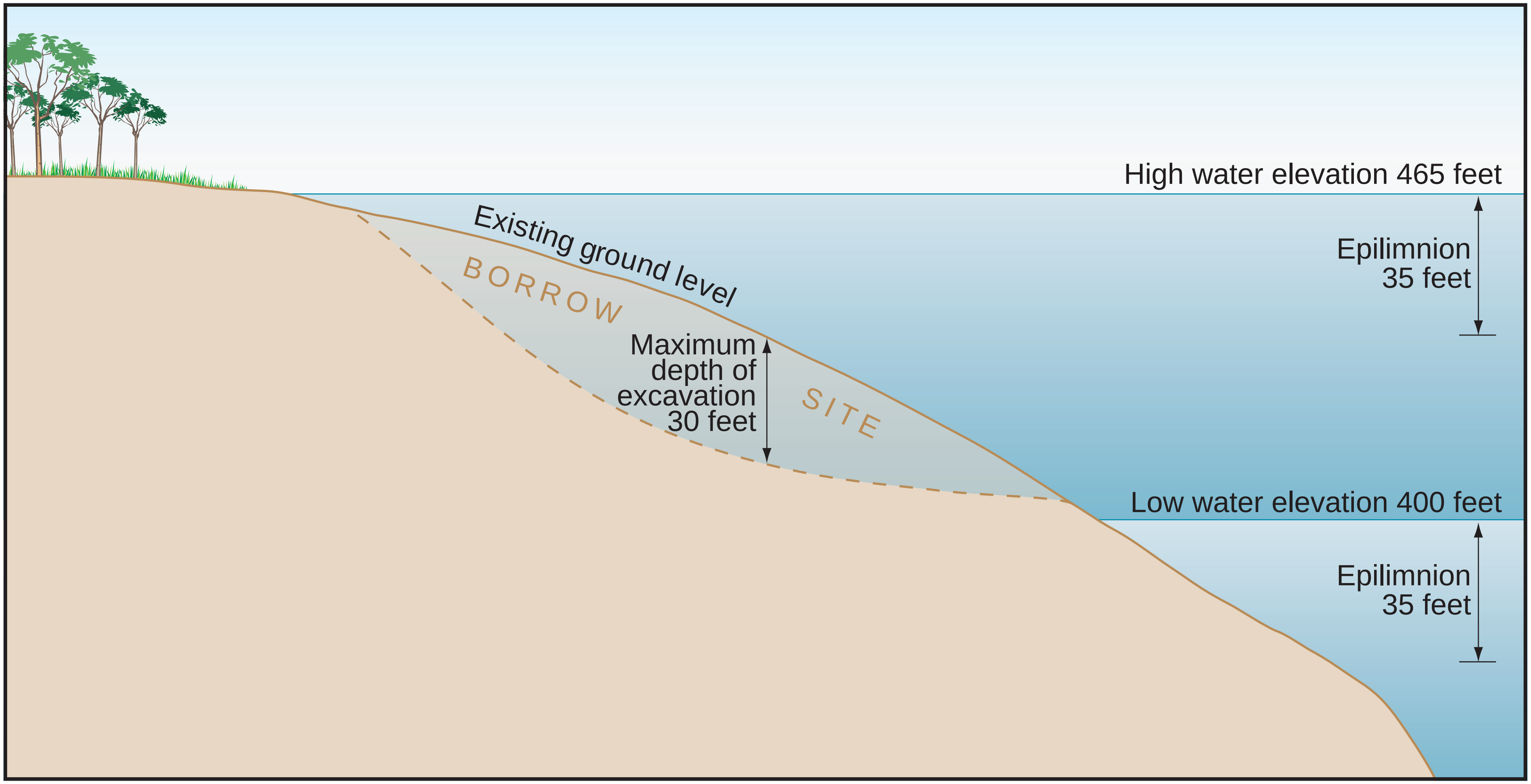

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Figure 3.4-1
Cross Section of an Idealized Borrow Site Located in the Innundation Zone of Folsom Reservoir Showing High and Low Water Levels and the Location of the Summer Thermocline

Construction activities may result in alteration of habitat for protected vernal pool invertebrates or direct impacts to these species.

Seasonal ponds that could provide limited habitat for the vernal pool fairy shrimp or California vernal pool tadpole shrimp were observed at proposed construction use areas near Dike 2 and east of MIAD. Activities associated with this area include road access, movement of vehicles and other construction equipment, presence of workers in the area, and possibly short-term storage of construction supplies and materials. These activities and the associated uses of the area may directly impact the seasonally ponded area by physical disturbance, erosion and deposition of materials on the surface, and discharge of toxic substances from machinery. Impacts to these ponds could result in significant adverse effects if the ponds were occupied by either of these species.

This impact would be potentially significant. Mitigation Measures AQINV-1a through AQINV-1d would reduce this impact to a less than significant level.

Jet Grouting at MIAD could adversely alter the water level or chemistry within downstream wetlands.

The injection of grout into the subsurface at MIAD could adversely affect downstream wetlands through either a water chemistry change (grout has low pH and soluble compounds) or water level change. This could adversely affect wetlands ecological health or reduce water levels. Jet grout could re-emerge near or within the wetlands, also adversely affecting water quality.

This impact would be potentially significant but mitigable. Mitigation Measures HWQ-4 through HWQ-8 described in Section 3.1.4 Hydrology, Water Quality and Groundwater, would reduce this impact to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 2

Alternative 2 would involve greater borrow activities and the impacts would be slightly greater in area and in duration relative to Alternative 1. Impacts from excavation and construction of the Auxiliary Spillway approach channel are the same as Alternative 1. The impacts of Alternative 1 to fisheries would still be considered less than significant. Effects to vernal pool species would be similar. Alternative 2 would have the potential for increasing the reservoir pool elevation above normal operations during emergency floodwater retention events. This effect is introduced below. Dewatering of MIAD to facilitate excavation and replacement of the downstream foundation could reduce water levels in downstream wetlands. Alternative 2 would have similar potential effects to vernal pool species as Alternative 1.

Construction of Alternative 2 would not have any downstream impacts that would harm fish, or their habitat.

Alternative 2 is a Flood Damage Reduction alternative, and was designed to pass the Probable Maximum Flood. Under this alternative, it is anticipated that the features would be operated infrequently to pass the design flood. The principle features of Alternative 2 would be a fuseplug Auxiliary Spillway with an underlying tunnel, and a raise of up to 4 feet.

The fuseplug spillway features of this alternative would only operate at a point when over 500,000 cfs was already being released downstream as described in Alternative 1. The tunnel would provide a substantially lower level of discharge capacity, allowing for the initiation of earlier releases, and maintaining flows at 160,000 cfs or below for duration's equivalent to the 1 in 200 year event.

All operations-related impacts would have already occurred downstream before the fuseplug would operate. All habitats within the Lower American River Parkway and the river channel itself would already be adversely impacted. Therefore, this alternative would not have significant downstream impacts to fish, or their habitat.

Alternative 2 would not have adverse impacts to the coldwater pool, or downstream temperatures (water quality). The fuseplug would be reconstructed as soon as feasible once the event has passed. Stockpiles of the material required to rebuild the fuseplug would be available for this purpose. Timely replacement of the fuseplug would ensure no adverse impacts to the coldwater pool, or downstream conditions.

Construction and utilization of the features in Alternative 2 would not substantially alter current Folsom Reservoir operations and, in general, would decrease downstream hydraulic impacts during a severe storm event. Construction of this alternative would not impact Critical Habitat downstream for listed species.

Downstream impacts from reservoir operations and flood releases for Alternative 2 would be less than significant.

Direct or indirect impacts to protected vernal pool invertebrates or their habitat may occur due to temporary or permanent alteration of habitat by a large hydrologic event.

Under the Folsom DS/FDR, Reclamation would utilize the temporary increase in reservoir capacity afforded by the dam raise during extreme flood events to safely release water through the concrete dam into the American River. Seasonal pools located at or below the maximum capacity after the dam raise may be subject to inundation during extreme flood events. Inundation of these pools could alter habitat conditions and introduce invasive predators such as fish into naturally fish-less systems. Inundation may also cause geomorphic alterations to such pools through sedimentation or erosion. Such occurrences could result in direct impacts to individuals and adverse effects to the habitat of this species.

This impact would be potentially significant but mitigable. Mitigation Measures AQINV-1e and AQINV-2 would reduce this impact to a less than significant level.

Excavation and replacement of the MIAD foundation could adversely alter the water level or chemistry within downstream wetlands.

Dewatering of the toe of MIAD to facilitate replacement of its foundation could adversely affect downstream wetlands through either a water chemistry change or water level change. This could adversely affect wetlands ecological health or reduce water levels.

This impact would be potentially significant but mitigable. Mitigation Measure HWQ-10 described in Section 3.1.4 Hydrology, Water Quality and Groundwater, would reduce this impact to a less than significant level.

Environmental Consequence/Environmental Impacts of Alternative 3

This alternative would involve the same impacts as Alternative 1, including underwater blasting and dredging for construction of the JFP Auxiliary Spillway. Because Alternative 3 would increase the amount of spillway site excavation compared to Alternative 1, the impacts would be slightly greater in area and in duration of construction relative to Alternative 1. Alternative 3 would have an additional impact related to the extension of the stilling basin downstream of Folsom Dam. Impacts to vernal pool species would be the same and would require mitigation. Impacts at MIAD would be the same as Alternative 1. The impacts to aquatic resources would still be considered less than significant with mitigation as appropriate.

Construction of Alternative 3 would not have any downstream impacts that would harm fish, or their habitat.

Under Alternative 3, Folsom Dam would have four methods of discharging flows from the reservoir: three power penstocks, eight flood control outlets (four upper tier and four lower tier, all 5 ft x 9 ft), tainter/radial spillway gates set near the main spillway crest (five service and three emergency), and six submerged tainter gates in the proposed Auxiliary Spillway. In general, utilization of the features described in Alternative 3 would involve greater releases earlier in a major hydrologic event that closely match downstream channel capacity.

The JFP Auxiliary Spillway would allow the objective release of 115,000 cfs to be achieved sooner in a flood event, and would lessen peak flows fore large, infrequent hydrologic events. A maximum flood release of 160,000 cfs, which is the emergency downstream channel capacity, would be made through the Auxiliary Spillway when necessary, based on observed and anticipated reservoir inflows. Emergency releases of 160,000 cfs or above would not be made any sooner with the JFP Auxiliary Spillway features completed than under existing conditions.

Variations in releases utilizing the Folsom Facility would not be any larger than those allowed under existing conditions. Under this alternative, the same amount of water would ultimately be released with and without implementation of this alternative (due to operational constraints), but operators would have the ability to release more water sooner in a hydrologic event. Features of this alternative would be operated under existing operating criteria; therefore, the implementation of Alternative 3 would not have adverse impacts to fish or their habitat. Construction of this alternative would not impact Critical Habitat downstream for listed species.

Downstream impacts from reservoir operations and flood releases for Alternative 3 would be less than significant.

<u>*Underwater construction activities for the JFP Spillway may result in localized impacts to reservoir fishes.*</u>

Fishes in the JFP spillway construction area would be exposed to the effects of underwater blasting and dredging. Underwater blasting would kill, injure, or alter the behavior of fishes in the construction area. Fish not killed outright from the concussion may be injured and eventually die or become prey for other fish and birds. Dredging would create additional disturbance, increase local turbidity and underwater noise as the blasted rubble is removed. The additional effects of dredging on the fish population would be minimal if dredging occurs within hours to days after blasting. Construction of the JFP spillway would displace some of the habitat that is presently used by fish in the reservoir.

The impacts to water quality would be slightly greater for this alternative than Alternatives 1 and 2, due to the length of the approach. The base of the approach channel would vary in width from about 330 feet (at the upstream end) to 168 feet wide (just upstream of gate structure), and would be about 900-ft long.

The disturbance from blasting and dredging would be a less than significant, short-term impact. The loss of habitat from the reservoir would be a less than significant long-term impact.

<u>*Dewatering the Stilling Basin would displace and potentially harm fish.*</u>

The Stilling Basin must be dewatered while extension work is being performed. Because there is no fish stocking program for the Stilling Basin, the fish (primary non-native and exotics) inhabiting the facility most likely were transported through the Folsom Dam river outlets. Dewatering of the Stilling Basin could result in the harm or death of some native fish, such as riffle sculpin, that are known to occur there (Corps 2006b). However, special status species are unlikely to be present as there is no mechanism for them to be present. Because it would not be possible to remove all fish prior to dewatering, some fish loss would be expected. A fish recovery plan would be implemented to minimize this impact (see Mitigation Measure Fish-1).

The impact of dewatering of stilling basin for extension work would be less than significant for special status fish species.

Environmental Consequences/Environmental Impacts of Alternative 4

This alternative would involve the same construction impacts as Alternative 2 and Stilling Basin impacts as Alternative 3. However, because Alternative 4 would increase the amount of borrow excavation compared to Alternative 2, the impacts would be slightly greater in area and in duration of construction relative to Alternative 3. Impacts to fish populations would still be considered less than significant with appropriate mitigation. Impacts to vernal pool species would be the same and would require mitigation.

Construction of Alternative4 would have no downstream impacts that would harm fish, or their habitat.

Alternative 4 would provide Folsom Dam with the same four methods of discharging water as Alternative 3. In general, utilization of the features described in Alternative 4 would involve greater releases earlier in a major hydrologic event that closely match downstream channel capacity. The new Auxiliary Spillway would allow the objective release of 115,000 cfs to be achieved sooner in a flood event, and would lessen peak flows fore large, infrequent hydrologic events. A maximum flood release of 160,000 cfs, which is the emergency downstream channel capacity, would be made through the new Auxiliary Spillway when necessary based on observed and anticipated reservoir inflows.

Emergency releases of 160,000 cfs or above would not be made any sooner with the Folsom DS/FDR features than under existing conditions. Variations in releases utilizing Folsom DS/FDR features would not be any larger than those allowed under the existing conditions. Under this scenario, the same amount of water would ultimately be released with and without the Folsom DS/FDR features (due to operational constraints), but operators would have the ability to release more water sooner in a hydrologic event. The features would be operated under existing operating criteria; therefore, there would be no adverse impacts to fish or their habitat due to the implementation of Alternative 4. Construction of this alternative would not impact Critical Habitat downstream for listed species.

Downstream impacts from reservoir operations and flood releases for Alternative 4 would be less than significant.

Environmental Consequences/Environmental Impacts of Alternative 5

This alternative would have substantially greater impacts than Alternative 4 due to the need to fully develop all in-reservoir borrow sites. Because a new Auxiliary Spillway would not be constructed, there would be no borrow material coming from that site. The impacts would be greater in the area within and along the shoreline and in duration of construction relative to Alternative 4, but would still be considered less than significant with appropriate mitigation. Vernal pool and MIAD impacts would be the same as for Alternative 4.

Construction of Alternative 5 would not have any downstream impacts that would harm fish, or their habitat.

The 17-ft raise would be designed to contain a large storm event and pass it without overtopping the downstream levees. Variations in releases utilizing Folsom DS/FDR features would not be any larger than those allowed under existing conditions. In addition, the top of the flood control pool would be raised to increase the flood storage space. Alternative 5 would allow the reservoir to hold more flood water and would allow a substantially larger timeframe for the evacuation of downstream communities.

Downstream impacts would remain the same as the No Action/No Project Alternative. The implementation of Alternative 5 would not have adverse downstream impacts to fish or their habitat. Releases would be made according to the Interim Flood Control Diagram. Construction of this alternative would not impact Critical Habitat downstream for listed species.

Downstream impacts from reservoir operations and flood releases for Alternative 5 would be less than significant.

3.4.3 Comparative Analysis of Alternatives

The No Action/No Project Alternative would have no impact on fisheries resources. The action alternatives described above would all have several identifiable impacts, but all would be considered “less than significant”, except for vernal pool habitat and potential impacts to MIAD wetlands. Therefore, the differences between the overall impacts of the Folsom DS/FDR alternatives have to do with the relative magnitude of the “less than significant” adverse impacts. These adverse impacts are provided in Table 3.4-1 with the provision that impacts associated with borrow site excavation would tend to increase between Alternative 1 and 5 as borrow volumes increase. Prior to applying mitigation measures, there would be significant impacts to vernal pool habitats and species. However, with mitigation, these impacts would be reduced to less than significant under all alternatives.

Table 3.4-1 Comparison of Folsom Dam Raise Impacts for Fisheries and Vernal Pool Species (relative level of impacts increase from Alt 1 to Alt 5)						
Affected Resource and Area of Potential Impact	***Alternative***					
	No Action Compared to Existing Conditions	***1***	***2***	***3***	***4***	***5***
Impact						
1. Blasting	N	LS, A	LS, A	LS, A	LS, A	LS, A
2. Turbidity	N	LS, A	LS, A	LS, A	LS, A	LS, A
3. Vibration	N	LS, A	LS, A	LS, A	LS, A	LS, A
4. Lighting	N	LS, A	LS, A	LS, A	LS, A	LS, A
5. Substrate Change at Borrow Sites	N	LS, A	LS, A	LS, A	LS, A	LS, A
6. Depth Change at Borrow Sites	N	LS, A	LS, A	LS, A	LS, A	LS, A
7. Fuseplug Spillway	N	LS, A	LS, A	N	N	N
8. JFP Spillway	N	N	N	LS, A	LA, A	N
9. Dewatering Stilling Basin	N	N	N	LS, A	LS, A	LS, A
10. Direct or indirect impacts to protected vernal pool invertebrates or their habitat due to temporary or permanent alteration of habitat by construction activities.	N	SM, A	SM, A	SM, A	SM, A	SM, A
11. Direct or indirect impacts protected vernal pool invertebrates or their habitat due to temporary flooding of habitat by a large hydrologic event.	N	N	SM, A	SM, A	SM, A	SM, A
12. Direct or indirect impacts to MIAD wetlands due to release of jet grout mixture into emergent groundwater	N	SM, A	N	SM, A	SM, A	N
13. Direct or indirect impacts to MIAD wetlands due to dewatering of groundwater to facilitate foundation replacement.	N	N	SM, A	N	N	SM, A

Key:
SU = Significant and Unavoidable Impact (CEQA)
SM = Significant but mitigable Impact (CEQA)
LS, A = Less than Significant Impact (CEQA)
N = No Impact (CEQA, NEPA)
B = Beneficial Impact (NEPA)
A = Adverse Impact (NEPA)

3.4.4 Mitigation Measures

Implementation of Mitigation Measures AQINV-1a through AQINV-2, and FISH-1 , would reduce impacts to aquatic resources to a less than significant level.

AQINV-1a: Protocol surveys for special-status branchiopods will be completed prior to any grading or other construction activities in potential habitat for these species.

AQINV-1b: Potential vernal pool habitat will be avoided (preserved) by placing fencing and a suitable buffer area around the vernal pool area to prevent effects from vehicles and other construction-related activities. For vernal pool habitat that is to be avoided, an approved biologist (monitor) will inspect construction-related activities to ensure that no unnecessary take or destruction of habitat occurs. The biologist will contact the construction representative who has the authority to stop activities that may result in such take or destruction until corrective measures have been taken. The biologist will also be required to report immediately any unauthorized effects to Reclamation or the Corps, and to the USFWS and CDFG.

AQINV-1c: On-site construction personnel will receive instruction (from Reclamation, Corps, or trained representative) regarding the potential presence of listed species and the importance of avoiding impacts.

AQINV-1d: Adverse impacts to potential vernal pool habitat in the Folsom DS/FDR footprint will be compensated in a manner agreed upon by the responsible Federal agency and the USFWS. For example, for habitat that is directly or indirectly affected, vernal pool credits will be dedicated within a USFWS-approved ecosystem preservation bank. Based on a USFWS evaluation of conservation values of the affected habitat, vernal pool habitat will be preserved, or created and monitored, on the Folsom DS/FDR site, or on another non-bank site approved by the USFWS. Vernal pool habitat and associated upland habitat used as on-site mitigation will be protected from adverse effects and managed in perpetuity or until the responsible Federal agency and USFWS agree on a process to exchange such areas for credits within a USFWS-approved mitigation banking system.

AQINV-1e: Effects caused by emergency retention of floodwaters will be minimized by conducting baseline surveys below the maximum potential surface elevation. Protocol surveys for vernal pool fairy shrimp and California vernal pool tadpole shrimp will be conducted by a USFWS-approved biologist at seasonal pools capable of supporting these vernal pool species.

- If these vernal pool species are not found, no additional minimization measures will be required.
- If vernal pool fairy shrimp and/or California vernal pool tadpole shrimp are found, sites supporting populations will be recorded.
- Following a large hydrologic event that temporarily increases Folsom reservoir surface elevation above the normal operations maximum, affected pools supporting vernal pool fairy shrimp and/or vernal pool tadpole shrimp

populations will be again surveyed by an approved biologist for presence/absence, and the responsible Federal agency will re-initiated consultation with the USFWS if necessary or appropriate.

AQINV-2: In the event of emergency operations, supplemental environmental compliance will be completed. It is anticipated that surveys would be completed after the event. Based on the results of these surveys, formal Section 7 consultation would be reinitiated by the responsible federal agency.

*FISH-1***:** A fish removal plan will be developed prior to dewatering of the existing Stilling Basin and implemented at the time of dewatering.

3.4.5 Cumulative Effects

The following analysis evaluates the impacts of the Folsom DS/FDR actions when considered together with related past, present, and reasonably foreseeable projects. Of the cumulative projects described in Chapter 5, only the Folsom Bridge Project is relevant to the evaluation presented herein. All of the other projects are located away from the Reservoir and, therefore, would not contribute to impacts to aquatic resources.

The Folsom Bridge Project is expected to result in limited impacts to fishery resources, in part in areas also potentially affected by the Folsom DS/FDR actions. Therefore, the cumulative effects of the Folsom Bridge Project and the Folsom DS/FDR actions would not be cumulatively considerable for fishery resources in general.

The DEIS/EIR for the Folsom Bridge Project (Corps 2006b) found that there would be no adverse effects to the vernal pool fairy shrimp, or the California vernal pool tadpole shrimp from any of the alternatives evaluated for that project because "…no suitable habitat for special-status reptiles, amphibians, or invertebrates was noted during the wetland delineation for the proposed project".

Therefore, the effects of this project, in combination with the Folsom DS/FDR actions, would not be cumulatively considerable for fisheries resources or aquatic invertebrates in general or for special-status invertebrates.

3.5 Terrestrial Vegetation and Wildlife

3.5.1 Affected Environment/Existing Conditions

Terrestrial biological resources include vegetation, wildlife habitats, wetlands, wildlife species, and threatened and endangered species. The information provided in this document describes the botanical resources and wildlife that occur in the vicinity of Folsom Reservoir.

The analysis area is dominated by aquatic habitat within Folsom Reservoir, but stands of native vegetation occupy much of the area adjacent to the shoreline. This area supports seven major terrestrial vegetation types that are typical of the foothills of California's Central Valley. The vegetation mosaic is a result of interactions between natural and human influences including: climate, soil type and depth, elevation, slope gradient, slope aspect, grazing, fire, physical disturbances by humans, reservoir fluctuations, and invasive exotic vegetation.

Native plant communities in the analysis area provide suitable habitat for a variety of native wildlife, including special-status species. The primary habitat types that occur within the analysis area include annual grassland, interior live oak woodland and savanna, blue oak woodland, chaparral, willow scrub, riparian forest, seasonal wetland, freshwater marsh, and aquatic (lake, pond, creek, and stream). Alteration in composition and structure of native vegetation is likely to have resulted in reduced populations of native wildlife not adapted to the changed environment. Additional changes to the natural ecosystems have resulted from the incursion of non-native species and the related increase in native wildlife species that have adapted to these vegetation changes. Land development within the vicinity of Folsom Reservoir (including the dams themselves) has created significant barriers to wildlife movement and altered patterns of animal migration.

3.5.1.1 Area of Analysis

Potential impacts to biological resources have been evaluated for the Folsom Dam and the area surrounding the reservoir. Acreages discussed in the analysis are limited to those affected by the maximum combined footprint for the construction phase of the project and do not include any sites for additional new embankments related to raise features. Impacted habitat acreages and compensatory mitigation acreages identified in the Draft Fish and Wildlife Coordination Act Report (FWCAR) for the Folsom Dam Safety and Flood Damage Reduction Project (USFWS 2006) are estimated and being refined; impacts would be further minimized in coordination with the USFWS. The FWCAR does include areas of potential impact beyond the construction phase of the project. Subsequent environmental documents would address details of the construction of additional new embankments, if a raise feature is selected and new embankments are necessary.

3.5.1.2 Regulatory Setting

The following laws, ordinances, and regulations are applicable or potentially applicable to the project in the context of biological resources.

Federal

Endangered Species Act of 1973; 16 USC §1531 et seq.; 50 CFR Parts 17 and 222
This act includes provisions for protection and management of species that are federally listed as threatened or endangered or proposed for such listing and of designated critical habitat for these species. The administering agency for the above authority for non-marine species is the U.S. Fish and Wildlife Service (USFWS).

Migratory Bird Treaty Act: 16 USC §703-711; 50 CFR Subchapter B
This act includes provisions for protection of migratory birds, including basic prohibitions against any taking not authorized by federal regulation. The administering agency for the above authority is the USFWS.

Rivers and Harbors Act §10; 33 USC §201 et seq.
This act protects waters of the United States. The administering agency for the above authority is the U.S. Army Corps of Engineers (Corps).

Clean Water Act of 1977; 33 USC §1251-1376; 30 CFR §330.5(a) 26
These sections provide for the protection of wetlands. The administering agency for the above authority is the Corps.

Executive Order 11990, Protection of Wetlands (May 24, 1977)
This order provides for the protection of wetlands. The administering agency for the above authority is the Corps.

State

California Endangered Species Act of 1984, California Fish and Game Code §2050-2098
This act includes provisions for the protection and management of species listed by the state as endangered or threatened, or designated as candidates for such listing. This act includes a requirement for consultation “to ensure that any action authorized by a state lead agency is not likely to jeopardize the continued existence of any endangered or threatened species…or result in the destruction or adverse modification of habitat essential to the continued existence of the species” (§2090). Plants of California declared to be endangered, threatened, or rare are listed at 14 CCR §670.2. Animals of California declared to be endangered, threatened, or rare are listed at 14 CCR §670.5. The administering agency for the above authority is the California Department of Fish and Game (CDFG).

Native Plant Protection Act of 1977; California Fish and Game Code §1900 et seq.
This act lists state-designated rare and endangered plants and provides specific protection measures for identified populations. The administering agency for the above authority is the CDFG.

California Species Preservation Act of 1970; California Fish and Game Code §900-903
This act includes provisions for the protection and enhancement of the birds, mammals, fish, amphibians, and reptiles of California. The administering agency for the above authority is the CDFG.

California Fish and Game Code §900-903
This code section prohibits the taking or possessing of any bird egg or nest. The administering agency for the above authority is the CDFG.

California Fish and Game Code §3511 and 5050
This code section prohibits the taking or possessing of birds and reptiles listed as "fully protected." The administering agency for the above authority is the CDFG.

California Fish and Game Code §1930-1933
These code sections provide for the Significant Natural Areas program and database. The administering agency for the above authority is the CDFG.

California Environmental Quality Act (CEQA) PRC §21000 et seq.
This act provides for protection of the environment within the state of California. For the project, the administering agency for the above authority is the California State Lands Commission (CSLC).

Local

Local Native Tree Protection Ordinances
California State Senate Concurrent Resolution 17 and several city and county ordinances regulate effects on native oak and riparian trees and woodlands, as well as designated landmark or heritage trees. These local ordinances generally require permits for any activities that directly remove covered trees of specific size and species, or indirectly affect them by work under or adjacent to their canopy driplines. The ordinances typically have specific quantitative mitigation ratios for replacement of trees affected by projects.

3.5.1.3 Existing Conditions

Botanical Resources

The analysis area includes all construction use areas from Alternative 1 (no structural raise) to Alternative 5 (17-ft raise). This area is dominated by aquatic habitat within Folsom Reservoir, but stands of native vegetation occupy much of the area adjacent to the shoreline. This area supports seven major terrestrial vegetation types that are typical of the foothills of California's Central Valley. These types include: interior live oak woodland, blue oak woodland and savanna, annual grassland, chaparral, cottonwood-willow riparian, freshwater marsh, and seasonal wetland.

Sensitive plant communities have special protection or consideration under federal, state, and local laws. Sensitive communities for this project are those that meet any of the following criteria: communities that are described as Significant Natural Areas (SNAs) by CDFG, communities that are either known or believed to be of high priority for inventory in the California Natural Diversity Database (CNDDB) due to their rarity or level of threat, riparian communities subject to Corps jurisdiction or CDFG jurisdiction, and communities that are protected or recognized as a community of special concern by the state or local ordinances. Sensitive plant communities in the study area and vicinity include valley oak, blue oak savanna and woodland, gabbroic northern mixed chaparral, riparian forest, riparian scrub, freshwater marsh, and seasonal wetlands.

Vegetation

Upland Plant Communities

- *Interior Live Oak Woodland.* This upland vegetation community (classified as interior live oak series by Sawyer and Keeler-Wolf [1995]) was present above the ordinary high water mark (OHWM) of the reservoir (as indicated by evidence of regular inundation), and is therefore not influenced by fluctuation of the reservoir water line. Dominant tree species are interior live oak (*Quercus wislizenii*), blue oak (*Quercus douglasii*), and foothill or gray pine (*Pinus sabiniana*). This community intergrades with blue oak woodland (Holland 1986). The shrub layer was relatively depauperate with an occasional elderberry (*Sambucus mexicana*), or ceanothus (*Ceanothus* sp.). The understory herb layer was occupied by exotic Mediterranean grasses (*Bromus* spp.) and other ruderal species including short-pod mustard (*Hirschfeldia incana*), telegraph weed (*Heterotheca grandiflora*), and yellow star thistle (*Centaurea solstitialis*). In areas of dense tree cover, bare ground or leaf litter was dominant. Approximately 81 acres of oak woodland, including interior live oak woodland, are present in the maximum extent of the project construction area. The potential future inundation zone portion of the FWCAR evaluation area includes a maximum extent 1,323 acres of interior live oak woodland.

- *Blue Oak Woodland and Savanna.* Blue oak woodland is a highly variable climax woodland dominated by blue oak, but usually includes other oak species (coast live oak [*Quercus agrifolia*], and interior live oak) as well as foothill pine (Holland 1986). The community is described as blue oak series (Sawyer and Keeler-Wolf 1995) and blue oak woodland (Holland 1986) in the literature. Within the project area, blue oak woodlands are present outside of the reservoir fluctuation zone on relatively xeric sites. Canopy cover ranges from continuous to fairly open. Understory species are mainly herbaceous and include Mediterranean grasses (*Bromus* spp.), dogtail grass (*Cynosurus echinatus*) and yellow star thistle (*Centaurea solstitialis*). Approximately 81 acres of oak woodland, including blue oak woodland, are present in the maximum extent of the project construction area. The potential future inundation zone portion of the FWCAR evaluation area includes 1,323 acres of oak woodland, including blue oak woodland.

- *Annual Grassland.* Annual grassland is a heterogeneous mix of non-native grasses, annual forbs and wildflowers. This community is classified as California annual grassland series (Sawyer and Keeler-Wolf 1995) and valley and foothill grassland or non-native grassland (Holland 1986). Dominant plant species in the annual grassland include introduced annual grasses such as wild oat (*Avena fatua*), ripgut brome (*Bromus diandrus*), barley (*Hordeum* spp.), dogtail grass and fescue (*Vulpia* spp.). Herbaceous forbs and wildflowers present in this vegetation include both native species such as fiddle neck (*Amsinckia* spp.), western ragweed (*Ambrosia psilostachya*), and popcornflower (*Plagiobothrys* spp.), and non-native species such as short-pod mustard, yellow star thistle, and dove weed (*Eremocarpus setigerus*). Approximately 180 acres of annual grassland are present in the maximum extent of the project construction area.

- *Chaparral.* Chaparral consists of a dense cover of perennial, mostly evergreen shrubs, generally 1 to 3 meters in height. Chaparral is common around Folsom Reservoir, especially on steep, west or south facing slopes. The dominant species include chamise (*Adenostoma fasciculatum*) and whiteleaf manzanita (*Arctostaphylos viscida*). Other common species present include toyon (*Heteromeles arbutifolia*), California coffeeberry (*Rhamnus californica*), buck brush (*Ceanothus cuneatus* var. *cuneatus*), poison oak (*Toxicodendron diversilobum*), and redbud (*Cercis occidentalis*). Small stands of this community occur within the project construction area, sometimes as understory to interior live oak woodland. These small units are not shown on the vegetation map. Approximately 1.5 acres of chaparral are present in the maximum extent of the project construction area. The potential future inundation zone portion of the FWCAR evaluation area includes 66 acres of chaparral.

- *Gabbroic Northern Mixed Chaparral.* This chaparral occurs on gabbro- and diorite-derived soils along the South Fork American River arm of Folsom Reservoir between Sweetwater and Weber Creeks. This community is a sensitive plant community. This community is defined by the presence of specific soil types (the Rescue Series), that are rich in iron, magnesium and other heavy metals which many common plant species do not tolerate. In the analysis area, this chaparral is typically dominated by chamise and supports scattered populations of several special-status plants, many of them local endemics. These special-status plants occur in a fire-adapted plant community. However, this community does not occur within the project construction area.

Riparian and Wetland Plant Communities

- Riparian and wetland plant communities in the project construction area are found both outside of Folsom Reservoir and within the fluctuation zone of the reservoir between its ordinary high water line and the minimum pool elevation of the reservoir. Outside of the fluctuation zone of Folsom Reservoir, these communities may be found adjacent to the American River, tributary streams, drainage canals from reservoir dikes, or as isolated communities. Approximately 41 acres of woody riparian vegetation are present in the maximum extent of the project construction area. No woody riparian vegetation is present in the future inundation zone portion of the FWCAR evaluation area.

- *Cottonwood-Willow Riparian (Sensitive).* Vegetation communities dominated by Fremont cottonwood (*Populus fremontii* ssp. *fremontii*) and various species of willow (*Salix* spp.) are typically found on floodplains, riparian areas, and low-gradient depositions along the banks of rivers, seeps, and streams where soils are intermittently flooded. Cottonwood communities in the project area contain elements of both great valley cottonwood riparian forests and willow scrub described by Holland (1986) and the Fremont cottonwood series and mixed willow series described by Sawyer and Keeler-Wolf (1995).

- *Freshwater Marsh (Sensitive).* Freshwater marsh communities within the project area are wetland communities fed by seeps or springs and are permanently to semi-permanently flooded. The dominant species was cattail (*Typha latifolia*). The most applicable vegetation community described in the literature is coastal and valley freshwater marsh, a community dominated by perennial, emergent monocots including bulrush (*Scirpus* spp.) and cattail (*Typha* spp.) (Holland 1986). Approximately one acre of freshwater marsh is present in the maximum extent of the project construction area.

- *Riparian Vegetation Associated with the Reservoir Fluctuation Zone.* Scattered stands of willow and other woody vegetation are present within the reservoir fluctuation zone in the project area. Several categories have been mapped within this general vegetation type.

  The Gooding’s willow community is created by mature Gooding’s willow (*Salix goodingii*) trees that reached an average height of 30 feet. These communities are generally present within 100-200 feet below the OHWM within the heavily vegetated portion of the reservoir shoreline. Understory species are common herbaceous species including Bermuda grass (*Cynodon dactylon*), spiny cocklebur (*Xanthium strumarium*) and rushes (*Juncus* sp.).

Mixed Riparian Areas within the Reservoir Fluctuation Zone are generally associated with depressions, or riparian areas within the reservoir fluctuation zone. These areas appeared to be frequently inundated and also likely received overland flow from upland areas. Species present include rushes, buttonwillow (*Cephalanthus occidentalis*), seep monkey flower (*Mimulus guttatus*) and other common species.

Shrub Willow vegetation within the Reservoir Fluctuation Zone is dominated by willow shrubs (*Salix* sp.) that occur at certain areas at the very lowest elevations of the reservoir shoreline. These areas are frequently inundated and had saturated soil conditions.

Seasonal Wetland Communities

Seasonal wetland communities were mapped both inside and outside of the reservoir-influenced zone. The majority of wetland areas within the project area are seasonal. These communities are exposed to wetland hydrology for a limited period of time, though it may be for long enough duration to show indicators of wetland soil and hydrology and to seasonally host hydric vegetation. Much of this area, however, does not meet all three wetland criteria. Approximately 5 acres of seasonal wetlands are present in the maximum extent of the project construction area. Descriptions of the various types of seasonal wetland communities observed in the project construction area are provided below. No seasonal wetland vegetation has been mapped in the future inundation zone portion of the FWCAR evaluation area.

Seasonal Depression Vegetation within the Reservoir Fluctuation Zone is generally associated with depressions, or riparian areas within the area influenced by the reservoir. These areas appear to be frequently inundated and also likely receive overland flow from upland areas. Species present include rushes, seep monkey flower and other common species.

Seasonal Wetland Slope Community within the Reservoir Fluctuation Zone is by far the most common vegetation community below the OHWM of the reservoir. Dominant species include Bermuda grass, sand spurrey (*Spergularia* spp.), rough cocklebur, and rushes, with each species alternating in dominance, depending on the site conditions. Rushes and rough cocklebur appear to dominate the more mesic sites and depressions while Bermuda grass and sand spurrey are more common in the drier areas.

- *Seasonal Depressions and Riparian Areas outside the Reservoir Fluctuation Zone.* Seasonally wet areas in the project area outside the reservoir fluctuation zone were also mapped. These communities receive water from seeps, drainages and from direct precipitation. Some areas are confined to a distinct channel, but one area with uneven terrain and a partly-exposed bedrock outcrop has what appears to be seasonal ponding. Dominant species include pointed rush (*Juncus oxymeris*), Baltic rush (*Juncus balticus*), and often scattered willow and cottonwood. During the dry season, these areas support annual upland vegetation such as non-native brome grasses (*Bromus* spp.) and other forbs.

Disturbed Areas

- *Reservoir Shoreline Fluctuation Zone: Barren Areas.* The reservoir shoreline fluctuation zone occurs between the 425-foot and 466-foot elevations, which corresponds with the minimum and maximum pool volumes for the reservoir. Barren areas within this zone are generally devoid of vegetation or supported less than 10 percent cover. Areas of deep sand and rock are prevalent in this zone.

- *Developed Areas.* Developed land is intensively used with much of the land paved or covered by structures. The urban community includes residential, commercial, and industrial development. Vegetation in urban areas generally consists of non-native landscape species (lawns, flowerbeds, shrubs, or ornamental trees) or cleared areas that are generally devoid of vegetation.

  Developed communities within the project area include rip-rap slopes of dams and dikes, roads, trails, or parking lots. These communities are generally outside of the OHWM except in the case of a dam or dike in which the toe of the structure would be within the OHWM. Dikes and dams are generally devoid of vegetation but sometimes hosted ruderal species such as Mediterranean grasses, short-pod mustard, telegraph weed, yellow star thistle and tree tobacco (*Nicotiana glauca*). Parks and other developed areas are outside of the reservoir influence and are dominated by horticultural or ruderal species. Approximately 35 acres of developed land are present in the project construction area (Table 3.5-1).

Table 3.5-1
Vegetation Community Acreages in the Maximum Project Construction Area

Vegetation Community	***Acres***
Oak Woodland (Interior Live Oak and Blue Oak)	81
Annual Grassland	180
Riparian	41
Freshwater Marsh	1
Seasonal Wetland	12
Reservoir Fluctuation Zone: Ruderal and Barren Areas	667*
Developed Areas	35

*Some of this area extends below the water line on the aerial images and is not included in this value

Special-Status Plant Species

Special-status plants in this document are species in any of the following categories: plants listed, proposed for listing, or candidates for possible future listing under the federal Endangered Species Act (endangered [FE], threatened [FT], candidate species for listing [FC] and species proposed for listing [FPE, FPT]), plants listed or proposed for listing under the California Endangered Species Act (endangered [CE], threatened [CT]), plants listed as rare or endangered under the California Native Plant Protection Act (Rare [CR]), plants that meet the definitions of rare or endangered under the State CEQA Guidelines, plants by the California Native Plant Society (CNPS) to be "rare, threatened, or endangered in California" (Lists 1B and 2), plants by CNPS as plants about which more information is needed to determine their status, and plants of limited distribution (Lists 3 and 4), which may be included as special-status species on the basis of local significance.

A list of special-status plants that are reported to occur or have potential to occur in the analysis area or vicinity was compiled based on consultation with the USFWS, and searches of the latest version of the CNDDB (2005a, 2006).

Based on known occurrences and quality of existing habitat, a total of five special-status plant species have potential to occur in the project area. A table of all special-status species reported from the project vicinity and an evaluation of their potential to occur is provided in Appendix C. The five plant species are San Joaquin spearscale (*Atriplex joaquiniana*), big-scale balsamroot (*Balsamorhiza macrolepis* var. *macrolepis*), El Dorado bedstraw (*Galium californicum* ssp. *sierrae*), Boggs Lake hedge-hyssop (*Gratiola heterosepala*), and Layne's butterweed (*Senecio layneae*). The following section provides a brief description of each species followed by their potential to occur in the project area.

San Joaquin spearscale (Atriplex joaquiniana) – CNPS List 1B.

A member of the Chenopodiaceae family, the San Joaquin spearscale is an annual herb that blooms from April to October. The San Joaquin spearscale is found in chenopod scrub, meadows, playas, valley and foothill grassland habitats or alkaline soils within the elevation range of 1 to 1,050 feet. This species has been found in Alameda, Contra Costa, Colusa, Glenn, Merced, Monterey, Napa, Sacramento, San Benito, Santa Clara [extirpated], San Joaquin [extirpated], Solano, Tulare [extirpated], and Yolo Counties (CNPS 2001).

It is unlikely that the San Joaquin spearscale would occur within the project area because there are no chenopod scrubs, playas, or alkaline areas within the project vicinity.

Big-scale balsamroot (Balsamorhiza macrolepis var. macrolepis) – CNPS List 1B.

The big-scale balsamroot is a perennial herb that blooms from March to June. A member of the Asteraceae family, the big-scale balsamroot is found in chaparral, cismontane woodland, valley and foothill grassland habitats and sometimes serpentinite soils within an elevation range of 295 to 4,600 feet. The big-scale balsamroot has been within Alameda, Butte, Colusa, Lake, Mariposa, Napa, Placer, Santa Clara, Solano, Sonoma, and Tehama Counties (CNPS 2001).

Although there is no serpentinite within the project area, there is a possibility of finding the big-scale balsamroot on other substrates within woodland and grassland communities in the project area.

El Dorado bedstraw (Galium californicum ssp. sierrae) – FE, CR, CNPS List 1B.

The El Dorado bedstraw is a perennial herb that blooms from May to June. A member of the Rubiaceae family, this species is only found in El Dorado County. The El Dorado bedstraw is found within chaparral, cismontane woodland, lower montane and coniferous forest habitats and gabbroic soils within an elevation range from 100 to 585 meters (CNPS 2001). No critical habitat has been designated for this species.

It is unlikely that El Dorado bedstraw occurs in the project area based on the lack of chaparral and coniferous forest. However, the project area is in the lower extent of the elevation range for this species, and cismontane woodland is present. Therefore, there is a small possibility that this species could be present.

Boggs Lake hedge-hyssop (Gratiola heterosepala) – CE, CNPS List 1B.

Boggs Lake hedge-hyssop is an annual herb and a member of the Scrophulariaceae family. This species can be found in marshes, swamps (lake margins), and vernal pool habitats on clay soils ranging from 10 to 2,375 meters in elevation. Boggs Lake hedge-hyssops bloom from April to August and have been 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 (CNPS 2001).

The project area is within the known range Boggs Lake hedge-hyssop. Small areas of seasonal wetland and marshy habitat are present within the project area, but are not on clay soils. This species is not expected to occur in the project area.

Amador rush-rose (Helianthemum suffrutescens) – CNPS List 3.

Amador (Bisbee Peak) rush-rose is an evergreen shrub in the Asteraceae family. This species is found on serpentinite, gabbroic, or Ione soils in chaparral at elevations from 45 to 840 meters (CDFG 2005). Amador rush-rose flowers from

April to May. This rush-rose has been reported from Amador, Calaveras, El Dorado, Sacramento, and Tuolumne Counties (CNPS 2001).

Most of the construction area for the project does not include suitable habitat for the Amador (Bisbee Peak) rush-rose, but it could occur at sites for new embankments/flood easements or in the area that would be inundated by a large flood event if the dams and dikes are raised.

Layne's butterweed (Senecio layneae) – FT, CR, CNPS List 1B.

The Layne's butterweed is a perennial herb that blooms from April to May in chaparral and cismontane woodland habitats on serpentinite, gabbroic and/or rocky soils. A member of the Asteraceae family, the Layne's butterweed is found in El Dorado, Tuolumne and Yuba Counties. Habitat areas fall within 200 to 1,000 meters in elevation (CNPS 2001). No critical habitat has been designated for this species.

Layne's butterweed is not likely to occur in the project construction area based on the limited chaparral and lack of serpentinite soils.

El Dorado mule-ears (Wyethia reticulata) – CNPS List 1B.

El Dorado mule-ears is a perennial herb in the Asteraceae family. This species is found on clay or gabbroic soils in chaparral, cismontane woodland, and lower montane coniferous forest at elevations from 185 to 630 meters (CDFG 2005). El Dorado mule-ears flowers from May to July. This mule-ears is known only from El Dorado County (CNPS 2001).

Most of the construction area for the project does not include suitable habitat for El Dorado mule-ears, but it could occur at sites for new embankments/flood easements or in the area that would be inundated by a large flood event if the dams and dikes are raised.

Wildlife

This section presents information on wildlife resources in the analysis area. Descriptions of wildlife resources are derived from the *American River Watershed, California Long-Term Study Final Supplemental Plan Formulation Report/ Environmental Impact Statement/ Environmental Impact Report (Corps 2002) and the Draft Resource Inventory Folsom Lake State Recreation Area* (LSA 2003).

Common Wildlife Habitats

Common habitats are distinguished from sensitive habitats on the basis of their local, regional, or statewide abundance. In the analysis area, common wildlife habitats include chaparral, annual grassland, and ruderal fields (Corps 2002).

Chaparral.

Chaparral provides important cover and foraging habitat for brush-dependent wildlife and a range of other wildlife species. Wrentits (*Chamaea fasciata*) and California thrashers (*Toxostoma redivivum*) are primarily chaparral-dependent wildlife species; other species that use the chaparral habitat include spotted towhees (*Pipilo maculatus*), California towhees (*Pipilo crissalis*), golden-crowned sparrows (*Zonotrichia atricapilla*), orange-crowned warblers (*Vermivora celata*), gray foxes (*Urocyon cinereoargenteus*), coyotes (*Canis latrans*), and mule deer (*Odocoileus hemionus*). Many species of reptiles occur in chaparral, including western rattlesnakes (*Crotalus viridis*), gopher snakes (*Pituophis melanoleucus*), western fence lizards (*Sceloporus occidentalis*), and western whiptails (*Cnemidophorus tigris*) (Corps 2002).

Annual Grassland.

Annual grasslands in the analysis area have moderate value as wildlife habitat. Grasslands provide foraging habitat for wide-ranging species such as red-tailed hawks (*Buteo jamaicensis*), coyotes, gray foxes, and bobcats (*Lynx rufus*). These species depend on grassland prey species that include California voles (*Microtus californicus*), California ground squirrels (*Spermophilus beecheyi*), gopher snakes, and western fence lizards. In addition, many species that nest or roost in adjacent woodlands, including western bluebirds (*Sialia mexicana*), western kingbirds (*Tyrannus verticalis*), and some species of bats may forage in grasslands (Corps 2002).

Ruderal Fields.

Ruderal fields have similar wildlife values to those of annual grasslands, except that they commonly support fewer wildlife species. They are dominated by non-native plants and, therefore, may offer sparse cover. In addition, ruderal fields are typically disturbed on a more or less ongoing basis by human activity, which further reduces their value for wildlife (Corps 2002).

Sensitive Wildlife Habitats

For purposes of this document, the term sensitive habitat is defined as plant communities and wildlife habitats composed of native species that are especially diverse, regionally uncommon, or of specific concern to state or federal agencies. Sensitive habitats in the analysis area include seasonal wetland, freshwater marsh, oak woodland and savanna, blue oak woodland and savanna, willow scrub, and riparian forest (Corps 2002).

Oak Woodland and Savanna.

Oak woodlands and savannas offer diverse, abundant, and valuable wildlife habitat. Oak trees provide nesting sites for cavity-nesting birds and small mammals, including acorn woodpeckers (*Melanerpes formicivorus*), Nuttall's woodpeckers (*Picoides nuttallii*), northern flickers (*Colaptes auratus*), white-breasted nuthatches (*Sitta carolinensis*), oak titmice (*Baeolophus inornatus*), western bluebirds, western gray squirrels (*Sciurus griseus*), and raccoons (*Procyon lotor*). Oak trees also provide roosting sites for some species of bats including the hoary bat (*Lasiurus cinereus*) and pallid bat (*Antrozous pallidus*). Acorns are used by a variety of wildlife species, including California quail (*Callipepla californica*), wild turkeys (*Meleagris gallopavo*), northern flickers, western scrub-jays (*Aphelocoma californica*), western gray squirrels, and mule deer. Oak foliage provides a foraging substrate for insectivorous birds such as ruby-crowned kinglets (*Regulus calendula*), bushtits (*Psaltriparus minimus*), warbling vireos (*Vireo gilvus*), Hutton's vireos (*Vireo huttoni*), and Wilson's warblers (*Wilsonia pusilla*). Blackberries and elderberries are eaten by many species of birds and mammals, including American robins (*Turdus migratorius*), Bullock's orioles (*Icterus bullockii*), house finches (*Carpodacus mexicanus*), spotted towhees, California towhees, and gray foxes. Finally, the shrub understory of these habitats provide cover for many species of songbirds as well as for California quail, gopher snakes, common kingsnakes (*Lampropeltis getula*), bobcats, gray foxes, and a variety of rodents (Corps 2002).

Blue Oak Savanna.

Blue oak savanna has particularly high value for wildlife because blue oak trees provide excellent substrates for cavity-nesting wildlife. Wildlife use of blue oaks in the savanna setting is similar to the use of oak woodlands described above, except that the higher density of blue oaks provides a greater number of nesting sites for cavity-nesting birds and small mammals (Corps 2002).

Willow Scrub.

Willow scrub along the North Fork American River and South Fork American River has high value for wildlife. Willow scrub provides cover, nesting habitat, and foraging habitat for many wildlife species, including habitat particularly suitable for migratory songbirds. Belted kingfishers (*Ceryle alcyon*), Anna's hummingbirds (*Calypte anna*), bushtits, ruby-crowned kinglets, Wilson's warblers, yellow warblers (*Dendroica petechia*), and lesser goldfinches (*Carduelis psaltria*) also use the willow scrub environment, as do Pacific treefrogs (*Hyla regilla*), raccoons, striped skunks (*Mephitis mephitis*), and mule deer (Corps 2002).

Permanent Freshwater Marsh.

Small areas of Permanent Freshwater Marsh are found at the toe of the Mormon Island Auxiliary Dam. Water birds and other wildlife depend on the freshwater marshes in these areas for foraging and/or rearing habitat. These species include Pacific treefrogs, western toads (*Bufo boreas*), common garter snakes

(*Thamnophis sirtalis*), beavers (*Castor canadensis*), raccoons, and muskrats (*Ondatra zibethicus*) (Corps 2002).

Special-Status Wildlife Species

Special-status wildlife in this document are species in any of the following categories: species that are federally listed as endangered (FE) or threatened (FT), species that are proposed for federal listing (FPE, FPT) or are candidates (FC) for possible future listing under the federal Endangered Species Act, species listed or proposed for listing under the California Endangered Species Act or other state statutes (endangered (CE), threatened (CT), rare (CR), species identified as state species of concern by CDFG (CSC), and state fully protected species (CFP). A list of special-status wildlife that are reported to occur or have potential to occur in the analysis area or vicinity was compiled based on consultation with the USFWS, and searches of the latest version of the CNDDB (2005, 2006).

Based on known occurrences and quality of existing habitat, a total of 27 special-status terrestrial wildlife species have the potential to occur in the project area (Table 3.5-2). These species include one invertebrate, three amphibians, three reptiles, sixteen birds and four mammals as described below. A table of all special-status wildlife species reported from the project vicinity and an evaluation of the likelihood of their occurrence in the project area is provided in Appendix C.

One special-status terrestrial invertebrate species with potential to occur is the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*). Special-status amphibian and reptile species that may occur are California red-legged frog (*Rana aurora draytonii*), foothill yellow-legged frog (*Rana boylii*), western spadefoot toad (*Spea* [*Scaphiopus*] *hammondii*), western pond turtle (*Emys* [*Clemmys*] *marmorata marmorata*), California horned lizard (*Phrynosoma coronatum frontale*), and giant garter snake (*Thamnophis gigas*).

Special-status bird species with potential to occur are Cooper's hawk (*Accipiter cooperii*), tricolored blackbird (*Agelaius tricolor*), western burrowing owl (*Athene cunicularia hypugaea*), Aleutian Canada goose (*Branta canadensis leucopareia*), ferruginous hawk (*Buteo regalis*), Swainson's hawk (*Buteo swainsoni*), Vaux's swift (*Chaetura vauxi*), mountain plover (*Charadrius montanus*), white-tailed kite (*Elanus leucurus*), American peregrine falcon (*Falco peregrinus anatum*), bald eagle (*Haliaeetus leucocephalus*), loggerhead shrike (*Lanius ludovicianus*), long-billed curlew (*Numenius americanus*), osprey (*Pandion haliaetus*), white-faced ibis (*Plegadis chihi*), and bank swallow (*Riparia riparia*).

Special-status mammals that may occur are pallid bat (*Antrozous pallidus*), Pacific western big-eared bat (*Corynorhinus* [*Plecotus*] *townsendii townsendii*), spotted bat (*Euderma maculatum*), and greater western mastiff-bat (*Eumops perotis* *californicus*). The following section provides a brief description of each species followed by the likelihood of their occurrence in the project area.

Table 3.5-2
Special-status Terrestrial Wildlife Species Potentially Occurring in the Project Area

Species	Status
Invertebrates	
Valley elderberry longhorn beetle	FT
Amphibians	
California red-legged frog	FT, CSC
Foothill yellow-legged frog	CSC
Western spadefoot toad	CSC
Reptiles	
Northwestern pond turtle	CSC
California horned lizard	CSC
Giant garter snake	FT, CT
Birds	
Cooper's hawk	CSC
Tricolored blackbird	CSC
Western burrowing owl	CSC
Aleutian Canada goose	FD
Ferruginous hawk	CSC
Swainson's hawk	CT
Vaux's swift	CSC
Mountain plover	CSC
White-tailed (=black shouldered) kite	CSC, CFP
American peregrine falcon	FD, CE
Bald eagle	FT, CE, CFP
Loggerhead shrike	CSC
Long-billed curlew	CSC
Osprey	CSC
White-faced ibis	CSC
Bank swallow	CT
Mammals	
Pallid bat	CSC
Pacific western big-eared bat	CSC
Spotted bat	CSC
Greater western mastiff-bat	CSC

Special-status Invertebrates

- *Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus) – FT.* The valley elderberry longhorn beetle is associated with various species of elderberry (*Sambucus* spp.). This beetle generally occurs along waterways and in floodplains that support remnant stands of riparian vegetation. Both larvae and adult beetle feed on elderberry shrubs. Larvae feed internally on the pith of the trunk and larger branches, while adult beetles appear to feed externally on elderberry flowers and foliage. Prior to metamorphosing into the adult life stage, the larvae chew an exit hole in the elderberry trunk, through which the adult beetle later exits the plant (CDFG 2003). Critical habitat has been designated for this species, but does not include the project area (Federal Register 1980).

The Folsom project area contains blue elderberry (*Sambucus mexicana*), the host plant of the valley elderberry longhorn beetle. Exit holes have been observed in the elderberry shrubs in the project area. Therefore, this species occurs within the project area. Results of protocol elderberry surveys conducted for the Folsom DS/FDR Action are shown in Figure 3.5-1 and Table 3.5-3.

Table 3.5-3
Elderberry Shrubs Within or Adjacent to the Folsom DS/FDR Action Area

Location	Stem Diameter (maximum at ground level)	Exit Hole on Shrub	Number of Stems Observed
Transplantable Shrubs[1]			
Non-Riparian	1-3 inches	No	147
		Yes	66
Non-Riparian	3-5 inches	No	91
		Yes	31
Non-Riparian	More than 5 inches	No	141
		Yes	27
Riparian	1-3 inches	No	5
		Yes	0
Riparian	3-5 inches	No	14
		Yes	0
Riparian	More than 5 inches	No	15
		Yes	0
Total Shrubs	150		
Non-Transplantable Shrubs[2]			
Non-Riparian	1-3 inches	No	5
		Yes	0
Non-Riparian	3-5 inches	No	4
		Yes	0
Non-Riparian	More than 5 inches	No	7
		Yes	1
Riparian	1-3 inches	No	7
		Yes	0
Riparian	3-5 inches	No	0
		Yes	0
Riparian	More than 5 inches	No	10
		Yes	0
Total Shrubs			11

1 indirect effects to 34 transplantable shrubs compensated for under earlier contracts
2 indirect effects to 9 non-transplantable shrubs compensated for under earlier contracts

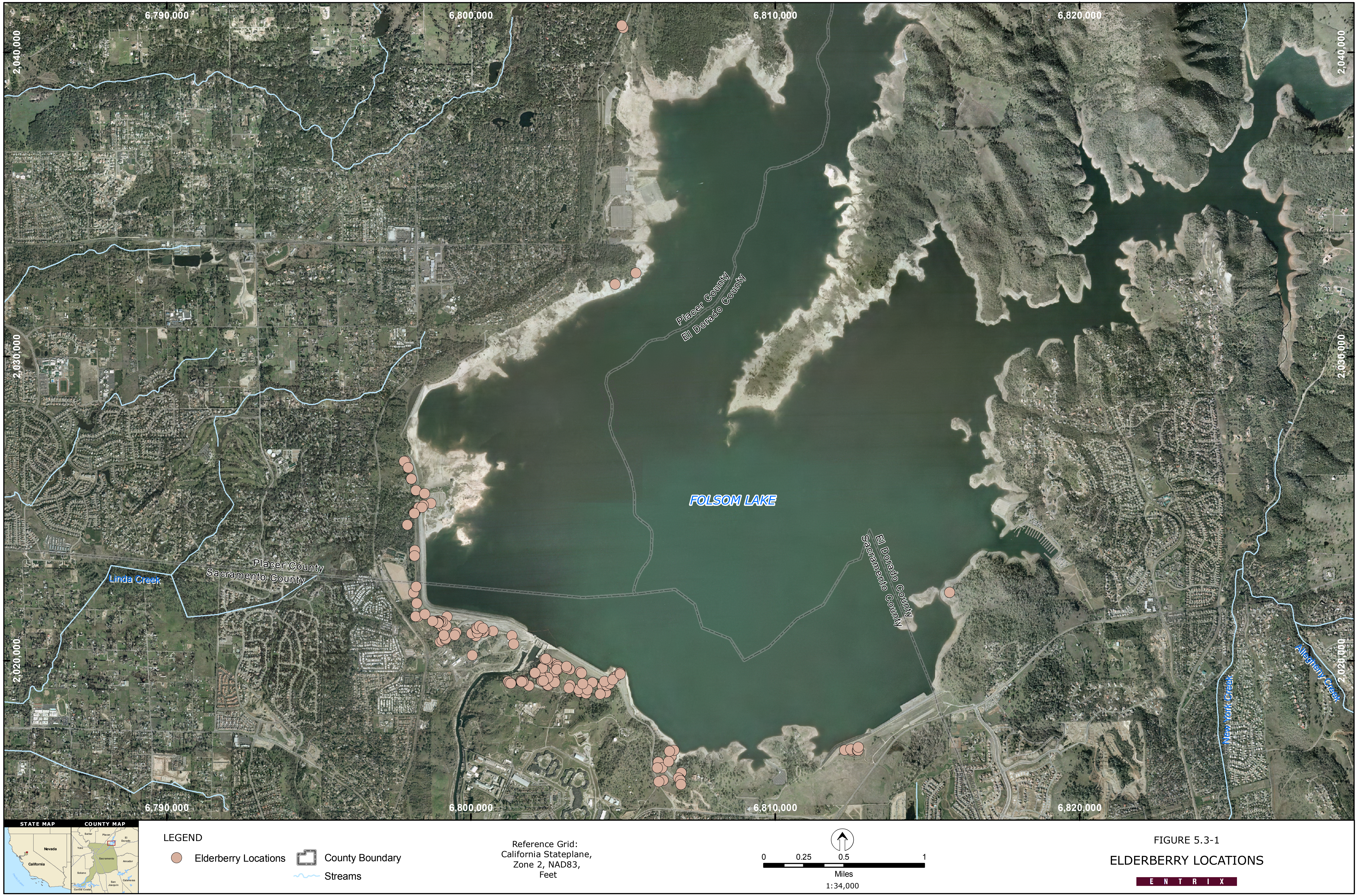

FIGURE 5.3-1

ELDERBERRY LOCATIONS

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Special-status Amphibians

- *California red-legged frog (Rana aurora draytonii) - FT, CSC.* The California red-legged frog is a federally threatened species (Federal Register 1996) and a California species of special concern. Critical habitat for this species was designated in 2001. However, on November 6, 2002, the U.S. District Court for the District of Columbia entered a consent decree, vacating the critical habitat designation (except Units 5 and 31) and remanding the designation to the USFWS to conduct an economic analysis. The USFWS released a recovery plan in 2002 (USFWS 2002). Critical habitat was again designated on April 13, 2006 (Federal Register 2006). No proposed critical habitat is within the project area.

  Historically, the California red-legged frog occurred in coastal mountains from Marin County south to northern Baja California, and along the floor and foothills of the Central Valley from about Shasta County south to Kern County (Jennings et al. 1992). Currently, this subspecies generally only occurs in the coastal portions of its historic range; it is apparently extirpated from the valley and foothills and in most of southern California south of Ventura County. California red-legged frogs are usually associated with aquatic habitats, such as creeks, streams and ponds, and occur primarily in areas having pools approximately three feet deep, with adjacent dense emergent or riparian vegetation (Jennings and Hayes 1988). Adult frogs rarely move large distances from their aquatic habitat. California red-legged frogs breed from November to March. Egg masses are attached to emergent vegetation (Jennings and Hayes 1994) and hatch within fourteen days. Metamorphosis generally occurs between July and September.

  Within the project construction area, perennial and intermittent creeks and Folsom Reservoir may provide marginally suitable habitat for this species. This frog has been reported from a location upstream of the construction project area in a tributary to Folsom Reservoir (CDFG 2006b). The presence of centrarchids (including species of the warmwater fish community such as bass) and fluctuating reservoir levels that affect vegetation communities make Folsom Reservoir marginally suitable to unsuitable for this species. Perennial and intermittent creeks, seasonal wetlands, and ponds may provide marginally suitable habitat for adult California red-legged frog, but the lack of vegetation and/or the presence of centrarchids substantially reduce the value of aquatic habitat for spawning and rearing frogs.

- *Foothill Yellow-Legged Frog (Rana boylii) – CSC.* Foothill yellow-legged frogs inhabit foothill and mountain streams from sea level to about 6,000 feet in elevation. Their known range includes the Coast Ranges from the Oregon border south to the Transverse Mountains in Los Angeles County, most of northern California west of the Cascade crest, and along the western flank of the Sierra south to Kern County. Most records are below 3,500 feet. The foothill yellow-legged frog is found in a variety of habitats, including valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadow types (Zeiner et al. 1988).

Home ranges are small, but these frogs may move several hundred meters to spawning habitat. Adult frogs congregate at suitable spawning sites as spring runoff declines, when water temperatures reach 54ºF to 59ºF (12ºC to 15ºC), usually any time from mid-March to May, depending on local water conditions. The breeding season at any locality is usually about two weeks for most populations. Spawning frogs favor low to moderately steep gradient streams (0 to 8 degrees). Females deposit eggs in shallow edgewater areas with low water velocities (Seltenrich and Pool 2002). Egg masses are often attached to the downstream sides of cobbles and boulders, or to gravel, wood, or other materials. Eggs hatch in approximately five days. Tadpoles transform in three to four months and stay for a time in spawning habitat but eventually disperse. Tadpoles feed on diatoms or algae on the surface of the substrate (Stebbins 1951). Tadpoles favor calm, shallow water.

Juvenile and adult frogs bask on midstream boulders or in terrestrial sites along riffles, cascades, main channel pools, and plunge-pools, often in dappled sunlight near low overhanging vegetation. Adults generally avoid deep shade. Foothill yellow-legged frogs are relatively strong swimmers and prefer faster water habitat than do other frog species in the foothills, such as the bullfrog (*Rana catesbeiana*) or the California red-legged frog.

Foothill yellow-legged frogs are not likely to occur in the project area, although they may occur in upstream areas. Fluctuating reservoir levels and the presence of exotic species (bullfrogs, crayfish and introduced fish) probably preclude the establishment of a viable population. The perennial and intermittent creeks provide potential habitat, however they are likely too small and lack the appropriate substrate to sustain a viable population (Wallace et al. 2003).

- *Western Spadefoot Toad (Spea [Scaphiopus] hammondii) – CSC.* This species ranges throughout the Central Valley and adjacent foothills from sea level to 4,500 feet, primarily in grasslands with shallow temporary pools, and occasionally in valley-foothill hardwood. The Western spadefoot toad typically lives underground in burrows up to 3 feet deep during most of the year, with the first rains of the year initiating movement to the surface. Terrestrial burrowing sites may be well removed from breeding sites.

Breeding occurs from late winter to late March. Western spadefoot toad utilizes shallow, temporary pools formed by heavy winter rains, with sand and gravel substrate, for breeding habitat and tadpole rearing. Sandy, gravelly washes or small streams (often temporary) may also be used. Egg masses, in clusters of 10 to 40, are attached to plant material, or the upper surfaces of small, submerged rocks, with eggs hatching within two weeks. During late spring, recently metamorphosed juveniles seek refuge in breeding ponds for several days after transformation (Zeiner et al. 1988, Stebbins 1972). However, aquatic breeding habitat is unsuitable in the presence of predators (bullfrogs, fish or crayfish) or in the presence of mosquitofish.

While most of the grassland/savanna communities in the project area appear suitable for adult toads, there is little suitable aquatic habitat for reproduction. Most of the seasonal wetlands in the project area are too small to hold water long enough for spadefoot larvae to reach metamorphosis (LSA 2003). There are few seasonal wetlands that may inundate long enough to serve as rearing habitat. Therefore, the lack of breeding habitat may limit the population within the project area.

Special-status Reptiles

- *Western pond turtle (Emys [Clemmys] marmorata marmorata) – CSC.* This turtle occurs in suitable aquatic habitat throughout California, west of the Sierra-Cascade crest, from sea level to about 6,000 feet (Zeiner et al. 1988). It is absent from desert regions except in the Mojave Desert along the Mojave River and its tributaries. It is found in permanent or nearly permanent water in a wide variety of habitat types with basking sites such as partially submerged logs, rocks, mats of floating vegetation, or open mud banks. Individuals are active all year where climates are warm but hibernate during cold periods elsewhere. During the spring or early summer, females move overland up to 325 feet to find suitable sites for egg-laying. Eggs are laid from March to August depending on local conditions and incubate from 73 to 80 days. Sexual maturity is reached at about eight years of age (Zeiner et al. 1988).

  Most of the creeks, ponds, and reservoir backwater areas in the project area are suitable for western pond turtles. They have been regularly observed in the vicinity of the project area at Avery's Pond since the 1970's (David Murth pers. obs., as cited in LSA 2003). Avery's Pond is a constructed pond near the reservoir shoreline at Rattlesnake Bar, more than 2.5 miles upstream from the construction Project area. Western pond turtles may also inhabit the preserve downstream from MIAD. However, Holland (1994) and Jennings and Hayes (1994) suggest that turtles that are found occupying reservoirs, stock ponds and the like represent displaced individuals and, therefore, do not represent viable populations.

- *California horned lizard (Phrynosoma coronatum frontale) - CSC.* The California horned lizard occurs in open country, especially gravelly or sandy areas, washes, flood plains and wind-blown deposits, sand dunes, alluvial fans, etc. Common habitats include valley foothill hardwood, conifer and riparian habitats, alkali flats, chaparral, as well as in pine-cypress, juniper and annual grass habitats. This lizard has a wide range in California occurring from Shasta County south, along the Sacramento Valley, east to the Sierra Nevada foothills (below 4,000 feet), west through much of the South Coast Ranges, and in the Southern California deserts and mountains below 6,000 feet. Horned lizards are generally active from April through October. The reproductive season for the California horned lizard varies from year to year and geographically depending on local conditions. Courtship generally occurs in the spring, and hatchlings first appear in mid-summer. Horned lizards prefer to eat ants, but they will also eat many other types of invertebrates, such as grasshoppers, beetles, and spiders.

  Suitable habitat is present for the California horned lizard within the project area. In addition, recorded observations of this species have occurred within five miles of the project site within the past 20 years (CDFG 2005a). It is likely that this species occurs within the project area.

- *Giant garter snake (Thamnophis gigas) - FT, CT.* The giant garter snake historically ranged in the Sacramento and San Joaquin valleys from Butte County in the north to Kern County in the south (Rossman et al. 1996). Its current range is much reduced, and it is apparently extirpated south of northern Fresno County (Bury 1971; Rossman et al. 1996). No critical habitat has been designated for this species.

  The giant garter snake inhabits marshes, sloughs, ponds, small lakes, low-gradient streams, and other waterways and agricultural wetlands, such as irrigation and drainage canals and rice fields. Giant garter snakes feed on small fishes, tadpoles, and frogs (Fitch 1941; Federal Register 1993). Habitat requirements consist of adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; emergent herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; grassy banks and openings in waterside vegetation for basking; and higher elevation uplands for cover and refuge from flood waters during the snake's dormant season in the winter (Federal Register 1993). Giant garter snakes are absent from larger rivers and other waterbodies that support introduced populations of large, predatory fish, and from wetlands with sand, gravel, or rock substrates (Rossman and Stewart 1987; Brode 1988, Federal Register 1993).

The giant garter snake inhabits small mammal burrows and other soil crevices above prevailing flood elevations throughout its winter dormancy period (November to mid-March). Giant garter snakes typically select burrows with sunny aspects along south and west facing slopes. Upon emergence, males immediately begin wandering in search of mates. The breeding season extends through March and April, and females give birth to live young from late July through early September (Hansen and Hansen 1990). Brood size is variable, ranging from 10 to 46 young (Hansen and Hansen 1990). Young immediately scatter into dense cover and absorb their yolk sacs, after which they begin feeding on their own. Sexual maturity averages 3 years of age in males and 5 years for females.

It is unlikely that the seasonal wetlands in the project area hold water throughout the summer and into the fall. While potential habitat may exist within the vicinity of the project area, it is unlikely that a viable population occurs within the boundaries of the project.

Special-status Birds

- *Cooper's Hawk (Accipiter cooperii) – CSC.* The Cooper's hawk is a breeding resident throughout most of the wooded portion of the state. The Cooper's hawk, which can be found in elevations ranging from sea level to 8,860 feet, requires dense stands of live oak, riparian, deciduous, or other forest habitats near water when nesting. The breeding season begins in March and continues through August, with average clutch sizes of 4 to 5 eggs. During this period, the female will incubate the eggs while the male provides food. The hawk's primary food source is small birds, supplemented by reptiles and amphibians. More of an ambush predator, the Cooper's hawk will take prey from the ground, on branches or in mid-flight (Johnsgard 1990). Hunting takes place in broken woodland and habitat edges. The Cooper's hawk is seldom found in areas without dense tree stands. Some individuals are year-long residents of California, while others from the more northern areas winter in California. Cooper's hawks are commonly found in the southern Sierra Nevada foothills, New York Mountains, Owens Valley, and other local areas in southern California (Zeiner et al. 1990a).

  There is a high potential for the Cooper's hawk to occur within the project area because there is suitable nesting habitat and project sites are within their known range. A wintering Cooper's hawk was observed perched in an oak tree in the vicinity of Beal's Point behind Dike 6 on December 29, 2005 (Schell pers. comm. 2005).

- *Tricolored blackbird (Agelaius tricolor) – CSC.* The tricolored blackbird ranges throughout the Central Valley of California, typically nesting in colonies numbering several hundred. An adequate breeding ground for the tricolored blackbird requires open water, protected nesting substrate (emergent wetland vegetation) and a foraging area with insect prey within a few kilometers (miles) of the colony. Tricolored blackbird foraging habitats in all seasons include pastures, agricultural fields and dry seasonal pools. Occasionally these birds will also forage in riparian scrub, marsh boarders and grassland habitats. Egg laying generally begins within 4 days of the colonies arrival, with one egg being laid per day and clutch size usually around three to four eggs. Tricolored blackbirds typically leave their wintering areas in late March and early April for breeding locations in Sacramento County and throughout the San Joaquin Valley (Beedy and Hamilton 1997).

There is potential for the tricolored blackbird to occur within the project area due to the presence of suitable foraging sites (i.e., grasslands) in an around the project area. No suitable nesting habitat is present due to the limited size of emergent marshland habitat.

- *Western burrowing owl (Athene cunicularia hypugaea) –CSC.* The western burrowing owl was formerly a common permanent resident throughout much of California. However, a decline that became noticeable in the 1940's (Grinnell and Miller 1944) has continued through to the present time. The western burrowing owl is a year-long resident of open, dry grassland and desert habitats often associated with burrowing animals. They have also been found to inhabit grass, forb, and shrub stages of pinyon and ponderosa pine habitats. Western burrowing owls commonly perch on fence posts or on top of mounds outside their burrows. Western burrowing owls are active both day and night, with a lessening in activity at the peak of the day. Western burrowing owls are opportunistic feeders and large arthropods comprise a majority of their diet. Small mammals, reptiles, birds, and carrion are also important components of the burrowing owl's diet (Zeiner et al. 1990a). The nesting season of the burrowing owl occurs from February through August, with a peak in breeding occurring from April to May. Western burrowing owls nest in burrows in the ground and often utilize old ground squirrel or other small mammal nests (Zeiner et al. 1990a). However, western burrowing owls may dig their own nests in areas of soft soil. Pipes, culverts, and nest boxes are also used in areas where burrows are scarce (Robertson 1929).

  Portions of the project area contain grassland habitat with small mammal burrows. Therefore, there is potential for Western burrowing owls to occur.

- *Aleutian Canada goose (Branta canadensis leucopareia) - FD.* The Aleutian Canada goose breeds in the Aleutian Island chain of Alaska and winters in California, Oregon and Washington. These geese are among the smaller of the Canada goose subspecies, and migrate south to wintering areas between

August and December, with the greatest number leaving the Aleutian Island chain in September. Aleutian Canada geese are omnivores, having a steady diet of arthropods, evergreen shrubs, roots, tubers, leaves, and stems during the breeding season; with all their water taken from vegetation. During the non-breeding season they feed on crops such as corn, wheat, barley, oats, and lima beans. They can be found wintering on lakes, reservoirs, ponds and inland prairies, and will forage on natural pasture or fields cultivated in grain (Sibley 2001).

There is moderate potential for the Aleutian Canada goose to occur within the project area because suitable wintering habitat is present, although the area is outside the reported wintering sites for this subspecies. A Canada goose (subspecies not identified) was observed in the vicinity of Beal's Point on November 17, 2005 (Colgate, pers. comm. 2005), and many Canada geese (subspecies not identified) were observed all around the reservoir on May 24 and 25, 2006 (Victorine, pers. comm. 2006).

- *Ferruginous hawk (Buteo regalis) - CSC.* The ferruginous hawk is an uncommon winter resident and migrant in the lower elevations and open grasslands of the Central Valley and Coast Ranges. It is a fairly common resident in the Southern Californian grasslands and agricultural areas. Ferruginous hawks favor open grasslands, sagebrush flats, desert scrubs, low foothills surrounding valleys and fringes of pinyon-juniper habitats. Requiring open, treeless areas to hunt, the ferruginous hawk feeds on rabbits, jackrabbits, ground squirrels, and mice, but also takes birds, reptiles and amphibians. It is speculated that the hawk’s population trend follows the lagomorph population cycles. There are no records of the ferruginous hawk breeding in California. Ferruginous hawks prefer to roost in open areas, usually in a lone tree or other elevated structure. Migration to California usually occurs in September, where the ferruginous hawk will remain until mid-April (Zeiner et al. 1990a).

  Roosting and foraging habitat for the ferruginous hawk is present in the vicinity of the project. Based on their reported distribution, the species is not likely to breed within the project area.

- *Swainson’s Hawk (Buteo swainsoni) – CT.* Swainson's hawk is restricted to portions of the Central Valley and Great Basin regions where suitable nesting and foraging habitat is still available. Swainson's hawk requires large, open grasslands with abundant prey in association with suitable nest trees. Suitable foraging areas include native grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands. Central Valley populations are centered in Sacramento, San Joaquin, and Yolo Counties. Over 85 percent of Swainson's hawk territories in the Central Valley are associated with riparian systems adjacent to suitable foraging habitats. Swainson's hawk often nests peripherally to riparian systems, and is known to utilize lone trees or groves of trees in agricultural fields. Valley oak, Fremont cottonwood, walnut, and large willow 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 on the uplands.

- *Vaux's swift (Chaetura vauxi) – CSC.* Vaux's swift is a summer resident of northern California, preferring redwood and Douglas-fir habitats. Between April and September, the Vaux's swift is a fairly common migrant throughout the state. Nesting typically takes place in hollow redwood, Douglas-fir, and occasionally other coniferous trees, with the nest near the bottom of the cavity. The Vaux's swift shows a preference to forage over rivers and lakes, but will forage over most terrain or habitat. They feed almost exclusively on flying insects taken in long continuous foraging flights. The Vaux's swift breeds from early May to mid-August, with a clutch size usually of four to five eggs (Zeiner et al. 1990a).

  Although it is unlikely that the Vaux's swift nests within the project area, there are adequate foraging sites in the project area.

- *Mountain Plover (Charadrius montanus) – CSC.* The mountain plover is known to winter in northern California, southern Arizona, New Mexico, and central Texas south into north-central Mexico, however has not been known to nest in California. The mountain plover avoids high and dense cover, preferring prairie grasslands, shortgrass plains and plowed fields with little vegetation. The mountain plover forages for large insects, in particular grasshoppers. Breeding takes place from late April through June with a peak in late May. The average clutch is three eggs. In years of abundant food, the male may incubate the existing clutch to allow the female to lay an additional clutch, often attended by another male (Zeiner et al. 1990a).

  The project area provides only marginal foraging habitat for the mountain plover, therefore this species is not likely to occur there.

- *White-Tailed Kite (Elanus leucurus) – CFP.* The white-tailed kite is a common to uncommon, year-long resident in coastal and valley lowlands, and is rarely found away from agricultural areas. This species inhabits herbaceous and open stages of most habitats in cismontane California, and uses herbaceous lowlands with variable tree growth, especially those with dense populations of voles. Substantial groves of dense, broad-leaved deciduous trees are used for nesting and roosting. The white-tailed kite forages in undisturbed, open grasslands, meadows, farmlands, and emergent wetlands. White-tailed kites eat small rodents, especially the California vole as well as birds, snakes, lizards, frogs and large insects. Nests are built of twigs and sticks with an inner layer of grass or leaves in trees that are usually on habitat edges. Nest-building occurs January through August (Dunk 1995). Egg-laying begins in February and probably peaks in March and April. Peak fledging probably occurs in May and June with most fledging complete by October. Clutch size is most commonly four (Zeiner, et al. 1990a).

Suitable habitat for the white-tailed kite can be found within the project vicinity. Therefore, the white-tailed kite may occur within the project area.

- *American Peregrine Falcon (Falco peregrinus anatum) – FD, CE.* The American peregrine falcon is a medium-sized raptor that breeds from non-Arctic portions of Alaska and Canada south to Baja California (except the coast of southern Alaska and in British Columbia), throughout Arizona and into Mexico (locally). Nesting American peregrine falcons usually winter in their breeding range, with the exception of the more northern residents, which move south. The primary nesting habitat for the American peregrine falcon tends to be cliffs or series of cliffs that dominate the surrounding landscape. However, river cutbanks, trees, and manmade structures including tall towers and the ledges of tall buildings can also serve as suitable nesting sites. American peregrine falcons hunt their prey in the air, usually over open habitat types such as waterways, fields, and wetland areas, diving at speeds of up to 200 miles per hour to strike their targets. Bluejays, flickers, meadowlarks, pigeons, starlings, shorebirds, waterfowl, and other readily available species make up the American peregrine falcon's diet. The raptor may travel 10 to 12 miles from their nests in search of prey. Breeding takes place in later March and April, with a usual clutch size of three to four eggs.

  There is potential for the American peregrine falcon to occur within the project area. Adequate nesting sites and sufficient foraging habitat is available within the project area and vicinity.

- *Bald Eagle (Haliaeetus leucocephalus) – FT, FPD, CE, CFP.* 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 at 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 from 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 branchwork, usually 50 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 based on the availability of adequate nesting sites and foraging habitat within the project area and vicinity, the bald eagle will 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.

- *Loggerhead Shrike (Lanius ludovicianus) – CSC.* The loggerhead shrike is a common resident and winter visitor in lowlands and foothills throughout California. It prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches. Its highest density occurs in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. It occurs only rarely in heavily urbanized areas, but is often found in open cropland. It builds its nest on stable branches in densely foliaged shrubs or trees, usually well-concealed. Nest height is 1 to 50 feet above ground. It lays eggs from March into May, and young become independent in July or August. The loggerhead shrike is a monogamous, solitary nester with a clutch size of four to eight. Incubation lasts 14 to 15 days. Altricial young are tended by both parents and leave the nest at 18 to 19 days (Zeiner et al. 1990a).

  There is a high potential for the loggerhead shrike to be present within the project area because of favorable riparian woodlands within the vicinity. A wintering loggerhead shrike was observed perched on barbed wire atop a chain-link fence behind the right-wing dam on December 29, 2005.

- *Long-billed curlew (Numenius americanus) – CSC.* In California, the long-billed curlew is known to nest on elevated interior grasslands and wet meadows, usually adjacent to lakes or marshes, in northeastern California. Breeding long-billed curlew will be present in northeastern California from April to September. Generally a solitary nester, the long-billed curlew may be loosely colonial in favorable habitats. Both parents incubate a mean clutch size of four eggs for 27 to 28 days. The long-billed curlew prefers to winter in large coastal estuaries, upland herbaceous areas, and croplands. Some years, large numbers of nonbreeders remain in the Central Valley in the summer. The long-billed curlew uses its characteristic long bill to probe deep into substrate, or to grab prey from mud surfaces. During its inland stay, the long-billed curlew takes insects (adults and larvae), worms, spiders, berries, crayfish, snails, and small crustaceans. Occasionally they will take nestling birds. In coastal estuaries and intertidal zones, the long-billed curlew will prey on mud crabs, ghost shrimp, mud shrimp, insect pupae, gem clams and small estuarine fish (Zeiner et al. 1990a).

The long-billed curlew has the potential to occur in the project area based on the availability of grassland and lake habitat. However, this habitat is marginal at best.

- *Osprey (Pandion haliaetus) - CSC (Nesting).* The osprey occurs along seacoasts, lakes, and rivers, primarily in ponderosa pine and mixed conifer habitats. It preys mostly on fish at or below the water surface, but will also take small mammals, birds, reptiles, amphibians, and invertebrates. Large snags and open trees near large, clear, open waters are required for foraging. The osprey typically swoops from flight, hover, or perch to catch prey. In California, the osprey breeds primarily in the northern part of the state and typically builds its nests in large conifers, but may also use artificial platforms as nesting areas. The breeding season is from March to September. Nests are built on platforms of sticks at the top of large snags, dead-topped trees, on cliffs, or on human-made structures. A nest may be as much as 250 feet above ground and is usually within 1,000 feet of fish-producing water. Osprey need tall, open-branched "pilot trees" nearby for landing before approaching the nest and for use by young for flight practice. Typically, this species migrates in October south along the coast and the western slope of the Sierra Nevada to Central and South America (Zeiner et al. 1990a).

  The osprey has high potential to occur within the project area, because there is suitable foraging habitat in Folsom Reservoir and the nearby American River. Suitable nest trees (foothill pine) are also present. Osprey is frequently sighted at Folsom Reservoir.

- *White-faced ibis (Plegadis chihi) – CSC.* The white-faced ibis is a rare visitor to the Central Valley, and is more widespread in migration. The white-faced ibis prefers to feed in fresh emergent wetland habitats, shallow lacustrine waters, the muddy ground of wet meadows, and irrigated/flooded pastures or croplands. Within these habitats, the white-faced ibis feeds on earthworms, insects, crustaceans, amphibians, small fishes and miscellaneous invertebrates. The white-faced ibis uses its long bill to probe deep into mud.

It feeds in shallow water or on the surface. Preferred nesting sites are dense marsh vegetation near foraging areas in shallow water or muddy fields. The white-faced ibis no longer breeds regularly anywhere within California (Zeiner et al. 1990a).

It is unlikely that the white-faced ibis will occur within the project area. There is suitable foraging habitat on the margins of Folsom Reservoir; however, the fluctuating reservoir levels preclude the establishment of dense marsh vegetation, their preferred nesting habitat.

- *Bank swallow (Riparia riparia) – CT.* The bank swallow arrives in California from South America in early March and remains until early August when colonies are abandoned and migration begins. The bank swallow is found primarily in riparian and other lowland habitats in California west of the desert during the spring-fall period. The bank swallow is a common migrant within the interior of the state during the spring-fall period, and less common along the coast. There are few records of the bank swallow in California during the winter months. During the summer, the bank swallow is restricted to riparian, lacustrine, and coastal areas with vertical banks, bluffs, and cliffs with fine-textured or sandy soils. A colonial breeder, about 75 percent of the current breeding population in California nests along the banks of the Sacramento and Feather Rivers in the northern Central Valley. The bank swallow breeds from early May through July, digging horizontal nesting tunnels and burrows along the side of stream banks and cliffs. Most colonies have between 100 and 200 nesting pairs. The bank swallow feeds predominantly over open riparian areas, but will also forage over brushland, grassland, wetlands, water and cropland. A wide variety of aerial and terrestrial soft-bodied insects, including flies, bees and beetles make up the bank swallow's diet (Zeiner et al. 1990a).

  The bank swallow may occur within the project area due to suitable foraging habitat. However, the project area does not have vertical banks, bluffs or cliffs for nesting.

Special-status Mammals

- *Pallid Bat (Antrozous pallidus) – CSC.* The pallid bat ranges from western Canada to central Mexico. This species is usually found in rocky, mountainous areas near water, and in desert scrub. They are also found over more open, sparsely vegetated grasslands, and they seem to prefer to forage in the open. The pallid bat has three different roosts. The day roost is usually in a warm, horizontal opening such as in attics or rock cracks; the night roost is usually in the open, near foliage; and the hibernation roost, which is often in buildings, caves, or cracks in rocks (Miller 2002).

Although this species has not been recorded near the project vicinity, pallid bats are known to occur throughout California where suitable habitat exists (CDFG 2005a). Since suitable habitat exists within the project vicinity there is potential for the species to occur there.

- *Pacific Western Big-Eared Bat (Corynorhinus [Plecotus] townsendii townsendii) – CSC.* The Pacific Western big-eared bat (a subspecies of Townsend's big-eared bat) is known to occur in the coastal regions of north and central California to Washington. Townsend's big-eared bat can be found in a variety of habitats throughout California, from the moist coastal redwoods to the mid-elevation mixed conifers to the dry deserts, but are most commonly associated with desert scrub, mixed conifer, pinyon-juniper, and pine forest. Common roosting locations include limestone caves, lava tubes, mines, buildings and other structures. This species is extremely sensitive to disturbance in its roost. The Townsend's big-eared bat feeds primarily on small moths, but also takes other insects including flies, lacewings, dung beetles, and sawflies (Kunz and Martin 1982).

  This species could potentially utilize the project area as foraging habitat while using nearby buildings or other man-made structures as roosting habitat.

- *Spotted Bat (Euderma maculatum) – CSC.* Although spotted bats were once thought to be very rare (Zeiner et al. 1990b), this species is now known to range widely in western North America from southern British Columbia to Mexico (Pierson and Rainey 1998). In California, these bats probably occur throughout the state in suitable habitat. Spotted bats have been found foraging in many different habitats, from arid deserts to ponderosa pine forests and marshlands.

  Spotted bats have a patchy distribution that may be related to the distribution of suitable diurnal roosting sites (Pierson and Rainey 1998). Spotted bats roost in the small cracks found in steep cliffs and stony outcrops. They have been found as high as 3000 meters above sea level, and even below sea level in the deserts of California (Pierson and Rainey 1998).

  This species is usually found foraging in open areas (Pierson and Rainey 1998). In addition to the nightly migration to foraging sites, these bats might have a seasonal elevation migration from ponderosa pine high elevation habitats in June and July to lower elevations in August (Barbour and Davis 1969), although they are known to hibernate in some colder portions of their range (Pierson and Rainey 1998).

Due to the proximity of the project area to suitable roosting habitat and the recorded long-range nightly migrations of this species between roosting and foraging sites, this species may forage in the project vicinity, although spotted bats are unlikely to roost in the project area.

- *Greater Western Mastiff-Bat (Eumops perotis californicus) – CSC.* The greater western mastiff-bat occurs from central California to central Mexico. This bat is found in arid to semi-arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands and chaparral (Zeiner et al. 1990b). Preferred roosting sites include cracks and crevices in cliffs, trees, tunnels and buildings. Day roosts in cliffs are usually in large cracks in exfoliating slabs of granite or sandstone. Greater western mastiff-bats feed on both low-flying and high-flying insects and may forage as much as 195 feet above the ground (Zeiner et al. 1990b).

  This species has potential to occur in the project area based on the availability of preferred habitat, and the availability of roosting sites in trees and other man-made structures.

3.5.2 Environmental Consequences/Environmental Impacts

3.5.2.1 Assessment Methods

This section describes the potential impacts of action alternatives to biological resources that are associated with the project area. This analysis is based on the Folsom alternatives introduced in Chapter 2.0 of this EIS/EIR.

Information contained in previous documents prepared for Sacramento area flood protection measures, as well as field surveys conducted by ENTRIX, was used to characterize biological resources in the vicinity of the project area. Existing biotic resource surveys of the project vicinity, as described in Section 3.1.1, and a review of records from the CNDDB (CDFG 2006b) were used to develop a list of special-status species with potential to occur in the project area. Information used in developing these impact analyses was found in the following sources:

- The American River Watershed Project, California Final Supplemental Environmental Impact Statement/Environmental Impact Report (Corps 2006).

- Natural Resources, Animal Life, Folsom Lake State Recreation Area (Wallace, Todd, and Roberts et al. 2003).

- Folsom DS/FDR Action Biological Field Report (Appendix C).

- CNDDB (DFG 2006a).

Existing resource information, including the Draft FWCAR for the Folsom Dam Enlargement Plan Alternatives: Analysis and Recommendations American River Watershed Investigation (USFWS 2001), was used to develop the description of the environmental setting. The resources described in that section were evaluated in conjunction with activities associated with action alternatives to determine potential impacts and develop mitigation measures. The assessment of impacts is based on the most current information on the status and distribution of special-status species and the potential for changes in their habitat resulting from implementation of action alternatives. Impacted habitat acreages and compensatory mitigation acreages identified in the Draft FWCAR of the Folsom Dam Safety and Flood Damage Reduction Project (USFWS 2006) are estimates and are being refined; impacts will be further minimized in coordination with the USFWS. If Reclamation-owned land is not available or suitable for mitigation needs, then off-site mitigation would be sought. Reclamation will also discuss the potential for on-site mitigation in areas previously disturbed by construction activities with the USFWS.

The first step in the assessment was to evaluate the potential for species to occur based on recent field surveys, documented occurrences, and the availability of habitat for various life history stages (spawning, incubation, juvenile and adult rearing). The second step was to evaluate the potential for action alternatives to affect individuals and populations of those species likely to occur within project-affected areas, as well as potential impacts to their habitat.

Both direct and indirect effects are included in this analysis and the evaluation of the implementation of Best Management Practices (BMPs) and other measures designed to reduce impacts. Direct effects are those that occur at the same time and place of the project action. Indirect effects caused by project actions occur later in time or at another location. Examples of potential direct effects to species include disturbance, injury, or mortality that may occur during construction or maintenance activities, including alterations to habitat. Examples of potential indirect and secondary effects to species or habitats due to project activities could include alterations or loss of habitat that may occur later in time, such as alterations at borrow sites that potentially provide habitat or result in alterations to a species food base, changes in hydrology that affect the habitat or surrounding areas, introduction of toxic chemicals, and introduction of predators such as bullfrogs or mosquitofish.

Project Implementation Conditions:
The effects for the action alternatives were estimated based on the following conditions pertaining to project implementation:

- Excavation activities at borrow sites upstream of Folsom Dam would occur when sites are dry. Indirect effects to aquatic habitats may occur at these sites during the rainy season following excavation activities.

- Analyses for impacts of excavation of borrow sites upstream of Folsom Dam are based on the assumption that sites would be excavated to an approximate depth of 30 ft between the shoreline and the 400-ft contour and the reservoir rim, except for the Granite Bay area, which may be deepened to as much as 50 ft. Upon completion of borrow excavation activities, borrow areas would be sloped or restored to accommodate recreational foot traffic.

- Implementation of a spill prevention plan would reduce the risk of fuel or oil spills from construction and transportation equipment.

- The implementation of BMPs would control soil erosion due to construction activities, and minimize potential construction-related effects on water quality.

3.5.2.2 Significance Criteria

The mandatory findings of significance as explained in CEQA, Pub. Res. Code sec. 21083; guidelines sec. 15065, indicate that a project would have a significant effect on biological resources if it would:

- Substantially degrade environmental quality;

- Substantially reduce fish or wildlife habitat;

- Cause a fish or wildlife habitat to drop below self-sustaining levels;

- Threaten to eliminate a plant or animal community; or

- Reduce the numbers or range of a rare, threatened or endangered species.

Additional thresholds of significance for biological resources under CEQA have been used in the following evaluation. Impacts were significant if they would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, USFWS, or USFS;

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by CDFG, USFWS, or USFS;

- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

3.5.2.3 Environmental Consequences/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

Under the No Action/No Project Alternative, construction activities would not occur. No impacts to terrestrial, riparian, or wetland vegetation or to special-status species would occur from the No Action/No Project Alternative.

Environmental Consequences/Environmental Impacts of Alternative 1

Under Alternative 1, the Main Concrete Dam would receive a number of modifications, but would not be raised. Under this alternative, the crests of the LWD, RWD, MIAD, and dikes 4 through 6 would be strengthened through placement of additional earthen material. The Auxiliary Spillway site would be excavated. Haul roads would be constructed, borrow sites would be developed at Beal's Point, staging areas, material processing plants developed at Folsom Point and Beal's Point, a concrete batch plant for the jet grout work at MIAD, and a concrete batch plant constructed in the vicinity of the Main Dam, either at the Observation Point, or downstream of the LWD. Contractor use areas and/or waste material disposal/stockpile sites would also be developed at Dike 7, MIAD, Folsom Point, the Observation Point, Beal's Point, and downstream of the LWD. Underwater blasting and dredging would also be required to construct the approach channel.

There would be direct or indirect impacts to special-status plant species from construction.

According to CDFG (2006a), several special-status plant species could potentially occur in the vicinity of construction sites of Alternative 1. Vegetation studies conducted in this area in 2002 did not report any special-status plant species, although these studies were not species surveys (LSA 2003). If any such species are present, or establish in the interim, these populations could be directly affected by construction activities.

This impact would be potentially significant but mitigable. Mitigation Measures BIO-1 through BIO-5 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

<u>There would be direct or indirect impacts to protected oak woodlands.</u>

Oak woodlands are present within the construction areas and staging areas for Alternative 1 and may be affected by construction activities. These woodlands are protected under county tree ordinances.

This impact would be potentially significant but mitigable. Mitigation Measures BIO-1, BIO-2, BIO-4, VEG-1 and BIO-10 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

<u>There would be loss of other native vegetation</u>.

Alternative 1 construction activities would result in permanent loss of native vegetation, including sensitive riparian habitat. This loss includes only the small portion of the area that would be displaced by a constructed structure (i.e., dam, spillway, and dike alterations). However, permanent habitat loss would have a less-than-significant impact on special-status species (other than for listed or candidate species under the State and Federal Endangered Species Acts) unless extensive areas of suitable habitat are degraded or somehow made unsuitable, or areas supporting a large proportion of the species population are substantially and adversely affected.

This impact would be less than significant. To further reduce this impact, any native vegetation affected including riparian and chaparral vegetation would be compensated for by addressing requirements in the FWCAR and through implementation of mitigation measures VEG-2, VEG-3, VEG-5, VEG-6 and BIO-10.

<u>There would be no direct impact due to the Folsom Dam Security Enhancement Project.</u>

Security measures would not impact the flora or fauna surrounding the Folsom Dam Site. The installation of poles for security cameras would be constructed in areas already under construction and would be unlikely to contain any natural vegetation. There would be no impacts to Valley elderberry longhorn beetles. Work associated with the power poles would not start until all of the elderberry shrubs have been transplanted or other wise mitigated for. Also, work would not start until the areas 150 ft from the toe of each dike had been cleared for the placement of filters or other work that requires a 150-ft buffer from the structure (Folsom Dam Security Enhancement Project, 2006).

This impact would be less than significant.

There would be indirect impacts to native vegetation, including oaks.

Construction activities implemented for Alternative 1 may result in indirect adverse impacts to vegetation and wetlands identified as sensitive by the state or by counties, including increased erosion and sedimentation, damage to roots of oaks and other tree species adjacent to areas where heavy equipment would be operated, dust impacts to roadside vegetation, and colonization of exposed substrate by exotic plant species.

This impact would be potentially significant but mitigable. Mitigation Measures BIO-6, BIO-7, VEG-5, VEG-6 and BIO-10 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

There would be permanent loss of wetlands and other waters of the U.S.

Construction activities associated with Alternative 1 could result in the permanent loss of wetlands below the RWD and LWD, Dike 6, and below MIAD. There appears to be hydraulic connectivity between the area downstream of MIAD and the wetlands south of Green Valley Road in the State Preserve (Reclamation 2006b). Effects on the wetlands in the Preserve due to the construction activities at MIAD are unknown and would be monitored during all phases of construction at MIAD.

This impact would be potentially significant but mitigable. Mitigation Measures are described in Section 3.1.4 and 3.4.4 for monitoring the MIAD wetlands. VEG-4, VEG-7 and BIO-10 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

There would be temporary disturbance of wetlands and other waters of the U.S.

Construction activities associated with Alternative 1 would result in the temporary loss of wetlands below the OHWM of the reservoir.

This impact would be potentially significant but mitigable. Mitigation measure VEG-6 and VEG-7 would be implemented. Mitigation Measure VEG-4 and BIO-10 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

Construction activities and borrow site excavation may result in adverse effects to host plants for the valley elderberry longhorn beetle.

Elderberry shrubs, the host plant for the federally protected valley elderberry longhorn beetle, have been mapped at locations around the reservoir that could be affected by project construction activities, including excavation of borrow areas within the reservoir. Most of these elderberries are within the area potentially affected by Alternative 1. Actions resulting in adverse effects to elderberry shrubs in the Alternative 1 area are significant. The following avoidance and minimization measures are summarized from the Conservation Guidelines for the Valley Elderberry Longhorn Beetle (USFWS 1999). These measures are subject to and contingent upon a Section 7 consultation with the USFWS. This consultation would occur prior to permitting of construction.

This impact would be potentially significant but mitigable. Mitigation Measures INV-1a through INV-1e, described in Section 3.5.4 would reduce the impact to a less-than-significant level.

There could be direct or indirect impacts to special-status amphibian species or their habitat due to temporary or permanent alteration of terrestrial habitat.

Terrestrial habitat for special-status amphibian species occurs in the vicinity of the Proposed Action. A portion of the grassland/savanna habitat, which may be utilized by western spadefoot toad, may be affected by construction activities. Direct mortality or indirect impacts from local alterations to habitat could occur. However, within the area affected by Alternative 1, western spadefoot toad appears to be limited by the lack of aquatic habitat for breeding rather than terrestrial habitat, so disturbance to grassland/savannah habitat is not likely to affect the overall habitat value of the Alternative 1 area for this species. California red-legged frog has the potential to be present in marginally suitable habitat.

This impact would be potentially significant but mitigable. Mitigation Measures BIO-1 through BIO-5, BIO-9, and AMP-1 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

Excavation at borrow sites could alter amphibian (including special-status species) aquatic habitat.

Excavation at borrow sites would be implemented when the surface of the sites are dry; therefore, there would be no direct impacts to special-status amphibians or their aquatic habitat. However, the potential to indirectly affect aquatic habitat would occur if excavated areas pond water when inundated at the onset of the rainy season, creating seasonal or permanent ponds which potentially may be utilized by amphibians, including special-status amphibians such as the California red-legged frog or western spadefoot toad.

All borrow sites upstream of Folsom Dam can be inundated by water from Folsom Reservoir, allowing the introduction of species that prey on amphibians. The rest of the borrow sites are downstream of the reservoir and would not be inundated from rising water levels in Folsom Reservoir. The presence of centrarchids and other species that prey on amphibians, as well as the influence of fluctuating water levels on vegetation, makes aquatic habitat marginally suitable to unsuitable for amphibians. Therefore, direct or indirect impacts to amphibians or their habitat would generally not occur at these sites.

If, following excavation, ponds form in a portion(s) of the downstream D2 Pit site, it may create seasonal or permanent aquatic habitat during and following the next rainy season. If aquatic habitat of sufficient depth occurs for a sufficient time, it may provide additional breeding habitat for amphibian species. However, additional pond habitat, particularly if it contains permanent water, may be colonized by bullfrogs that prey on red-legged frogs. Furthermore, in ponds with permanent water, fish may be introduced, as they were to Avery Pond.

This impact would be potentially significant but mitigable. Mitigation Measure BIO-9 and AMP-1 described in Section 3.5.4 would reduce the impact to a less-than-significant level. With implementation of Mitigation AMP-1, the excavated area within the borrow site would be graded to drain water. Therefore, ponded areas would not be created.

Construction activities could directly or indirectly affect amphibians (including special-status species) or their aquatic habitat in permanent freshwater marshes.

There is a potential for direct or indirect effects to amphibians or their aquatic habitat if permanent freshwater marsh habitat is altered or lost. Construction activities associated with Alternative 1 could result in the temporary or permanent loss of wetlands below at the toe of the MIAD and the water that supplies the neighboring wetland across the road.

Construction activities would occur while reservoir elevations are at low levels, exposing borrow sites, haul routes and the Auxiliary Spillway approach. Because there areas would be dry at the time construction activities are performed direct impacts to amphibians are not likely to occur.

Although aquatic habitat within the area is generally marginally suitable to unsuitable for special-status amphibians, due to the presence of species that prey or compete with native amphibians, loss of any wetlands has the potential impact their habitat. Mitigation Measures BIO-5, VEG-2, VEG-4 and BIO-10 would implement a Revegetation Plan and Mitigation, Monitoring, and Reporting Plan which would replace lost acreage at a ratio stipulated in the FWCAR.

This impact would be potentially significant but mitigable. Mitigation Measures for monitoring the MIAD wetlands are described in Sections 3.1.4 and 3.4.4. Mitigation Measures BIO-5, VEG-2, VEG-4, VEG-7 and BIO-10 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

<u>Construction-related activities could result in temporary or permanent loss of terrestrial habitat for amphibians.</u>

Within the footprint of construction activities at the Main Concrete Dam, Auxiliary Spillway, LWD and RWD, and Dikes 4 through 6, roads, staging areas, borrow material processing sites, and concrete batch plant, activities would occur on dry land and would not directly affect aquatic habitat with which amphibians are generally associated. Furthermore, aquatic habitat contiguous with these sites generally contains reservoir habitat that is only marginally suitable to unsuitable for amphibians. Therefore, impacts to amphibians from this impact are less than significant.

This impact would be less than significant. No mitigation is required or recommended.

<u>Borrow site excavation and other construction activities could result in direct mortality to special-status wildlife species.</u>

Excavation of borrow material above the fluctuation zone of the reservoir could result in mortality of special-status wildlife species, including California horned lizard and northwestern pond turtle. This impact would be potentially significant.

This impact would be potentially significant but mitigable. Mitigation Measures BIO-1 through BIO-5 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

<u>Borrow site excavation and other construction activities could result in temporary or permanent alteration of habitat for special-status wildlife species.</u>

Excavation of the proposed borrow sites and other construction activities could result in the loss of special-status wildlife habitat, including habitat for California horned lizard, Cooper’s hawk, white-tailed kite, tricolored blackbird, American peregrine falcon, western burrowing owl, bald eagle, Aleutian Canada goose, loggerhead shrike, ferruginous hawk, long-billed curlew, Swainson's hawk, osprey, Vaux’s swift, white-faced ibis, mountain plover, bank swallow, pallid bat, spotted bat, Pacific western big-eared bat, and greater western mastiff-bat . However, permanent habitat loss is a less than significant impact on special-status species (other than for listed or candidate species under the State and Federal Endangered Species Acts) unless extensive areas of suitable habitat are degraded or somehow made unsuitable, or areas supporting a large proportion of the species population are substantially and adversely affected. This impact would be less than significant.

This impact would be less than significant. No mitigation is required or recommended.

<u>Borrow site excavation and other construction activities could result in sedimentation in streams, creeks and seasonal wetlands.</u>

Excavation and other construction activities could result in increased erosion and sedimentation. This may affect water quality (Section 3.1) and, therefore, habitat quality within the Alternative 1 area. Changes to water quality could substantially degrade aquatic or wetland habitat, which would be considered a significant impact.

This impact would be potentially significant but mitigable. Mitigation Measure BIO-6 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

<u>Borrow site excavation and other construction activities could result in impacts to burrowing owls and burrowing owl habitat.</u>

Borrow site excavation above the fluctuation zone of the reservoir and other construction activities could result in loss of burrowing owl habitat or individuals. Because this species is a state species of special concern, this is a significant impact.

This impact would be potentially significant but mitigable. Mitigation Measures BIO-1 through BIO-5 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

<u>Borrow site excavation and other construction activities could result in direct impacts to migrating and wintering birds.</u>

Folsom Reservoir is within the Pacific Flyway migration corridor and is, therefore, a stopover point for migrating and wintering birds. Bald eagles are known to winter and forage in the project area. Mountain plovers, ferruginous hawks, and Aleutian Canada geese are potential wintering species in the Alternative 1 area. Direct impact to individuals of these species is a significant impact.

This impact would be potentially significant but mitigable. Mitigation Measures BIO-1 and BIO-2 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

<u>Borrow site excavation and other construction activities could result in direct impacts to northwestern pond turtles.</u>

Northwestern pond turtles, a California species of special concern, are known to occur in the project vicinity. They lay their eggs along wetland margins and upland areas near water. They excavate nests and bury their eggs. Pond turtles also rely on upland areas as basking sites. Direct impacts to turtles or turtle nests during in-reservoir borrow site excavation is to be adverse and significant.

This impact would be potentially significant but mitigable. Mitigation Measure BIO-1 through BIO-5 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

Borrow site excavation and other construction activities could result in direct mortality to nesting birds protected by the Migratory Bird Treaty Act.

Take of bird eggs and nestlings protected by the Migratory Bird Treaty Act is prohibited and is an adverse significant impact.

This impact would be potentially significant but avoidable. Implementation of measures WIL-1, BRD-1 and BRD-2 described in Section 3.5.4 would avoid this impact.

Temporary loss of special-status wildlife habitat would result from construction activities.

Construction activities required for Alternative 1 that are temporary in nature and do not significantly alter natural processes (e.g., hydrology) are expected to leave such areas in a restorable condition. Such areas may include those used as haul routes and staging areas that would be vacated after the completion of Alternative 1.

However, permanent and temporary habitat loss is a less than significant impact (other than for listed or candidate species under the State and Federal Endangered Species Acts) unless extensive areas of suitable habitat are degraded or somehow made unsuitable, or areas supporting a large proportion of the species population are substantially and adversely affected. This impact would be less than significant.

This impact would be less than significant.

Borrow site excavation and other construction activities could result in loss of habitat for non special-status species.

Excavation of the proposed borrow sites and other construction activities could result in the loss of habitat for non-special-status wildlife. However, permanent habitat loss is a less than significant impact unless extensive areas of suitable habitat are degraded or somehow made unsuitable, or areas supporting a large proportion of the species population are substantially and adversely affected. This impact would be less than significant.

This impact would be less than significant. No mitigation is required or recommended.

There could be adverse noise effects on special-status bats from construction generated noise.

Noise generated by construction and blasting could potentially interfere with echolocating bats' roosting and breeding activities. Pallid bats are known to hibernate in rocky outcrops and may occur in rip-rap portions of the earthen dikes surrounding the reservoir. They are also intolerant of human disturbance. The greater western mastiff-bat may use the Main Concrete Dam as roosting habitat. Both pallid and greater western mastiff-bats are known to utilize buildings as roosts. It has been shown that high frequency noise (4,000-18,000 Hz) produced a deterring effect on bat colonies (USEPA 1971). Similarly other studies have shown that a 60-dB high frequency noise was sufficient to produce physiological effects in hibernating bats (USEPA 1971). High frequency noise (>2,000 Hz) at a level in excess of 50-db at bat roosts would result in an adverse significant impact.

This impact would be potentially significant but mitigable. Mitigation Measure WIL-1 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

<u>There could be adverse noise effects on special-status birds.</u>

Noise generated by construction and blasting could potentially interfere with bird roosting and breeding activities. It has been shown that noise in excess of 85-dB at the ear was sufficient to cause distress in birds. 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). Birds remaining within the blasting vicinity may sustain permanent hearing loss. Adverse impacts from construction-related noise on breeding special-status birds would be significant.

This impact would be potentially significant but mitigable. Mitigation Measures BIO-1, BIO-3, BRD-1 and BRD-2 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

<u>There could be adverse noise effects on non-special-status wildlife.</u>

Noise generated by construction and blasting activities could potentially cause adverse impacts to non-special-status wildlife. Noise can alter con-specific communication, predator avoidance calls, and behaviors. However, this impact would be less than significant.

This impact would be less than significant. No mitigation is required or recommended.

Blasting impacts and their associated mitigation measures would be the same for most actions as for Alternative 1.

Aquatic habitat would be altered when the stilling basin is extended

The stilling basin contains non-native fish species that are known to prey on native amphibian species, and therefore, is not likely to contain suitable habitat for amphibians.

No impacts to amphibians or their habitat would occur.

Adverse effects to wildlife could result from underwater blasting.

The use of blasting is particularly disruptive to wildlife (including special status species). Excessive noise associated with blasting can cause birds to abandon nests and bats to abandon roosts and hibernacula. Blasting can also cause direct mortality to any animals remaining within the blasting zones.

This impact would be potentially significant but mitigable. Mitigation Measures BIO-1 through BIO-5 would be implemented to reduce the impact to a less-than-significant level.

Environmental Consequences/Environmental Impacts of Alternative 2

Alternative 2 includes the additional modifications to those described for Alternative 1. The Main Concrete Dam would receive strengthening of the existing parapet wall. The Auxiliary Spillway would receive a partially or completely lined spillway, a 350 to 400-foot wide fuseplug, and a tunnel with 3 submerged tainter gates. The Left and Right Wing Dams would receive a 0.5-foot earthen raise with a 3.5-foot parapet concrete wall, toe drains and half-height filters. MIAD and all dikes would receive a 4-foot earthen raise. Excavated material would be processed downstream of the LWD, or at the Observation Point. A borrow site would be established Beal’s Point, as well as a processing plant. An additional staging area would be developed at Granite Bay.

Areas of lower elevation not protected by existing embankments would receive a new embankment. The numbers of new embankments required and their exact locations have not been determined. Typical construction of new embankments would involve the use of scrapers, loaders, and other equipment to create earthen berms. Access roads for construction and maintenance would also be required.

Under Alternative 2, flood control operations would utilize the temporary extra reservoir capacity afforded by dam and dike raises during flood events for as long as it takes to safely release water through the concrete dam into the American River.

Impacts to vegetation, invertebrates, amphibians, and wildlife species from construction at all facility sites and their associated mitigation measures would be similar to those for Alternative 1.

<u>Inundation caused by emergency flood retention could adversely affect special-status plant species.</u>

Inundation caused by emergency flood retention could adversely affect special status plant species if any are present in the inundated area and if the inundation is of sufficient duration.

Because such inundation would be a rare event and even for a 151-year flood would last for less than two days, with the water being progressively lowered, little or no adverse effects are expected to occur.

This impact is less than significant. No mitigation is required or recommended.

<u>Inundation caused by emergency flood retention could adversely affect native oaks.</u>

Inundation caused by emergency flood retention could adversely affect native oaks if the inundation is of sufficient duration. Blue oaks can be sensitive to inundation for as few as seven days, and evergreen oaks are likely to be more sensitive.

This impact would be potentially significant but mitigable. Mitigation Measure BIO-8 described in Section 3.5.4 would reduce the impact to a less-than-significant level.

<u>Inundation caused by emergency flood retention could adversely other native vegetation.</u>

Inundation caused by emergency flood retention could result in temporary loss of native upland vegetation. However, this habitat loss would have a less-than-significant impact on special-status species (other than for listed or candidate species under the State and Federal Endangered Species Acts) unless extensive areas of suitable habitat are degraded or somehow made unsuitable, or areas supporting a large proportion of the species population are substantially and adversely affected.

This impact would be less than significant. No mitigation is required or recommended.

<u>Inundation caused by emergency flood retention could adversely affect valley elderberry longhorn beetles.</u>

Inundation above the OHWM, associated with emergency retention of flood waters, could inundate elderberry plants that were previously not subjected to inundation. Depending on the duration of this flooding, elderberry plants could be adversely affected.

This impact would be potentially significant but mitigable. Mitigation Measure BIO-8 would reduce the impact to a less-than-significant level.

<u>Construction activities could potentially result in temporary or permanent alteration of terrestrial habitat for special-status amphibians at new embankments/flood easements for lower topography.</u>

Potential impacts to special-status amphibians, in particular California red-legged frog and western spadefoot toad, would be the similar as to Alternative 1.

This impact would be potentially significant but mitigable. Mitigation Measures BIO 1- through BIO-5 and BIO-9 would be implemented. Mitigation Measure AMP-1 would protect amphibians and would reduce the impact to a less-than-significant level. However, this impact would be further analyzed in subsequent environmental documents.

<u>Construction of new embankments/flood easements for lower topography would result in loss of terrestrial and aquatic habitat for amphibian species</u>

Construction activities at some new embankment/flood easement locations would occur in creek drainages and could directly affect aquatic habitat with which amphibians are generally associated. Aquatic habitat contiguous with these sites contains habitat that is marginally suitable for amphibians could potentially contain amphibians.

This impact would be potentially significant, but mitigable. Mitigation Measures BIO-1 through BIO-5 would be implemented and would reduce the impact to a less-than-significant level. However, this impact would be further analyzed in subsequent environmental documents.

<u>Inundation caused by emergency flood retention could adversely affect special-status amphibians.</u>

Inundation above the OHWM could adversely affect special status amphibians such as California red-legged frogs, foothill yellow-legged frogs and western spadefoot toads. Emergency action may cause the temporary loss of upland habitat for amphibians.

Flood stage usually occurs during spring runoff, which may affect frog breeding activities as well. Frogs may take advantage of flooded areas to breed and lay eggs. If these areas are dewatered by release of floodwaters through the spillway before the eggs hatch, there could be an impact to eggs as a result of desiccation. Additionally, California red-legged frog egg masses could be affected if rising waters knock egg masses loose from anchor vegetation, because drifting egg masses are subject to high mortality.

Because such inundation would be a rare event and even for a 151-year flood would last for less than two days, with the water being progressively lowered, little or no adverse effects are expected to occur.

This impact is less than significant. No mitigation is required or recommended.

Inundation caused by emergency flood retention could adversely affect other special-status wildlife.

Inundation above the OHWM could adversely affect special status wildlife such as western burrowing owls, northwestern pond turtles, California horned lizards, giant garter snakes, long billed curlew, white faced ibis, mountain plovers, and various bat species.

Emergency action may cause the temporary loss of upland habitat for reptiles and ground nesting and foraging birds. Reptiles that utilize burrows above the OHWM but below the new maximum reservoir elevation after implementation of Alternative 2 could be drowned. Species that are known to hibernate in such burrows are particularly susceptible. Inundation of upland northwestern pond turtle nests could result in the drowning of hatchling turtles or rupturing of eggs due to hydrostatic pressure.

Because such inundation would be a rare event and even for a 151-year flood would last for less than two days, with the water being progressively lowered, little or no impacts to reptiles and to ground-foraging birds that do not breed in the project area would occur.

The nests of ground nesting birds may be inundated if emergency retention occurs after eggs have been laid. Any western burrowing owls that occupy areas that lie between the current OHWM and the maximum reservoir elevation that would result from implementation of the project could be subject to drowning, loss of burrows and loss of eggs.

This impact would be potentially significant and unavoidable. Mitigation Measure BIO-8 would be implemented. Even with implementation of Mitigation Measure BIO-8, this impact would still be significant.

Inundation caused by emergency flood retention could adversely affect non special-status wildlife.

Inundation above the OHWM caused by retention of emergency flood waters could adversely affect non special status wildlife through temporary loss of upland habitat and mortality caused by drowning.

This impact is less than significant. No mitigation is required or recommended.

Environmental Consequence/Environmental Impacts of Alternative 3.
Alternative 3 includes the same modifications as Alternative 2 with the following exceptions. A gated Auxiliary Spillway would be constructed with construction of the approach channel into the reservoir. All structures would receive a 3.5-foot parapet concrete wall. A borrow site and processing plant would be developed at Beals Point.

Environmental Consequence/Environmental Impacts of Alternative 4.
Alternative 4 includes the same modifications as Alternative 2 with the following exceptions. Under Alternative 4, the Main Concrete Dam and all earthen structures would be raised 7 ft. Under Alternative 4, the Granite Bay borrow site would be developed and an additional processing plant would be installed at Granite Bay.

Impacts to vegetation, invertebrate, amphibian, and wildlife species and their associated mitigation measures would generally be similar to Alternative 3, but the extent of impacts would be greater due to the borrow site and processing plant at Granite Bay.

No additional mitigation measures are required or proposed.

Environmental Consequences/Environmental Impacts Alternative 5
Alternative 5 includes the same modifications as Alternative 4 with the following exception. The Main Concrete Dam along with all the earthen dams would be raised 17 feet. No Auxiliary Spillway would be constructed under this alternative. Excavation and replacement of the downstream foundation would be done at MIAD. Borrow sites under Alternative 5 would include Beal's Point, R1/R2, D1/D2, L1/L2 and Granite Bay. An additional processing plant would be necessary at Beal's Point and staging would be required at MIAD. Stockpiles of various types of material would be located at Folsom Point, Dike1/Dike2, Beal's Point, Granite Bay, D1, D2 and at the LWD. Underwater blasting and dredging would not be conducted under Alternative 5.

Impacts to vegetation, invertebrate, amphibian, and wildlife species and their associated mitigation measures would be the same as for Alternatives 1 and 2 because the analyses for similar construction activities were based on the assumption that all borrow sites upstream of Folsom Dam would be utilized and construction would occur at all existing and new dam and dike locations.

No additional mitigation measures are required or proposed.

3.5.3 Comparative Analysis of Alternatives

Table 3.5-4 presents a summary of the potential impacts to terrestrial biological resources. The No-Action Alternative would have no impacts from project-related construction activities.

Alternative 1 would have no impacts related to construction of new embankments or an increase in reservoir elevation during large flood events. Alternatives 2, 3, 4 and 5 could have adverse impacts on wildlife associated with construction of new embankments. These impacts would be further analyzed in subsequent environmental documents.

The other potential impacts of Alternatives 1 through 5 on special-status plant species are the same under all alternatives, and are less than significant or less than significant with mitigation. Because Alternatives 4 and 5 would require additional borrow sites, impacts to vegetation would be more extensive than for Alternatives 1, 2, and 3. There may be additional wildlife impacts associated with the additional borrow sites for Alternatives 4 and 5. Alternatives 3 and 4 could have adverse impacts to wildlife associated with blasting that would not occur with Alternatives 1, 2, and 5. All of these impacts would be less than significant with mitigation (Table 3.5-4**)**.

Table 3.5-4
Summary Comparison of Impacts of Alternatives

Affected Resource and Area of Potential Impact	***Alternative***					
	No Action Compared to Existing Conditions	***1***	***2***	***3***	***4***	***5***
Biological Resources						
(1) Direct or indirect impacts to special-status plant species from construction.	N	SM, A	SM, A	SM, A	SM, A	SM, A
(2) Direct or indirect impacts to protected oak woodlands	N	SM, A	SM, A	SM, A	SM, A	SM, A
(3) Loss of other native vegetation	N	LS	LS	LS	LS	LS
(4) Indirect impacts to native vegetation	N	SM, A	SM, A	SM, A	SM, A	SM, A
(5) Permanent Loss of wetlands and Other Waters of the U.S.	N	SM, A	SM, A	SM, A	SM, A	SM, A
(6) Temporary disturbance of wetlands and Other Waters of the U.S.	N	SM, A	SM, A	SM, A	SM, A	SM, A
(7) Inundation caused by emergency flood retention could adversely affect special-status plant species.	N	N	LS	LS	LS	LS
(8) Inundation caused by emergency flood retention could adversely affect native oaks.	N	N	SM, A	SM, A	SM, A	SM, A
(9) Removal of host plants for the valley elderberry longhorn beetle	N	SM, A	SM, A	SM, A	SM, A	SM, A
(10) Inundation of host plants of the valley elderberry longhorn beetle.	N	N	SM, A	SM, A	SM, A	SM, A
(11) Direct or indirect impacts to special-status amphibian species or their habitat due to temporary or permanent alteration of terrestrial habitat.	N	SM, A	SM, A	SM, A	SM, A	SM, A
(12) Alteration of amphibian (including special-status species) aquatic habitat associated with excavation of borrow sites.	N	SM, A	SM, A	SM, A	SM, A	SM, A
(13) Direct or indirect effects to amphibians (including special-status species) or their aquatic habitat in permanent freshwater marshes.	N	SM, A	SM, A	SM, A	SM, A	SM, A
(14) Temporary or permanent loss of terrestrial habitat for amphibians.	N	LS	LS	LS	LS	LS

Table 3.5-4
Summary Comparison of Impacts of Alternatives

Affected Resource and Area of Potential Impact	Alternative					
	No Action Compared to Existing Conditions	1	2	3	4	5
(15) Direct or indirect impacts to special-status amphibian species or their habitat due to temporary or permanent alteration of terrestrial habitat at new embankments for lower topography.	N	N	SM, A	SM, A	SM, A	SM, A
(16) Construction of new embankments for lower topography would result in loss of terrestrial habitat.	N	N	LS	LS	LS	LS
(17) Inundation by emergency retention could result in adverse impacts to special status amphibians.	N	N	LS	LS	LS	LS
(18) Alteration of aquatic habitat when the stilling basin is extended.	N	N	N	N	N	N
(19) Direct mortality to special-status wildlife species from excavation and other construction activities	N	SM, A	SM, A	SM, A	SM, A	SM, A
(20) Impacts to special-status wildlife habitat from borrow site excavation and other construction activities	N	LS	LS	LS	LS	LS
(21) Sedimentation of wildlife habitat in streams, creeks and seasonal wetlands	N	SM, A	SM, A	SM, A	SM, A	SM, A
(22) Impacts to burrowing owls and burrowing owl habitat	N	SM, A	SM, A	SM, A	SM, A	SM, A
(23) Impacts on migrating and wintering birds	N	SM, A	SM, A	SM, A	SM, A	SM, A
(24) Direct impacts to northwestern pond turtles	N	SM, A	SM, A	SM, A	SM, A	SM, A
(25) Direct impacts to nesting birds protected by the Migratory Bird Treaty Act	N	SAV, A	SAV, A	SAV, A	SAV, A	SAV, A
(26) Temporary loss of special-status wildlife habitat	N	LS	LS	LS	LS	LS
(27) Loss of habitat for non-special-status species	N	LS	LS	LS	LS	LS
(28) Noise effects on special-status bats	N	SM, A	SM, A	SM, A	SM, A	SM, A
(29) Noise effects on special-status birds	N	SM, A	SM, A	SM, A	SM, A	SM, A
(30) Noise effects on non-special-status wildlife	N	LS	LS	LS	LS	LS
(31) Inundation caused by emergency retention would result in adverse impacts to special status wildlife.	N	N	SU, A	SU, A	SU, A	SU, A
(32) Inundation caused by emergency retention would result in adverse impacts to non-special status wildlife.	N	N	LS	LS	LS	LS
(33) Adverse impacts to wildlife associated with blasting	N	N	N	SM, A	SM, A	N

Key:

SM = Significant but mitigable impact (CEQA)
SU = Significant and unavoidable impact
LS = Less than Significant Impact (CEQA)
N = No Impact (CEQA, NEPA)
B = Beneficial Impact (NEPA)
A = Adverse Impact (NEPA)
AV = Avoidable

Other potential impacts of Alternatives 1 through 5 on special-status amphibians and their habitat are the same under all alternatives, and would be no impact, less than significant or less than significant with mitigation (Table 3.5-4).

Other potential impacts of Alternatives 1 through 5 on other terrestrial wildlife and their habitat are the same under all alternatives, and would be less than significant or less than significant with mitigation (Table 3.5-4).

3.5.4 Mitigation Measures

This section lists all of the recommended mitigation measures for impacts common to all biological resources (BIO), or specific to vegetation (VEG), all wildlife (WIL), invertebrates only (INV), amphibians only (AMP), and birds only (BRD).

BIO-1: Within the project footprint, pre-construction surveys would be conducted by qualified biologists in areas that may contain suitable habitat for special-status plant, invertebrate, or wildlife species. The biologists would identify locations of special status plant, invertebrate, or wildlife species and take necessary measures to provide protection.

BIO-2: To the extent consistent with project implementation needs, any populations of special-status plant, invertebrate, or wildlife species would be avoided by placing fencing around the population and a suitable buffer area. Environmental monitors would regularly inspect any fenced sensitive biological resources to ensure no disturbance.

BIO-3: If populations of special-status plant, invertebrate, or wildlife species are found that cannot be avoided, USFWS and CDFG would be consulted and mitigation measures developed for those populations.

BIO-4: All construction personnel at the Folsom DS/FDR construction site would receive environmental awareness training from agency biologist(s) associated with the project, or suitably trained representative(s), regarding the potential presence of listed, special-status, and protected (e.g., oak trees) species in the project area and the importance of avoiding impacts to the habitat and reporting sightings.

BIO-5: A Revegetation Plan would be developed to address potential losses to all habitats impacted within the project footprint. The Revegetation Plan would be implemented immediately following construction in accordance with requirements in the SWPP, FWCAR, and Mitigation, Monitoring, and Reporting Plan (MMRP).

BIO-6: Standard erosion and sedimentation control measures (BMPs), as described in mitigation measures HWQ-1 through HWQ-3 in Section 3.1.4, would be implemented for all grading, filling, clearing of vegetation, or excavating that occurs in site preparation.

BIO-7: To minimize dust impacts to vegetation, wetlands, and breeding wildlife, unpaved access roads would be frequently watered with raw water using a sprayer truck during periods when trucks and other construction vehicles are using the roads, except during periods when precipitation has dampened the soil enough to inhibit dust. The speed limit on unpaved roads would be limited to avoid visible dust.

BIO-8: In the event of emergency operations that increase the reservoir surface elevation of Folsom Reservoir above the normal OHWM, supplemental environmental compliance will be completed. It is anticipated that surveys would be completed after the event and post-inundation surveys would be compared to the most recent pre-inundation survey data available to assess impacts and compensatory mitigation. The responsible Federal agency would contact other federal, state, and local agencies to develop appropriate mitigation measures. These measures would be based on the extent and duration of the emergency inundation and survey data. Based on the results of these surveys, formal Section 7 consultation would be reinitiated by the responsible federal agency and consultation with CDFG would also be conducted.

BIO-9: Qualified biologists (monitors) would be available throughout the construction period to identify any at-risk special-status species. The biologist would consult with the appropriate agency to remove individuals from the project area, according to USFWS and CDFG laws, handling guidelines, licenses, and permits.

BIO-10: Follow recommendations in the FWCAR and complete mitigation in the FWCAR for all affected habitats.

*VEG-1***:** Native oaks and oak woodlands impacted by construction would be compensated for at a ratio stipulated in the FWCAR and MMRP.

VEG-2: Riparian vegetation outside the OHWM of the reservoir impacted by construction will be compensated for at a ratio stipulated in the FWCAR and MMRP.

VEG-3: Chaparral vegetation impacted by construction will be compensated for at a ratio stipulated in the FWCAR and MMRP.

VEG-4: Wetlands impacted by construction will be compensated for at a ratio stipulated in the FWCAR and MMRP.

VEG-5: Prior to bringing in equipment from other sites, contractors will clean all mud, soil, and plant/animal material from the equipment. This will help prevent the importation of plants or animals that are exotic or invasive.

VEG-6: All revegetated or disturbed areas would be monitored annually for invasive non-native plant species, particularly French broom and pampas grass, for five years following completion of construction, with the assistance of a qualified botanist. If invasive species are becoming established on areas disturbed by project activities during the five-year period, invasive species will be removed at times that preclude the plants from setting new seed.

VEG-7: During jet grouting or excavation and replacement of the foundation at MIAD, wetlands downstream of MIAD will be flagged and clearly delineated. No equipment will be staged within 25 ft of a wetland, nor will work take place within 25 ft of a wetland.

INV-1a: Where avoidance is compatible with the construction of the Folsom DS/FDR Action, a 100-foot buffer zone will be established and maintained around all elderberry plants containing stems measuring 1.0 inches or greater in diameter at ground level. USFWS will be consulted before any disturbances within the buffer area occur.

INV-1b: Elderberry plants that cannot be avoided during Folsom DS/FDR construction activities will be transplanted to a conservation area approved by USFWS. All elderberry plants containing stems measuring 1.0 inches or greater in diameter at ground level will be transplanted to a conservation area if technically feasible, per Biological Assessment that was submitted to USFWS and Biological Opinion that is anticipated from USFWS as well as the Valley Elderberry Longhorn Beetle (VELB) conservation guidelines (USFWS 1999).

INV-1c: Each elderberry stem measuring 1.0 inch or greater in diameter at ground level that is adversely affected (e.g., those that are transplanted or destroyed) will be compensated, in the conservation area, with elderberry seedlings and associated native plant seedlings per the Biological Opinion for the Project and USFWS's 1999 VELB Conservation Guidelines. A minimum survival rate of at least 60 percent of the elderberry plants will be maintained throughout the monitoring period (see *INV-1e*). If survival drops below this level, additional seedlings or cuttings will be planted. Stock for plantings will be obtained from local sources.

INV-1d: Native plants associated with elderberry plants at the Folsom DS/FDR Action site, or at similar reference sites, will be planted at ratios provided in the Biological Opinion for the Project. A minimum survival rate of at least 60 percent of the associated native plants must be maintained throughout the monitoring period (see *INV-1e*). If survival drops below this level, additional seedlings or cuttings will be planted. Only stock from local sources will be used.

INV-1e: A conservation area will be established distinct from the project area and will be protected in perpetuity as a compensation site for transplanted elderberry plants and associated native vegetation. This area will provide at least 1,800 square feet for each transplanted elderberry plant. The condition of the valley elderberry longhorn beetle, elderberry shrubs, and general condition of the conservation area will be monitored over a period of ten consecutive years or for seven years over a

15-year period occurring on the first, second, third, fourth, fifth, seventh, tenth, and fifteenth years.

AMP-1: The excavated areas within the proposed borrow sites will be graded to drain water to prevent attraction to the artificial pools by amphibian species as well as prevent fish stranding with changing reservoir water surface elevations.

WIL-1: To the extent possible, excavation and construction activities would be initiated during non-breeding seasons for special-status and protected wildlife. Habitat for special status and protected species would be removed during the non-breeding season if practicable to preclude return to the project area by the species during construction activities.

BRD-1: To the extent possible, removal of vegetation and potential bird breeding habitat in the Folsom DS/FDR project area would occur between September 1 and February 28, when birds are not expected to be nesting within the project area, in order to comply with the Migratory Bird Treaty Act (MBTA). Impacts to non-breeding birds still may occur between September 1 and February 28, because they are not reproductively constricted to the project area during that period. During the period from March 1 to August 31, bird reproduction is occurring and therefore the potential for impacts to nesting birds exists.

BRD-2: To mitigate and monitor construction-related impacts to birds during the breeding season, a bird monitoring plan would be developed as part of the MMRP and implemented to comply with the MBTA and Executive Order 13186. Mitigation will include but is not limited to a nest monitoring zone of an adequate size, per the Migratory Bird Act, to avoid or significantly reduce impacts to breeding birds at active construction sites. Also, methods to deter nesting, and/or to acclimate birds to construction noise and activities made. One potential method would be to use acoustic recordings within 500 ft of blasting sites to deter birds from nesting near blasting areas or allow them to become habituated to the noise. Also, an appropriate buffer zone around active nests of special status bird species would be implemented.

3.5.5 Cumulative Effects

Table 5-1 provides a list of past, present and probable future projects in the general vicinity of the study area that are included in the cumulative effects analysis.

The following analysis evaluates the impacts of the Folsom DS/FDR Action on terrestrial biological resources with added related past, present and reasonably foreseeable projects. This analysis includes the potential impacts of the Folsom Bridge Project, the Future Redundant Water Pipeline for Roseville, Folsom, and San Juan Water District the Lower American River Common Features Project, and the Sacramento Municipal Utility District Transmission Line Project. The Folsom Dam

Road Closure and the Folsom Historic District Traffic Calming Program are not likely to affect biological resources and are not included in this evaluation.

Construction of any of the Folsom DS/FDR actions will not significantly alter current Folsom Facility operations. During construction and upon completion of structural modifications current operational parameters, as summarized above and defined in appropriate agreements and authorities, will remain in effect until the current flood operations agreement expires, or a new Flood Management Plan is developed and implemented, or if there are new Congressional authorizations, directives or mandates.

Vegetation

The Folsom Bridge Project is expected to result in limited impacts to native vegetation, in part in areas also potentially affected by the Folsom DS/FDR Action. These impacts include impacts to jurisdictional wetlands. The project provides mitigation to reduce these impacts to a less-than-significant level. The Sacramento Municipal Utility District Transmission Line Project would result in limited impacts to native vegetation, primarily in areas also potentially affected either by the Folsom Bridge Project or the Folsom DS/FDR Action. Additional impacts to native vegetation in the Folsom DS/FDR Action area are not expected from this project. Potential alterations to stream flow due to modification of the spillway at French Meadows Reservoir would be attenuated in the long distance between L.L. Anderson Dam and the Folsom DS/FDR Action area and are not likely to affect vegetation in the Folsom DS/FDR Action area. Although work related to the Lower American River Common Features Project is on-going, it is close to completion and consists primarily of levee work outside the floodway.

Therefore, the effects of these projects in combination with the Folsom DS/FDR Action would not be cumulatively considerable for vegetation in general, for riparian vegetation, or for wetland vegetation.

Special-status Plant Species

The Folsom Bridge Project is not expected to result in impacts to special-status plant species. The SMUD Transmission Line Project is not expected to result in impacts to special-status plant species. Potential alterations to stream flow due to modification of the spillway at French Meadows Reservoir would be attenuated in the long distance between L.L. Anderson Dam and the Folsom DS/FDR Action area and are not likely to affect vegetation in the Folsom DS/FDR Action area. Although work related to the Lower American River Common Features Project is on-going, it is close to completion and consists primarily of levee work outside the floodway.

Cumulative impacts to federally or state-listed plant species from the Folsom DS/FDR Action are not expected to occur because species in those categories are unlikely to occur in the project area. In addition, other special-status plant species are unlikely to be affected by the Folsom DS/FDR Action. While complete avoidance of such species may not be possible, should they be found in the interim, the proposed mitigation measures would reduce the impact to a less-than-significant level. The implementation of the Folsom DS/FDR Action, its implementation along with the Folsom Bridge Project would not result in cumulatively considerable impacts.

Therefore, the effects of these projects in combination with the Folsom DS/FDR Action would not be cumulatively considerable for special-status plant species.

Special-status Wildlife Species

Construction-related disturbances for all alternatives of the Folsom DS/FDR Action have the potential to affect elderberry shrubs, the host plant for the valley elderberry longhorn beetle. Mitigation measures specified in Section 3.5.2 would reduce this impact to a less-than-significant level. Mitigation for these impacts may be compensated in a joint area with elderberry compensation for the Folsom Bridge Project to provide better quality habitat and greater cost efficiency.

Construction-related disturbances for all alternatives of the Folsom DS/FDR Action have the potential to affect only small amounts of existing amphibian aquatic habitat, most of which is unsuitable to marginally suitable for amphibian species, including special-status species. Terrestrial habitat potentially utilized by western spadefoot toad may be altered temporarily or permanently, but since the distribution of this species appears to be limited by the lack of aquatic breeding habitat rather than terrestrial habitat, none of the proposed alternatives are likely to affect the overall habitat value for this species. Mitigation measures, such as performing pre-construction surveys and implementation of a Mitigation, Monitoring and Reporting Plan for wetlands affected by the project, would reduce both direct and indirect impacts to a less-than-significant level. Therefore, these impacts would result in only a very minor contribution to ongoing cumulative effects caused by other projects within the region.

Construction-related disturbances for all alternatives of the Folsom DS/FDR Action have the potential to affect special-status reptiles, birds, and bats and their habitat, and other breeding migratory birds. However, other habitat is available adjacent to the project area. With the mitigation measures described in Section 3.5.2, these potential impacts would be reduced to a less-than-significant level.

The DEIS/EIR for the Folsom Bridge project (Corps 2006b) found there would be no adverse effects to the California red-legged frog or the giant garter snake from any of the alternatives evaluated for that project because "…no suitable habitat for special-status reptiles, amphibians, or invertebrates was noted during the wetland delineation for the proposed project" (Corps 2006b). The DEIS/EIR for the Folsom Bridge project did identify potential impacts to the white-tailed kite and for the bald eagle if these species were to be present during construction. This document also provided mitigation measures to reduce any potential impacts to a less-than-significant level.

Construction activities for three other projects would be implemented concurrently with, and generally within the footprint of, construction activities implemented for the Folsom DS/FDR Action. Therefore, they would not contribute to additional direct or indirect impacts. These projects include the Reliable Water Supply Project for the City of Roseville, City of Folsom, the San Juan Water District project and the Sacramento Municipal Utility District Transmission Line Project.

Because environmental documents to fulfill NEPA/CEQA requirements have not yet been completed for the redundant water pipeline for the City of Roseville, City of Folsom, the San Juan Water District project, or the Sacramento Municipal Utility District Transmission Line Project impacts to wildlife and wildlife habitat, including special-status species, have not been identified. However, any alternative that would install a new intake and redundant delivery pipeline would affect habitat already disturbed by the existing infrastructure. Furthermore, a substantial portion of the construction-related impacts would occur concurrently with, and within the footprint of, construction activities for the Folsom DS/FDR Action. Likewise, a substantial portion (possibly all) of the construction-related impacts for Sacramento Municipal Utility District Transmission Line Project would occur within the footprint of, construction activities for the Folsom DS/FDR Action or the Folsom Bridge project.

Two projects, the L.L. Anderson Dam Project and the Lower American River Common Features Project would not affect local or proximate populations of wildlife, including special-status species. Potential alterations to stream flow due to modification of the spillway at French Meadows Reservoir would be attenuated in the long distance between L.L. Anderson Dam and the Folsom DS/FDR Action area. Although work related to the Lower American River Common Features Project is on-going, it is close to completion. Impacts to wildlife and their habitat due to the Folsom DS/FDR Action are less-than-significant with mitigation and, therefore, would not contribute to cumulative impacts with the remaining levee work.

Therefore, the effects of these projects in combination with the Folsom DS/FDR Action would not be cumulatively considerable for wildlife in general or for special-status wildlife.

3.6 Soils, Minerals, and Geological Resources

This section discusses the effects that construction may have on soils, minerals, and geologic resources in the study area.

3.6.1 Affected Environment/Existing Conditions

This section describes the soils, minerals, and geological resources in the study area as well as the regulatory setting relevant to these resources.

3.6.1.1 Area of Analysis

The area of analysis for this section includes Folsom Reservoir and the area surrounding the reservoir.

3.6.1.2 Regulatory Setting

Federal Regulations

The Clean Water Act (CWA) includes provisions for reducing soil erosion relevant to water quality. The CWA made it unlawful for any person to discharge any pollutant from a point source (including construction site), into navigable waters, unless a permit was obtained under its provisions. This pertains to construction sites where soil erosion and storm runoff as well as other pollutant discharges could affect downstream water quality. Further details are provided in Section 3.1, Hydrology, Water Quality, and Groundwater.

The National Pollutant Discharge Elimination System (NPDES) process, established by the CWA, is intended to meet the goal of preventing or reducing pollutant runoff. Projects involving construction activities (e.g., clearing, grading, or excavation) involving land disturbance greater than one acre must file a Notice of Intent with the applicable Regional Water Quality Control Board (RWQCB) to indicate their intent to comply with the State General Permit for Storm Water Discharges Associated with Construction Activity (General Permit). This Permit establishes conditions to minimize sediment and pollutant loading and requires preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP) prior to construction. Section 3.1 provides further details.

The Clean Air Act (CAA) also includes provisions for reducing soil erosion relevant to air and water quality. On construction sites, exposed soil surfaces are vulnerable to wind erosion and small soil particulates are carried into the atmosphere. Suspended particulate matter (PM10 and PM2.5) is one of the six criteria air pollutants of the CAA. PM standards and additional details on the CAA are provided in Section 3.3, Air Quality.

State Regulations

State regulations including the Porter Cologne Act and Fish and Game Code 1600 provide provisions to reduce soil erosion. The Porter Cologne Act established the

State Water Resources Control Board (SWRCB) and nine regional boards that regulate water quality. The regional boards carry out the NPDES permitting process for point source discharges and the CWA Section 401 certification program. Additional information is provided in Section 3.1.

Fish and Game Code 1600 requires notification for projects that are planned to occur in or in close proximity to a river, stream, lake, or its tributaries. Applicants are to enter into a “streambed alteration agreement” with the Department of Fish and Game when a construction activity would 1) divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake, 2) use material from a stream bed, or 3) result in the disposal of disposition of debris, waste, or other material containing crumbled, flaked, or ground pavement that could pass into a river, stream, or lake.   The Federal Government is not required to submit a Fish and Game code 1600 permit; however, the same impacts will be addressed under a 401, and a 404 permit.

The 1972 Alquist-Priolo Earthquake Fault Zoning Act (California Public Resources Code (CPRC) Section 2621 et *seq*.) requires local agencies to regulate development within earthquake fault zones to reduce the hazards associated with surface fault ruptures. It also regulates construction in earthquake fault zones.

The 1990 Seismic Hazards Mapping Act (CPRC Sections 2690-2699.6) addresses strong ground shaking, liquefaction, landslides, or other ground failures as a result of earthquakes. This Act requires statewide identification and mapping of seismic hazard zones which would be used by cities and counties to adequately prepare the safety element of their general plans and protect public health and safety (California Geological Survey 2003). Local agencies are also required to regulate development in any seismic hazard zones, primarily through permitting. Permits for development projects are not issued until geologic investigations have been completed and mitigation has been developed to address any issues.

The Surface Mining and Reclamation Act (SMARA) of 1975 (CPRC Sections 2710 *et seq*.) addresses surface mining and requires mitigation to reduce adverse impacts to public health, property, and the environment. SMARA applies to anyone (including a government agency) that disturbs more than one acre or removes more than 1,000 cubic yards of material through surface mining activities, even if activities occur on federally managed lands (California Department of Conservation, Office of Mine Reclamation 2006). Local city and county “lead agencies” develop ordinances for permitting that provide the regulatory framework for mining and reclamation activities. The permit generally includes a permit to mine, a reclamation plan to return the land to a useable condition, and financial reports to ensure reclamation would be feasible. The State Mining and Geology Board reviews lead agency ordinances to ensure they comply with SMARA (California Department of Conservation Office of Mine Reclamation 2006).

The Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (See Title 17 CCR Section 93105) contains the requirements for construction operations that would disturb any portion of an area that is located in a geographic ultramafic rock unit or that has naturally-occurring asbestos, serpentine, or ultramafic rock. Construction or grading operations on property where the area to be disturbed is greater than one acre, require an Asbestos Dust Mitigation Plan to be submitted and approved by the air quality management district before the start of construction. The Asbestos Dust Mitigation Plan must be implemented at the beginning and must be maintained throughout the duration of the operation. In order to receive an exemption from this Airborne Toxic Control Measure, a registered geologist must conduct a geologic evaluation of the property and determine that no serpentine or ultramafic rock is likely to be found in the area to be disturbed. This report must be presented to the executive officer or air pollution control officer of the air pollution control or air quality management district, who may then grant or deny the exemption.

The Asbestos Airborne Toxic Control Measure for Surfacing Applications (17 CCR Section 93106) applies to any person who produces, sells, supplies, offers for sale or supply, uses, applies, or transports any aggregate material extracted from property where any portion of the property is located in a geographic ultramafic rock unit or the material has been determined to be ultramafic rock, or serpentine, or material that has an asbestos content of 0.25 percent or greater. Unless exempt, the use, sale, application, or transport of material for surfacing is restricted, unless it has been tested using an approved asbestos bulk test method and determined to have an asbestos content that is less than 0.25 percent. Any recipient of such materials may need to be provided a receipt with the quantity of materials, the date of the sale, verification that the asbestos content is less than 0.25 percent, and a warning label. Anyone involved in the transportation of the material must keep copies of all receipts with the materials at all times.

Local Regulations

The General Plans for El Dorado, Placer, and Sacramento Counties have a goal of minimizing threat to life, injury, and property from seismic and geological hazards. El Dorado County plans to accomplish this through the adoption and enforcement of development regulations, including building and site standards that provide protection against seismic and geologic hazards and the continued evaluation of seismic-related hazards such as liquefaction, landslides, and avalanches (El Dorado County 2004).

The Sacramento County General Plan calls for a geotechnical report and appropriate mitigation measures for new development in seismic and geologically sensitive areas; a draft of an ordinance to establish a program for the removal or strengthening of poorly anchored parapets, unreinforced masonry walls, and architectural detailing; support efforts of local, State, and Federal agencies in investigating and mitigating geologic hazards; and prohibits development on slopes that exceed 40 percent (County of Sacramento 1993b).

Placer County's General Plan also calls for a variety of policies that focus on minimizing geologic and seismic hazards. These include the preparation of soils reports as well as soils engineering and geologic seismic analysis prior to development in geologic and seismic sensitive areas; appropriate investigation, site selection, and design provisions pertaining to structures that may encounter potential landslides, expansive soils, liquefaction, seismic ground shaking, as well as fault rupture and/or creep; appropriate mitigation for habitual structure and sewage systems located on critically expansive soils; preparation of drainage plans for development in hillside areas; prohibition of activities that may alter land in a manner that increases the potential for landslides; and the support of scientific investigations on geologic and seismic hazards (Placer County 1994).

3.6.1.3 Environmental Setting

This section describes the geological resources, mineral resources, and soils within the study area. Information on the topography, geology, seismicity, landslides, and subsidence is provided in the geological resources section. The mineral resources section focuses on minerals that could be extracted for economically beneficial purposes and the soils section describes the soil characteristics within the study area.

Geological Resources

Topography

The study area is located in the American River watershed which ranges in elevation from 10,000 ft in the Sierra Nevada Mountains (Sierras) to 10 ft above mean sea level (amsl) at the confluence with the Sacramento River. Folsom Reservoir is in the foothills of the Sierras, residing in a valley at the confluence of the North and South Forks of the American River. The reservoir extends into the canyons of the North and South Forks of the American River with an elevation of 466 ft at the Main Concrete Dam spillway. The slope surrounding Folsom Reservoir is generally steep to moderate with exception to the flatter areas of the Peninsula Campground area, Goose Flat, and Granite Bay.

Geology

The study 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 Reservoir 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. Figure 3.6-1 shows the local geologic characteristics surrounding Folsom Reservoir.

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

Ultramific rocks originate from oceanic sediments including volcanic pillow basalts and andesite breccia. These rocks have been lifted from deep beneath the earth’s crust through faulting and underthrusting of the earth’s crust. Outcrops of ultramafic rock are relatively resistant to erosion and often form topographic highs. The largest exposure occurs on Flagstaff Mountain on the Folsom Reservoir Peninsula. Ultramafic rock consists of serpentine minerals (antigorite, chrysotile, and chlorite) and chromite, minor nickel, talc and naturally-occurring asbestos.

Metamorphic rocks are found in a north-northwest trending band that is east of Rattlesnake Bar through most of the peninsula that is between the two arms of the reservoir. Metamorphic rocks are also a part of the Copper Hill Volcanics along the southern portion of the study area. These rocks originate from an ancient chain of volcanic islands and seafloor sediments that have been subjected to heat and pressure forming metavolcanic and metasedimentary rocks that are mainly composed of metamorphosed basaltic breccia, pillow lava, and ash.

Granodiorite intrusive rocks are similar to granite. They are composed of a coarse grained crystalline matrix with slightly more iron and magnesium-bearing minerals and less quartz than granite. The feldspar and hornblend of the granodiorite is less resistant than the quartz crystals and easily weathers. When weathering occurs, the remaining feldspars separate from the quartz resulting in decomposed granite. The granodiorite intrusive rocks occur in the study area in two intrusive plutons, the Rocklin and Penryn Plutons. The Rocklin Pluton is on both sides of Folsom Reservoir and extends to Lake Natoma. The Penryn Pluton is upstream of the Rocklin Pluton.

The volcanic mud flows and alluvial deposits are found downstream of Folsom Reservoir. These deposits form two major formations, the Merhten and Laguna Formation. The Laguna and Merhten Formations occur in a small area in the southeast corner of the Folsom Reservoir. The Merhten Formation is a complex unit of volcanic sediments mixed with volcanic mudflows. It contains volcanic conglomerate, sandstone, and siltstone, all derived from andesitic sources. Portions of the Merhten are gravels deposited by ancestral streams. The Laguna Formation, deposited on the Merhten Formation is a sequence of gravel, sand and silt derived from granitic sources. It was deposited mainly as debris flows.

The western side of Folsom Reservoir is bounded by igneous rocks, primarily granodiorite intrusive rocks. The eastern side of Folsom Reservoir is bounded by a metamorphic intrusive complex that includes the Copper Hill Volcanics and Ultramafic rocks. Naturally-occurring asbestos may be found in both of these formations. Near MIAD in the southeast corner of Folsom Reservoir are the Laguna and Merhten Formations.

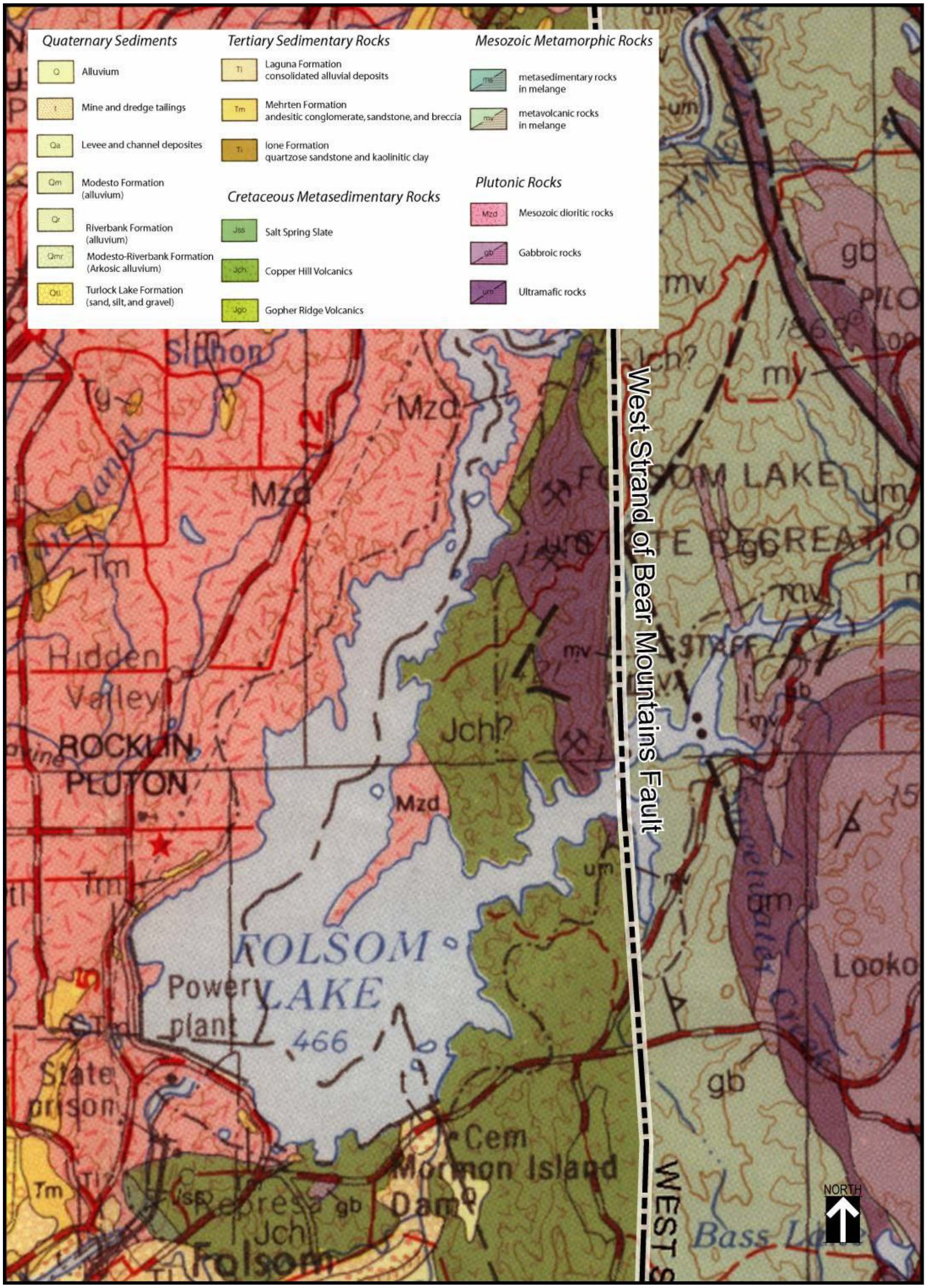
Seismicity

The study area is in 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 the New York Creek. Figure 3.6-1 shows the location of the west strand of the Bear Mountains Fault. The last major movement of this system occurred 140 million years ago and the United States Geological Survey has not designated the Bear Mountains Fault as an active fault (Corps 2006b).

Faults 11 to 102 miles away could potentially generate earthquakes with a magnitude of 6.5 to 7.9 (Wallace, Roberts, and Todd et al. 2003). However, risk of shaking at the study area is relatively low given the distance, hard bedrock, and thin soil cover. The California Geological Survey Seismic Shaking Hazard Map, Figure 3.6-2, shows the study area lies within the 10-20 percent acceleration of gravity zone. This means that within the study area, there is a 10 percent probability that the seismic ground motion will exceed 10 percent to 20 percent of the acceleration of gravity within the next 50 years.

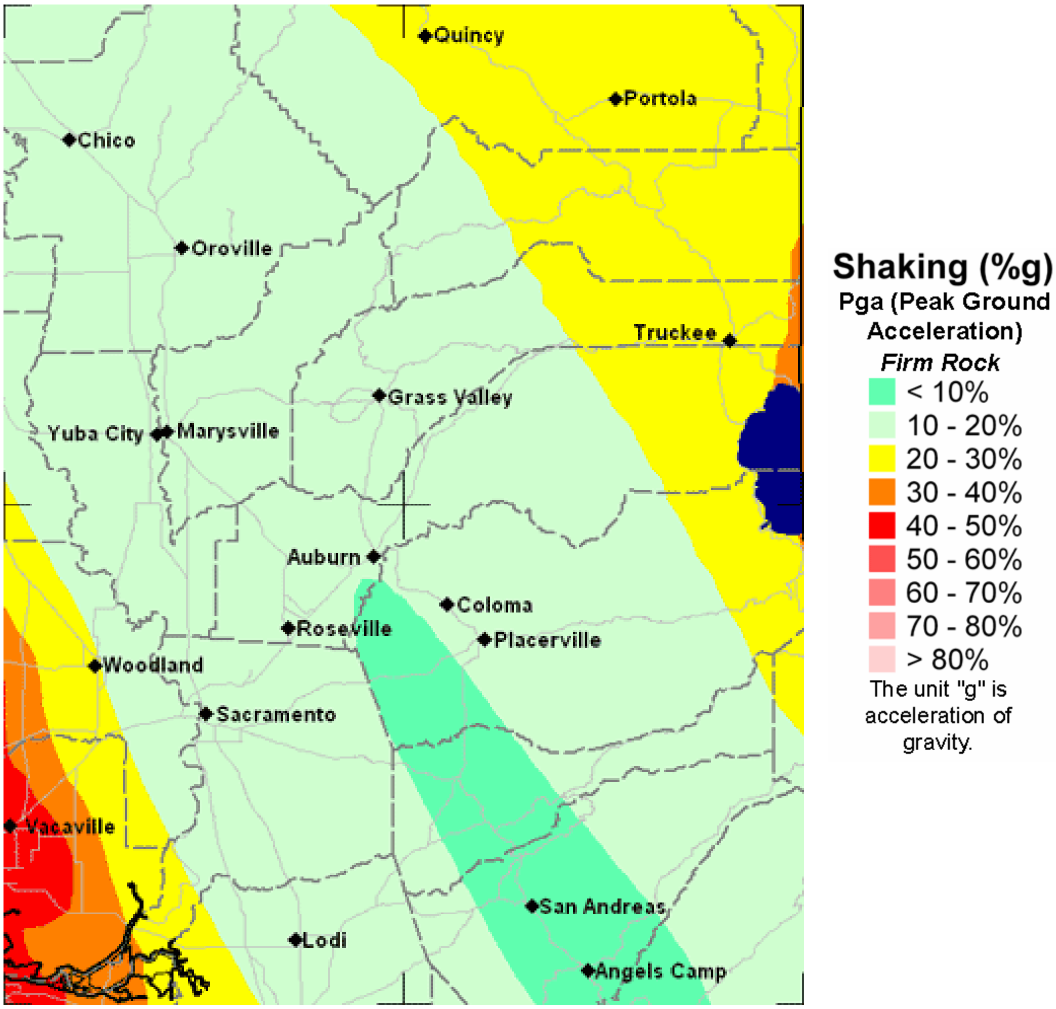
Although the risk of shaking is relatively low, the seismic safety of the Folsom Facility is important considering the large downstream population. Studies in the late 1980s indicated that all features of the Folsom Facility were stable assuming a Maximum Earthquake of Magnitude 6.5 occurring 15 km on the East Branch of the Bear Mountains Fault Zone with exception of risk to MIAD and the Main Concrete Dam. The Corps identified a potential risk of liquefaction of the foundation materials at MIAD. Liquefaction occurs when soils lose their strength and stiffness as a result of earthquake shaking or rapid loading. Soils are not able to support structures resulting in collapse and damage.

In response to risk of liquefaction, Reclamation, in cooperation with the Corps, took actions to reduce this risk through jet grouting. In 1995, after several tests, Reclamation discovered that the lower portion of the foundation was not treated. Although Reclamation has determined the technical risks for liquefaction are low, the foundation at MIAD requires additional treatment to ensure safety.



Source: Wallace, Roberts, and Todd et al 2003

Figure 3.6-1
Local Geology of Folsom Reservoir



Source: California Geologic Survey, Seismic Shaking Hazard Map, http://www.consrv.ca.gov/CGS/rghm/pshamap/pshamain.html

Figure 3.6-2
California Geological Survey Seismic Shaking Hazard Map

Land Subsidence

Land subsidence is the gradual or sudden sinking, or settling of the ground surface. The potential for a possible hazard as a result of subsidence in the study area is very low. Conditions that generally result in subsidence include natural geologic processes such as a cavern collapse or peat oxidation and human activities involving groundwater extraction as well as oil and gas mining. Local collapse of small mines in the Flagstaff mountain area could potentially occur, yet is unlikely. The surrounding rocks of the mines appear to be stable and the extent of the mine shaft is limited. Generally, conditions that may cause subsidence are not of scale to warrant substantial risk of subsidence in the study area (Wallace, Roberts, and Todd et al. 2003).

Landslides

Factors that influence slope stability include slope inclination, bedrock geology, geologic structure, geomorphology, weathering, vegetation, and granitic rocks. Studies along the Highway 50 corridor have shown slides to occur where metamorphic and granitic rocks are in contact as well as where metamorphic and Tertiary sedimentary rocks are in contact. These geologic conditions are present within the study area where the sedimentary Laguna Formation overlies the metamorphic bedrock and along the north side of Folsom Reservoir where the Mehrten Formation tops the granite hills. Despite these geologic formations, landslides are not a major hazard in the study area because soils are thin and the slopes are not particularly steep (Wallace, Roberts, and Todd et al. 2003).

Mineral Resources

A variety of mineral resources are present within the study area. Resources such as chromite, minor nickel, talc, and asbestos are associated with the ultramific rocks and past mining has occurred within the region. The richest chromite mining area of the western foothill region is located on Flagstaff Hill where sporadic mining occurred from 1894 to 1955. Chromite mining also occurred on the peninsula between the Forks of the two rivers. Abandoned or idle pit mines of talc and asbestos also occur on the peninsula. Mineral resources associated with the metamorphic belt include disseminated gold, lode gold, copper, limestone, and zinc. Limestone is mined on the north side of the peninsula across from Rattlesnake Bar.

Placer gold is associated with the Merhten Formation which is exposed in the bluffs northwest of upper Lake Natoma. Mine and dredge tailings in the area have been left from previous placer gold mining activities. The majority of the tailings are found along Lake Natoma, but they can also be found below and to the south of MIAD. The mine and dredge tailings are made up of well-washed large gravel, cobbles, and boulders that have been left in large piles along the river banks. The well-rounded cobbles and boulders could be mined for landscape rock.

Decomposed granite may also be considered a resource within the study area. Although this rock has not been used for commercial purposes, decomposed granite would be used as fill material for the potential dike and dam raises of the selected alternative.

Soils

Soils in higher elevations of the study area are generally thin and have numerous outcroppings of igneous and metamorphic rock. Loose soils of decomposed granite are found on the north and west portions of Folsom Reservoir. These soils are highly erodible and excessive erosion has been observed along the north shore. Clayey and denser soils are concentrated on the south end. Generally, all soils within the study area are of low shrink-swell potential. Serpentine soil and rock are located on the Peninsula between the North and South Forks and south of the South Fork of the American River at Iron Mountain. These soils are high in nickel, chromium, and manganese which limit the variety of plant species that can grow. This soil is also corrosive and generally is not suitable for leach fields (Wallace, Roberts, and Todd et al. 2003).

3.6.2 Environmental Consequences/Environmental Impacts

3.6.2.1 Assessment Methods

Potential impacts associated with each alternative were assessed through a qualitative evaluation. Information presented in the existing conditions discussion above as well as the following factors were considered during the evaluation process:

- Proximity to faults and frequency of seismic activity;
- The types of mineral resources that would be excavated;
- The amount and location of on-site material displacement including stripping, borrow, and fill material; and
- Existing regulatory controls in place to offset and/or mitigate adverse effects.

3.6.2.2 Significance Criteria

Under criteria based on the CEQA Guidelines and agency guidance, the Folsom DS/FDR action would be considered to have significant impacts on geology, soils, and mineral resources if it would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, or injury, or death involving:
    - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault,
    - Strong seismic ground shaking,
    - Seismic-related ground failure, including liquefaction,
    - Landslides;

- Result in the loss of availability of a known mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan that would be of value to the region and the residents of the State;
- Result in substantial soil erosion or loss of topsoil; and
- Airborne naturally-occurring asbestos could expose workers to health risks.

3.6.2.3 Environmental Consequences/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

The No Action/No Project Alternative assumes that no action would be taken by any agency. As described in Section 3.6.1, seismic concerns have been identified for the foundations of both MIAD and the Main Concrete Dam. Liquefaction of the MIAD foundation could occur during seismic activity. The MIAD foundation materials have been treated, yet subsequent testing and analysis revealed that methods to densify the foundation material did not fully treat the lower portion of the foundation. Under the No Action/No Project Alternative, the current seismic risk posed to these facilities would remain into the future.

The No Action/No Project Alternative would retain current risks associated with seismic activity, would not result in a loss of mineral resources or topsoil, and would not disturb naturally-occurring asbestos.

Environmental Consequences/Environmental Impacts of Alternative 1

<u>*Alternative 1 could result in adverse effects associated with seismic activity.*</u>

In order to excavate the Auxiliary Spillway channel, and to produce fill material for MIAD, wing dams, and dikes, blasting would be necessary when hard materials are encountered. Blasting is not expected to affect the nearest active or inactive faults (Sherer 2006a). The nearest faults are too distant from the Folsom DS/FDR site to be affected; therefore, construction of Alternative 1 would not induce earthquake activity along the fault.

In addition, modifications to MIAD and the Main Concrete Dam would provide seismic benefits. The stabilization of both dam foundations would provide additional assurance that seismic activity would not cause severe structure damage.

Potential effects associated with seismic activity would be less than significant.

<u>*Alternative 1 could result in adverse effects associated with landslides.*</u>

As described in Section 3.6.1, landslides are not a major hazard in the study area because soils are thin and the slopes are not particularly steep. Excavation would be conducted in a manner to further minimize the potential for landslides (e.g., excavation may be terraced to stabilize slopes).

Impacts associated with landslides would be less than significant.

Alternative 1 would result in adverse effects associated with the loss of decomposed granite and other minerals which would be extracted from the reservoir bed and used for construction.

Shell material (this includes decomposed granite in addition to impervious soil and miscellaneous shell soil) would be excavated from the designated borrow locations and the Auxiliary Spillway. This material would be used to harden the crests of the earthen dam/dike embankments.

As shown in Figure 3.6-3, decomposed granite would be excavated in the western and northern portions of the study area. Decomposed granite would be a major portion of material removed. This excavation would occur at the bottom of the reservoir and in the Auxiliary Spillway. If borrow material is excavated east of the Left Wing Dam, talc, chromite, and asbestos could be encountered. Although the extraction of these materials as well as decomposed granite may be considered a loss of a known resource, there is no future potential for the commercial mining of these materials.

Table 3.6-1 provides estimated quantities of material that would be excavated and/or placed (as shell material, filter material, bank protection, etc.) for all alternatives. Excavated material includes material extracted from the Auxiliary Spillway site and material stripped from the Left Wing Dam, Right Wing Dam, Dikes 1 through 8, and MIAD prior to placement of filter material and additional shell material.

Table 3.6-1
Folsom Facility Estimated Material Quantities

Alternative	Estimated Quantity of Excavated and Applied Material (CY)
No Action/No Project	0
#1	5,821,000
#2	11,964,000
#3	3,564,000
#4	6,525,000
#5	7,161,000

The impacts associated with the loss of mineral resources would be less than significant.

Alternative 1 would result in effects associated with asbestos disturbance.

Figure 3.6-3 shows the location of where naturally-occurring asbestos may be present in the Copper Hill Volcanics and ultramafic rocks in the southern and eastern portions of the reservoir. Samples collected from D1/D2 borrow site investigations in the vicinity of MIAD and Dike 8 were subject to a petrographic examination of amphibolite schist bedrock. Termolite, an asbestoform mineral, was one of the main minerals in the amphibolite schist. Additional screening level tests (using a polarized light microscope) revealed that about 97 percent of the amphibole schist samples were positive for less than 1 percent regulated asbestos (from a regulatory perspective, the shape/size and mineralogy may constitute concern) (Reclamation 2006d).

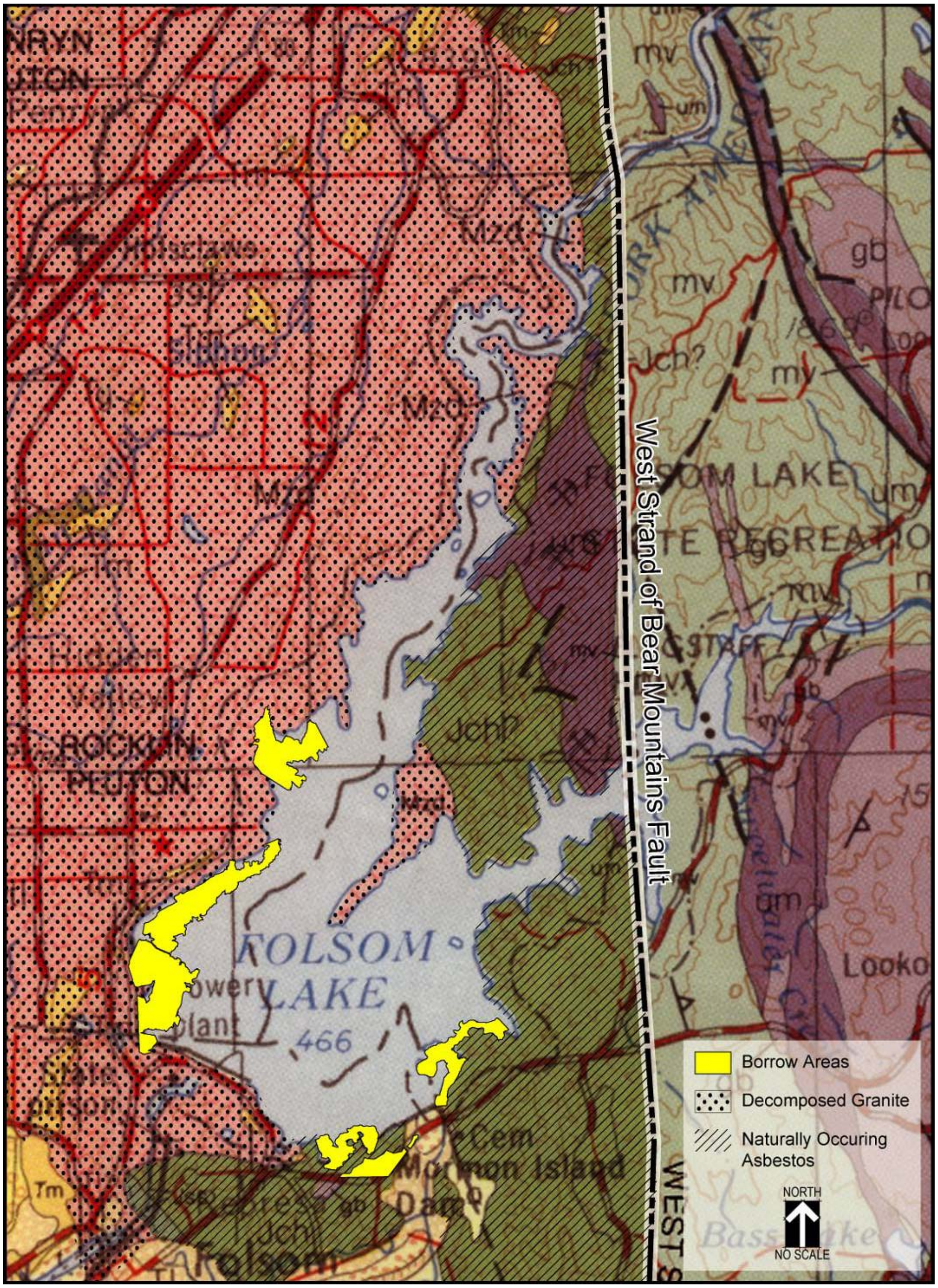
In accordance to the Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (Title 17 CCR Section 93105), the Sacramento and El Dorado Counties Air Quality Management District were notified of the positive tests. Permits would be required prior to any earth displacement in this location of the Folsom DS/FDR study area. In order to obtain the permits from both Sacramento and El Dorado Counties, a geologic site characterization report (signed by a California Registered Geologist) must be prepared as well as a county approved Dust Mitigation Plan. These measures are in place to reduce impacts associated with asbestos excavation.

The impacts associated with the excavation of asbestos would be significant. Mitigation Measure GR-1 would reduce impacts to a less than significant level.

Alternative 1 would result in adverse effects associated with the loss of topsoil.

The Auxiliary Spillway, borrow areas, wing dam, and dike embankments would be stripped of organics prior to excavation and borrow development. This would result in a loss of topsoil. However, the majority of this soil is not of high ecological or agricultural value due to either the shallow nature of soil over granitic bedrock, the origin of the material was either excavated from the local granitic borrow sites when the facility was constructed during the 1950s, or the borrow is excavated from the bottom of the reservoir. (Ecological impacts associated with excavation are provided in Section 3.5, Terrestrial Vegetation and Wildlife).

Adverse effects associated with the loss of topsoil would be less than significant.



Source of geologic formations: Geotechnical Consultants 2003

Figure 3.6-3
Decomposed Granite and Asbestos

Alternative 1 would result in significant impacts associated with an increased potential for soil erosion.

Construction activities would expose bare ground surface through stripping and excavation as well as through the use of staging/processing areas and movement of large construction equipment. These activities remove the vegetative root structure that stabilizes soil and contributes to the protection of the soil surface from wind and soil erosion. The newly exposed surface is exposed to storm water runoff during the rainy season and remains vulnerable until new vegetation has the opportunity to become established.

Impacts from soil erosion would be significant. Mitigation Measure GR-2 would reduce impacts to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 2
The potential impacts associated with seismic activity, landslides, and asbestos disturbance would be the same as for Alternative 1. The potential for loss of minerals and topsoil through excavation and soil erosion would be greater than Alternative 1. This is because more material would be excavated for shell placement. Table 3.6-1 provides estimated quantities of material that would be excavated and placed for each alternative. All impacts would be less than significant with the exception of impacts from soil erosion and asbestos disturbance. Mitigation Measures GR-1 and GR-2 would reduce impacts to a less than significant level.

Environmental Consequence/Environmental Impacts of Alternative 3
The potential impacts associated with seismic activity, landslides, asbestos disturbance, and loss of minerals and topsoil through excavation and soil erosion would be similar to Alternative 1. Less material would be excavated for fill (Table 3.6-1) as parapet walls would potentially be constructed. All impacts would be less than significant with the exception of soil erosion and asbestos disturbance. Mitigation Measures GR-1 and GR-2 would reduce impacts to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 4
The potential impacts associated with seismic activity, landslides, asbestos disturbance, and loss of minerals and topsoil through excavation and soil erosion would be greater than Alternatives 1 and 3. This is because additional material would be excavated to raise all earthen structures. Table 3.6-1 provides estimated quantities of material that would be excavated and placed for this alternative. All impacts would be less than significant with the exception of soil erosion and asbestos disturbance. Mitigation Measures GR-1 and GR-2 would reduce impacts to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 5

The potential impacts associated with seismic activity, landslides, asbestos disturbance, and loss of minerals and topsoil through excavation and soil erosion would be greater than Alternatives 1, 3, and 4. This is because no Auxiliary Spillway would be constructed and all shell material would be excavated from within the reservoir and at the D1/D2 location. All potential borrow sites would be developed under Alternative 5. Table 3.6-1 provides estimated quantities of material that would be excavated and placed for this alternative. All impacts would be less than significant with the exception of soil erosion and asbestos disturbance. Mitigation Measures GR-1 and GR-2 would reduce impacts to a less than significant level.

3.6.3 Comparative Analysis of Alternatives

None of the impacts associated with each alternative would be significant with the exception for the potential for asbestos disturbance and soil erosion. Asbestos disturbance and soil erosion impacts would be mitigated through Mitigation Measures GR-1 and GR-2, respectively.

Table 3.6-1 shows the estimated amount material that would be excavated and placed for each alternative. With exception to the No Action/No Project Alternative, Alternative 3 requires the least amount of material handling and processing. Consequently, Alternative 3 has the least potential for adverse effects associated with asbestos disturbance, loss of topsoil, and erosion. In contrast, Alternative 2 involves the greatest amount of material handling as a result of tunnel construction and it would result in the largest potential for adverse effects. The amount of material and associated impacts for the remaining alternatives in increasing order are Alternatives 1, 4, and 5.

3.6.4 Mitigation Measures

Implementation of Mitigation Measures GR-1 and GR-2 would reduce asbestos, soil, and geological resource impacts to a less than significant level.

GR-1: In order to obtain air quality permits from both Sacramento and El Dorado Counties, a geologic site characterization report (signed by a California Registered Geologist) and a county approved Dust Mitigation Plan must be prepared. The geologic site characterization report will be useful for mitigation purposes by identifying areas of naturally-occurring asbestos. The Dust Mitigation Plan will specify the activities and Best Management Practices (BMPs) required to minimize airborne naturally-occurring asbestos. These activities and BMPs are specified in the Airborne Toxic Control Measure regulation as well as the more restrictive county requirements. These include, but are not limited to, the following:

- Pre-wet work area and keep area sufficiently wet during construction operations. An approved palliative material may also be used to seal loose fibers to the parent material;
- Limit vehicle access and speed on serpentine and other materials containing asbestos;
- Cover areas that are exposed to vehicle travel;
- Material transfers and stockpiles of loose material must be covered, kept adequately wet, or sealed by an approved palliative; and
- Worker safety precautions and monitoring should be considered. Written employee notifications should be provided, notifying employees of the potential health risk and requirements of the asbestos dust mitigation plan (El Dorado County 2003).

GR-2: Prior to construction activity, a Notice of Intent must be filed with the Central Valley RWQCB to indicate the intent to comply with the General Permit. The General Permit establishes conditions to minimize sediment and pollutant loading and requires preparation and implementation of a SWPPP prior to construction (see Section 3.1 for more details). The purpose of this Plan is to prevent the movement of construction pollutants (in contact with storm water) into receiving water. This is accomplished through the selection of BMPs which are measures that are applied to control erosion and sediment transport. The SWPPP lists the BMPs that will be used and identifies the placement of the BMPs (State Water Resources Control Board 2006). BMPs will be used during the construction period to stabilize the soil in affected areas (e.g., Auxiliary Spillway and borrow and fill sites) until vegetation will be reestablished as well as reduce the intensity of stormwater runoff and intercept sediment prior to offsite transport. BMPs may include the installation of hay bales, sediment traps, fiber rolls, sediment fences, and rock check dams. Proper installation, monitoring and maintenance of BMPs will be implemented and enforced. Additional details are provided in Section 3.1.

3.6.5 Cumulative Effects

Construction activities associated with the Folsom DS/FDR action in combination with construction of the projects identified in Table 5-1 would not have any non-mitigable significant cumulative effects on soil, mineral, or geological resources.

Combined construction activities would not result in cumulative adverse effects associated with seismic activity. Projects that are within close proximity to the study area include the New Folsom Bridge. Blasting could potentially be required for the New Folsom Bridge. However, blasting would be of sufficient distance from the Bear Mountains Fault system and would not trigger seismic activity. Seismic activity is also unlikely given that the Bear Mountains Fault system is not designated as an active fault and that the risk of seismic shaking is relatively low. Cumulative adverse effects associated with seismic activity would be less than significant.

Combined construction activities would not result in cumulative adverse effects associated with landslides. Although the construction of the New Folsom Bridge and the Folsom DS/FDR actions would involve a substantial amount of soil and material displacement, the potential for landslides within the study area is low and construction techniques would be implemented to minimize the potential for landslides. Cumulative adverse effects associated with landslides would be less than significant.

Combined construction activities would result in adverse effects associated with the loss of minerals or topsoil which would be extracted and used for construction. Although the construction of the New Folsom Bridge and the Folsom DS/FDR actions would involve a substantial amount of soil and material displacement, impacts associated with this loss would be less than significant. Any minerals that would be excavated would not be used for commercial purposes and therefore would not be considered an economic loss. Similarly, excavated topsoil is not of a high ecological or agricultural value. Cumulative adverse effects associated with soil losses would be less than significant.

Combined construction activities would result in significant impacts associated with an increase potential for soil erosion. Construction activities for the Folsom DS/FDR Action and the New Folsom Bridge would expose bare ground surface through stripping and excavation as well as through the use of staging/processing areas and movement of large construction equipment. This would substantially increase erosion potential. However, both actions would be mitigated through the implementation of BMPs set forth in the SWPPP. These BMPs would reduce erosion and intercept sediment present in stormwater runoff. The SWPPP and implementation of the BMPs would effectively mitigate impacts associated with soil erosion. Cumulative adverse effects associated with soil erosion would be significant. The development and implementation of an SWPPP for each action would effectively mitigate impacts to a less than significant level.

3.7 Visual Resources

Both natural and artificial landscape features contribute to perceived visual images and the aesthetic value of a view. The value is determined by contrasts, forms and textures exhibited by geology, hydrology, vegetation, wildlife, and man-made features. Individuals respond differently to changes in the physical environment, depending on prior experiences and expectations and proximity and duration of views. Therefore, visual effects analyses tend to be highly subjective in nature.

This section describes the existing conditions with respect to the visual resources in the Folsom DS/FDR area. The existing conditions describe the visual character of the area and identify potentially sensitive visual resources. This section also identifies the potential environmental impacts on visual resources that could result from each of the proposed alternatives.

3.7.1 Affected Environment/Existing Conditions

3.7.1.1 Area of Analysis

The study area of visual resources for this EIS/EIR includes Folsom Reservoir and lands adjacent to it in the Folsom Lake State Recreation Area (FLSRA) and the surrounding area that are in visible range of the areas of activity for each alternative (e.g., Folsom Dam, potential dike construction zones, potential borrow areas, potential contractor use areas, and processing and concrete mixing areas). These areas consist of Folsom Reservoir itself (including marinas and boat launching facilities), other public facilities (including campgrounds, day use facilities, roads, numerous hiking trails along Folsom Reservoir), and private properties (including residential housing along Folsom Reservoir and the surrounding hillsides).

3.7.1.2 Regulatory Setting

Reclamation and the California Department of Parks and Recreation (CDPR) do not have regulations or specific guidance on how to evaluate impacts to visual resources. As a result, this analysis uses the Scenery Management System (SMS) developed by the U.S. Department of Agriculture (USDA) Forest Service as a guide to assess visual impacts.

3.7.1.3 Environmental Setting

FLSRA represents an important visual and scenic resource within the region. Although the manmade reservoirs were created for flood control, water supply and power generation, the resulting waterfront setting affords visitors with dramatic panoramas of the water and the surrounding natural landscape. The growing urban development around the reservoir also affords visitors with views of less scenic urban elements such as the dam, electric transmission facilities, industrial areas, and residential subdivisions and roadways. Together, the length and configuration of the FLSRA’s shoreline, coupled with the hilly topography, provide substantial variety in both viewpoint orientation and available viewsheds and create a wealth of viewing conditions and opportunities. These resources include a combination of panoramic views in which the reservoir forms the dominant foreground element and the surrounding Sierra Foothills landscape forms the background, as well as distinctive landscape and built features.

Numerous visual resources, such as panoramic views, vista points, landscape features, and built features contribute to an existing positive visual experience for FLSRA users. There are also, however, a number of visual features or characteristics in the FLSRA and vicinity that detract from the quality of the views and scenic character. Some of these features are within the FLSRA (e.g., parking lots, utility corridors) while others are outside the FLSRA boundaries. In addition, visual resources include public views of the FLSRA from external viewpoints, including from private properties and local roadways. There are no historic buildings or scenic highways in the area of analysis; however there are cultural resources. These are described in Section 3.11, Cultural Resources.

The remaining portions of this Environmental Setting section describe these visual resources. Much of the content of these descriptions was taken from the FLSRA Resource Inventory (Wallace, Roberts, and Todd et al. 2003). Visual resources are described in the context of the scenery management system, which is used by the USDA Forest Service to evaluate impacts to visual resources. Scenic attractiveness classifications are a key component of the SMS and are used to classify visual features into the following categories (USDA Forest Service 1995):

- Class A “distinctive.” Areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide unusual, unique, or outstanding scenic quality. These landscapes have strong positive attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

- Class B “typical.” Areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide ordinary or common scenic quality. These landscapes generally have positive, yet common, attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

- Class C “indistinctive.” Areas where landform, vegetation patterns, water characteristics, and cultural features have low scenic quality. Often water and rock form of any consequence are missing in Class C landscapes. These landscapes have weak or missing attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

Class A and B visual resources typically include state or federal park, recreation, or wilderness areas, including rivers and reservoirs. Class C resources generally include areas that have low scenic quality and contain more common landscapes.

In addition, the SMS uses three primary distance zones as part of the assessment of visibility (USDA Forest Service 1995). These distance zones, described below, are foreground, middleground, and background.

- Foreground (0 to 0.5 mile): At a foreground distance, people can distinguish small boughs of leaf clusters, tree trunks and large branches, individual shrubs, clumps of wildflowers, medium-sized animals, and medium-to-large birds.

- Middleground (0.5 to 4 miles): At a middleground distance, people can distinguish individual tree forms, large boulders, flower fields, small openings in the forest or tree line, and small rock outcrops. Form, texture, and color remain dominant, and pattern is important.

- Background (4 miles to horizon): At a background distance, people can distinguish groves or stands of trees, large openings in the forest, and large rock outcrops. Texture has disappeared and color has flattened, but large patterns of vegetation or rocks are still distinguishable, and landform ridgelines and horizon lines are the dominant visual characteristics.

Panoramic Views

The FLSRA's most notable visual resources are dramatic and high quality panoramic views. These panoramas include views across the reservoir, views from the reservoir, and views out over the surrounding nonpark landscape. East-facing views from the western shores of Folsom Reservoir include the sweep of the reservoir surface (Figure 3.7-1) in the foreground with the regionally characteristic landscape of rolling hills, open grasslands, and scattered oak and gray pine woodlands on the peninsula. Views north from Folsom Dam provide a sweeping view of Folsom Reservoir framed by foothills. Each of these panoramas includes a unique combination of water, sky, and natural and built features.

Vista Points

Because of the varied topography and sheer length of shoreline within the FLSRA, there are innumerable points from which to enjoy the area's visual resources. However, limitations on vehicle access around the reservoirs prevents visitation to some vista points and increases visitation at accessible sites. Lake Overlook—the highest point within the park—is one of the best-known vista points. From Lake Overlook, one is presented with sweeping views of Lake Natoma, the Sierra Foothills, Nimbus Flat, Nimbus Dam, Nimbus Shoals, and urban development in the valley below. Observation Point by Folsom Dam provides sweeping views of

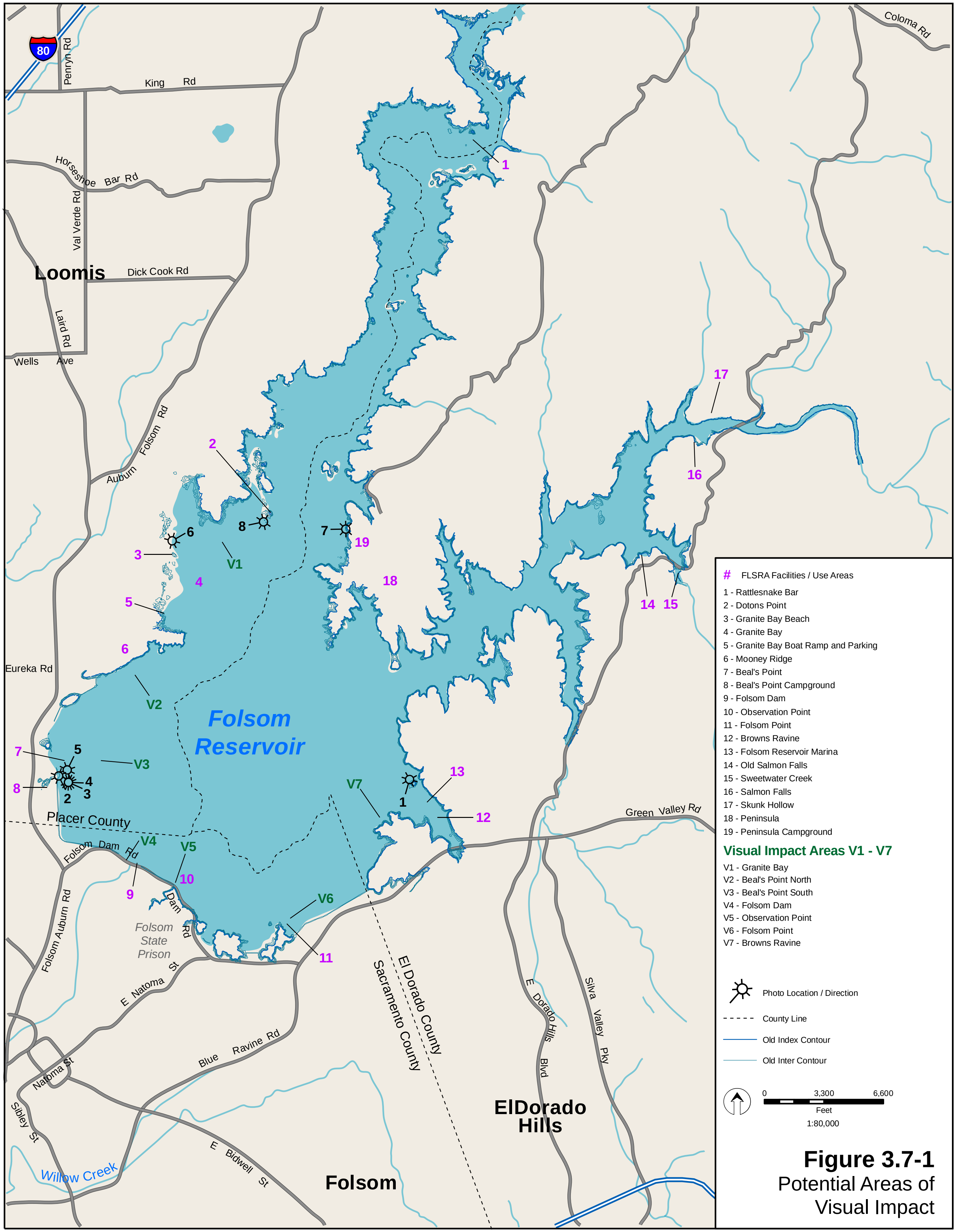


Figure 3.7-1
Potential Areas of Visual Impact

Source: ENTRIX

Folsom Reservoir, the dikes, and the rugged oak-studded hills of the peninsula. In addition to these vista points, other frequently visited viewing areas that provide sweeping vistas of the FLSRA are near public facilities along the reservoir shoreline, such as the Folsom Reservoir Marina, Folsom Point, Beal's Point, Granite Bay, Doton’s Point, etc. (Figure 3.7-1).

Other vista points are accessible only by trail and receive much lower visitation due to their more limited access and remote location. For example, a vista point exists at the tip of the peninsula on the eastern shore of Folsom Reservoir. This vista point is visited primarily by mountain bikers and hikers on the Danington Trail. From this vantage point, views extend from the rugged eastern shore of the North Fork of the American River, south toward Folsom Dam, and west toward the beaches at Granite Bay.

Landscape Features

The rugged peninsula separating the North and South Forks of the American River at Folsom Reservoir is visible from many parts of the park and contributes to a sense of wild undeveloped countryside due to the limited development. Flagstaff Hill (at over 1,400 feet) and Shirttail Peak (at over 1,300 feet) mark the highest points of the prominent ridgeline that forms the peninsula. Nearby Iron Mountain, where New York Creek meets the South Fork of the American River, also stands out on the eastern shore of Folsom Reservoir rising almost 300 feet above the water. Along the western shore of Folsom Reservoir where it meets the North Fork of the American River, a substantial ridgeline rises above the water between North Granite and Horseshoe Bar. Steep gorges further upstream on both the North and South Forks of the American River (as they extend toward the Sierra Foothills) are even more impressive.

Distinctive Built Features

The aesthetic value of built features in the natural landscape is subject to different interpretations. Whereas such features are often distinctive because of their contrast with their setting, determining whether their aesthetic contribution is positive or negative can be quite subjective. For example, the damming of the American River at Folsom has resulted in a number of distinctive built features within the FLSRA. The major feature is Folsom Dam, a concrete structure more than 1,400 feet long and 340 feet high (Reclamation 2006). Associated structures include earthen dikes that emerge from Folsom Dam and form the eastern and western shores at the south end of Folsom Reservoir. While certainly visually distinctive, the effect of these features on the visual character of the FLSRA is mixed. The large engineering projects detract from the “natural” character of the setting, and the natural character of the FLSRA is one of its scenic strengths.

Built Features within the FLSRA

In several locations throughout the FLSRA, built features or human intervention detract from the overall visual quality and ultimately the visitor experience. These features include the dams, parking lots, utility corridors, and temporary structures associated with park activities. A complete description of parking lots, utility corridors, and temporary structures associated with park activities has been included in the FLSRA Resource Inventory (Wallace, Roberts and Todd et al. 2003).

Exposed Shoreline of Folsom Reservoir

Seasonal fluctuation in water levels results in considerable impacts on the visual quality of Folsom Reservoir. The highest elevations occur in late winter or early spring when storm and snowmelt runoff fill the reservoir; the lowest in late fall or early winter following the dry season. As a result, the elevations drop continuously—up to about 70 feet in normal years—from the start of the peak recreation season around Memorial Day through the season’s end at Labor Day. Unlike bodies of water under tidal influence or natural riparian corridors as found upstream in the South and North Forks of the American River, Folsom Reservoir does not have the advantage of habitats that can adapt to such large changes in environmental condition. This leaves much of the exposed shoreline devoid of vegetation. The relatively gradual slope to the reservoir bottom results in a greater area of exposed shoreline with lower water levels, resulting in the “bathtub ring” effect common to California reservoirs. As the water level elevation and water surface area within Folsom Reservoir shrink over the course of the recreation season, so does the quality of the views along its 75 miles of shoreline. This condition is further exacerbated by visitors who drive their vehicles out onto the exposed slopes, causing rutting and erosion of the exposed areas. In some years, this condition is minimized by a striking display of wildflowers along shorelines with a particular aspect, including along the eastern shoreline between New York Creek and Old Salmon Falls.

External Views

Public views of the FLSRA from external viewpoints are limited due to the topography of the area, the heavy vegetation within the FLSRA boundaries, and the nature of land ownership around the FLSRA. Views from private property, particularly of Folsom Reservoir, are impressive as reflected by the high-end residential estate development occurring around the reservoir. In El Dorado County, this style of development commands the hills along the majority of the eastern boundary of Folsom Reservoir to Salmon Falls. As this development extends from Salmon Falls Road north of Green Valley Road, property size increases dramatically as Folsom Reservoir views become a major selling factor. Along the western boundary of Folsom Reservoir in Placer County, most of the choice properties with reservoir views have been developed (e.g., the housing development along Mooney Ridge). In addition, several exclusive gated subdivisions currently exist on the ridge above the reservoir. As a result, few clear public access points exist from which to view Folsom Reservoir.

Views from Key Observation Points

Key observation points were identified based on the methods described in the Assessment Methods section below. These key observation points were selected if features of one or more alternatives were within a line of site and if they represented foreground or middleground views (i.e., within 4 miles of the key observation point). Identified Key Observation Points include Folsom Reservoir (on-reservoir viewpoint), Browns Ravine/Folsom Reservoir Marina, Beal's Point, Granite Bay, Peninsula Campground, various Folsom Reservoir trails, and a few private residential neighborhoods. These key observation points and associated alternative views, which are listed on Table 3.7-1 and shown on Figure 3.7-1, are described below.

Folsom Reservoir

Folsom Reservoir is used throughout the year for various boating activities. Although most recreational boats are launched from the various boat launch facilities including Folsom Reservoir Marina (at Browns Ravine) and Granite Bay Marina, views for boaters are not limited to these areas. With the exceptions of views of the marina and other man-made features, these on-reservoir views are Class A and B visual resources (as discussed in the next section). Also, boaters have access to areas in close proximity to all construction activities occurring along the reservoir’s shoreline. As a result, all construction activity areas may represent foreground views depending on the location of the boat at any one time.

Browns Ravine/Folsom Reservoir Marina

Browns Ravine/Folsom Reservoir Marina consist of a marina with both boat docks and upland boat storage areas, and a picnic area on the adjacent point to the west of the marina. Most views from the marina toward the reservoir are obstructed by the presence of boats and/or docks, which are aligned along the relatively narrow ravine. The best views are available from the picnic area west of the marina. These views are Class A or B visual resources. With the exception of the potential borrow area and processing facility at Browns Ravine (V7), all construction activity areas are either not in the line of sight or are at least 3.5 miles away. With the exception of the immediately adjacent shoreline, views out over the reservoir capture largely background views, where ridgelines and horizon lines are the dominant visual characteristic. Stands of trees and open grass fields are distinguishable, but specific features (e.g., individual building structures) are barely noticeable. Along the immediate shoreline area, foreground views of tree stands and grass fields are present, with natural features readily distinguishable. The closest portion of the Browns Ravine (V7) activity area is within 0.25 mile of the marina picnic area (Figure 3.7-1); this area is shown on Figure 3.7-2.

Table 3.7-1 Viewing Distances from Use Areas to Visual Impact Areas

View Area	Potential Visual Impact Areas													
	Granite Bay V1		Beals Point North V2		Beals Point South V3		Folsom Dam V4		Observation Point V5		Folsom Point V6		Brown's Ravine V7	
	Activity Area visible?	Distance to Activity Area (miles)	Activity Area visible?	Distance to Activity Area (miles)	Activity Area visible?	Distance to Activity Area (miles)	Activity Area visible?	Distance to Activity Area (miles)	Activity Area visible?	Distance to Activity Area (miles)	Activity Area visible?	Distance to Activity Area (miles)	Activity Area visible?	Distance to Activity Area (miles)
FLSRA Facilities/Use Areas														
Folsom Lake Areas														
On Folsom Lake*	Yes	various	Yes	various	Yes	various	Yes	various	Yes	various	Yes	various	Yes	various
Brown's Ravine/Folsom Lake Marina*	Yes	3.8	Yes	4.2	Yes	4.5	Yes	4.0	Yes	3.5	No	--	Yes	0.75
Folsom Point (closed during construction)	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--
Observation Point (closed to visitors along with Folsom Dam)	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--
Beals Point Day Use Facility*	No	--	Yes	1.25	Yes	0.0	Yes	1.25	Yes	1.8	Yes	3.25	Yes	4.1
Beals Point Campground	No	--	No	--	No	--	No	--	No	--	No	--	No	--
Granite Bay*	Yes	0.0	Yes	0.5	No	--	No	--	No	--	Yes	4.0	Yes	3.75
Old Salmon Falls	No	--	No	--	No	--	No	--	No	--	No	--	No	--
Sweetwater Creek	No	--	No	--	No	--	No	--	No	--	No	--	No	--
Peninsula Campground*	Yes	2.0	Yes	2.5	Yes	4.5	No	--	No	--	No	--	No	--
Folsom Lake River Access Areas	No	--	No	--	No	--	No	--	No	--	No	--	No	--
Skunk Hollow and Salmon Falls	No	--	No	--	No	--	No	--	No	--	No	--	No	--
Folsom Lake Trails														
Pioneer Express Trail*	Yes	0.1	Yes	0.1	No	--	No	--	No	--	No	--	Yes	3.75
Los Lagos Trail	No	--	No	--	No	--	No	--	No	--	No	--	No	--
Doton's Point ADA Trail*	Yes	0.75	Yes	1.6	No	--	Yes	4.1	Yes	4.0	Yes	4.25	Yes	3.75
Granite Bay Multi-Use Trails*	Yes	0.1	Yes	0.5	No	--	No	--	Yes	4.0	Yes	4.25	Yes	4.0
Folsom Point/Brown's Ravine Trail*	Yes	3.5	Yes	3.75	Yes	4.5	Yes	4.0	Yes	3.5	Yes	2.5	Yes	1.0
Sweetwater Creek Trail	No	--	No	--	No	--	No	--	No	--	No	--	No	--
Darrington Trail	No	--	No	--	No	--	No	--	No	--	No	--	No	--
Peninsula ADA Trail*	Yes	2.0	Yes	3.0	Yes	4.0	Yes	3.75	Yes	3.5	Yes	3.3	Yes	2.25
Private Residential Neighborhoods	Yes	various	Yes	various	Yes	various	Yes	various	Yes	various	Yes	various	Yes	various

Definition of Visual Impact Areas
Granite Bay V1 includes two aggregate processing facilities and the adjacent potential borrow area just northeast of Granite Bay.
Beals Point North V2 includes one aggregate processing facility and the adjacent potential borrow area northeast of Beals Point.
Beals Point South V3 includes one combined aggregate processing/concrete facility and the adjacent potential borrow area surrounding Beals Point.
Folsom Dam V4 includes the dam and associated upgrades.
Observation Point V5 includes one combined aggregate processing/concrete facility and the adjacent potential construction area.
Folsom Point V6 includes one aggregate processing facility and the adjacent potential borrow area and potential construction area surounding Folsom Point.
Brown's Ravine V7 includes a combined aggregate processing/concrete facility, an aggregate processing facility and the adjacent potential borrow area west of Browns Ravine.

NA - not applicable
* Key observation point based on potential visual impact areas being in direct line of sight to and within 3 miles

Figure 3.7-2
View of Browns Ravine from Folsom Reservoir Marina
(Photo Location 1 in Figure 3.7-1)

Beal's Point

Beal's Point consists primarily of picnic grounds, beach/swimming areas and associated facilities. Along the perimeter of Beal's Point, there are unobstructed views of most areas of Folsom Reservoir. These views are Class A or B visual resources. With the exception of the immediately adjacent shoreline to the northeast, views out over the reservoir capture largely background views, where ridgelines and horizon lines are the dominant visual characteristic. Stands of trees and open grass fields are distinguishable, but specific features (e.g., individual building structures) are barely noticeable. Along the immediate shoreline area, foreground views of tree stands and grass fields are present, with natural features, dikes and houses readily distinguishable. Beal's Point is within the Beal's Point South (V3) construction activity area (foreground), which includes a potential borrow area and a processing facility. In addition, Beal's Point North (V2), Folsom Dam (V4), Observation Point (V5), and Folsom Point (V6) construction activity areas are within the middleground of Beal's Point (Figure 3.7-1). Figure 3.7-3 views the dikes between Beal's Point and Folsom Dam, and is the location of a proposed processing facility in the foreground. Figure 3.7-4 views Folsom Dam (V4) where proposed dam raising activities would occur. Figure 3.7-5 views the shoreline between Folsom Dam and Browns Ravine, which include proposed borrow areas and concrete and process facilities associated with middleground views of Observation Point (V5) and Folsom Point (V6). Figure 3.7-6 views the potential borrow areas and processing facility of Beal's Point South

(V3) (foreground) and Beal's Point North (V4) (middleground), including the Mooney Ridge residential development on the ridge overlooking Folsom Reservoir.

Figure 3.7-3
View from Beal's Point at Right Wing Dam
(Photo Location 2 in Figure 3.7-1)

Figure 3.7-4
View from Beal's Point South toward Folsom Dam
(Photo Location 3 in Figure 3.7-1)

Figure 3.7-5
View from Beal's Point toward Folsom Point
(Photo Location 4 in Figure 3.7-1)

Figure 3.7-6
View from Beal's Point North toward Mooney Ridge
(Photo Location 5 in Figure 3.7-1)

Granite Bay

Granite Bay consists of a marina with launching ramps, picnic grounds, beach/swimming areas and associated facilities. Reservoir views are generally toward Doton's Point, the Peninsula, and Browns Ravine on the eastern side of the reservoir. These views are Class A or B visual resources. With the exception of the immediately adjacent shoreline to the south and to Doton's Point to the northeast, views out over the reservoir capture largely background views, where ridgelines and horizon lines are the dominant visual characteristic. Stands of trees and open grass fields are distinguishable, but specific features (e.g., individual building structures) are barely noticeable. Along the immediate shoreline area, foreground views of tree stands and grass fields are present, with natural features readily distinguishable. The potential borrow area and processing facilities at Granite Bay (V1) and a small portion of the borrow area at Beal's Point North (V2) are within the foreground view of Granite Bay facilities. All other construction activity areas are either not in sight or are at least 3.5 miles away. Figure 3.7-7 shows a view from Granite Bay beach of the potential borrow area and processing facilities to the northeast.

Figure 3.7-7
View from Granite Bay to northeast
(Photo Location 6 in Figure 3.7-1)

Peninsula Campground

Peninsula Campground, which is present along the shoreline of the west side of the Peninsula, has unobstructed views of the west side of Folsom Reservoir. These views are Class A or B visual resources. With the exception of the immediately adjacent Peninsula shoreline, views out over the reservoir capture largely background views, where ridgelines and horizon lines are the dominant visual characteristic. Stands of trees and open grass fields are distinguishable, but specific features (e.g., individual building structures) are barely noticeable. Along the immediate shoreline area, foreground views of tree stands and grass fields are present, with natural features readily distinguishable. Only views of potential borrow areas and processing facilities at Granite Bay (V1) and Beal's Point North (V2) are present within the middleground, while no potential construction activity areas are within the foreground views. Figure 3.7-8 shows a view from the Peninsula campground toward the potential borrow area and processing facilities at Granite Bay (V1).

Figure 3.7-8
View from Peninsula Campground West Toward Granite Bay
(Photo Location 7 in Figure 3.7-1)

Folsom Reservoir Trails

Folsom Reservoir trails offer a variety of views of the reservoir and its shorelines from different vantage points, several of which are key observation points. These trails include Pioneer Express Trail, Doton's Point ADA Trail, Granite Bay Multi-use Trails, Folsom Point/Browns Ravine Trail, and Peninsula ADA Trail. Selected views along each of these trails represent Class A or B visual resources. With the exception of the immediately adjacent shoreline, views out over the reservoir capture largely background views, where ridgelines and horizon lines are the dominant visual characteristic. Stands of trees and open grass fields are distinguishable, but specific features (e.g., individual building structures) are barely noticeable. Along the immediate shoreline area, foreground views of tree stands and grass fields are present, with natural features, dikes and houses readily distinguishable. With the exception of the Peninsula ADA trail, each of these trails appears to have foreground views of one or more potential borrow areas (including associated processing facilities). Figure 3.7-9 shows a view from Doton's Point toward the potential borrow area and processing facilities at Granite Bay (V1).

Figure 3.7-9
View to the West from Doton's Point Toward Granite Bay
(Photo Location 8 in Figure 3.7-1)

Residential Properties

Some private residential developments are along the shoreline of Folsom Reservoir with varying scenic views. Residential homes with direct unobstructed views of the reservoir have Class A or B visual resources. With the exception of the immediately adjacent shorelines, views out over the reservoir largely capture background views, where ridgelines and horizon lines are the dominant visual characteristic. Stands of trees and open grass fields are distinguishable, but specific features (e.g., individual building structures) are barely noticeable. Along the immediate shoreline area, foreground views of tree stands and grass fields are present, with natural features, dikes and houses readily distinguishable. With a few exceptions, views of construction activity areas represent middleground to background views. Notable exceptions include selected homes along Mooney Ridge, which have foreground and middleground views of Beal's Point North (V2) and Beal's Point South (V3).

3.7.2 Environmental Consequences/Environmental Impacts

3.7.2.1 Assessment Methods

In this analysis, the assessment methods are guided by the SMS developed by the USDA Forest Service in 1995 and outlined in *Landscape Aesthetics: A Handbook for Scenery Management*, *Agriculture Handbook Number 701*. The SMS is an evolved and updated version of the Visual Management System (USDA Forest Service 1995). The SMS allows for improved integration of aesthetics with other biological, physical, and social/cultural resources in the planning process. This assessment describes the effects of each alternative on known sensitive visual resources and landscapes in the area of analysis. The analysis discusses the effects of each alternative, including excavation from potential borrow areas, operation of processing and concrete facilities, use of construction and contractor-use areas, transportation of materials, and raising the Folsom structures.

The implementation of any action alternative addressed within this EIS/EIR is limited solely to the construction activities associated with the various improvements proposed therewith. Such construction activities anticipated for any of the action alternatives would only affect the water level of Folsom Reservoir temporarily during rare, large flood events, and would not permanently increase the “bathtub ring” effect along the reservoir’s shoreline. As explained in Chapter 1, any subsequent changes in the operation of the Folsom Facility, which could alter water levels in the Reservoir, would not be decided until after the approval of the selected proposed improvements. The environmental effects of such reoperation, including those associated with any potential change in water levels, would be addressed in a supplemental environmental document. Effects addressed below were evaluated based on the significance criteria described in the following section. The SMS-based assessment methods were applied to the alternatives used the following steps:

- Identify visually sensitive areas. Sensitivity is rated highest for views seen by people driving to or from recreational activities, or along routes designated as scenic corridors. Views from relatively moderate to high-use recreation areas were also rated sensitive.

- Define the landscape character. Landscape character gives a geographic area its visual and cultural image and consists of the combination of physical, biological, and cultural attributes that make each landscape identifiable or unique. Landscape character embodies distinct landscape attributes that exist throughout an area. A description of landscape character as it applies to Key Observation Points is provided in Section 3.7.1, Affected Environment/Existing Conditions, for each of the visually sensitive areas identified.

- Identify visually sensitive observation points. Potential impacts to visual resources from the implementation of any one alternative could include the presence of construction equipment and processing and concrete facilities. This step identifies visually sensitive observation points within FLSRA and from external areas (private properties and roadways). This step compares these views to potential visual impact areas (V1 through V9) associated to one or more alternative. If direct views of any potential visual impact area from any of these observation points were present, then distances to each applicable potential visual impact area (i.e., to midpoint of defined area) was measured. In addition to these visual impact areas, earthwork would occur along dikes (i.e., dikes) along the southern shoreline areas for all alternatives. However, because these areas are in close proximity to these identified visual impact areas, they were not evaluated separately for the purposes of this assessment. Table 3.7.1 includes results from this step.

- Identify visually affected key observation points. Based on the location and distance of potential visual impact areas from these visually sensitive observation points, only a portion of the observation points may be significantly affected. This analysis further evaluated observation points to determine if visual impact areas were (1) in the direct line of site and (2) within the foreground (0 to 0.5 mile) and middleground (0.5 to 4 mile) views. This “screening’ method was selected because (1) alternative construction features are generally small (e.g., construction equipment less than 30 feet high), (2) no color contrasts are expected as a result of excavation in the borrow areas, and (3) small features become indistinct when viewed from distances of three miles or more. Also, further limitations were not employed due to earth curvature issues because reservoir levels would be low at the time of alternative activities and would not likely limit the view of the features. Observation points with visual impact areas in the direct line of site or within the foreground and background view are referred to as key observation points. These key observation points are described in the subsection titled *Views from Key Observation Points* above and identified in Table 3.7-1.

- Classify scenic attractiveness. Scenic attractiveness classifications are a key component of the SMS and were used to classify visual features into the following categories (USDA Forest Service 1995). Classifications include Class A “Distinctive”, Class B “Typical”, and Class C “Indistinctive”. These classifications are described in 3.7.1.3.

A total of seven key observation points that had Class A or B scenic attractiveness classifications were used to evaluate potential visual impacts. These classifications have been applied to these key observation points in Section 3.7.1, subheading Views from Key Observation Points.

3.7.2.2 Significance Criteria

Pursuant to the CEQA Guidelines, a proposed alternative would result in potentially significant impacts 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 within a state scenic highway
- Substantially degrade the existing visual character or quality of the site and its surroundings.

In addition to using these significance criteria to assess potential visual impacts, a consideration was made regarding the rate of visitation to the FLSRA at the time of construction. Because in-reservoir area borrow excavation would generally be implemented between October and March when reservoir levels are low, visual impacts from this construction activity would only affect visitors or residents during this time period.

3.7.2.3 Environmental Consequences/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

Under the No Action/No Project Alternative, there would not be any dam raise or improvements made to the Folsom Facility and no action would be taken by any of the agencies. The visual setting would remain the same as existing conditions.

The No Action/No Project Alternative would not affect visual resources.

Environmental Consequences/Environmental Impacts of Alternative 1

Under Alternative 1, construction activities, including, Auxiliary Spillway excavation, borrow development near Beal's Point, and operating concrete and processing facilities would occur at visual impact areas V3 through V6. As a result, impacts have been identified at the following Key Observation Points: Folsom Reservoir (on-reservoir viewpoint), Beal's Point, Folsom Reservoir Trails, and a few private residential developments.

Construction would affect boaters' views from the reservoir.

Boaters would have access to portions of the reservoir in close proximity (i.e., foreground views) to all visual impact areas and may experience a different view and opinion towards the Class A and B visual resources. The primary use of the reservoir by boaters is during summer months when the majority of the in-reservoir borrow sites would be inundated. During these months, the primary visual impact would be construction equipment on tops of the dikes and dams (V-3, V-4, and V-6) and construction of the inlet for the Auxiliary Spillway (V-5). Excavation of borrow sites during the fall and winter would have less of a visual effect because of less frequent visitor usage (about 16 percent of the annual visitor use occurs from October through March). Construction would result in a less than significant impact to boaters.

Construction-related impacts to visual resources experienced by boaters from multiple viewpoints would be less than significant.

Construction-related facilities would affect views from Beal's Point.

The potential borrow area and associated borrow material processing facilities at Beal's Point (V3) (which also includes Dikes 5 and 6) would be within the foreground views from most all vantage points at Beal's Point. These activities would significantly impact Class A and B visual resources. The processing facilities would be at the least visible location relative to the beach area, minimizing this visual impact. The view of construction at Dike 4 would be within the middleground views from the Beal's Point Beach.

Although activities at Folsom Dam (V4) (which includes Right and Left Wing Dams) and Observation Point (V5) (which includes the Auxiliary Spillway construction and borrow development) are within 3 miles of Beal's Point, impacts to these views would not be significant because of the existing alterations in landscape represented by the dam and associated dikes, and the fact that these areas are closed to the general public.

The visual impact to views from Beal's Point would be potentially significant. There are no mitigation measures available to reduce these impacts; therefore these impacts are significant and unavoidable until completion of construction.

<u>*Construction-related facilities would affect views from Granite Bay*</u>*.*
Under Alternative 1, there would be no activity at the proposed Granite Bay borrow area and associated processing facility (V1), which would be within the foreground views from the beach area at Granite Bay. Construction at Dikes 1, 2, and 3 would also not be implemented as part of this alternative, though these dikes are generally not visible from beach/recreation areas of Granite Bay. Therefore, there would be no impact to Class A and B visual resources as viewed from Granite Bay for this alternative.

There would be no construction-related impacts to visual resources experienced from Granite Bay under Alternative 1.

<u>*Construction-related activities would impact views from Peninsula Campground*</u>*.*
Peninsula Campground has distant middleground views of visual impact areas at Beal's Point. However, because of the distance and relatively small size of construction equipment that would be used in these areas, impacts to Class A and B visual resources as viewed from Peninsula Campground would be less than significant.

Construction-related impacts to visual resources as experienced from Peninsula Campground would be less than significant.

<u>*Folsom Reservoir Trails would be affected by construction activity*</u>*.*
Three trails would have foreground Class A and B visual resource views that would include visual impact areas. Portions of Pioneer Express Trail and Granite Bay Multi-use Trails pass in close proximity to Beal's Point. Visual impacts may be experienced by regular trail users at certain locations along these trails. However, because of the distance between the view points and the construction areas, the impacts would be less than significant for Alternative 1. Detours would be provided for all trails that would come in close proximity to haul trucks, staging areas, or other equipment for public safety reasons. These detours would help to lessen the visual impacts of the construction equipment and disturbed areas.

Construction-related impacts to views from Folsom Reservoir Trails across the reservoir toward construction sites would be less than significant.

<u>*Construction activities would affect views from selected residential developments*</u>*.*
Several private residential developments contain homes with reservoir views, usually consisting of Class A or B visual resources. Some of these homes would have views of visual impact areas, including construction equipment and staging and borrow areas. Specifically, homes with reservoir views on Mooney Ridge, between Granite Bay and Beal's Point, would have foreground views of the potential borrow area, middleground views of the potential borrow processing facilities at Beal's Point South (V3) and Observation Point (V5), and middleground views of the Folsom Dam

construction (V4). For these Mooney Ridge homes with reservoir views, the visual impacts on foreground views would be significant and unavoidable. Although relatively few homes have these reservoir views, these residents would potentially view construction activities throughout the day and evening throughout the duration of the Folsom DS/FDR.

Construction-related impacts to visual resources at selected residential developments are significant and cannot be mitigated to a less than significant level. Therefore, the impact would be significant and unavoidable until completion of construction.

Modifications of the Folsom Facility would permanently alter the visual character of the reservoir setting.
Alternative 1 does not involve the raising of any structures and only minimal embankment raise, therefore, the current visual character of the Folsom Facility would not be changed to any notable degree. Alternative 1 would not have a significant permanent effect on visual resources.

Facility modification-related impacts to visual resources would be less than significant.

Implementation of security measures would impede views around the Folsom Facility.
Due to the security enhancement project taking place at Folsom Dam, there would be an additional impact of lighting and security camera poles being permanently installed on the site. While construction is taking place, temporary generators would be onsite to maintain power to both the cameras and the lighting until utility lines are permanently installed. Construction of the security powerlines would be coordinated with construction of the other components of the Folsom DS/FDR action. Visual impacts from the generators would be temporary, for two years maximum. After the installation, the generators would be removed with power provided by underground electrical lines.

Security-related impacts to visual resources would be less than significant.

Environmental Consequences/Environmental Impacts of Alternative 2
Under Alternative 2, impacts to visual resources at key observation points would generally be the same as for Alternative 1. Both alternatives involve the use of the same potential borrow areas and associated concrete and processing facilities, and construction staging areas. Although Alternative 2 would involve earthen raises of Dikes 1, 2, and 3, views from Granite Bay would be not be impacted because construction at Dikes 1, 2 and 3 would occur behind the recreation area.

The impact associated with all view areas, including Granite Bay, would be less than significant.

Construction of parapet walls would affect views from trails established on the tops of the wing dams.

The construction of concrete parapet walls would impair middle and background views of the Left and Right Wing Dams. The parapet walls would be constructed of concrete and would stand out from the existing earthen wing dams.

This impact would be potentially significant. Mitigation Measure VIS-3 would reduce this impact to a less than significant level.

The construction of parapet walls on tops of Left and Right Wing Dams would impair views of hikers. This view impact would be further impaired by placement of a safety rail at the top of each wall to prevent walking on top of and falling off of the walls. Due to their height limitations, the view impairment would mostly affect youth and children.

This impact would be a potentially significant impact that cannot be mitigated to a less than significant level. Therefore, the impact would be significant and unavoidable.

Implementation of security measures would impede views around the Folsom Facility.

Impacts would be the same as those described under Alternative 1.

Modifications of the Folsom Facility would permanently alter the visual character of the reservoir setting.

Alternative 2 involves the raising of all structures thereby altering the current visual character of the Folsom Facility. The 4-ft earthen raise would not likely be noticed following construction because it would simply involve the placement of 4 feet of earth material on top of the existing dikes and MIAD. However, parapet walls constructed atop the wing dams would result in a significant, unavoidable impact to the character of those structures. Alternative 2 would have a permanent, significant adverse affect on visual resources.

Facility modification would have significant, unavoidable adverse impacts to visual resources that cannot be mitigated.

Construction of new embankments could have visual impacts.

Existing embankments would be raised by approximately 4 feet and new embankments could be constructed to provide localized flood damage reduction. They could impair view of the reservoir from the shoreline, depending on the exact viewing location and relative viewing height.

Construction of new embankments would have a potentially significant impact that cannot be mitigated to a less than significant level. Therefore, the impact would be significant and unavoidable.

Environmental Consequence/Environmental Impacts of Alternative 3

Alternative 3 includes similar modifications as Alternatives 1 and 2 except all structures would have a potential 3.5-ft raise via a concrete parapet wall. Impacts to visual resources at key observation points would generally be the same as for Alternative 2 because the same borrow areas and associated processing facilities would be used.

Construction of parapet walls would affect views.

The construction of concrete parapet walls would impair views of the Folsom Facility including Right Wing Dam, Left Wing Dam, MIAD, and Dikes 1 through 8.The parapet walls would be constructed of concrete and would stand out from the existing earthen wing dams, dikes and MIAD.

This impact would be potentially significant. Mitigation Measure VIS-3 would reduce this impact to a less than significant level.

The construction of parapet walls would impair views of hikers. This view impact would be further impaired by placement of a safety rail at the top of each wall to prevent walking on top of and falling off of the walls. Due to their height limitations, the view impairment would mostly affect youth and children.

This impact would be a potentially significant impact that cannot be mitigated to a less than significant level. Therefore, the impact would be significant and unavoidable.

Modifications of the Folsom Facility would permanently alter the visual character of the reservoir setting.

Alternative 3 involves the raising of all structures using parapet walls, thereby altering the current visual character of the Folsom Facility. The parapet walls constructed atop of all dams and dikes would result in a significant, unavoidable impact to the character of those structures. Therefore, Alternative 3 would have a permanent, significant adverse affect on visual resources.

Facility modification would have significant, unavoidable adverse impacts to visual resources that cannot be mitigated.

Implementation of security measures would impede views around the Folsom Facility.

The impacts from the implementation of the security measures would be the same as those described under Alternative 1.

<u>*Construction of new embankments could have visual impacts.*</u>
Under this alternative, new embankments may be constructed for flood damage reduction of residential properties along the boundary of the reservoir. The exact need, location, and size/height of such improvements would be determined in conjunction with future more detailed planning, should this alternative be selected. If new embankments/walls are constructed, they could impair view of the reservoir from the shoreline.

Construction of new embankments would have a potentially significant impact that cannot be mitigated to a less than significant level. Therefore, the impact would be significant and unavoidable.

Environmental Consequences/Environmental Impacts of Alternative 4
Under Alternative 4, construction activities, including, Main Concrete Dam modifications, Auxiliary Spillway excavation, borrow development near Beal's Point, Granite Bay, MIAD Left, MIAD Right, MIAD D1/D2 and operating concrete and processing facilities would occur at visual impact areas V-1 through V-7. As a result, impacts have been identified at the following Key Observation Points: Folsom Reservoir (on-reservoir viewpoint), Beal's Point, Folsom Reservoir Trails, and several private residential developments.

<u>*Construction would affect boaters' views from the reservoir*</u>*.*
Boaters would have access to portions of the reservoir in close proximity (i.e., foreground views) to all visual impact areas and may experience a different view and opinion towards the Class A and B visual resources. The primary use of the reservoir by boaters is during summer months when the majority of the in-reservoir borrow sites would be inundated. During these months, the primary visual impact would be construction equipment on tops of the dikes and dams (V-1 to V-4, and V-6 and V-7) and construction of the inlet for the Auxiliary Spillway (V-5). Excavation of borrow sites during the fall and winter would have less of a visual effect because of less frequent visitor usage (about 16 percent of the annual visitor use occurs from October through March). Construction would result in a less than significant impact to boaters.

Construction-related impacts to visual resources experienced by boaters from multiple viewpoints would be less than significant.

<u>*Construction-related facilities would affect views from Beal's Point*</u>*.*
The potential borrow area and associated borrow material and concrete processing facilities at Beal's Point (V3) (which also includes Dikes 5 and 6) would be within the foreground views from most all vantage points at Beal's Point. These actions would significantly impact Class A and B visual resources. The processing facilities would be the least visible location relative to the beach area, minimizing this visual

impact. The view of construction at Dike 4 would be within the middleground views from the Beal's Point Beach.

Although activities at Folsom Dam (V4) (which includes Right and Left Wing Dams) and Observation Point (V5) (which includes the Auxiliary Spillway construction and borrow development) are within 3 miles of Beal's Point, impacts to these views would not be significant because of the existing alterations in landscape represented by the dam and associated dikes, and the fact that these areas are closed to the general public.

The visual impact to views from Beal's Point would be significant. No mitigation measures are available; therefore, this impact would be significant and unavoidable until completion of construction.

Construction-related facilities would affect views from Granite Bay.
Under Alternative 4, there would be activity at Granite Bay borrow area and associated processing facilities (V1), which would be within the foreground views from the beach area at Granite Bay and could affect Class A and Class B visual resources. Construction at Dikes 1, 2, and 3 would occur as part of this alternative, but these dikes are generally not visible from beach/recreation areas of Granite Bay. The construction-related impacts to views at Granite Bay would be significant.

The construction-related impacts to visual resources experienced from Granite Bay would be significant. Mitigation Measure VIS-2 would reduce visual impacts of the borrow areas from the beach. Even with mitigation, it is likely that sections of the borrow areas, construction equipment, or processing plants would still be visible. No mitigation would reduce these impacts to less than significant; therefore, these impacts would be significant and unavoidable until completion of construction.

Construction-related activities would impact views from Peninsula Campground.
Peninsula Campground has distant middleground views of alternative visual impact areas at Beal's Point and Granite Bay. However, because of the distance and relatively small size of construction equipment that would be used in these areas, impacts to Class A and B visual resources as viewed from Peninsula Campground would be less than significant.

Construction-related impacts to visual resources as experienced from Peninsula Campground would be less than significant.

Construction-related activities would impact views from Browns Ravine/Folsom Reservoir Marina.
Browns Ravine/Folsom Reservoir Marina has distant views of alternative visual impact areas at Beal's Point and Granite Bay. Because of the distance and relatively small size of construction equipment that would be used in these areas, impacts to

visual resources as viewed from Browns Ravine/Folsom Reservoir Marina would be less than significant. The borrow area and processing plant at MIAD Left would be within the foreground views from most all vantage points at Browns Ravine/Folsom Reservoir Marina.

Construction-related impacts to visual resources as experienced from Browns Ravine/Folsom Reservoir Marina would be significant. Mitigation Measure VIS-1 would help to reduce visual impacts from the processing plant. However, no mitigation measures are available to reduce impacts from the borrow area; therefore, the impacts would be significant and unavoidable until completion of construction.

Folsom Reservoir Trails would be affected by construction activity.
Three trails would have foreground Class A and B visual resource views that would include visual impact areas. Portions of Pioneer Express Trail and Granite Bay Multi-use Trails pass in close proximity to Beal's Point and Granite Bay. Visual impacts may be experienced by regular trail users at certain locations along these trails and also along the trails near Browns Ravine. However, because of the distance between the view points and the construction areas, the impacts would be less than significant. Detours would be provided for all trails that would come in close proximity to haul trucks, staging areas, or other equipment for public safety reasons. These detours would help to lessen the visual impacts of the construction equipment and disturbed areas.

Construction-related impacts to views from Folsom Reservoir Trails across the reservoir toward construction sites would be less than significant.

Construction activities would affect views from selected residential developments.
Several private residential developments contain homes with reservoir views, usually consisting of Class A or B visual resources. Some of these homes would have views of visual impact areas, including construction equipment and staging and borrow areas. Specifically, homes with reservoir views on Mooney Ridge, between Granite Bay and Beal's Point, would have foreground views of the potential borrow area, middleground views of the potential borrow area and concrete and processing facilities at Beal's Point South (V3) and Observation Point (V5), and middleground views of the Folsom Dam construction (V4). For these Mooney Ridge homes with reservoir views, the visual impacts on foreground views would be significant and unavoidable. Although relatively few homes have these reservoir views, these residents would potentially view construction activities throughout the day and evening for the duration of the construction.

Construction-related impacts to visual resources at selected residential developments are significant and cannot be mitigated to a less than significant level.

Therefore, the impact would be significant and unavoidable until completion of construction.

Modifications of the Folsom Facility would permanently alter the visual character of the reservoir setting.
Alternative 4 would involve the raising of all structures by 7 feet, thereby permanently altering the current visual character of the Folsom Facility. The raises of all dams and dikes would result in a significant, unavoidable impact to the character of those structures. Several homes around the Mooney Ridge and Granite Bay area may have significant visual impacts and may be unable to see Folsom Reservoir because of the magnitude of the raise. Therefore, Alternative 4 would have a permanent, significant adverse affect on visual resources.

Facility modification would have significant, unavoidable adverse impacts to visual resources that cannot be mitigated.

Implementation of security measures would impede views around the Folsom Facility.

Impacts from installing security measures would be the same as Alternative 1.

Construction of new embankments could have visual impacts.
Under this alternative, new embankments may be needed to provide for localized flood damage reduction. If new embankments are constructed, they could impair views of the reservoir from the shoreline.

Construction of new embankments would have a potentially significant impact that cannot be mitigated to a less than significant level. Therefore, the impact would be significant and unavoidable.

Environmental Consequences/Environmental Impacts of Alternative 5
Alternative 5 would have the same construction activities as Alternative 4. Alternative 5 would include the same impacts to visual resources as Alternative 4 except there would be a potential 17-foot earth raise to all structures. Impacts to visual resources at key observation points would be greater than for Alternative 4 because of the complete development of all potential borrow areas and processing sites throughout the Folsom Facility. Impacts to visual resources associated with Alternative 5 would be greater as a result of greater duration of activities at Beal's Point and Granite Bay, as well as a longer construction period. Mitigation Measures VIS-1 and VIS-2 would apply.

Construction-related activities would impact views from Browns Ravine/Folsom Reservoir Marina.
Browns Ravine/Folsom Reservoir Marina has distant views of alternative visual impact areas at Beal’s Point and Granite Bay. Because of the distance and relatively

small size of construction equipment that would be used in these areas, impacts to visual resources as viewed from Browns Ravine/Folsom Reservoir Marina would be less than significant. The borrow area and processing plant at MIAD Left would be within the foreground views from most all vantage points at Browns Ravine/Folsom Reservoir Marina.

Construction-related impacts to visual resources as experienced from Browns Ravine/Folsom Reservoir Marina would be significant. Mitigation Measure VIS-1 would help to reduce visual impacts from the processing plant. However, no mitigation measures are available to reduce impacts from the borrow area; therefore, the impacts would be significant and unavoidable until completion of construction.

Modifications of the Folsom Facility would permanently alter the visual character of the reservoir setting.
Alternative 5 would involve the raising of all structures by 17 feet, thereby permanently altering the current visual character of the Folsom Facility. The raises of all dams and dikes would result in a significant, unavoidable impact to the character of those structures. Several homes around the Mooney Ridge and Granite Bay area may have significant visual impacts and may be unable to see Folsom Reservoir because of the magnitude of the raise. Therefore, Alternative 4 would have a permanent, significant adverse affect on visual resources.

Facility modification under Alternative 5 would have significant, unavoidable adverse impacts to visual resources.

Implementation of security measures would impede views around the Folsom Facility.

Impacts from installing security measures would be the same as Alternative 1.

Construction of new embankments could have visual impacts.
Under this alternative, new embankments may be needed to provide for localized flood damage reduction. If new embankments are constructed, they could impair views of the reservoir from the shoreline.

Construction of new embankments would have a potentially significant impact that cannot be mitigated to a less than significant level. Therefore, the impact would be significant and unavoidable.

3.7.3 Comparative Analysis of Alternatives

Table 3.7-2 summarizes effects of the five action alternatives on visual resources. This analysis was based on the intended use of all potential borrow areas and associated concrete and processing facilities among five alternatives. Based on the

common locations planned for the borrow areas and associated processing facilities, impacts of these facilities would be similar for Alternatives 1, 2, and 3, and greater for Alternatives 4 and 5.

Table 3.7-2
Comparison of Alternative Effects on Visual Resources

Visual Impact	***Alternative 1***	***Alternative 2***	***Alternative 3***	***Alternative 4***	***Alternative 5***
Construction-Related Impacts to Visual Resources experienced by boaters from multiple viewpoints	Foreground views of visual impact areas V2 through V6 Less than significant	Foreground views of visual impact areas V2 through V6 Less than significant	Foreground views of visual impact areas V2 through V6 Less than significant	Foreground views of visual impact areas V1 through V7 Less than significant	Foreground views of visual impact areas V1 through V7 Less than significant
Construction-Related Impacts to Visual Resources as viewed from Browns Ravine/Folsom Reservoir Marina.	No Impact	No Impact	No Impact	Foreground views of visual Impact area at Browns Ravine (V7) Significant and unavoidable	Foreground views of visual Impact area at Browns Ravine (V7) Significant and unavoidable
Construction-Related Impacts to Visual Resources as viewed from Beal's Point.	Foreground views of visual impact area at Beal's Point South (V3) Significant and unavoidable	Foreground views of visual impact area at Beal's Point South (V3) Significant and unavoidable	Foreground views of visual impact area at Beal's Point South (V3) Significant and unavoidable	Foreground views of visual impact area at Beal's Point South (V2) and North (V3) Significant and unavoidable, second highest impact	Foreground views of visual impact area at Beal's Point South (V2) and North (V3) Significant and unavoidable, highest impact
Construction-Related Impacts to Visual Resources as viewed from Granite Bay.	No Impact	No Impact	No Impact	Foreground views of visual impact area at Granite Bay (V1) Significant and unavoidable after mitigation, second highest impact	Foreground views of visual impact area at Granite Bay (V1) Significant and unavoidable after mitigation, highest impact
Construction-Related Impacts to Visual Resources as viewed from Peninsula Campground.	Middleground views of visual impact areas V2 and V3 Less than significant	Middleground views of visual impact areas V2 and V3 Less than significant	Middleground views of visual impact areas V1 through V3 Less than significant	Middleground views of visual impact areas V1 through V3 Less than significant	Middleground views of visual impact areas V1 through V3 Less than significant,

Table 3.7-2 Comparison of Alternative Effects on Visual Resources (continued)					
Visual Impact	***Visual Impact***	***Visual Impact***	***Visual Impact***	***Visual Impact***	***Visual Impact***
Construction-Related Impacts to Visual Resources as viewed from along Folsom Reservoir Trails.	Foreground views of visual impact areas V1 through V7 Less than significant	Foreground views of visual impact areas V1 through V7 Less than significant	Foreground views of visual impact areas V1 through V7 Less than significant	Foreground views of visual impact areas V1 through V7 Less than significant	Foreground views of visual impact areas V1 and V2 Less than significant,
Construction-Related Impacts to Visual Resources as viewed from Selected Residential Developments.	Foreground and middleground views of various visual impact areas Significant and unavoidable	Foreground and middleground views of various visual impact areas Significant and unavoidable	Foreground and middleground views of various visual impact areas Significant and unavoidable	Foreground and middleground views of various visual impact areas Significant and unavoidable, second highest impact	Foreground and middleground views of various visual impact areas Significant and unavoidable, highest impact
Permanent Facility Impacts Following Construction	No Impact; facility changes would be for the most part be unnoticed	Significant and unavoidable impact as a result of parapet wall raises	Significant and unavoidable impact as a result of parapet wall raises	Significant and unavoidable impact as a result of earth raises	Significant and unavoidable impact as a result of earth raises
Impacts to Visual Resources from construction of new embankments	No Impact	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable
Security Project	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant

The implementation of Alternative 1 would have less overall impact on visual resources because excavation and construction activities are generally shorter in duration or would not occur (e.g., no excavation and construction at Granite Bay), and the structures would not be raised to increase flood storage. Impacts to visual resources would be greater for Alternatives 4 and 5 because the duration of borrow development activities would be longer, more borrow would be required and the heights of the raises. Alternatives 4 and 5 would have the greatest permanent visual impacts because they would involve raises of 7 and 17 feet respectively. These raises would permanently alter views of the reservoir from recreation areas and from residential areas around Mooney Ridge and Granite Bay. The implementation of Alternatives 2 through 5 would have impacts to visual resources along trails because portions of Pioneer Express Trail, Doton's Point Trail, and Granite Bay Multi-use Trails pass in close proximity to Granite Bay (V1), and Beal's Point (V-2), which would have active construction and excavation activities.

3.7.4 Mitigation Measures

Implementation of Mitigation Measures VIS-1 to VIS-3 would help reduce potentially significant impacts to the Browns Ravine and Granite Bay recreation sites; however there could still be significant impacts after mitigation.

VIS-1: To minimize the impact to a less than significant level, move the processing facility at Browns Ravine (V7) southeast into the cove area so that there is no direct view of it from the picnic grounds area (at Folsom Reservoir Marina). This would also minimize any impacts to the residential community on the northeast side of the marina.

VIS-2: To lessen the visual impacts directly in front of the Granite Bay beach area, reduce the size of the potential borrow area (at Granite Bay V1) so that no excavation activities occur directly in front of the beach area.

VIS-3: To lessen the visual impacts of the concrete parapet walls, a coloring agent will be added to the concrete to help it blend in with the natural surroundings.

3.7.5 Cumulative Effects

Cumulative effects on visual resources were evaluated considering the effects of past, present, and reasonably foreseeable projects. Table 5-1 summarizes projects in the cumulative analysis. Under the cumulative condition, only the New Folsom Bridge Project and Folsom DS/FDR would affect visual resources within the local visual setting. However, because the Bridge Project would not be visible from the same FLSRA view points, it would not create a noticeable change in the characteristic visual landscape. The Folsom DS/FDR would not contribute to any cumulative effects.

3.8 Agricultural Resources

This section presents an analysis of potential impacts on agricultural resources from construction of the Folsom DS/FDR alternatives.

3.8.1 Affected Environment/Existing Conditions

This section discusses Federal and State programs designed to protect agricultural land. This section also describes the existing agricultural land use conditions.

3.8.1.1 Area of Analysis

Construction activities that could affect agricultural resources would occur around Folsom Reservoir in portions of Placer, El Dorado, and Sacramento Counties. The area of analysis, therefore, will include the area immediately surrounding Folsom Reservoir in these counties.

3.8.1.2 Regulatory Setting

Conversion of farmland into other uses is a public issue in most agricultural regions experiencing rapid urbanization. California's multi-billion dollar agricultural industry depends on a large supply of fertile farmland for both crop and animal production. California's growing population necessitates further development of land, threatening existing and potential agricultural lands. This elevating conflict has led to the development of several Federal and State programs aimed towards protecting farmland. The following sections describe Federal and State programs that exist to promote the preservation of agricultural lands.

3.8.1.2.1 Federal Programs

Farmland Protection Policy Act

Congress passed the Agriculture and Food Act of 1981 (Public Law 97-98), which includes the Farmland Protection Policy Act (FPPA) to minimize the effect that Federal programs would have on conversion of farmland to other, non-agricultural uses. FPPA does not exclude fallow farmland, but includes land designated as prime farmland, unique farmland, and land of statewide or local importance. Categories of land are forestland, pasture land, cropland, or other land, as long as it is not water or developed urban land (USDA NRCS 2006a). The FPPA specifically requires that federal agencies use the criteria provided in Section 658.5 to identify and assess federal project effects on the protection of farmland (USDA NRCS 2006b).

Conservation Reserve Program

The Conservation Reserve Program (CRP) is a Federal program administered by the Farm Services Agency. The CRP is a voluntary program that offers annual rental payments, incentive payments, and annual maintenance payments for certain activities, and cost-share assistance to establish approved cover on eligible cropland. To be eligible for placement in the CRP, land must be (1) cropland that is planted or considered planted to an agricultural commodity in two of the five most recent crop years (including field margins) and that is physically and legally capable of being planted in a normal manner to an agricultural commodity or, (2) marginal pastureland that is either enrolled in the Water Bank Program or suitable for use as a riparian buffer to be planted to trees.

Wetlands Reserve Program
The Wetlands Reserve Program (WRP) is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The USDA Natural Resources Conservation Service (NRCS) provides technical and financial support to help landowners with their wetland restoration. The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection. In California, the WRP has focused on the restoration of a variety of wetland types throughout the state, including seasonal wetlands, semi-permanent marsh, and vernal pools along the perimeter of the Central Valley, riparian corridors, and tidally-influenced wetlands.

3.8.1.2.2 State Programs
Williamson Act
The California Land Conservation Act, better known as the Williamson Act, has been the State’s premier agricultural land protection program since its enactment in 1965. The California Legislature passed the Williamson Act in 1965 to preserve agricultural lands by discouraging premature and unnecessary conversion to urban uses. The act creates an arrangement whereby private landowners contract with counties and cities to voluntarily restrict their land to agricultural and compatible open space uses. The vehicle for these agreements is a rolling term, 10-year contract (unless either party files a “notice of nonrenewal,” the contract is automatically renewed on an annual basis to maintain the 10-year commitment duration). In return, restricted parcels are assessed for property tax purposes at a rate consistent with their actual use, rather then potential market value. The Williamson Act also establishes a Farmland Security Zone, which introduces a 20-year contract between a private landowner and a county that restricts land to agricultural or open space uses.[1]

California Farmland Conservancy Program
The California Farmland Conservancy Program (CFCP) is a voluntary state program that seeks to encourage the long-term, private stewardship of agricultural lands through the use of agricultural conservation easements. The CFCP provides grant funding for projects that use and support agricultural conservation easements for

[1] A farmland security zone is essentially an area created within an agricultural preserve by a board of supervisors (board) upon request by a landowner or group of landowners. An agricultural preserve defines the boundary of an area within which a city or county will enter into Williamson Act contracts with landowners. The boundary is designated by resolution of the board or city council having jurisdiction. Agricultural preserves must generally be at least 100 acres in size.

protection of agricultural lands. An agricultural conservation easement is a voluntary, legally recorded deed restriction that is placed on a specific property used for agricultural production. The goal of an agricultural conservation easement is to maintain agricultural land in active production by removing the development pressures from the land. Such an easement prohibits practices that would damage or interfere with the agricultural use of the land. Because the easement is a restriction on the deed of the property, the easement remains in effect even when the land changes ownership.

Farmland Mapping and Monitoring Program

The Farmland Mapping and Monitoring Program (FMMP) was established in 1982 and produces maps and statistical data used for analyzing effects on California's agricultural resources. The maps are updated every 2 years with the use of aerial photographs, a computer mapping system, public review, and field reconnaissance. The FMMP rates agricultural land according to soil quality and irrigation status and denotes the best quality land Prime Farmland. FMMP characterizes land use into the following categories:

- **Prime Farmland[2] –** Land with the best combination of physical and chemical features able to sustain long-term production of agricultural crops. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for production of irrigated crops at some time during the two update cycles prior to the mapping date.

- **Farmland of Statewide Importance –** Land similar to Prime Farmland that has a good combination of physical and chemical characteristics for the production of crops. This land has minor shortcomings, such as greater slopes or less ability to store soil moisture than Prime Farmland. Land must have been used for production of irrigated crops at some time during the two update cycles prior to the mapping date.

- **Unique Farmland –** Lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include non-irrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the two update cycles prior to the mapping date.

- **Farmland of Local Importance –** Land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee.

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[2] The term 'Prime' as it refers to rating for agricultural uses has two meanings in California. FMMP determines the location and extent of 'Prime Farmland' as described above; while under the state's Williamson Act, land may be enrolled under the 'Prime Land' designation if it meets certain economic or production criteria.

- **Grazing Land –** Land on which the existing vegetation is suited to the grazing of livestock.
- **Urban and Built-Up Land –** Land occupied by structures with a building density of at least one unit to 1.5 acres, or approximately six structures to one 10-acre parcel.
- **Other Land –** Land that does not meet the criteria of any other category.
- **Water –** Water areas with an extent of at least 40 acres.

Interim Farmland Mapping Categories[3]

- **Irrigated Farmland –** Cropped land with a developed irrigation water supply that is dependable and of adequate quality. Land must have been used for irrigated agricultural production at some time during the 4 years prior to the mapping date.
- **Non-irrigated Farmland –** Land on which agricultural commodities are produced on a continuing or cyclic basis using stored soil moisture.

3.8.1.3 Environmental Setting

This section describes the environmental setting for agricultural resources for the Folsom DS/FDR impact zone (the Folsom Facility and immediate vicinity) by county. Information on agricultural land use and zoning is based on county and City of Folsom land use maps. Information on agricultural land classification is compiled from FMMP reports and maps.

El Dorado County

According to El Dorado County land use maps (Figure 3.12-3), agricultural land adjacent to Folsom Reservoir occurs along the South Fork of the American River right bank across from Salmon Falls. According to FMMP maps, this area is also classified as Farmland of Local Importance (Figure 3.8-1). Additional land in the County adjacent to Folsom Reservoir also classified as Farmland of Local Importance by FMMP is an area along the North Fork of the American River left bank near the terminus of Rattlesnake Bar Road. Further upstream from Folsom Reservoir along both forks of the American River are lands classified as grazing. None of these areas are within the footprints of the Folsom Facility.

[3] For farmed areas lacking modern soil survey information and for which there is expressed local concern on the status of farmland, Irrigated and Non-irrigated Farmland substitute for the categories of important farmland.

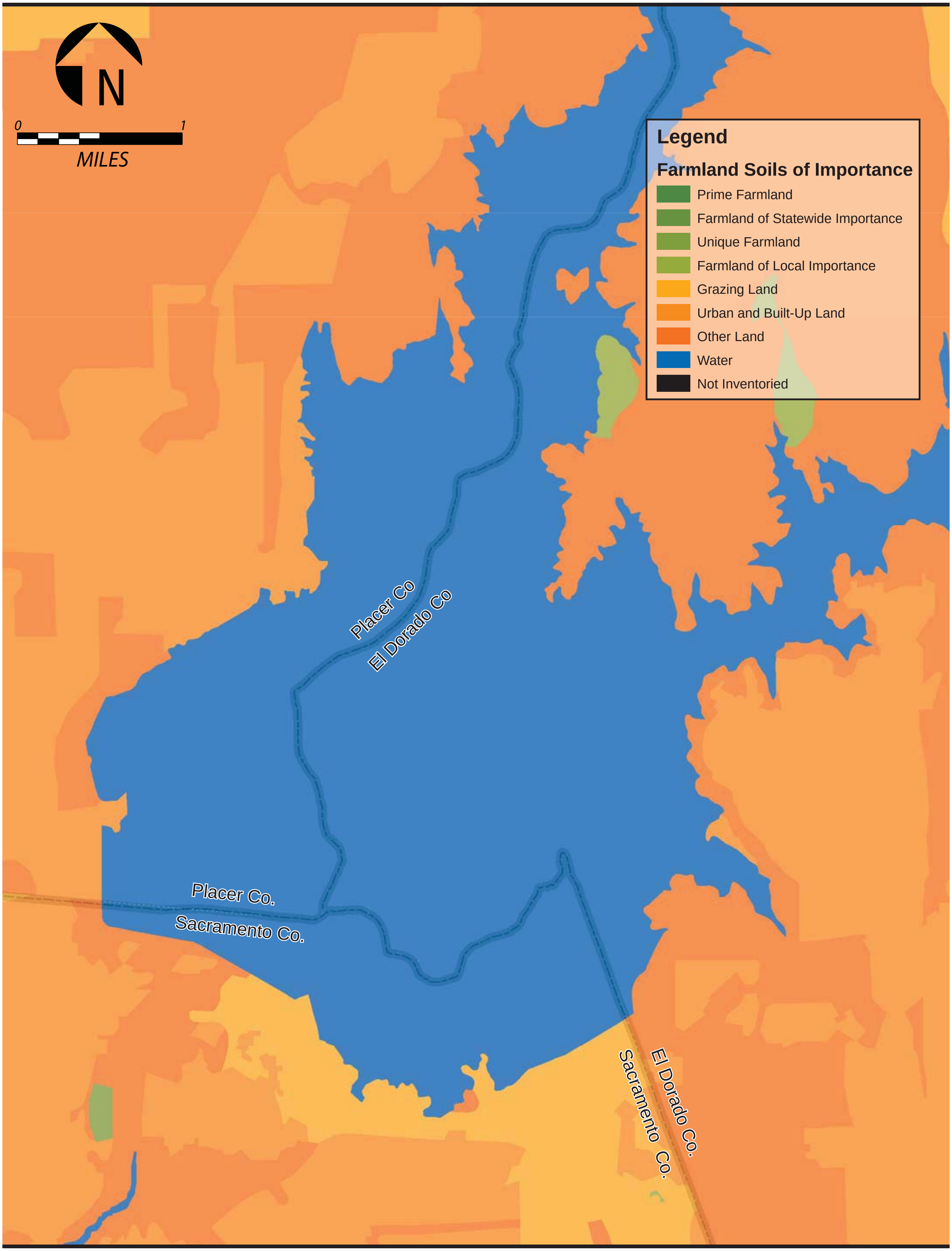

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Figure 3.8-1
Farmland Soils of Importance

CDM

Placer County

The Placer County land use map (Figure 3.12-2) does not show any agricultural land use adjacent to Folsom Reservoir. FMMP maps display land classified as grazing upstream from the Folsom Reservoir along the North Fork of the American River.

Sacramento County

The City of Folsom land use map (Figure 3.12-4) shows land zoned as agriculture adjacent to Folsom Reservoir east of Folsom Dam Road and north of East Natomas Street. This land is classified as grazing by the FMMP. These areas occur adjacent to Dikes 7 and 8 and MIAD. None of these areas are within the footprint of the Folsom Facility.

3.8.2 Environmental Consequences/Environmental Impacts

3.8.2.1 Assessment Methods

Potential impacts associated with each alternative were assessed qualitatively. Information presented in the affected environment/existing conditions discussion as well as the following factors were considered during the evaluation process:

- Proximity of agricultural resources to the Folsom DS/FDR footprint; and
- Classification of agricultural resources within the area of analysis.

3.8.2.2 Significance Criteria

Based on criteria in the CEQA guidelines, the Folsom DS/FDR would be considered to have significant impacts on agricultural resources if it would:

- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance as shown on maps prepared pursuant to the FMMP to non-agricultural use or involve other changes in the existing environment which, because of their location or nature would also result in conversion; or,
- Conflict with existing zoning for agricultural use, or a Williamson Act contract.

3.8.2.3 Environmental Consequences/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

The No Action/No Project Alternative would not convert farmland to non-agricultural uses.

There are no areas within or adjacent to the area of analysis that have been classified as Prime, Unique, or Statewide Importance Farmland. The No Action/No Project Alternative would not cause the conversion of Prime, Unique, or Statewide Importance Farmland to a non-agricultural use.

The No Action Alternative would have no effect on agricultural resources associated with conversion on Prime, Unique, or Statewide Importance Farmland.

The No Action/No Project Alternative would not conflict with existing agricultural land use zoning or Williamson Act contracts.

Lands adjacent to Dikes 7 and 8 and MIAD are zoned agricultural by the City of Folsom. However, no dam safety or flood damage reduction measures would be taken under the No Action/No Project Alternative and there are no proposed changes in land use that would require a change in zoning. No Williamson Act lands were identified in the area of analysis.

The No Action/No Project Alternative would have no effect on land use zoning or Williamson Act contracts.

Environmental Consequences/Environmental Impacts of Alternative 1

Construction of this alternative would not convert Prime, Unique, or Statewide Importance Farmland.

There are no areas within or adjacent to the area of analysis that have been classified as Prime, Unique, or Statewide Importance Farmland. Therefore, actions under Alternative 1 would not convert farmland with these classifications to non-agricultural use. There are no areas meeting these definitions within the footprint of the Folsom Facility.

There would be no conversion of Prime, Unique, or Statewide Importance Farmland from construction of Alternative 1.

Construction activities would not conflict with existing agricultural land use zoning or Williamson Act contracts.

Lands adjacent to Dikes 7 and 8 and MIAD are zoned agricultural by the City of Folsom. However, actions under Alternative 1 do not propose any changes in land use that would require a change in agricultural land use zoning. No Williamson Act lands were identified in the area of analysis.

Construction would have no effect on land use zoning or Williamson Act contracts.

Environmental Consequences/Environmental Impacts of Alternative 2

Alternative 2 would have the same effect on agricultural resources as Alternative 1.

Environmental Consequence/Environmental Impacts of Alternative 3

Alternative 3 would have the same effect on agricultural resources as Alternative 1.

Environmental Consequences/Environmental Impacts of Alternative 4

Alternative 4 would have the same effect on agricultural resources as Alternative 1.

Environmental Consequences/Environmental Impacts of Alternative 5

Alternative 5 would have the same effect on agricultural resources as Alternative 1.

3.8.3 Comparative Analysis of Alternatives

None of the alternatives, including the No Action/No Project Alternative would affect agricultural resources.

3.8.4 Mitigation Measures

None of the alternatives would significantly affect agricultural resources. Therefore, no mitigation measures are necessary.

3.8.5 Cumulative Effects

Because none of the alternatives would affect agricultural resources, there would be no cumulative effects.

3.9 Transportation and Circulation

This section describes how the construction activities for the Folsom DS/FDR affect the area's transportation and circulation. This includes a description of the Folsom DS/FDR study area, the local and direct access routes identified to be used during construction, the existing bicycle facilities and transit resources. Furthermore, an accepted methodology has been utilized to analyze the traffic volumes on access routes as affected during construction for all alternatives. A number of mitigation measures are proposed to reduce impacts during construction. Appendix F includes multiple tables (Tables 3.9-22 to 3.9-85) that support the transportation and circulation analysis.

It is important to note that no permanent or long-term traffic volume increases or changes in traffic patterns are expected as a result of the Folsom DS/FDR alternatives. As such, any incremental transportation impacts associated with implementation of the Folsom DS/FDR are limited to the proposed construction years; hence, the focus of the analysis presented herein is on those impacts occurring from, and during, Folsom DS/FDR related construction activities.

3.9.1 Affected Environment/Existing Conditions

3.9.1.1 Area of Analysis

The Folsom DS/FDR study area includes roadways in the following jurisdictions:

- Counties: Yuba, Sacramento, Placer, and El Dorado.
- Communities: Cities of Folsom, Roseville, Lincoln, Rocklin, Wheatland and Marysville and Community of Granite Bay.

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

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

Access to the proposed work sites is primarily restricted to the southwest region of Folsom Reservoir. Direct access to the Folsom Facility is limited to the routes described in Table 3.9-1.

Table 3.9-1
Direct Access to the Folsom Facility

Direct Access Route	Access Area	Facility/Structure
Douglas Boulevard	Granite Bay	Dikes 1, 2, 3,
Auburn Folsom Road/Folsom-Auburn Road	Beal's Point	Dikes 4, 5, 6, Right Wing Dam (RWD)
Folsom Dam Road[(1)]	Main Concrete Dam	Folsom Dam
Natoma Street	Folsom Point	Left Wing Dam (LWD), Dike 7, Dike 8, MIAD
Green Valley Road	MIAD	MIAD

(1) Folsom Dam Road will only be used to access the Main Concrete Dam, and complete use of the roadway is not included in this analysis.

A multi-leveled approach has been applied to the Folsom DS/FDR to divide the evaluation of potential transportation impacts into two distinct areas of analysis:

- Local Access Routes
- Regional Access Routes

The local and regional access routes provide access to the Folsom DS/FDR features via the direct access routes shown in Table 3.9-1.

Figures 3.9-1 and 3.9-2 illustrate the regional and local routes, respectively, that are proposed to be used for providing access for materials and equipment related to construction of the alternatives. Figure 3.9-3 illustrates access routes available to Folsom DS/FDR construction personnel. A more detailed description of the selection of these routes is discussed below in Trip Generation and Trip Distribution. Access to the Direct Access Routes is provided via the local roadway network as illustrated in Table 3.9-2.

Table 3.9-2 provides a breakdown of the local access routes in terms of the names of the potentially affected roadways, the roadway segments of interest (i.e., limits of analysis), the city and county where the roadway is located, and finally the agency that has jurisdiction over each roadway segment. In addition, truck routes designated by California Department of Transportation (Caltrans) and/or transportation departments with jurisdiction have been highlighted. For the purposes of this analysis, Interstate 80 is considered the dividing line between local and regional access routes for the Folsom DS/FDR study area.

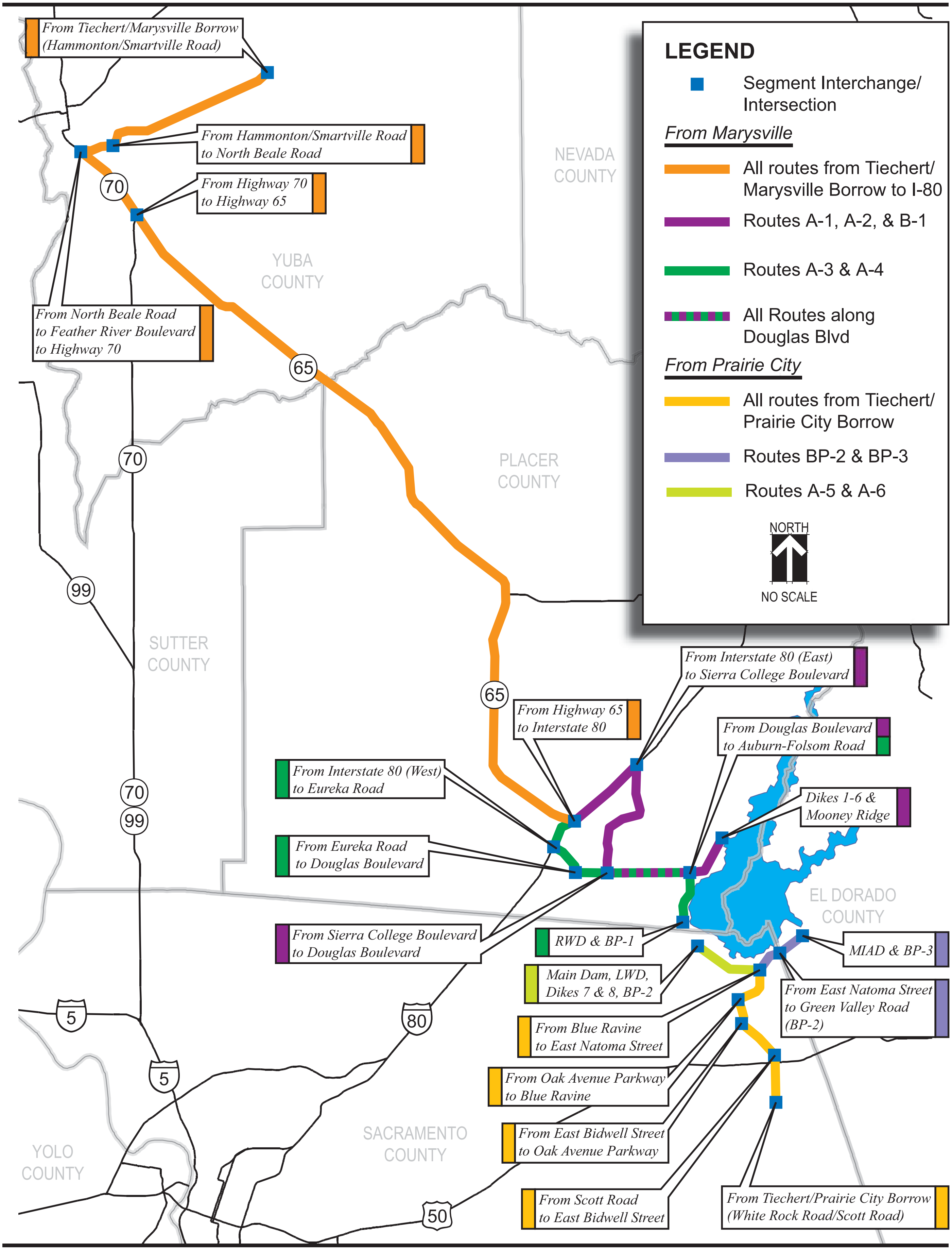

Figure 3.9-1
Regional Access Routes

CDM

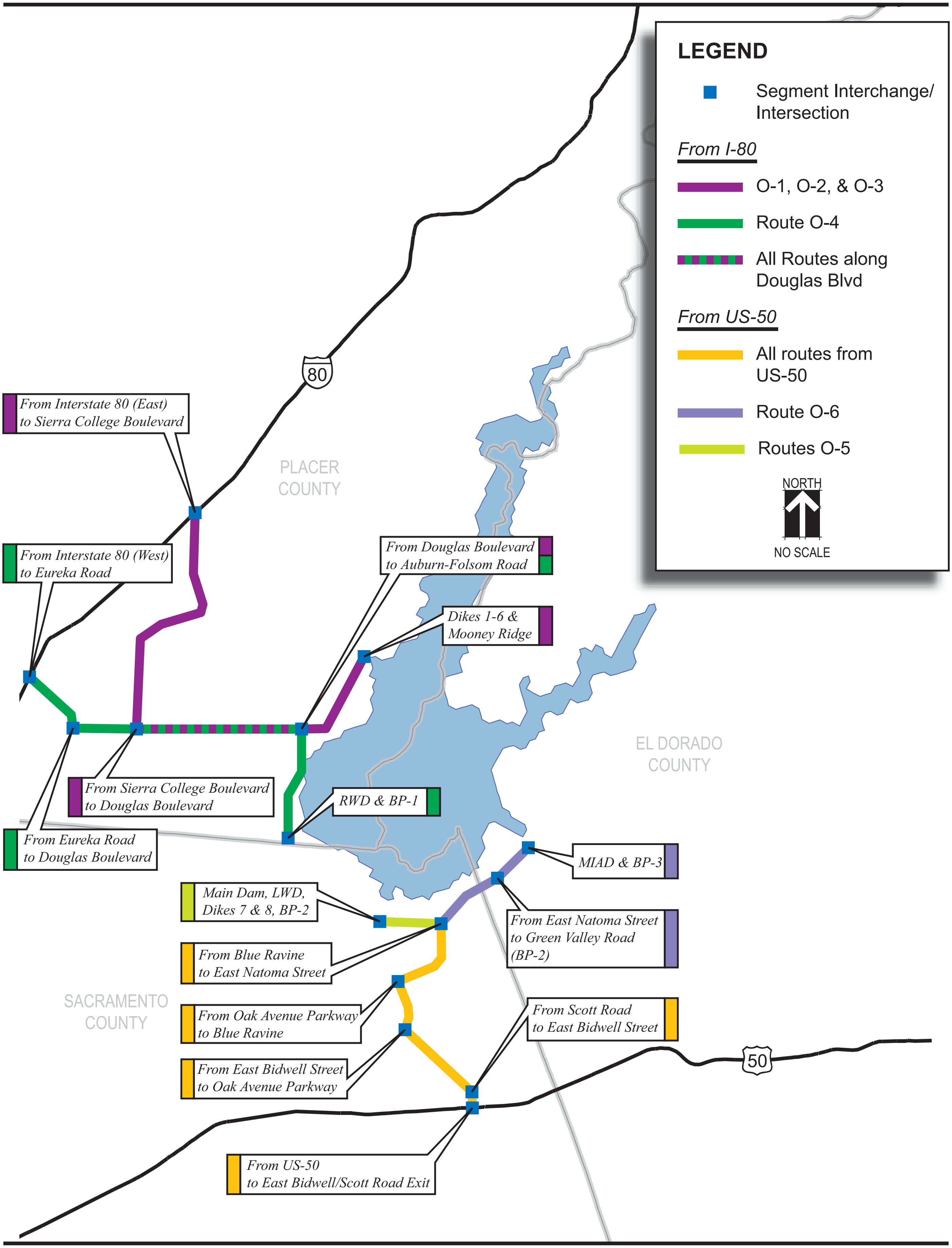

Figure 3.9-2
Local Access Routes

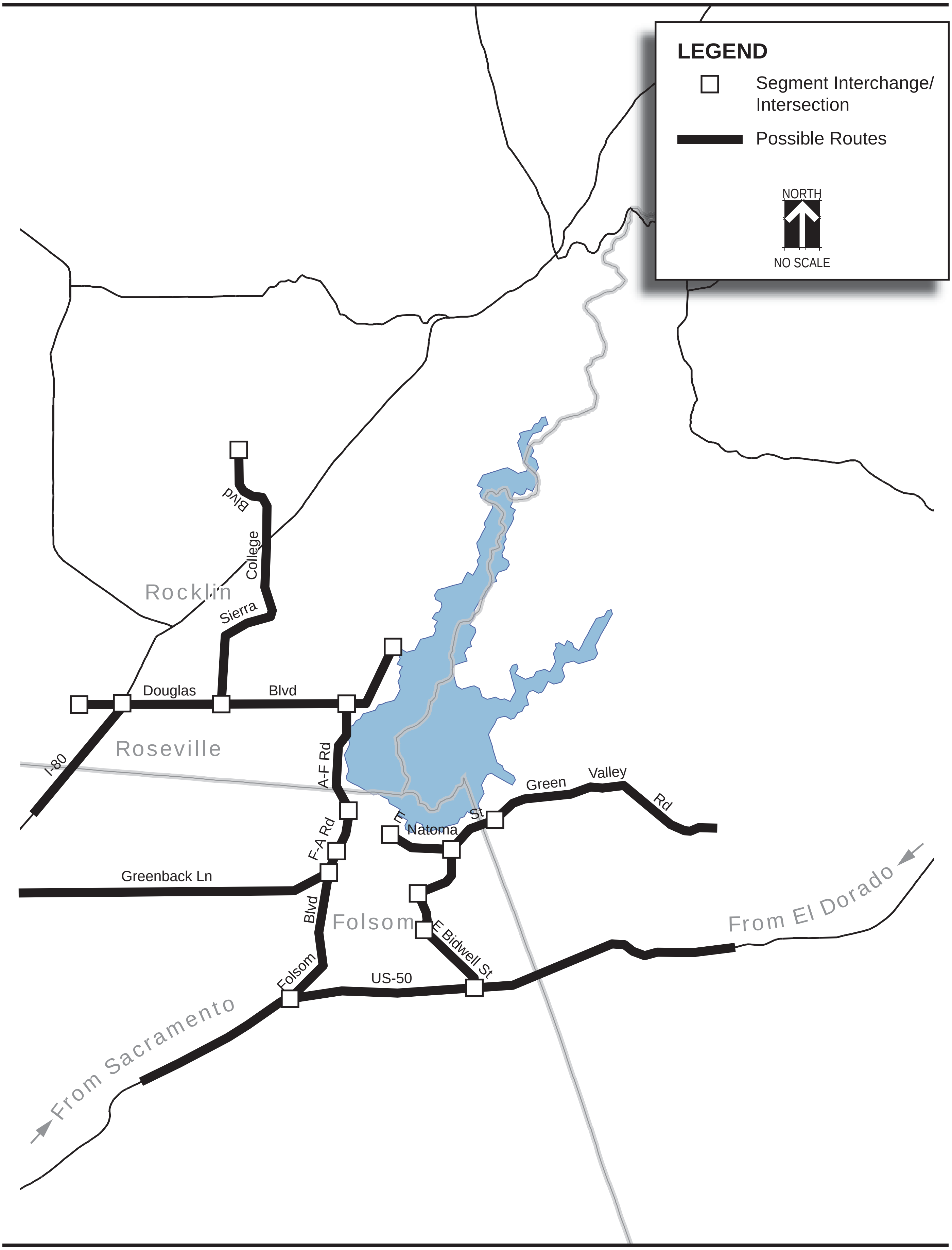

Figure 3.9-3
General Folsom DS/FDR Area Transportation Routes

Table 3.9-2
Local Access Routes

Roadway	Segment Limits	City/Community	County	Jurisdiction
Folsom Boulevard	from US 50 to A-F Road	City of Folsom	Sacramento County	City of Folsom
Auburn-Folsom (A-F) Road	from Folsom Boulevard to county line	City of Folsom	Sacramento County	City of Folsom
F-A Road	From county line to Douglas Boulevard	City of Roseville	Placer County	Placer County
Eureka Road	Interstate 80 to Douglas Boulevard	City of Roseville	Placer County	City of Roseville
Douglas Boulevard	Sierra College Boulevard to A-F Road	Granite Bay	Placer County	Placer County
Blue Ravine Road	Folsom Boulevard to Green Valley Road	City of Folsom	Sacramento County	City of Folsom
East Natoma Street	Folsom Boulevard to Green Valley Road	City of Folsom	Sacramento County	City of Folsom
Green Valley Road	Blue Ravine Road to County Line	City of Folsom	Sacramento County	City of Folsom
Green Valley Road	County Line to Sophia Parkway	Unincorporated El Dorado County	El Dorado County	El Dorado County
Oak Avenue Parkway	East Bidwell Street to Blue Ravine Road	City of Folsom	Sacramento County	City of Folsom
Sierra College Boulevard	Interstate 80 to Douglas Boulevard	City of Rocklin	Placer County	Placer County and Rocklin
Douglas Boulevard	Eureka Road to Sierra College Boulevard	City of Roseville	Placer County	City of Roseville
Eureka Road	Interstate 80 to Douglas Boulevard	City of Roseville	Placer County	City of Roseville
East Bidwell Street	US50 to Oak Avenue Parkway	City of Folsom	Sacramento County	City of Folsom
White Rock Road	Grant Line Road to Scott Road	Unincorporated Sacramento County	Sacramento County	Sacramento County
Scott Road	White Rock Road to Iron Point Road	Unincorporated Sacramento County	Sacramento County	Sacramento County
Sophia Parkway	County Line to Green Valley Road	Unincorporated El Dorado County	El Dorado County	El Dorado County

Roadway - CA Legal Route/Local Route
Roadway – Surface Transportation Assistance Act (STAA) Federal Route The STAA requires states to allow large trucks on identified access routes.

3.9.1.2 Regulatory Setting

As indicated above, the Folsom DS/FDR study area includes roadways in the Counties of Yuba, Sacramento, Placer, and El Dorado, and the Cities of Folsom, Roseville, Lincoln, Rocklin, Wheatland, and Marysville, and the Community of Granite Bay. The study area also includes roadways within the jurisdiction of Caltrans.

Each of these jurisdictions, with the exception of the City of Marysville, has adopted standards regarding the desired performance level for traffic conditions on the circulation system within its jurisdiction. A measure called "Level of Service" (LOS) is used to characterize traffic conditions. Progressively worsening traffic conditions are given the letter grades "A" through "F". While most motorists consider an "A", "B", "C" LOS as satisfactory, LOS "D" is considered marginally acceptable. Congestion and delay are considered unacceptable to most motorists and given the LOS "E" or "F" ratings. A more detailed explanation of LOS, and how it is determined, is provided later in Section 3.9.3.1. These LOS thresholds, reflected at the local jurisdiction level through the County and City General Plans, define the minimum levels of acceptable traffic conditions within the respective jurisdictions, typically LOS C or, in more urbanized areas, LOS D. Related to those LOS thresholds are additional thresholds used to determine where a change in traffic conditions, such as that associated with additional traffic from a new development project, would result in a significant impact to the local roadway system. Should a significant impact be identified, the formulation of mitigation measures for that impact is warranted. Table 3.9-3 presents the local and regional LOS standards and associated significance thresholds. These local significance thresholds were considered when developing significant thresholds for the CEQA impact analysis.

Table 3.9-3
Local and Regional LOS Standards and Significance Thresholds

Regulatory Agency	***Standards***	***Significance Thresholds***
Sacramento County	Rural collectors: LOS D Urban area roads: LOS E	*Roadways/Signalized Intersections*: A project is considered to have a significant effect if it would: • result in a roadway or a signalized intersection operating at an acceptable LOS to deteriorate to an unacceptable LOS; or • increase the volume to capacity (V/C) ratio by more than 0.05 at a roadway or at a signalized intersection that is operating at an unacceptable LOS without the project. *Unsignalized Intersections*: A project is considered to have a significant effect if it would: • result in an unsignalized intersection movement/approach operating at an acceptable LOS to deteriorate to an unacceptable LOS, and also cause the intersection to meet a traffic signal warrant; or • for an unsignalized intersection that meets a signal warrant, increase the delay by more than 5 seconds at a movement/approach that is operating at an unacceptable LOS without the project. *Freeway Ramps*: A project is considered to have a significant effect if it would: • result in a facility operating at an acceptable LOS to deteriorate to an unacceptable LOS, according to the LOS threshold defined by Caltrans. *Freeway Segments*: A project is considered to have a significant effect if it would: • result in a facility operating at an acceptable LOS to deteriorate to an unacceptable LOS, according to the LOS threshold defined in the Caltrans Route Concept Report for that facility. *Residential Streets*: A project is considered to have a significant effect if it would: • result in a residential street operating at an acceptable LOS to deteriorate to an unacceptable LOS; or • increase the V/C ratio by more than 0.05 at a residential street that is operating at an unacceptable LOS without the project. *Bicycle and Pedestrian Facilities:* A project is considered to have a significant effect if it would: • eliminate or adversely affect an existing bikeway or pedestrian facility in a way that

Table 3.9-3 ***Local and Regional LOS Standards and Significance Thresholds***		
Regulatory Agency	***Standards***	***Significance Thresholds***
		would discourage its use; • interfere with the implementation of a planned bikeway as shown in the Bicycle Master Plan, or be in conflict with the Pedestrian Master Plan; or • result in unsafe conditions for bicyclists or pedestrians, including unsafe bicycle/pedestrian, bicycle/motor vehicle, or pedestrian/motor vehicle conflict. *Safety:* A project is considered to have a significant effect if it would: • substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).
City of Folsom	LOS C	If the "no project" LOS is LOS C or better and the project-generated traffic causes the intersection level of service to degrade to worse than LOS C (i.e., LOS D, E or F) then the proposed project must implement mitigation measures to return the intersection to LOS C or better. If the "no project" LOS is worse than LOS C (i.e., LOS D, E or F) and the project-generated traffic causes the overall average delay value at the intersection to increase by five seconds or more, then the Folsom DS/FDR must implement mitigation measures to improve the intersection to the "no project" condition or better. It is not necessary to improve the intersection to LOS C. If the "no project" LOS is worse than LOS C (i.e., LOS D, E, or F) and the project-generated traffic causes the overall delay value at the intersection to increase by less than five seconds, then the traffic impact is considered less than significant and no mitigation is required.
Placer County	LOS C on rural roadways, except within one-half mile of state highways where the standard shall be LOS D. LOS C on urban/suburban roadways except within one-half mile of state highways where the standard shall be LOS D.	Require mitigation to LOS C unless an intersection is within one-half mile of a State Highway, in which case the LOS standard is "D". This applies where the existing LOS is at these levels, or better. If the LOS is worse than these standards, seek to mitigate impacts back to the existing level (Brinkman 2006).
Granite Bay	The LOS on major roadways (i.e., arterial and collector routes) and intersection identified in the CIP shall be at Level C or better.	Require mitigation to LOS C (Granite Bay Community Plan).
City of Lincoln	LOS C for all streets and intersections (some variation by intersection)	If the Folsom DS/FDR is shown to cause degradation of intersection LOS to worse than "C" (Or whichever LOS is identified in the General Plan for the particular intersection) after considering any improvements already planned by the City, then the traffic study shall recommend feasible mitigation measures to bring the intersection LOS within acceptable standards (in accordance with the General Plan)(City of Lincoln Department of Public Works Design Criteria and Procedures Manual 2004)
City of Roseville	Varies by intersection	If the Folsom DS/FDR causes a signalized intersection previously identified in the Capital Improvement Program (CIP) as functioning at LOS C or better to function at LOS D or worse; If the Folsom DS/FDR causes a signalized intersection previously identified in the CIP as functioning at LOS D or E to degrade by one or more LOS category (i.e. from LOS D to LOS E); If the Folsom DS/FDR causes the overall percentage of intersections meeting LOS C at p.m. peak hour to fall below 70%.

Table 3.9-3 *Local and Regional LOS Standards and Significance Thresholds*		
Regulatory Agency	***Standards***	***Significance Thresholds***
Yuba County	On County roads in urban areas and within specific/community plan areas, LOS C shall be maintained during the PM Peak Hour at signalized intersections. On County roads in rural areas, LOS C shall be maintained	n/a
Wheatland	Maintain LOS C or better on all roadways, except within one-quarter mile of state highways. In these areas, the City shall strive to maintain LOS D or better.	n/a
City of Marysville	n/a	n/a
El Dorado County	Varies by intersection, LOS for County-maintained roads and state highways within the unincorporated areas of the county shall not be worse than LOS E in the Community Regions or LOS D in the Rural Centers and Rural Regions except as specified in Table TC-2 or, after December 31, 2008, Table TC-3.	Two (2) percent increase in traffic during the a.m. peak hour, p.m. peak hour, or daily, or The addition of 100 or more daily trips, or The addition of 10 or more trips during the a.m. peak hour or the p.m. peak hour.

Sources: 2004 El Dorado County General Plan; 1985 City of Marysville General Plan; 1993 Sacramento County General Plan; 1994 Placer County General Plan; 1993 City of Folsom General Plan; 2003 City of Roseville General Plan; October 2005 General Plan Public Draft Goals and Policies Report City of Lincoln; Wheatland General Plan Policy Document Part II December 2005

3.9.1.3 Environmental Setting

The following describes the existing characteristics of the roadways and intersections located within the traffic analysis study area. Existing traffic volume data for the subject roadways were collected from a variety of sources. Recent EIS/EIR filings, City and County Transportation Divisions, and General Plan documents were researched to collect as much existing traffic volume data as possible. The primary source of traffic data information is the American River Watershed Project Folsom

Dam Raise, Folsom Bridge Draft Supplemental EIS/EIR (Bridge EIS/EIR) dated May 2006 along with Caltrans traffic counts website and local city/county contacts.

If and where available, based on information currently available recent intersection capacity analysis data is included in the descriptions provided below.

Local Access Route Descriptions

Folsom Boulevard

Folsom Boulevard is functionally classified as a divided arterial and provides north-south access between the cities of Auburn to the north and Folsom to the south. Headed north from the US Highway 50 Interchange, Folsom Boulevard is a six-lane divided roadway to Iron Point Road. At Iron Point Road, the northbound side is reduced to two lanes while the southbound side maintains 3 lanes. At Natoma Station Drive, the southbound side of Folsom Boulevard also is reduced to two lanes. From Natoma Station Drive to Blue Ravine Road/Auburn-Folsom Road, Folsom Boulevard is a four-lane divided roadway. The speed limit is posted at 50 miles per hour (mph). Land use along much of the roadway is predominantly commercial.

Major intersections along Folsom Boulevard include:

<u>Folsom Boulevard at the US Highway 50 Interchange:</u> The traffic flow at this intersection consists of three intersection approaches. The approach from US Highway 50 (eastbound) consists of an exclusive left turn lane, a shared left/right lane, and a right turn lane. The northbound approach on Folsom Boulevard consists of an exclusive left turn lane and three through lanes. The southbound Folsom Boulevard approach consists of two through lanes. The intersection is signalized; there are no facilities for pedestrians or bicyclists. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

<u>Folsom Boulevard at Iron Point Road:</u> The traffic flow at this intersection consists of three intersection approaches. Iron Point Road enters from the east with two exclusive left turn lanes and one right turn lane. Folsom Boulevard northbound consists of two through lanes and one right turn lane. Folsom Boulevard southbound consists of one exclusive left turn lane and three through lanes. Iron Point Road has sidewalks on both sides of the roadway. There is a bicycle/pedestrian pathway that runs parallel with this section of Folsom Boulevard with a connector to the Iron Point Road/Folsom Boulevard intersection. Pedestrian crosswalks are provided on the westbound and southbound approaches to connect Iron Point Road to the bicycle/pedestrian pathway. The intersection is signalized and has pedestrian signal heads and push buttons. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Folsom Boulevard at Natoma Station Drive: The Folsom Boulevard at Natoma Station Drive intersection consists of three approaches. Natoma Station Drive enters from the east and consists of two exclusive left turn lanes and one right turn lane. The Folsom Boulevard northbound approach has a lane configuration of two through lanes and one right turn lane. Folsom Boulevard southbound consists of one exclusive left turn lane and two through lanes. Natoma Station Drive has sidewalks on both sides of the roadway. A pedestrian/bicycle pathway connects into the intersection from the west. Crosswalks are provided across the Natoma Station Drive and Folsom Boulevard southbound approaches. The Folsom Boulevard/Natoma Station Drive intersection is signalized and includes pedestrian push buttons and signal heads. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Folsom Boulevard at Blue Ravine Road: The traffic flow at the intersection of Folsom Boulevard at Blue Ravine Road consists of four intersection approaches. The Folsom Boulevard northbound and southbound approaches consist of an exclusive left turn lane, two through lanes, and a right turn lane. The Blue Ravine Road approaches consist of an exclusive left turn lane, one through lane, and one right turn lane. Sidewalks are provided on both sides of Blue Ravine Road in the vicinity of the intersection; short sections of sidewalk are provided on the west side of Folsom Boulevard to provide access to businesses adjacent to the intersection. There are pedestrian crosswalks on the Folsom Boulevard northbound approach and the Blue Ravine Road westbound approach. The intersection is signalized and includes pedestrian signal heads and push buttons. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Folsom Boulevard at Natoma Street and Forrest Street: The Folsom Boulevard at Natoma Street/Forrest Street intersection consists of four approaches. The Folsom Boulevard approaches both consist of an exclusive left turn lane, two through lanes, and a right turn lane. The lane configuration of the Forrest Street approach is one combined left/through lane and one right turn lane. The Natoma Street approach consists of a left turn lane, a through lane, and a right turn lane. There is a bicycle lane provided along this section of Auburn-Folsom Road both northbound and southbound. Forrest Street and Natoma Street have sidewalks along both sides in the vicinity of the intersection. Pedestrian crossings are provided on all four approaches with pedestrian push button actuation. This intersection currently experiences a worse case of LOS D during the evening peak hour (4 p.m. to 6 p.m.) period as illustrated in the Bridge EIS/EIR.

Iron Point Road at Folsom Boulevard: The traffic flow at this intersection consists of three intersection approaches. Iron Point Road enters from the east with two exclusive left turn lanes and one right turn lane. Folsom Boulevard northbound consists of two through lanes and one right turn lane. Folsom Boulevard southbound consists of one exclusive left turn lane and three through lanes. Iron Point Road has sidewalks on both sides of the roadway. There is a bicycle/pedestrian pathway that runs parallel with this section of Folsom Boulevard with a connector to the Iron Point Road/Folsom Boulevard intersection. Pedestrian crosswalks are provided on the westbound and southbound approaches to connect Iron Point Road to the bicycle/pedestrian pathway. The intersection is signalized and has pedestrian signal heads and push buttons. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Auburn-Folsom Road
Auburn-Folsom Road is functionally classified as an undivided arterial and provides north-south access between the cities of Auburn to the north and Folsom to the south. Beginning at the intersection of Greenback Lane/Riley Street/Folsom Boulevard, Auburn-Folsom Road is a four-lane divided roadway. Heading north, Auburn-Folsom Road continues with two lanes in each direction, becoming an undivided roadway outside of the City of Folsom limits, to its intersection with Folsom Dam Road. Continuing north, Auburn-Folsom Road narrows to one lane in each direction, crosses the Sacramento/Placer county line, and remains a two-lane undivided roadway to the Douglas Boulevard intersection. The speed limit is posted at 50 miles mph. Land use along Auburn-Folsom Road is mixed; commercial, residential and light industrial, however in downtown Folsom the land use becomes mainly commercial.

Major intersections located along Auburn-Folsom Road include:

<u>Folsom Boulevard/Auburn-Folsom Road at Greenback Lane:</u> The Folsom Boulevard/Auburn-Folsom Road at Greenback Lane intersection traffic flow is comprised of four approaches. The northbound approach on Folsom Boulevard (on the American River Bridge) has two exclusive left turn lanes, two through lanes, and a right turn lane. The Auburn-Folsom Road southbound approach and Greenback Lane westbound approaches consist of an exclusive left turn lane, two through lanes, and a right turn lane. The eastbound Greenback Lane approach lane configuration is two exclusive left lanes, one through lane, and a channelized right turn lane. Auburn-Folsom Road northbound has bicycle lanes on both sides of the roadway; Greenback Lane eastbound has a marked bicycle lane on the south side of the roadway. Pedestrian crosswalks are provided on all four intersection approaches and include pedestrian pushbuttons. The intersection is signalized. This intersection currently experiences a LOS F during the peak hour periods as illustrated in the Bridge EIS/EIR.

Auburn-Folsom Road at Oak Avenue Parkway: The intersection of Auburn-Folsom Road at Oak Avenue Parkway consists of four intersection approaches. The Auburn-Folsom Road approaches both have an exclusive left turn lane and two through lanes. The Oak Avenue Parkway approaches both have a single shared lane. Pedestrian crosswalks are provided across the Auburn-Folsom Road approaches with pedestrian pushbuttons and signal heads; however, there are no sidewalks present within the vicinity of the intersection. The intersection of Auburn-Folsom Road at Oak Avenue Parkway is signalized. This intersection currently experiences a LOS D during the peak hour periods as illustrated in the Bridge EIS/EIR.

Auburn-Folsom Road at Inwood Road: The traffic flow at this intersection consists of three intersection approaches. The Auburn-Folsom Road northbound approach has an exclusive left turn lane and two through lanes. The Auburn-Folsom Road southbound approach has two lanes, one through and one shared through/right. Inwood Road comes into the intersection from the west with an exclusive left turn lane and an exclusive right turn lane. There are no sidewalks present in the vicinity of the Auburn-Folsom Road at Inwood Road intersection; however, pedestrian crosswalks are present across the northbound and eastbound approaches. The intersection is signalized. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Auburn-Folsom Road at Folsom Dam Road: The intersection of Auburn-Folsom Road at Folsom Dam Road consists of four intersection approaches. The Auburn-Folsom Road approaches consist of an exclusive left turn lane and two through lanes. The Folsom Dam Road eastbound approach is one shared lane; the westbound approach consists of an exclusive left turn lane and a shared through/right lane. Bicycle lanes are present on both sides of Auburn-Folsom Road in the vicinity of the intersection. Folsom Dam Road west of the intersection has sidewalks on both sides; the southbound Auburn-Folsom Road approach has a segment of sidewalk on the west side at the intersection. Pedestrian crosswalks are provided across the Auburn-Folsom northbound approach and the Folsom Dam Road eastbound approach. The intersection is signalized. This intersection currently experiences a LOS A during the peak hour periods as illustrated in the Bridge EIS/EIR.

Auburn-Folsom Road at Pinebrook Drive: The Auburn-Folsom Road at Pinebrook Drive intersection traffic flow consists of four approaches; three approaches are roadways, the fourth a driveway. The Auburn-Folsom Road northbound approach has an exclusive left turn lane and one through lane. The Auburn-Folsom Road southbound approach consists of a through lane and an exclusive right turn lane. The Pinebrook Drive approach lane configuration is one exclusive left turn lane and one right turn lane. The driveway approaches from the east and consists of a narrow general use lane. There are no marked pedestrian crosswalks; however, there is a short section of sidewalk on the Auburn-Folsom Road southbound approach that connects Pinebrook Drive to the commercial property to the north. The intersection is signalized. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

<u>Auburn-Folsom Road at Oak Leaf Way and Beal's Point Road:</u> The intersection is comprised of four approaches. Auburn-Folsom Road northbound consists of an exclusive left turn lane and one through lane. The southbound Auburn-Folsom Road approach has an exclusive left turn lane, one through lane, and a right turn lane. Oak Leaf Way comes into the intersection with a shared left/through lane and an exclusive right tune lane. Beal's Point Road consists of a single general use lane. Crosswalks are present across the northbound Auburn-Folsom Road, Oak Leaf Way and Beal's Point Road approaches. There are no marked bicycle lanes or sidewalks within the vicinity of the intersection. The Auburn-Folsom Road at Oak Leaf Way/Beal's Point Road intersection is signalized. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

<u>Auburn-Folsom Road at Eureka Road:</u> The intersection of Auburn-Folsom Road at Eureka Road has four approaches; three roadway approaches and one driveway access. The northbound approach on Auburn-Folsom Road consists of an exclusive left turn lane and a through lane; southbound consists of an exclusive left turn lane, one through lane, and an exclusive right turn lane. The Eureka Road approach from the west has a shared left/through lane and an exclusive right turn lane. A driveway access is directly across the intersection from Eureka Road. Pedestrian crosswalks are provided across the Auburn-Folsom Road northbound approach and the Eureka Road approach. There are no sidewalks within the vicinity of the intersection. The Auburn-Folsom Road at Eureka Road intersection is signalized. This intersection currently experiences a LOS B during the peak hour periods as illustrated in the Bridge EIS/EIR.

<u>Auburn-Folsom Road at Douglas Boulevard:</u> The Auburn-Folsom Road at Douglas Boulevard intersection is comprised of four intersection approaches. The Auburn-Folsom Road southbound, and both Douglas Boulevard approaches, consist of one exclusive left turn lane, two shared through lanes, and an exclusive channelized right turn lane. The Auburn-Folsom Road northbound approach consists of an exclusive left turn lane, one shared left/through lane, one through lane, and an exclusive channelized right turn lane. All four approaches have sidewalks present on both sides in the vicinity of the intersection. Pedestrian access is provided by crosswalks from each corner of the intersection to the channelization islands; and across each leg of the intersection from island to island. Pedestrian pushbuttons and signal heads are provided for all crossings. The intersection is signalized. This intersection currently experiences a LOS D during the peak hour periods as illustrated in the Bridge EIS/EIR.

Douglas Boulevard

Douglas Boulevard is an east-west roadway and is functionally classified as a divided arterial. Between Sierra College Boulevard and Auburn-Folsom Road, Douglas Boulevard consists of two lanes in each direction. Continuing east, it further narrows to a two-lane undivided roadway. Land uses along much of the roadway are offices and commercial to Sierra College Boulevard; residential/vacant/open space with limited commercial between Sierra College Boulevard and Auburn-Folsom Road; and primarily residential east of Auburn-Folsom Road. Douglas Boulevard west of Interstate 80 is two lanes in each direction through heavily developed and densely populated areas.

Major intersections along Douglas Boulevard include:

<u>Douglas Boulevard at Eureka Road:</u> The intersection of Douglas Boulevard at Eureka Road consists of four intersection approaches. The Douglas Boulevard eastbound approach has six lanes: two exclusive left turn lanes, three through lanes, and a right turn lane. The westbound Douglas Boulevard approach consists of two exclusive left turn lanes, three through lanes, and a channelized right turn lane. The Eureka Road northbound approach has two exclusive left turn lanes, two through lanes, and a right turn lane. The southbound Eureka Road approach consists of two left turn lanes, two through lanes, and a channelized right turn lane. The Eureka Road approaches also include a marked bicycle lane between the through and right turn lanes; Douglas Boulevard has a bicycle lane only on the north side between the through lane and the channelized right turns. All four approaches have sidewalks present on both sides of the roadways. Crosswalks are provided across all of the intersection approaches. The intersection is signalized and pedestrian push buttons are provided. This intersection currently experiences a LOS C during the peak hour period as illustrated in the Circulation Element section of the City of Roseville General Plan.

<u>Douglas Boulevard at East Roseville Parkway:</u> The intersection of Douglas Boulevard at East Roseville Parkway consists of four intersection approaches. The Douglas Boulevard eastbound approach has six lanes: two exclusive left turn lanes, three through lanes, and a right turn lane. The westbound Douglas Boulevard approach consists of two exclusive left turn lanes, three through lanes, and a channelized right turn lane. The East Roseville Parkway northbound approach has one exclusive left turn lane, two through lanes, and one right turn lane. The southbound East Roseville Parkway approach consists of two left turn lanes, two through lanes, and a channelized right turn lane. The East Roseville Parkway approaches also include a marked bicycle lane between the through and right turn lanes; Douglas Boulevard has a bicycle lane only on the north side between the through lane and the channelized right turns. All four approaches have sidewalks present on both sides of the roadways. Crosswalks are provided across all of the intersection approaches. The intersection is signalized and includes pedestrian push

buttons. This intersection currently experiences a LOS A during the peak hour period as illustrated in the City of Roseville General Plan, Circulation Element.

Douglas Boulevard at Sierra College Boulevard: The intersection of Douglas Boulevard at Sierra College Boulevard consists of four intersection approaches. The eastbound Douglas Boulevard approach has four approach lanes: one exclusive left turn lane, two through lanes, and a shared through/right lane. The westbound approach on Douglas Boulevard consists of one left turn lane, three through lanes, and a channelized right turn lane. The Sierra College Boulevard approaches both have four lanes: one left turn lane, two through lanes, and a right turn lane. The right turn lane on the northbound approach is channelized. There are no marked bicycle lanes at this intersection. Pedestrian access is provided on all approaches with sidewalks on both sides of the roadways and pedestrian crosswalks across all four approaches. The intersection of Douglas Boulevard and Sierra College Boulevard is signalized and includes pedestrian pushbuttons. This intersection currently experiences a LOS E during the peak hour period as illustrated in the Circulation Element section of the City of Roseville General Plan.

Douglas Boulevard at Cavitt-Stallman Road: The Douglas Boulevard at Cavitt-Stallman Road intersection is comprised of four approaches. The eastbound Douglas Boulevard approach has an exclusive left turn lane, a through lane, and a shared through/right lane. The Douglas Boulevard westbound approach consists of an exclusive left turn lane, two through lanes, and a right turn lane. Both Douglas Boulevard approaches have a marked bicycle lane. The Cavitt-Stallman Road approaches each have two lanes: one shared left/through and one exclusive right. Sidewalks are present on both sides of the roadways; crosswalks are provided across the Douglas Boulevard eastbound and both Cavitt-Stallman Road approaches. The intersection is signalized and includes pedestrian pushbuttons. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Douglas Boulevard at Seeno Avenue: The intersection of Douglas Boulevard and Seeno Avenue consists of three intersection approaches. The Douglas Boulevard approaches, both east and west, have an exclusive left turn lane and two through lanes. The Seeno Avenue approach has one general use lane; however, it is wide enough to allow for both a right and left turning vehicles. There is sidewalk present on the north side of Douglas Boulevard; there are no marked pedestrian crossings at the intersection. The Douglas Boulevard at Seeno Avenue intersection is signalized. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Douglas Boulevard at Barton Road: The intersection of Douglas Boulevard and Barton Road has four intersection approaches. The eastbound Douglas Boulevard approach has one left turn lane, one through lane, and a shared through/right turn lane. The Douglas Boulevard westbound approach consists of an exclusive left turn lane, two through lanes, and a right turn lane. The north and southbound approaches on Barton Road are both two lanes: one shared left/through and one right turn lane. The Barton Road northbound right turn lane is channelized. Pedestrian crosswalks are provided across the Douglas Boulevard westbound approach and both Barton Road approaches. A sidewalk is present along the Barton Road southbound approach and on the north side of Douglas Boulevard heading west from the intersection. The intersection is signalized. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

<u>Douglas Boulevard at Auburn-Folsom Road:</u> The Auburn-Folsom Road at Douglas Boulevard intersection is comprised of four intersection approaches. The Auburn-Folsom Road southbound, and both Douglas Boulevard approaches, consist of one exclusive left turn lane, two shared through lanes, and an exclusive channelized right turn lane. The Auburn-Folsom Road northbound approach consists of an exclusive left turn lane, one shared left/through lane, one through lane, and an exclusive channelized right turn lane. All four approaches have sidewalks present on both sides in the vicinity of the intersection. Pedestrian access is provided by crosswalks from each corner of the intersection to the channelization islands; and across each leg of the intersection from island to island. Pedestrian pushbuttons and signal heads are provided for all crossings. The intersection is signalized. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Blue Ravine Road

Blue Ravine Road is an east-west roadway connecting Folsom Boulevard to East Natoma Street. It is classified as an arterial. Between Folsom Boulevard and Prairie City Road/Sibley Street, Blue Ravine Road consists of three lanes in each direction. East of Sibley Street, Blue Ravine Road narrows to two lanes in each direction to the intersection of Joerganson Road and then continues east varying between one-lane and two-lane configurations to East Natoma Street/Green Valley Road. Blue Ravine Road is classified as a divided arterial. The speed limit is 45 mph and the roadway is posted as a local truck route. Land uses along much of the roadway are mixed commercial/office with dense residential along its full length.

Major intersections along Blue Ravine Road include:

<u>Blue Ravine Road at Folsom Boulevard and Auburn-Folsom Road:</u> The traffic flow at the intersection of Blue Ravine Road at Folsom Boulevard and Auburn-Folsom Road consists of four intersection approaches. The Folsom Boulevard (northbound) and Auburn-Folsom Road (southbound) approaches consist of an exclusive left turn lane, two through lanes, and a right turn lane. The Blue Ravine Road approaches

consist of an exclusive left turn lane, one through lane, and one right turn lane. Sidewalks are provided on both sides of Blue Ravine Road in the vicinity of the intersection; short sections of sidewalk are provided on the west side of Folsom Boulevard and Auburn-Folsom Road to provide access to businesses adjacent to the intersection. There are pedestrian crosswalks on the Folsom Boulevard northbound approach and the Blue Ravine Road westbound approach. The intersection is signalized and there are pedestrian signals and push buttons. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

<u>Blue Ravine Road at Oak Avenue Parkway:</u> The Blue Ravine Road at Oak Avenue Parkway intersection has four approach legs. The eastbound approach on Blue Ravine Road consists of five lanes: two left turn lanes, two through lanes, and a channelized right turn lane. The Blue Ravine Road westbound approach has two left turn lanes, one through lane, and a shared through/right turn lane. The Oak Avenue Parkway northbound approach leg consists of one left turn lane, three through lanes, and a channelized right turn lane. There is a marked bicycle lane between the through and right turn lanes. The southbound Oak Avenue Parkway approach has one left turn lane, one through lane, and a shared through/right turn lane. Sidewalks are present on both sides of all of the intersection approaches; pedestrian crosswalks are provided across all four legs of the intersection. The Blue Ravine Road at Oak Avenue Parkway intersection is signalized and provides pushbuttons and signal heads for pedestrian access. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

<u>Blue Ravine Road at Green Valley Road and East Natoma Street:</u> The intersection of Green Valley Road at Blue Ravine Road/East Natoma Street consists of four intersection approaches. The eastbound and westbound approaches on East Natoma Street both consist of an exclusive left turn lane and a shared through/right turn lane. The northbound Green Valley Road approach, and the southbound Blue Ravine Road approach, both have one left turn lane, one through lane, and one right turn lane. There is sidewalk present on the south side of eastbound East Natoma Street approach and on the west side of Green Valley Road heading south away from the intersection. Crosswalks are marked across the Green Valley Road approach and the East Natoma Street westbound approach. There is a marked bicycle path on both sides of East Natoma Street east of the intersection. The Green Valley Road at East Natoma Street and Blue Ravine Road intersection is signalized and includes pedestrian pushbuttons and signal heads. This intersection currently experiences a worse case of LOS C during the evening peak hour period (4 pm – 6 pm) as illustrated in the Bridge EIS/EIR.

East Natoma Street

Natoma Street is an east-west roadway in the City of Folsom. It is classified as an undivided arterial. Natoma Street consists of one lane in each direction from Folsom Boulevard to Stafford Street. East of Stafford Street, Natoma Street widens to two lanes in each direction and continues as a four-lane undivided roadway to Fargo Way. At Fargo Way, Natoma Street becomes East Natoma Street and continues to Folsom Dam Road as a two-lane undivided roadway. At Folsom Dam Road, the eastbound side of the roadway increases to two lanes; it continues as a three-lane road to Green Valley Road/Blue Ravine Road. Natoma Street is posted at 35 mph through the City of Folsom and then increases to 45 mph at the Prison entrance and increases again to 50 mph at Briggs Ranch Drive. Within the downtown area, land use is mixed use residential/commercial/office; east of Fargo Way the land use changes to residential/recreational.

Major intersections along East Natoma Street include:

East Natoma Street at Auburn-Folsom Road and Forrest Street: The Auburn-Folsom Road at Natoma Street/Forrest Street intersection consists of four approaches. The Auburn-Folsom Road approaches both consist of an exclusive left turn lane, two through lanes, and a right turn lane. The lane configuration of the Forrest Street approach is one combined left/through lane and one right turn lane. The Natoma Street approach consists of a left turn lane, a through lane, and a right turn lane. There is a bicycle lane provided along this section of Auburn-Folsom Road both northbound and southbound. Forrest Street and Natoma Street have sidewalks along both sides in the vicinity of the intersection. Pedestrian crossings are provided on all four approaches with pedestrian push button actuation. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

East Natoma Street at Riley Street: The intersection of Natoma Street at Riley Street consists of four approach legs. The lane configuration on all approaches is an exclusive left turn lane and a shared through/right turn lane. Bicycle lanes are present on both sides of the roadway. Pedestrian crosswalks are provided across the four approaches; there is sidewalk in the vicinity of the intersection on all approaches. The Natoma Street at Riley Street intersection is signalized and pedestrian pushbuttons and signal heads are provided. This intersection currently experiences a worse case of LOS F during the evening peak hour period (4 pm – 6 pm) as illustrated in Bridge EIS/EIR.

East Natoma Street at Coloma Street: The Natoma Street at Coloma Street intersection consists of four intersection approaches. All four intersection legs have the same lane configuration: one left turn lane and one shared through/right turn lane. Sidewalks are present on both sides of Natoma Street and Coloma Street in the vicinity of the intersection. Pedestrian crosswalks are provided across all four intersection approaches. The intersection is signalized and pedestrian pushbuttons and signal heads are provided for each crossing. This intersection currently experiences a worse case of LOS C during the evening peak hour period (4 pm – 6 pm) as illustrated in the Bridge EIS/EIR.

East Natoma Street at Stafford Street: The intersection of Natoma Street at Stafford Street has four approaches; the Stafford Street approaches are slightly offset with the northbound approach further west than the southbound approach. The Natoma Street eastbound approach consists of a left turn lane and a shared through/right turn lane. The Natoma Street westbound approach has a left turn lane, on through lane, and a right turn lane. The northbound and southbound Stafford Street approaches both have a marked shared left/through/right lane. Sidewalks are present on both sides of all four intersection legs. Crosswalks are provided across all intersection approaches. The Natoma Street at Stafford Street intersection is signalized and includes pedestrian pushbuttons. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

East Natoma Street at Wales Drive: The intersection of Natoma Street at Wales Drive consists of four approaches; three roadway approaches and one driveway access. The eastbound and westbound Natoma Street approaches have one left turn lane, one through lane, and a shared through/right lane. The Wales Drive northbound leg consists of one left turn lane and a shared through/right lane. The driveway access southbound has a left turn lane and a shared through/right turn lane. There are sidewalks present along both sides of Natoma Street and Wales Drive; the driveway access has sidewalk on the east side only. The Natoma Street and Wales Drive approaches have crosswalks. The intersection is signalized and pedestrian pushbuttons are provided. This intersection currently experiences a LOS B during the peak hour periods as illustrated in the Bridge EIS/EIR.

East Natoma Street at Natoma Street and Prison Road: The Natoma Street at East Natoma Street and Prison Road intersection has three approach legs. The Natoma Street eastbound approach consists of a left turn lane and a through lane. This approach also has a marked bicycle lane. The westbound East Natoma Street approach has one shared lane and a marked bicycle lane. The Prison Road, southbound, leg of the intersection has one left turn lane and a right turn lane. There are no pedestrian crosswalks or sidewalks at this intersection. The Natoma Street at East Natoma Street and Prison Road intersection is signalized. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

East Natoma Street at Folsom Dam Road and Briggs Ranch Drive**:** The traffic flow at the intersection of East Natoma Street at Folsom Dam Road consists of four intersection approaches. The eastbound East Natoma Street approach has one left turn lane, a though lane, and a shared through/right turn lane. The westbound approach on East Natoma Street consists of a left turn lane, a through lane, and a right turn lane. The Briggs Ranch Drive northbound leg to the intersection consists of a shared left/through lane and a right turn lane. The southbound approach on Folsom Dam Road has a left turn lane and a shared left/through/right turn lane. Sidewalks are present on both sides of Briggs Ranch Drive south of the intersection; there are crosswalks on both the East Natoma Street and northbound Briggs Ranch Drive approaches. The East Natoma Street at Folsom Dam Road and Briggs Ranch Drive intersection is signalized and pedestrian signals and pushbuttons are provided for each crossing. This intersection currently experiences a LOS A during the peak hour periods as illustrated in the Bridge EIS/EIR.

<u>East Natoma Street at Briggs Ranch Drive:</u> The traffic flow at the intersection of East Natoma Street and Briggs Ranch Drive consists of four approach legs. The eastbound East Natoma Street approach has one left turn lane, two through lanes, and a right turn lane. The westbound East Natoma Street leg consists of one left turn lane, one through lane, and one right turn lane. The Briggs Ranch Drive approach from the south has one shared left/through lane and a right turn lane; the approach from the north has a single, unmarked, shared use lane. Briggs Ranch Drive has sidewalks on both sides to the south of the intersection. East Natoma Street has sidewalk on the north side to the west of the intersection. The northbound Briggs Ranch Drive and eastbound East Natoma approaches have crosswalks. The intersection is signalized. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Green Valley Road
Green Valley Road is an east-west roadway that begins at the intersection with East Natoma/Blue Ravine Road and continues east into El Dorado County. Within the Folsom DS/FDR area, Green Valley Road is a two-lane undivided roadway and is classified as an undivided arterial. The speed limit is posted at 45 mph. Green Valley Road does not have sidewalks or marked bicycle facilities. The land use along much of the roadway is primarily residential/recreational.

Folsom Dam Road
On February 28, 2003, "following a series of security reviews, Reclamation indefinitely closed Folsom Dam Road, as an emergency measure to preserve and protect the core mission of Folsom Dam and Reservoir and to ensure public safety in the vicinity of the dam and other parts of Sacramento County." Following a Record of Decision issued May 2005, Reclamation allowed the road to be opened to commuter traffic for 3-hour periods during the morning and evening peak periods subject to the City of Folsom providing safety and infrastructure improvements. The City of Folsom is currently unable to open the roads subject to Reclamation's conditions; therefore, the road remains temporarily closed.

To provide a conservative analysis of potential impacts on currently open roads, this analysis assumes that Folsom Dam Road is not available for construction activities. During implementation of the Folsom DS/FDR, the Folsom Dam Road could be used to accommodate construction traffic, which would reduce potential transportation impacts.

Sierra College Boulevard
Sierra College Boulevard is a north-south roadway that begins at its intersection with Hazel Avenue and Old Auburn Road and continues north to Interstate 80 and ends at the Caperton Reservoir. From Old Auburn Road to Seymour Place, Sierra College Boulevard is a four-lane divided roadway. At Seymour Place, the northbound side reduces to one lane. Sierra College Boulevard continues as a three-lane divided roadway to the Rocklin line north of Olympus Drive where it further reduces to a two-lane undivided roadway. It is classified as a divided arterial. Sierra College Boulevard is posted at 45 mph through the Folsom DS/FDR area. Land use along much of the roadway varies from residential to commercial/retail.

Major intersections along Sierra College Boulevard include:

<u>Sierra College Boulevard at Douglas Boulevard:</u> The intersection of Douglas Boulevard at Sierra College Boulevard consists of four intersection approaches. The eastbound Douglas Boulevard approach has four approach lanes: one exclusive left turn lane, two through lanes, and a shared through/right lane. The westbound approach on Douglas Boulevard consists of one left turn lane, three through lanes, and a channelized right turn lane. The Sierra College Boulevard approaches both have four lanes: one left turn lane, two through lanes, and a right turn lane. The right turn lane on the northbound approach is channelized. There are no marked bicycle lanes at this intersection. Pedestrian access is provided on all approaches with sidewalks on both sides of the roadways and pedestrian crosswalks across all four approaches. The intersection of Douglas Boulevard and Sierra College Boulevard is signalized and includes pedestrian pushbuttons. This intersection currently experiences a LOS E during the peak hour period as illustrated in the City of Roseville General Plan, Circulation Element.

Eureka Road
Eureka Road is a north-south roadway; within the limits of the Folsom DS/FDR study area, it begins at the intersection of Eureka Road and Douglas Boulevard and ends at the Interstate 80 interchange intersection. It is classified as an arterial, changing from undivided to divided within the Folsom DS/FDR study area. The roadway consists of six lanes, divided, with marked bicycle lanes on both sides. The posted speed limit within the Folsom DS/FDR study area is 45 mph. Land use along much of the roadway is predominantly commercial/retail and large office space.

Major intersections along Eureka Road include:

Eureka Road at Douglas Boulevard: The intersection of Eureka Road at Douglas Boulevard consists of four intersection approaches. The Douglas Boulevard eastbound approach has six lanes: two exclusive left turn lanes, three through lanes, and a right turn lane. The westbound Douglas Boulevard approach consists of two exclusive left turn lanes, three through lanes, and a channelized right turn lane. The Eureka Road northbound approach has two exclusive left turn lanes, two through lanes, and a right turn lane. The southbound Eureka Road approach consists of two left turn lanes, two through lanes, and a channelized right turn lane. The Eureka Road approaches also include a marked bicycle lane between the through and right turn lanes; Douglas Boulevard has a bicycle lane only on the north side between the through lane and the channelized right turns. All four approaches have sidewalks present on both sides of the roadways. Crosswalks are provided across all of the intersection approaches. The intersection is signalized and pedestrian push buttons are provided. This intersection currently experiences a LOS C during the peak hour period as illustrated in the Circulation Element section of the City of Roseville General Plan.

Eureka Road at Lead Hill Boulevard: The intersection of Eureka Road at Lead Hill Boulevard consists of four intersection approaches. The Eureka Road northbound and southbound approaches have five lanes: one exclusive left turn lane, three through lanes, and a channelized right turn lane. There is a marked bicycle lane between the through and right turn lane. The Lead Hill Boulevard approaches consist of four lanes: one exclusive left turn lane, two through lanes, and a channelized right turn lane. A bicycle lane is present between the through and right lane. All four approaches have sidewalks present on both sides of the roadway. Crosswalks are provided across all four intersection legs. The intersection is signalized and includes pedestrian signal heads and pushbutton actuation. This intersection currently experiences a LOS A during the peak hour period as illustrated in the Circulation Element section of the City of Roseville General Plan.

Eureka Road at Rocky Ridge Drive: The intersection of Eureka Road at Rocky Ridge Drive consists of four intersection approaches. The Eureka Road northbound and southbound approaches have five lanes: one exclusive left turn lane, three through lanes, and a channelized right turn lane. There is a marked bicycle lane between the through and right turn lane. The Rocky Ridge Drive approaches consist of four lanes: one exclusive left turn lane, two through lanes, and a channelized right turn lane. A bicycle lane is present between the through and right lane. All four approaches have sidewalks present on both sides of the roadway. Crosswalks are provided across all four intersection legs. The intersection is signalized and includes pedestrian signal heads and pushbutton actuation. This intersection currently experiences a LOS D during the peak hour period as illustrated in the Circulation Element section of the City of Roseville General Plan.

Eureka Road at Sunrise Avenue: The intersection of Eureka Road at Sunrise Avenue consists of four intersection approaches. The Eureka Road northbound and southbound approaches have five lanes: one exclusive left turn lane, three through lanes, and a channelized right turn lane. There is a marked bicycle lane between the through and right turn lane. The Sunrise Avenue approaches consist of six lanes: two exclusive left turn lanes, three through lanes, and a channelized right turn lane. A bicycle lane is marked between the through and right turn lane. All four intersection legs have pedestrian crosswalks; there are sidewalks on both sides of all approaches. The intersection is signalized and includes pedestrian pushbuttons. This intersection currently experiences a LOS D during the peak hour period as illustrated in the Circulation Element of the City of Roseville General Plan.

Eureka Road at Taylor Road and the Interstate 80 Off-Ramp: The intersection of Eureka Road at Taylor Road and Interstate 80 has four intersection approaches. The northbound Eureka Road approach consists of three through lanes and a channelized right turn lane. The southbound Eureka Road approach has one exclusive left turn lane, and two though lanes. The Taylor Road westbound approach consists of two exclusive left turn lanes and one exclusive right turn lane. The Interstate 80 off-ramp approach eastbound has one exclusive left turn lane, one through lane, and a channelized right turn lane. Sidewalks are present on both sides of the Taylor Road approach and the Eureka Road northbound approach. Crosswalks are marked across all four legs of the intersection. The Eureka Road at Taylor Road and Interstate 80 intersection is signalized and includes pedestrian signal heads and pushbuttons. This intersection currently experiences a LOS D during the peak hour period as illustrated in the Circulation Element of the City of Roseville General Plan.

East Bidwell Street

East Bidwell Street is a north-south roadway that connects Highway 50 with downtown Folsom. Within the Folsom DS/FDR study area, East Bidwell Street varies between four and six divided lanes. A marked bicycle lane and sidewalks are present along some sections of East Bidwell Street. The roadway is classified as a divided arterial. The speed limit is posted at 45 mph. Land use along much of the roadway is predominantly commercial and residential.

Major intersections along East Bidwell Street include:

East Bidwell Street at Highway 50 Interchange Off-Ramp: The traffic flow at this intersection consists of three intersection approaches. East Bidwell Street enters from the north with three though lanes and from the south with two through lanes. The Highway 50 westbound traffic exits East Bidwell Street to a highway entrance ramp before the intersection. The Highway 50 interchange off-ramp enters the intersection from the east and consists of two exclusive left turn lanes and two right turn lanes. The intersection is signalized, and a pedestrian crosswalk is provided across the Highway 50 ramp. There are no marked bicycle lanes at this location.

Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

East Bidwell Street at Iron Point Road: The intersection of East Bidwell Street and Iron Point Road has four approaches. The northbound and southbound legs of East Bidwell Street have two exclusive left turn lanes, three though lanes, and a channelized right turn lane. The Iron Point Road eastbound approach consists of one left turn lane, a through lane, and a shared through/right turn lane. The westbound Iron Point Road approach has two exclusive left turn lanes, two through lanes, and a channelized right turn lane. Bicycle lanes are present on all four intersection approach legs. Crosswalks are provided across all four approaches and pedestrian signal heads and timings are included. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

East Bidwell Street at Broadstone Parkway: The intersection of East Bidwell Street and Broadstone Parkway has four intersection legs. The northbound East Bidwell Street approach has one left turn lane, three through lanes, and a channelized right turn lane. The southbound approach on East Bidwell Street consists of two left turn lanes, three through lanes, and a channelized right turn lane. The eastbound and westbound Broadstone Parkway approaches both have two left turn lanes, three through lanes, and a channelized right turn lane. Marked bicycle lanes are provided on all four intersection approaches as are pedestrian crosswalks and pushbuttons. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

East Bidwell Street at Scholar Way and Clarksville Road: The intersection of East Bidwell Street at Scholar Way/Clarksville Road consists of four approaches. The northbound East Bidwell Street approaches has two left turn lanes, two through lanes, and a channelized right turn lane; the southbound approach has two left turn lanes, three through lanes, and a channelized right turn lane. The Scholar Way westbound and Clarksville Road eastbound approaches consist of one left turn lane, two through lanes, and a channelized right turn lane. Bicycle lanes are present on all four approach legs. Pedestrian accommodations, including crosswalks and pushbuttons, are included on all approaches. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

East Bidwell Street at Oak Avenue Parkway: The intersection of East Bidwell Street and Oak Avenue Parkway has four intersection approaches. All of the approaches have the same lane configuration: two left turn lanes, three through lanes, and a channelized right turn lane. Bicycle lanes are marked between the through and right turn lanes on all of the intersection legs. Crosswalks and pedestrian push buttons are included for all approaches. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Oak Avenue Parkway

Oak Avenue Parkway is a six-lane divided roadway. Within the Folsom DS/FDR study area – between East Bidwell Street and Blue Ravine Road – there are no center left turn lanes for access to off-side driveways. All changes of direction are made at the intersections. Oak Avenue Parkway is classified as a divided arterial. The speed limit is posted at 45 mph. Land use along much of the roadway is predominantly residential with some small retail. Marked bicycle lanes and sidewalks are provided intermittently along the roadway.

Major intersections along Oak Avenue Parkway include:

<u>Oak Avenue Parkway at East Bidwell Street:</u> The intersection of Oak Avenue Parkway and East Bidwell Street has four intersection approaches. Each of the approaches consists of two left turn lanes, three through lanes, and a channelized right turn lane. Sidewalks are present on both sides of all approach legs. Bicycle lanes are marked between the through and right turn lanes on all of the intersection legs. Crosswalks and pedestrian push buttons are included for all approaches. Sidewalks are present on all four intersection corners. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

<u>Oak Avenue Parkway at South Lexington Drive:</u> The intersection of Oak Avenue Parkway and South Lexington Drive consists of four intersection approaches. The northbound and southbound Oak Avenue Parkway approaches have one left turn lane, two through lanes, and a shared through/right turn lane. The east and westbound South Lexington Drive approaches have one left turn lane and a shared through/right turn lane. Sidewalks are present on all four intersection approaches. Marked bicycle lanes are present on both Oak Avenue Parkway approach legs. Crosswalks with pedestrian pushbuttons are provided for all four approaches. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

<u>Oak Avenue Parkway at North Lexington Drive:</u> The intersection of Oak Avenue Parkway and North Lexington Drive has four intersection approaches. The north and south Oak Avenue Parkway intersection legs have one left turn lane, two through lanes, and a shared through/right turn lane. The North Lexington Drive approaches consist of a left turn lane and a shared through/right turn lane. Pedestrian accommodations, including sidewalks, crosswalks and pushbuttons, are provided for

all four intersection approaches. There are marked bicycle lanes on the northbound and southbound Oak Avenue Parkway approaches. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Oak Avenue Parkway at Blue Ravine Road: The Oak Avenue Parkway at Blue Ravine Road intersection has four approach legs. The Oak Avenue Parkway northbound approach leg consists of one left turn lane, three through lanes, and a channelized right turn lane. There is a marked bicycle lane between the through and right turn lanes. The southbound Oak Avenue Parkway approach has one left turn lane, one through lane, and a shared through/right turn lane. The eastbound approach on Blue Ravine Road consists of five lanes: two left turn lanes, two through lanes, and a channelized right turn lane. The Blue Ravine Road westbound approach has two left turn lanes, one through lane, and a shared through/right turn lane. Sidewalks are present on both sides of all of the intersection approaches; pedestrian crosswalks are provided across all four legs of the intersection. The Blue Ravine Road at Oak Avenue Parkway intersection is signalized and provides pushbuttons and signal heads for pedestrian access. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Greenback Lane

Greenback Lane is a four-lane, divided roadway with center left turn lanes for cross-street and driveway access. It runs predominantly in an east-west direction and connects the City of Folsom with Interstate 80 and points west. Sidewalks are present intermittently on both sides of the roadway; there are marked bicycle facilities from Auburn-Folsom Road to Madison Avenue. It is classified as a divided arterial. The posted speed limit is 45 mph. The land use along much of the roadway within the Folsom DS/FDR study area is predominantly residential and small commercial/retail.

Major intersections along Greenback Lane include:

Greenback Lane at Folsom Boulevard/Auburn-Folsom Road: The Greenback Lane at Auburn-Folsom Road/Folsom Boulevard intersection traffic flow is comprised of four approaches. The northbound approach on Folsom Boulevard (on the American River Bridge) has two exclusive left turn lanes, two through lanes, and a right turn lane. The Auburn-Folsom Road southbound approach and Greenback Lane westbound approaches consist of an exclusive left turn lane, two through lanes, and a right turn lane. The eastbound Greenback Lane approach lane configuration is two exclusive left lanes, one through lane, and a channelized right turn lane. Auburn-Folsom Road northbound has bicycle lanes on both sides of the roadway; Greenback Lane eastbound has a marked bicycle lane on the south side of the roadway. Pedestrian crosswalks are provided on all four intersection approaches and include pedestrian pushbuttons. The intersection is signalized. The intersection is signalized. This intersection currently experiences a LOS F during the peak hour periods as illustrated in the Bridge EIS/EIR.

<u>Greenback Lane at Madison Avenue/Lake Natoma Drive:</u> The intersection of Greenback Lane and Madison Avenue/Lake Natoma Drive consists of four approach legs. Greenback Lane westbound has one exclusive left turn lane, two through lanes, and a channelized right turn lane. The Greenback Lane southbound approach consists of one left turn lane and one shared left/through/right lane. The Madison Avenue eastbound approach has one exclusive left turn lane, one through lane, and a shared through/right turn lane. The northbound Lake Natoma Drive approach consists of one left turn lane, one through lane, and one right turn lane. The intersection is signalized. Sidewalks are present on both sides of all three roadways. Pedestrian crossings are located across the Madison Avenue, Lake Natoma Drive, and Greenback Lane southbound legs of the intersection. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

<u>Greenback Lane at Main Street:</u> The intersection of Greenback Lane and Main Street has four approach legs. All of the approaches have the same lane configuration: one exclusive left turn lane, one through lane, and a shared through/right turn lane. There is sidewalk present on all four approaches; pedestrian facilities are provided for all legs of the intersection. The Greenback Lane at Main Street intersection is signalized. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

<u>Greenback Lane at Hazel Avenue:</u> The Greenback Lane and Hazel Avenue intersection consists of four approach legs. The approaches each have five lanes: two exclusive left turn lanes, two through lanes, and a right turn lane. Sidewalks are available on all approaches. Pedestrian facilities, including crosswalks and pushbuttons, are provided on all four intersection legs. The Greenback Lane and Hazel Avenue location is signalized. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Scott Road

Scott Road is a narrow two-lane, undivided roadway. Scott Road has a limited paved shoulder and minimal pavement markings. There are no sidewalks or marked bicycle facilities along Scott Road within the Folsom DS/FDR route. The posted speed limit is 35 mph. The land use along much of the roadway is predominantly agricultural.

White Rock Road
White Rock Road is a narrow two-lane, undivided roadway with limited paved shoulder and pavement markings. Sidewalks and marked bicycle facilities are not provided within the Folsom DS/FDR area. The posted speed limit is 35 mph. Land use along much of the roadway is mainly agricultural.

Regional Access Routes
In addition to the local roadway access routes, sand is expected to be hauled to the Folsom DS/FDR site from the City of Marysville, located approximately 50 miles to the northwest of the Folsom Facility. The Regional Routes accessing the Folsom DS/FDR area are listed in Table 3.9-4.

Table 3.9-4
Regional Access Routes

Roadway	*Segment Limits*	*City/Community*	*County*	*Jurisdiction*
Hammonton-Smartville (H-S) Road	From Teichert Aggregate to N. Beale Road	Marysville	Yuba County	Yuba County
N Beale Road	From H-S Road	Marysville	Yuba County	Yuba County
Feather River Boulevard	From N Beale Road to Highway 70	Marysville	Yuba County	Yuba County
Highway 70	Feather River Boulevard to Highway 65	Marysville	Yuba County	Yuba County
Highway 65	From Highway 70 to County Line (south of Wheatland)	Marysville/ Wheatland	Yuba County	Caltrans
Highway 65	County Line (south of Wheatland) to Interstate 80	Lincoln, Roseville	Placer County	Caltrans
Interstate 80	Highway 65 to Sierra College Boulevard	Roseville, Rocklin	Placer County	Caltrans
Interstate 80	Highway 65 to Eureka Road	Roseville, Rocklin	Placer County	Caltrans

Roadway – STAA Federal Route

Hammonton-Smartville Road
Hammonton-Smartville Road is an east-west roadway that runs from State Highway 20 to Chestnut Road (beneath Scenic Route 70). It is classified as a collector roadway. Hammonton-Smartville Road consists of two undivided lanes. There is limited paved shoulder and minimal pavement markings. The posted speed limit is 35 mph from North Beale Road to Dunning Avenue and then increases to 55 mph from Dunning Avenue to the Teichert Industries location. The land use along the roadway is predominantly agricultural.

Major intersections along Hammonton-Smartville Road include:

<u>Hammonton-Smartville Road at North Beale Road:</u> The Hammonton-Smartville Road at North Beale Road intersection consists of four intersection legs. The North Beale approaches have an exclusive left turn lane, two through lanes, and a

channelized right turn lane. The Hammonton-Smartville Road approaches have one exclusive left turn lane, one through lane, and a channelized right turn lane. Pedestrian crosswalks are provided across all four intersection approaches with pedestrian pushbuttons and signal heads. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

North Beale Road
North Beale Road is an east-west roadway in the City of Marysville that runs from Hammonton-Smartville Road to the Highway 70 westbound on-ramp. It is classified as a minor arterial. The roadway consists of four, undivided lanes. A center turn lane is provided intermittently along the roadway. A marked bicycle lane is present on both sides of the segment with the Folsom DS/FDR study area. The posted speed limit is 35 mph. Land use in the area is mixed use residential, commercial and retail.

Major intersections along North Beale Road include:

North Beale Road at Hammonton-Smartville Road: The North Beale Road at Hammonton-Smartville Road intersection consists of four intersection legs. The North Beale Road approaches have an exclusive left turn lane, two through lanes, and a channelized right turn lane. The Hammonton-Smartville Road approaches have one exclusive left turn lane, one through lane, and a channelized right turn lane. Pedestrian crosswalks are provided across all four intersection approaches with pedestrian pushbuttons and signal heads. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

North Beale Road at Lindhurst Avenue: The North Beale Road at Lindhurst Avenue intersection consists of four intersection legs. The North Beale Road southbound approach has an exclusive left turn lane, two through lanes, and two right turn lanes which are channelized well away from the intersection. The North Beale Road westbound approach has one exclusive left turn lane, a shared left/through lane, one through lane, and a channelized right turn lane. Lindhurst Avenue approaches eastbound; it consists of one exclusive left turn lane, one through lane, and a channelized right turn lane. The forth approach is a driveway for a retail center and has one left turn lane, two through lanes, and a channelized right turn lane. Bike lanes are present on all of the intersection approaches. Pedestrian crosswalks are provided across the Lindhurst Avenue and driveway approaches. Pushbuttons and signal heads are also provided for pedestrian access. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

North Beale Road at Walmart Drive***:*** The North Beale Road at Walmart Drive intersection consists of four intersection legs. The North Beale Road approaches have an exclusive left turn lane, one through lane, and a shared through/right lane. The Walmart Drive approach consists of one shared left/through lane and an exclusive right turn lane. The driveway approach has one shared left/through/right lane. Crosswalks are provided on all approach legs with pushbuttons and pedestrian signals. A bicycle lane is marked on the North Beale Road legs. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

North Beale Road at Feather River Boulevard: The intersection of North Beale Road and Feather River Boulevard consists of four approach legs. The North Beale Road westbound approach has one exclusive left turn lane, a through lane, and a shared through/right lane. The eastbound North Beale Road approach consists of one exclusive left turn lane and two through lanes; a right turn lane is present further to west of the intersection keeping those vehicles out of the intersection traffic stream. The Feather River Boulevard approach has one shared left/through lane and a channelized right turn lane. The forth leg of the intersection is a driveway approach with a shared left/through lane and an exclusive right turn lane. Pedestrian crosswalks and pushbuttons are provided on all four intersection approaches. A bicycle lane is marked on the North Beale Road approaches. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Feather River Boulevard
Feather River Boulevard is a north-south roadway that connects North Beale Road in the City of Marysville to Highway 70 south of the city. It is classified as a collector roadway. Within the study area, Feather River Boulevard has sidewalks provided on both sides of the roadway. The roadway consists of four, undivided lanes.

Major intersections along Feather River Boulevard include:

Feather River Boulevard at North Beale Road: The intersection of Feather River Boulevard at North Beale Road consists of four approach legs. The North Beale Road westbound approach has one exclusive left turn lane, a through lane, and a shared through/right lane. The eastbound North Beale Road approach consists of one exclusive left turn lane and two through lanes; a right turn lane is present further to west of the intersection keeping those vehicles out of the intersection traffic stream. The Feather River Boulevard approach has one shared left/through lane and a channelized right turn lane. The forth leg of the intersection is a driveway approach with a shared left/through lane and an exclusive right turn lane. Pedestrian crosswalks and pushbuttons are provided on all four intersection approaches. A bicycle lane is marked on the North Beale Road approaches. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Scenic Route 70

Scenic Route 70 is an east-west highway that connects Route 99 near Sacramento to Highway 395 north of Reno, Nevada. It is part of both the California Freeway and Expressway system and the Scenic Route system. The freeway section of Highway 70 ends at the North Beale/Feather River Road exits and then continues east as a scenic route. Scenic Route 70 is classified as principal arterial with a posted speed limit of 65 mph. It is a four-lane divided highway from the North Beale/Feather River Road exit south to the junction with Highway 65.

Scenic Route 65

Scenic Route 65 is a north-south state highway composed of two sections connecting Bakersfield to Exeter and Roseville to Yuba City. A highway section to connect the two pieces has not been constructed. Highway 65 is part of the California Freeway and Expressway system. The section of Highway 65 used as a regional haul route – between Highway 70 and Interstate 80 – is classified as a principal arterial. It consists of two, undivided lanes with varying shoulder width. The posted speed limit varies along the route, from low 25-30 mph sections through higher population areas to 55-65 mph sections through the rural/agricultural areas.

Major intersections along Scenic Route 65 include:

<u>Highway 65 at 7th Street:</u> The Highway 65 at 7th Street intersection consists of four intersection approaches. All four approaches have the same lane configuration: one left turn lane and one shared through/right turn lane. Sidewalks are present on both sides of all intersection approaches. Pedestrian crosswalks and pushbuttons are also present. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

<u>Highway 65 at 5th Street:</u> The Highway 65 at 5th Street intersection has four approaches. The northbound and southbound Highway 65 legs both consist of an exclusive left turn lane and a shared through/right turn lane. The eastbound 5th Street approach has one shared use lane; the westbound approach has an exclusive left turn lane and a shared through/right turn lane. There are sidewalks on both sides of all approaches. Pedestrian crosswalks and pushbuttons are also provided for all intersection legs. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

<u>Highway 65 at McBean Park Drive:</u> The intersection of Highway 65 at McBean Park Drive has four approach legs. The northbound Highway 65 approach consists of an exclusive left turn lane and a shared through/right turn lane. The southbound Highway 65 approach is a single shared use lane. McBean Park Drive eastbound has a left turn lane and a shared through/right turn lane; westbound is a single shared use

lane. All of the Highway 65 at McBean Park Drive approaches has pedestrian crosswalks and pushbuttons. Sidewalks are provided on all legs to the intersection. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Highway 65 at 3rd Street: The Highway 65 at 3rd Street intersection consists of four approaches. The four approaches all have the same lane configuration with one left turn lane and a shared through/right turn lane. Sidewalks are present on both sides of all of the Highway 65 at 3rd Street approaches. Pedestrian accommodations, both crosswalks and pushbuttons, are also provided on all intersection legs. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Highway 65 at 1st Street: The intersection of Highway 65 at 1st Street has four approach legs. Each approach consists of one left turn lane and a shared through/right turn lane. Crosswalks with pedestrian pushbuttons are provided for each intersection approach. Sidewalks are present along both sides of each leg. Recent capacity analysis data for this intersection were not evident in the information, contacts, and documents reviewed as part of the traffic study for the Folsom DS/FDR action.

Interstate 80

Interstate 80 is the second-longest interstate highway in the United States. The section of Interstate 80 located within the study area runs from Eureka Road to Sierra College Boulevard in a predominantly north-south direction within the analysis area, but, in general, is considered an east-west route. It is classified as a freeway. Interstate 80 consists of six lanes, divided by barriers, within the analysis area with acceleration/deceleration lanes at the interchanges.

Major intersections with Interstate 80 ramps include:

Eureka Road at Taylor Road and the Interstate 80 Off-Ramp: The intersection of Eureka Road at Taylor Road and Interstate 80 has four intersection approaches. The northbound Eureka Road approach consists of three through lanes and a channelized right turn lane. The southbound Eureka Road approach has one exclusive left turn lane, and two though lanes. The Taylor Road westbound approach consists of two exclusive left turn lanes and one exclusive right turn lane. The Interstate 80 off-ramp approach eastbound has one exclusive left turn lane, one through lane, and a channelized right turn lane. Sidewalks are present on both sides of the Taylor Road approach and the Eureka Road northbound approach. Crosswalks are marked across all four legs of the intersection. The Eureka Road at Taylor Road and Interstate 80 intersection is signalized and includes pedestrian signal heads and pushbuttons. This intersection currently experiences a LOS D during the peak hour period as illustrated in the Circulation Element of the City of Roseville General Plan.

Sierra College Boulevard at Interstate 80 Ramps: The Sierra College Boulevard at Interstate 80 Ramps intersection consists of three approaches. The northbound Sierra College Boulevard approach has one left turn lane and one through lane. The southbound Sierra College Boulevard approach has a through lane and an exclusive right turn lane. The Interstate 80 eastbound approach consists of one left turn lane and a right turn lane. There are no sidewalks at this intersection location; however, crosswalks are provided across the Sierra College northbound and Interstate 80 approaches. These crossings have pedestrian pushbuttons and signals. This intersection currently experiences a LOS D during the peak hour period as illustrated in the Circulation Element of the City of Roseville General Plan.

Douglas Boulevard
Douglas Boulevard is an east-west roadway and is functionally classified as an Arterial. Douglas Boulevard consists of three lanes in each direction, divided, from Interstate 80 to Sierra College Boulevard. Between Sierra College Boulevard and Auburn-Folsom Road, Douglas Boulevard consists of two lanes in each direction. Continuing east, it further narrows to a two-lane undivided roadway. Land uses along much of the roadway are offices and commercial to Sierra College Boulevard; residential/vacant/open space with limited commercial between Sierra College Boulevard and Auburn-Folsom Road; and primarily residential east of Auburn-Folsom Road. Douglas Boulevard west of Interstate 80 is 2 lanes in each direction through heavily developed and densely populated areas.

A full description of major intersections on Douglas Boulevard can be found above in the description of Local Access Routes.

Eureka Road
Eureka Road is a north-south roadway; within the Folsom DS/FDR study area it begins at the intersection of Eureka Road and Douglas Boulevard and ends at the Interstate 80 interchange intersection. It is classified as an arterial. The roadway consists of six lanes, divided, with marked bicycle lanes on both sides. The posted speed limit within the Folsom DS/FDR limits is 45 mph. Land use along much of the roadway is predominantly commercial/retail and large office space.

Full intersection descriptions for the locations on Eureka Road can be found above in the description of Local Access Routes.

Sierra College Boulevard
Sierra College Boulevard is a north-south roadway that begins at its intersection with Hazel Avenue and Old Auburn Road and continues north to Interstate 80 and ends at the Caperton Reservoir. From Old Auburn Road to Seymour Place, Sierra College

Boulevard is a four-lane divided roadway. At Seymour Place, the northbound side reduces to one lane. Sierra College Boulevard continues as a three-lane divided roadway to the Rocklin line north of Olympus Drive where it further reduces to a two-lane undivided roadway. Sierra College Boulevard is posted at 45 mph through the Folsom DS/FDR area. Land use along much of the roadway varies from residential to commercial/retail.

A description of major intersections on Sierra College Boulevard can be found in the local haul routes section above.

Auburn-Folsom Road

Auburn-Folsom Road is functionally classified as an urban arterial and provides north-south access between the cities of Auburn to the north and Folsom to the south. Beginning at the intersection of Greenback Lane/Riley Street/Folsom Boulevard, Auburn-Folsom Road is a four-lane divided roadway. Heading north, Auburn-Folsom Road continues with two lanes in each direction, becoming an undivided roadway outside of the City of Folsom limits, to its intersection with Folsom Dam Road. Continuing north, Auburn-Folsom Road narrows to one lane in each direction, crosses the Sacramento/Placer County line, and remains a two-lane undivided roadway to the Douglas Boulevard intersection. The speed limit is posted at 50 mph. Land use along Auburn-Folsom Road is mixed; commercial, residential and light industrial, however in downtown Folsom the land use becomes mainly commercial.

A description of major intersections on Auburn-Folsom Road can be found in the local haul routes section above.

Access Route Incident (Collision) History

Incident or collision history along the local access routes has been collected and analyzed for the most recent three-year period available. The purpose of the collision analysis is to identify routes that may currently experience safety concerns as demonstrated by a high number of incidents. If a corridor currently experiences substantial safety concerns, the corridor may be ruled out as an access route to avoid a potential increase in collisions due to the construction traffic from the Folsom DS/FDR action, or the Folsom DS/FDR action may provide safety improvements as mitigation measures if there are no alternative routes available.

Collision rates at individual intersections have not been calculated. Instead, the intersection collision numbers have been included in the corridor collision rates. Including these collisions within the calculation will cause the corridor collision rate to be higher; however, it will help represent a conservative value for each roadway.

The Hundred Million Vehicle Miles traveled (HMVM) crash rate was determined for each roadway segment within the Folsom DS/FDR study area as a method of demonstrating overall corridor safety. Based on the latest three years of crash data available, crash rates should be calculated for roadway segments based on HMVM as follows:

HMVM = (A x 100,000,000)/ (ADT x D x L)

A = number of total crashes at the study location during a given period

ADT = Average Daily Traffic

D = number of days in the study period

L = length of study location in miles

The results of these calculations are contained in Table 3.9-5.

Based on the most recent motor vehicle safety data from the National Highway Traffic Safety Administration (NHSTA), there was a national average crash rate of 221 crashes per hundred million vehicle miles traveled in 2002. Thus, any rate higher than 221 may be indicative of a safety concern. A review of the collision data indicates that the following roadways may pose potential safety concerns relative to the selection of haul routes:

- Douglas Boulevard – Eureka Road to Sierra College Boulevard
- Douglas Boulevard – Barton Road to Auburn-Folsom Road
- East Bidwell Street – Blue Ravine Road to Oak Avenue Parkway
- Folsom Boulevard – Natoma Street to Blue Ravine Road/US 50 to Greenback Lane

Again, the calculations prepared include collisions that occurred at major intersections, which are typically not included in the HMVM calculation. Therefore, the results of the collision analysis are conservative (i.e., high). Specific intersection ‘crash rates’ are typically calculated separately from the HMVM.

Table 3.9-5 Accident History - Corridor Collision Rate					
		2006			
		No Action/No Project			
Roadway	Location	ADT	Accidents [1]	Length of Roadway Section (miles)	Accident Rate [2]
Folsom Boulevard	Natoma Street to Blue Ravine Road	38,398			
Folsom Boulevard	US50 to Greenback Lane	34,900	296	3.10	227.10
Folsom-Auburn Road	Oak Hill Drive to Folsom Dam Road	32,292			
Folsom-Auburn Road	Folsom Dam Road to Oak Avenue	29,591	162	2.20	208.25
Auburn-Folsom (A-F) Road	Douglas Boulevard to Eureka Road	31,563			
Auburn-Folsom (A-F) Road	Eureka Road to Oak Hill Drive	27,097	88	1.76	144.67
Blue Ravine Road	Folsom Boulevard to Sibley Street	19,410	24	0.73	154.69
Blue Ravine Road	Sibley Street to Riley Street	29,631	33	0.77	132.09
Blue Ravine Road	Oak Avenue Parkway to Green Valley Road/East Natoma Street	19,122	25	3.07	38.89
East Natoma St	Cimmaron Circle to Folsom Dam Road	19,967	11	0.81	62.11
East Natoma St	Folsom Dam Road to Green Valley Road	18,054	17	1.27	67.71
Natoma St	Folsom Blvd to Cimmaron Circle	~~	154	1.58	~~
Green Valley Road	East Natoma Street to Sophia Parkway	26,681	~~	1.20	~~
Greenback Lane	Hazel Avenue to Madison Avenue	24,390	32	1.63	73.51
Greenback Lane	Madison Avenue to Folsom Blvd	~~	43	1.04	
Douglas Boulevard	Eureka Road to Sierra College	12,800	81	1.12	515.99
Douglas Boulevard	Barton Road to A-F Road	37,452	164	1.01	395.94
Sierra College Boulevard	between I-80 and Douglas Boulevard	24,549	~~	~~	~~
Eureka Road	between I-80 and Douglas Boulevard	37,774	~~	~~	~~
Oak Avenue	Hazel Avenue to Santa Juanita Avenue	10,620	~~	~~	~~
East Bidwell Street	Blue Ravine Road to Oak Avenue Parkway	26,216	76	0.99	267.42
East Bidwell Street	Clarksville Road to Iron Point Road	36,371	40	1.00	100.44
Oak Avenue Parkway	Blue Ravine Road to East Bidwell Street	18,586	12	0.94	62.73
Oak Avenue Parkway	East Bidwell St to Riley St	12,145	3	0.38	59.36
Scott Road (south)	south of White Rock Road	1,604	~~	~~	~~
White Rock Road	between Scott Road (south) and Scott Road (north)	8,822	~~	~~	~~
Scott Road (north)	north of White Rock Road	6,140	~~	~~	~~
US50	Hazel Avenue to Folsom Boulevard	116,811	~~	~~	~~
US50	Folsom Boulevard to Prairie City Road	98,424	~~	~~	~~
US50	Prairie City Road to East Bidwell Street	75,161	~~	~~	~~
US50		82,051	~~	~~	~~
Regional Access Routes					
Hammonton-Smartville (H-S) Road		8,780	~~	~~	~~
N Beale Road		26,995	~~	~~	~~
Feather River Blvd.		0	~~	~~	~~
Highway 70	Yuba County, east of Feather River Boulevard interchange	53,371	~~	~~	~~
Highway 65	Roseville, northeast of Route 80	94,382	~~	~~	~~
Highway 65	Lincoln, northeast of 7th Street	20,899	~~	~~	~~
Highway 65	Wheatland, northeast of Evergreen Drive	21,910	~~	~~	~~
Interstate 80	Roseville, northeast of Route 65	123,064	~~	~~	~~
Interstate 80	Rocklin, northeast of Sierra College Boulevard	101,846	~~	~~	~~

[1] Accident totals represent most recent 3-years of available information
[2] Accident Rate is skewed high due to accidents at intersections being included in the calculation

3.9.2 Environmental Consequences/Environmental Impacts

3.9.2.1 Assessment Methods of Future Traffic Conditions

While a typical traffic impact analysis for a development project in the SACOG area would involve the use of trip modeling software such as MINUTP, the transportation impacts associated with the Folsom DS/FDR are only related to the construction elements of the project. No long-term or permanent traffic volume increases or long-term changes in traffic patterns are expected as a result of the Folsom DS/FDR. Therefore, any incremental transportation impacts associated with the Folsom DS/FDR are limited to the proposed construction years. According to the schedule, the Folsom DS/FDR is expected to be under construction from 2007 through 2014. Therefore, the analysis years include all construction years from Folsom DS/FDR startup in 2007 to Folsom DS/FDR completion in 2014, as well as the 2006 baseline conditions required by CEQA.

Two components of traffic growth are typically considered when evaluating future year conditions. First, an annual background growth rate is determined based on historical data. Second, any increase in traffic volumes expected from approved development projects are added into the network.

However, given the size of the Folsom DS/FDR area and the varying full buildout dates of the multitude of projects expected in the region over the next 10 years, an individual breakdown of traffic growth factors along every roadway in the Folsom DS/FDR area is beyond the scope of this analysis.

Instead, the SACOG Projections Data Set, approved by the Board of Directors December 16, 2004, has been utilized to develop an appropriate growth rate. Table 3.9-6 illustrates the expected population, household and job growth projects; growth rates vary widely throughout the region. The growth rates can be broken down into the two distinct project areas studied for the Folsom DS/FDR: Local Routes and Regional Routes.

According to the projections, with the exception of the Roseville jobs projection, the Local Access Routes area is generally expected to experience a growth rate of 3% or less per year for the next five years (2010), and 2% or less per year for the following five years (2015). Therefore, a conservative annual growth rate for the local routes has been selected as 3% per year compounded through 2010 and 2% per year compounded through 2015. Impacts associated with potential developments in the study area are already incorporated in the population, household and job growth rates. Consequently, only the growth rate will be applied to each construction year with no additional development project-specific traffic volume increases.

Table 3.9-6
SACOG Projections Adopted 12.16.04 for Jurisdictions 2005 - 2015

	2005 *			2010						2015					
	Population	**Households**	**Jobs**	**Population**		**Households**		**Jobs**		**Population**		**Households**		**Jobs**	
					% increase per year from 2005		**% increase per year from 2005**		**% increase per year from 2005**		**% increase per year from 2010**		**% increase per year from 2010**		**% increase per year from 2010**
El Dorado County	147,045	56,111	51,644	159,422	**1.63%**	59,074	**1.03%**	58,267	**2.44%**	171,212	**1.44%**	64,526	**1.78%**	61,988	**1.25%**
Unincorp. El Dorado County	136,974	51,819	38,241	148,169	**1.58%**	54,488	**1.01%**	43,837	**2.77%**	158,772	**1.39%**	59,444	**1.76%**	47,467	**1.60%**
Placer County	301,560	121,507	156,237	330,381	**1.84%**	128,711	**1.16%**	180,607	**2.94%**	358,488	**1.65%**	141,461	**1.91%**	196,896	**1.74%**
Lincoln	26,661	11,741	6,158	28,364	**1.25%**	11,644	**-0.17%**	8,354	**6.29%**	29,883	**1.05%**	11,926	**0.48%**	10,405	**4.49%**
Rocklin	52,035	19,999	15,003	56,765	**1.76%**	21,038	**1.02%**	17,349	**2.95%**	61,338	**1.56%**	22,961	**1.76%**	19,042	**1.88%**
Roseville	104,136	42,244	66,250	107,038	**0.55%**	42,379	**0.06%**	80,211	**3.90%**	108,692	**0.31%**	43,976	**0.74%**	91,013	**2.56%**
Sacramento County	1,361,637	502,142	657,100	1,454,596	**1.33%**	525,837	**0.93%**	734,253	**2.25%**	1,539,049	**1.14%**	571,255	**1.67%**	775,273	**1.09%**
Unincorp. Sacramento County	540,521	201,673	225,261	564,736	**0.88%**	207,112	**0.53%**	235,388	**0.88%**	583,772	**0.67%**	220,474	**1.26%**	231,365	**-0.34%**
Folsom	67,325	23,178	31,654	70,372	**0.89%**	23,971	**0.68%**	34,981	**2.02%**	72,778	**0.67%**	25,709	**1.41%**	36,453	**0.83%**
Yuba County	65,952	21,533	22,988	75,792	**2.82%**	24,880	**2.93%**	28,751	**4.58%**	85,979	**2.55%**	29,619	**3.55%**	33,752	**3.26%**
Marysville	12,916	4,727	8,982	13,314	**0.61%**	4,839	**0.47%**	10,235	**2.65%**	13,563	**0.37%**	5,134	**1.19%**	10,899	**1.27%**
Wheatland	3,698	1,219	365	4,847	**5.56%**	1,596	**5.54%**	683	**13.34%**	6,100	**4.71%**	2,090	**5.53%**	1,028	**8.52%**

** Note that the base year population numbers are estimates made by the State Department of Finance's Demographic Research Unit*

Local Routes

Regional Routes

Source: http://www.sacog.org/demographics/projections/index.cfm

According to the projections, with the exception of the Marysville area, the Regional Access Routes area is generally expected to experience substantial growth between 2005 through 2015. Based on the data illustrated by SACOG, a 6% per year compounded growth rate would be applicable to the Regional Access Routes. However, since the regional routes involve a larger area of influence than the local access routes, historical traffic volume data from Caltrans has been evaluated. Table 3.9-7 illustrates the historical traffic growth data over the past ten years, and the past five years. According to this research near the communities of Lincoln and Wheatland, traffic volumes along Highway 65 have grown 8 to 9% per year over the past five years and 6% per year over the past ten years. Highway 65 near Interstate 80 has experienced traffic growth of 11% per year over the past five years and 12% per year over the past 10 years. Contrarily, Interstate 80 in Rocklin and Roseville has experienced a consistent 2 to 4% annual growth in traffic volumes since 1994.

Therefore, varying growth rates are applied to the regional routes, as these routes involve a larger area of influence. A 6% annual growth rate is applied to Highways 65 and 70, while the 3%/2% annual growth rate applied to the local access routes will be applied to Interstate 80 and the roadways in Marysville.

Hereon, sections of the Folsom Bridge EIS/EIR are incorporated by reference into this analysis. This document is available for public review at local Corps offices, City of Folsom, and online at http://www.folsom.ca.us/about/whats_new/bridge.asp. Table 3.9-8 illustrates the No Action/No Project traffic volumes expected along each route evaluated in the Folsom DS/FDR study area. Given the smaller scope of the Folsom Bridge Project relative to the Folsom DS/FDR, the Folsom Bridge EIR/EIS analysis applied ‘site specific’ growth rates to each roadway studied. These individual growth rates were applied to each roadway studied in the Folsom DS/FDR action to determine the 2007 baseline conditions for No Action Alternative and Alternatives 1 through 5. If the Folsom Bridge EIS/EIR did not include one of the Folsom DS/FDR study roadways, then the 2006 baseline data was determined by applying the background growth rates as described above. The CEQA baseline 2006 traffic volume data for the Folsom DS/FDR was established by interpolating between the 2004 and 2007 No Action Alternative Folsom Bridge EIS/EIR data.

Table 3.9-8 illustrates the future traffic volumes expected along the local and regional access routes without implementation of the Folsom DS/FDR. Furthermore, Table 3.9-8 also illustrates the expected LOS based on the facility type code expected to be in place during each analysis year (i.e., in terms of the number of lanes and type of roadway expected to be in place, such as a two-lane undivided arterial road coded as "2AU", or a four-lane divided arterial "4AD", or a freeway "F", etc.). Most of the codes illustrated in Table 3.9-8 are provided in the Folsom Bridge EIS/EIR for 2004 as well as 2007. The Folsom Bridge EIS/EIR determined facility type code and LOS for 2004, 2007 and 2025.

Table 3.9-7 Historical Traffic Data - Background Growth Rates												
				1994	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**1994-2004**	**1999-2004**
Route	**County**	**Postmile**	**Description**	*AADT*	*AADT*	*AADT*	*AADT*	*AADT*	*AADT*	*AADT*	*% increase per year over 10 years*	*% increase per year, most recent 5 years*
65	Placer	4.86	Roseville, Jct. Rte. 80	27,000	50,000	56000	60000	60000	70000	84000	12%	11%
65	Placer	14.05	Lincoln, 7th Street	10,800	12,500	14200	14200	14200	16600	18600	6%	8%
65	Yuba	1.5	Wheatland, Evergreen Drive	10,500	12,900	14200	14200	14200	18200	19500	6%	9%
70	Yuba	0.35	Feather River Boulevard	10,000	11,600	37500	11600	40000	12600	13000	3%	2%
80	Placer	4.16	Roseville, Jct. Rte. 65	80,000	96,000	109000	103000	10300	10800	116000	4%	4%
80	Placer	7.42	Rocklin, Sierra College Blvd	77,000	87,000	93000	85000	90000	90000	96000	2%	2%

AADT = Annual Average Daily Traffic
Source: http://traffic-counts.dot.ca.gov/

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Table 3.9-8
No Action/No Project Traffic Volume Data

Local Access Routes

				*Existing Conditions						Future Conditions (Without Project)																													
				2002	2003	2004	2005			2006			2007*						2008			2009			2010			2011			2012			2013			2014		
		ROUTE DESIGNATIONS								Interpolated			Folsom Bridge No Action Alternative			Folsom Bridge Allternatives 2-5			3% per year background growth						2% per year background growth rate														
Roadway	Location	Materials, Equipment, Batch Plant Routes	Worker Routes	ADT				code	LOS	ADT	code	LOS	ADT	code	LOS	ADT	code	LOS	ADT	code	LOS	ADT	code	LOS	ADT	code	LOS	ADT	code	LOS	ADT	code	LOS	ADT	code	LOS	ADT	code	LOS
Folsom Boulevard	Natoma Street to Blue Ravine Road		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C, W-3D, W-5D, W-3E, W-5E			37,800		4AD	F	38,398	4AD	F	38,700	4AD	F	37,800	4AD	F	38,934	4AD	F	40,103	4AD	F	40,906	4AD	F	41,725	4AD	F	42,560	4AD	F	43,412	4AD	F	44,715	4AD	F
Folsom Boulevard	Leidesdorff Street to Greenback Lane		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C			34,900		4AD	D	34,900	4AD	D	38,000	4AU	F	32,600	4AD	D	33,578	4AD	D	34,586	4AD	D	35,278	4AD	D	35,984	4AD	E	36,704	4AD	E	37,439	4AD	F	38,563	4AD	F
Folsom-Auburn Road	Oak Hill Drive to Folsom Dam Road	A-4, O-4, BP-1	W-1C, 2C, 3C, 4C, 5C, 6C, 7C, 1D,2D, 2E, W-3A, 5A, 6A, 3B, 5B,			31,300		2A	F	32,292	2A	F	32,800	4AU	F	40,300	4AU	F	41,509	4AU	F	42,755	2A	F	43,611	2A	F	44,484	2A	F	45,374	2A	F	46,282	2A	F	47,671	2A	F
Folsom-Auburn Road	Folsom Dam Road to Oak Avenue		W-3A, 5A, 6A, 7A, 3B, 4B, 5B, 6B, 7B, 1E, 2E, 5C			28,600		4AU	E	29,591	4AU	F	30,100	4AU	F	21,400	4AU	D	22,042	4AU	D	22,704	4AU	D	23,159	4AU	D	23,623	4AU	D	24,096	4AU	D	24,578	4AU	D	25,316	4AU	D
Auburn-Folsom (A-F) Road	Douglas Boulevard to Eureka Road	A-2,A-3,A-4, O-2, O-3, O-4, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E			30,900		2A	F	31,563	2A	F	31,900	4AU	F	34,300	4AU	F	35,329	4AU	F	36,389	4AU	F	37,117	4AU	F	37,860	4AU	F	38,618	4AU	F	39,391	4AU	F	40,573	4AU	F
Auburn-Folsom (A-F) Road	Eureka Road to Oak Hill Drive	A-2, A-3, O-2, O-3, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E			26,500		2A	F	27,097	2A	F	27,400	2A	F	30,500	2A	F	31,415	2A	F	32,358	2A	F	33,006	2A	F	33,667	2A	F	34,341	2A	F	35,028	2A	F	36,079	2A	F
Sierra College	north of Douglas Boulevard	A-1, A-2, O-1, O-2	W-2A, W-2B, W-2C, W-2D, W-2E		22,465	23,139		4AD	C	24,549	4AD	C	25,286	4AD	C	25,286	4AD	C	26,045	4AD	C	26,827	4AD	C	27,364	4AD	C	27,912	4AD	C	28,471	4AD	C	29,041	4AD	C	29,913	4AD	C
Eureka Road	east of N. Sunrise Avenue	A-3, A-4, O-3, O-4, BP-1			34,568	35,605		6AD	C	37,774	6AD	C	38,908	6AD	C	38,908	6AD	C	40,076	6AD	C	41,279	6AD	C	42,105	6AD	C	42,948	6AD	C	43,807	6AD	C	44,684	6AD	C	46,025	6AD	C
Douglas Boulevard	east of A-F Road	A-1,O-1	W-1A, W-2A, W-3A, W-4A, W-5A, W-6A, W-7A					2A	C	12,800	2A	C	13,184	2A	C	13,184	2A	C	13,580	2A	C	13,988	2A	C	14,268	2A	C	14,554	2A	C	14,846	2A	C	15,143	2A	C	15,598	2A	C
Douglas Boulevard	Barton Road to A-F Road	A-1, A-2, A-3, A-4, O-1, O-2, O-3, O-4, BP-1	W-1A, W-2A, W-4A, W-1B, W-2B, W-4B, W-1C, W-2C, W-1D, W-2D, W-1E, W-2E			36,000		4AD	E	37,452	4AD	F	38,200	4AD	F	40,200	4AD	F	41,406	4AD	F	42,649	4AD	F	43,502	4AD	F	44,373	4AD	F	45,261	4AD	F	46,167	4AD	F	47,553	4AD	F
Douglas Boulevard	Barton to Sierra Colleg Blvd.				41,305	42,544		4AD	F	45,136	4AD	F	46,491	4AD	F	46,491	4AD	F	47,886	4AD	F	49,323	4AD	F	50,310	4AD	F	51,317	4AD	F	52,344	4AD	F	53,391	4AD	F	54,993	4AD	F
Blue Ravine Road	Oak Avenue Parkway to Green	A-5, A-6,O-5, O-6, BP-2,	W-6D, W-6E			18,200		4AD	C	19,122	4AD	C	19,600	4AD	D	19,500	4AD	D	20,085	4AD	D	20,688	4AD	D	21,102	4AD	D	21,525	4AD	D	21,956	4AD	D	22,396	4AD	D	23,068	4AD	D
East Natoma St	Cimmaron Circle to Folsom Dam Road		W-1D, 3D, 4D, 5D, 1E, 2E, 3E, 4E, 5E			18,400		2A	E	19,967	2A	F	20,800	4AU	D	16,600	4AU	C	17,098	4AU	D	17,611	4AU	E	17,964	4AU	E	18,324	4AU	E	18,691	4AU	E	19,065	4AU	F	19,637	4AU	F
East Natoma St	Folsom Dam Road to Green Valley Road	A-5, A-6,O-5, O-6, BP-2, BP3	W-7A, 7B, 7C, 1D,2D,3D,4D,5D,6D,7D, 1E, 2E, 3E, 4E, 5E, 6E			16,300		2A	D	18,054	2A	E	19,000	4AU	D	27,100	4AU	D	27,913	4AU	F	28,751	4AU	F	29,327	4AU	F	29,914	4AU	F	30,513	4AU	F	31,124	4AU	F	32,058	4AU	F
Green Valley Road	East Natoma Street to Sophia Parkway	A-6, O-6	W-1E, W-2E, W-3E, W-4E, W-5E, W-6E			24,400		2A	F	26,681	2A	F	27,900	4AU	D	32,000	4AU	F	32,960	4AU	F	33,949	4AU	F	34,628	4AU	F	35,321	4AU	F	36,028	4AU	F	36,749	4AU	F	37,852	4AU	F
Greenback Lane	Hazel Avenue to Madison Avenue		W-4B, W-4C, W-4D, W-4E			23,400		4AMD	B	24,390	4AMD	B	24,900	4AMD	B	24,100	4AMD	B	24,823	4AMD	B	25,568	4AMD	C	26,080	4AMD	C	26,602	4AMD	C	27,135	4AMD	C	27,678	4AMD	C	28,509	4AMD	C
East Bidwell Street	Clarksville Road to Iron Point Road	A-5, A-6, O-5, O-6, BP-2, BP-3	W-6D, W-6E			32,800		4AD	D	36,371	4AD	E	38,300	4AD	F	39,300	4AD	F	40,479	4AD	F	41,694	4AD	F	42,528	4AD	F	43,379	4AD	F	44,247	4AD	F	45,132	4AD	F	46,486	4AD	F
Oak Avenue Parkway	Blue Ravine Road to East Bidwell Street	A-5, A-6, O-5, O-6, BP-2, BP-3	W-6D, W-6E			17,600		6AD	C	18,586	6AD	C	19,100	6AD	C	22,200	6AD	C	22,866	6AD	C	23,552	6AD	C	24,024	6AD	C	24,505	6AD	C	24,996	6AD	C	25,496	6AD	C	26,261	6AD	C
Scott Road (south)	south of White Rock Road	A-5, A-6, BP-2, BP-3			1,468			2C	A/B	1,604	2C	A/B	1,652	2C	A/B	1,652	2C	A/B	1,702	2C	A/B	1,754	2C	A/B	1,790	2C	A/B	1,826	2C	A/B	1,863	2C	A/B	1,901	2C	A/B	1,959	2C	A/B
White Rock Road	between Scott Road (south) and Scott Road (north)	A-5, A-6, BP-2, BP-3					8,565	2C	C	8,822	2C	C	9,087	2C	D	9,087	2C	D	9,360	2C	D	9,641	2C	D	9,834	2C	E	10,031	2C	E	10,232	2C	E	10,437	2C	E	10,751	2C	E
Scott Road (north)	north of White Rock Road	A-5, A-6, BP-2, BP-3		5,455				2C	C	6,140	2C	C	6,324	2C	C	6,324	2C	C	6,514	2C	C	6,710	2C	C	6,845	2C	C	6,982	2C	C	7,122	2C	C	7,265	2C	C	7,483	2C	C
US50	Hazel Avenue to Folsom Boulevard	O-5, O-6	W-5A, W-5B, W-5C, W-5D, W-5E			111,800		4FA	F	116,811	4FA	F	119,400	4FA	F	116,800	4FA	F	120,304	4FA	F	123,914	4FA	F	126,393	4FA	F	128,921	4FA	F	131,500	4FA	F	134,130	4FA	F	138,154	4FA	F
US50	Folsom Boulevard to Prairie City Road	O-5, O-6	W-6A, W-6B, W-6C			94,400		4F	F	98,424	4F	F	100,500	4F	F	99,000	4F	F	101,970	4F	F	105,030	4F	F	107,131	4F	F	109,274	4F	F	111,460	4F	F	113,690	4F	F	117,101	4F	F
US50	Prairie City Road to East Bidwell Street	O-5, O-6	W-6A, W-6B, W-6C			71,800		4F	E	75,161	4F	E	76,900	4F	E	71,800	4F	E	73,954	4F	E	76,173	4F	E	77,697	4F	E	79,251	4F	E	80,837	4F	F	82,454	4F	F	84,928	4F	F
US50	East Bidwell St to County Line		W-6A, W-6B, W-6C, W-6D, W-6E			77,000		4F	E	82,051	4F	F	84,700	4F	F	81,900	4F	F	84,357	4F	F	86,888	4F	F	88,626	4F	F	90,399	4F	F	92,207	4F	F	94,052	4F	F	96,874	4F	F
Regional Access Routes																																							
													3% per year background growth												2% per year background growth rate														
Hammonton-Smartville (H-S) Road	north of N. Beale Road	A-1, A-2		7801						8,780	2C	C	9,043	2C	D	9,043	2C	D	9,315	2C	D	9,594	2C	D	9,786	2C	D	9,982	2C	E	10,181	2C	E	10,385	2C	E	10,593	2C	E
N Beale Road	south of H-S Road	A-1, A-2		23,985						26,995	4AU	C	27,805	4AU	D	27,805	4AU	D	28,639	4AU	D	29,499	4AU	E/F	30,088	4AU	F	30,690	4AU	F	31,304	4AU	F	31,930	4AU	F	32,569	4AU	F
Feather River Blvd. Ramp	south of N. Beale Street	A-1, A-2									4AU					0			0			0			0			0			0			0			0		
													6% per year background growth																										
Highway 70	Yuba County, east of Feather River Boulevard interchange	A-1, A-2				47,500				53,371	4AMD	F	56,574	4AMD	F	56,574	4AMD	F	59,969	4AMD	F	63,568	4AMD	F	67,383	4AMD	F	71,426	4AMD	F	75,712	4AMD	F	80,255	4AMD	F	85,071	4AMD	F
Highway 65	Roseville, northeast of Route 80	A-1, A-2				84,000				94,382	4F	F	100,046	4F	F	100,046	4F	F	106,049	4F	F	112,412	4F	F	119,157	4F	F	126,307	4F	F	133,886	4F	F	141,920	4F	F	150,436	4F	F
Highway 65	Lincoln, northeast of 7th Street	A-1, A-2				18,600				20,899	2A	F	22,153	2A	F	22,153	2A	F	23,483	2A	F	24,892	2A	F	26,386	2A	F	27,970	2A	F	29,649	2A	F	31,428	2A	F	33,314	2A	F
Highway 65	Wheatland, northeast of Evergreen Drive	A-1, A-2				19,500				21,910	2A	F	23,225	2A	F	23,225	2A	F	24,619	2A	F	26,097	2A	F	27,663	2A	F	29,323	2A	F	31,083	2A	F	32,948	2A	F	34,925	2A	F
													3% per year background growth												2% per year background growth rate														
Interstate 80	Roseville, northeast of Route 65	A-1, A-2, O-1, O-2				116,000				123,064	4FA	F	126,757	4FA	F	126,757	4FA	F	130,560	4FA	F	134,477	4FA	F	138,512	4FA	F	141,283	4FA	F	144,109	4FA	F	146,992	4FA	F	149,932	4FA	F
Interstate 80	Rocklin, south of Sierra College Boulevard	A-1, A-2, O-1, O-2				96,000				101,846	4FA	E/F	104,902	4FA	F	104,902	4FA	F	108,050	4FA	F	111,292	4FA	F	114,631	4FA	F	116,924	4FA	F	119,263	4FA	F	121,649	4FA	F	124,082	4FA	F

Source: American River Watershed Project Folsom Dam Raise, Folsom Bridge Supplemental EIS/EIR May 2006; El Dorado County online traffic volume data; 2004 Caltrans online traffic volume data; 2003 data source:http://maps.roseville.ca.us/trafficinfotool/

With the exception of Highway 65, 70 and Interstate 80 data, 2004 data from the Amer
2007 data from Bridge EIS/EIR year 2007
2006 data interpolated between 2004 and 2007 data from Folsom Bridge EIS/EIR May 2006
2004 data for Sierra College Boulevard and Eureka Road based on 3% growth rate applied to 2003 data.
*code and LOS information for Existing Conditions and 2007 provided in Bridge EIS/EIR.
X,XXX volumes based on 3% per year growth rate
X,XXX collected in April 2006
No Action/No Project Alternative assumes no major roadway reconstruction projects that modfiy roadway classification on the horizon for the project area.

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Specifically, the LOS designations were identified using Table 3-2 *Functional Class and Daily Roadway Segment LOS Thresholds* from the Bridge EIS/EIR, as developed by Fehr & Peers. Because the Folsom DS/FDR years are from 2007 through 2014, this analysis determined facility codes and LOS for remaining years not used in the Bridge EIS/EIR based on major roadway expansion projects described in the General Plans reviewed. A further discussion of LOS follows.

Level of Service

The evaluation of transportation impacts associated with any Folsom DS/FDR focuses on capacity analysis. A primary result of capacity analysis is the assignment of levels of service to traffic facilities under various traffic flow conditions. The capacity analysis methodology is based on the concepts and procedures in the *Highway Capacity Manual* (HCM).[1] The concept of level of service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are assigned letter designations from A to F, with LOS A representing the best operating conditions and LOS F the worst. Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

A description of the operating condition under each level of service is provided below:

- *LOS A* describes conditions with little to no delay to motorists.
- *LOS B* represents a desirable level with relatively low delay to motorists.
- *LOS C* describes conditions with average delays to motorists.
- *LOS D* describes operations where the influence of congestion becomes more noticeable. Delays are still within an acceptable range.
- *LOS E* represents operating conditions with high delay values. This level is considered by many agencies to be the limit of acceptable delay.
- *LOS F* is considered to be unacceptable to most drivers with high delay values that often occur, when arrival flow rates exceed the capacity of the intersection.

[1]*Highway Capacity Manual 2000*, Transportation Research Board; Washington, D.C.; 2001.

Roadway Segments
Fehr & Peers developed a listing of LOS thresholds based on daily volumes, number of lanes and facility type as presented in Table 3-2, of the Folsom Bridge EIS/EIR (Corps 2006b). These thresholds were calculated based on the HCM and will be used to evaluate roadway segment level of service for the purposes of this Folsom DS/FDR EIS/EIR.

Unsignalized Intersections
Levels of service for unsignalized intersections are calculated using the operational analysis methodology of the HCM. The procedure accounts for lane configuration on both the minor and major street approaches, conflicting traffic stream volumes, and the type of intersection control (STOP, YIELD, or all-way STOP control). The definition of level of service for unsignalized intersections is a function of average *control* delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The level-of-service criteria for unsignalized intersections are shown in Table 3.9-9.

Table 3.9-9
Local Access Route Existing Traffic Volumes and Arterial LOS

Level of Service	***Unsignalized Intersection Criteria*** Average Control Delay (Seconds per Vehicle)	***Signalized Intersection Criteria*** Average Control Delay (Seconds per Vehicle)
A	≤10	≤10
B	>10 and ≤15	>10 and ≤20
C	>15 and ≤25	>20 and ≤35
D	>25 and ≤35	>35 and ≤55
E	>35 and ≤50	>55 and ≤80
F	>50	>80

Source: *Highway Capacity Manual 2000,* Transportation Research Board, 2001, pages 16-2 and 17-2.

Signalized Intersections
Levels of service for signalized intersections are also calculated using the operational analysis methodology of the HCM. The methodology for signalized intersections assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on average *control* delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

Table 3.9-9 *LOS Criteria* summarizes the relationship between level of service and average control delay.

For signalized intersections, this delay criterion may be applied in assigning LOS designations to individual lane groups, to individual intersection approaches, or to the entire intersection. For unsignalized intersections, this delay criterion may be applied in assigning LOS designations to individual lane groups or to individual intersection approaches.

As illustrated in Table 3.9-9, a good LOS consists of minimal delays, while a poor LOS consists of extended delays. Delays can be correlated to the ratio between traffic volume and capacity. For example, if the volume of traffic approaching an intersection is greater than the capacity for that volume of traffic, the end result is a poor LOS. Conversely, if the volume of traffic approaching an intersection is significantly less than the capacity, the end result is a good LOS.

Assessment Periods
According to Caltrans' Guidelines for Preparation of Traffic Impact Studies, the following scenarios are typically evaluated:

- Existing Conditions - Current year traffic volumes and peak hour LOS analysis of effected State highway facilities.

- Proposed Project Only - Trip generation, distribution, and assignment in the year the Folsom DS/FDR is anticipated to complete construction.

- Cumulative Conditions (Existing Conditions Plus Other Approved and Pending Projects Without Proposed Project) - Trip assignment and peak hour LOS analysis in the year the Folsom DS/FDR is anticipated to complete construction.

- Cumulative Conditions Plus Proposed Project (Existing Conditions Plus Other Approved and Pending Projects Plus Proposed Folsom DS/FDR) - Trip assignment and peak hour LOS analysis in the year the Folsom DS/FDR is anticipated to complete construction.

- Cumulative Conditions Plus Proposed Phases (Interim Years) - Trip assignment and peak hour LOS analysis in the years the Folsom DS/FDR phases are anticipated to complete construction.

Transportation impacts associated with the Folsom DS/FDR are evaluated in two ways; one regarding average daily traffic and the other in terms of specific time periods during the day (i.e., hourly basis, as needed). The analysis is based on the following criteria:

- Material hauling activity will occur during normal work hours, from 7am to 3pm.

- Equipment hauling activity will occur during normal work hours, from 7am to 3pm.

- Two work shifts will operate as follows:

  - 5am to 2pm

  - 2pm to 11pm

The first component of the traffic impact analysis is an evaluation of the increase in traffic volumes on a daily basis. As illustrated earlier in Table 3.9-3, there are a variety of thresholds established by the communities and counties through which the project transportation components are expected to pass. Most of the thresholds focus on whether the existing LOS along a roadway is degraded by one or more letter grades due to project-related traffic, (i.e., LOS C to LOS D or worse). However, when a facility is already experiencing a LOS F, the Sacramento County guidelines illustrate that an increase in the Volume to Capacity (V/C) ratio by more than 0.05 is also of concern. And finally, El Dorado County presents the most stringent thresholds that include determining whether project-related traffic exceeds a 2% increase in traffic during the a.m. peak hour, p.m. peak hour, or daily.

Therefore, only those roadways that are expected to experience LOS deterioration, or currently operate at LOS F and would experience an increase in the V/C ratio of more the 0.05 due to the Folsom DS/FDR, or would experience an increase in daily traffic volumes of 2% or more would typically be evaluated for hourly impacts, which is normally the second component of detailed traffic impact analysis conducted for a specific project. At this time, however, given the variety of alternatives evaluated and access routes to the Folsom DS/FDR features currently being considered a programmatic level of planning, it is beyond the scope of this EIS/EIR to conduct such a peak hour analyses of the roads and intersections distributed throughout the study area.

The work shifts illustrated above result in four potential impact hours: 4a.m. to 5a.m.; 1p.m. to 2p.m.; 2p.m. to 3p.m.; and 11p.m. to 12a.m. Based on 24-hour existing traffic data volumes collected, the critical peak hours to be evaluated based on the worker schedule are 1p.m. to 2p.m. and 2p.m. to 3p.m. Therefore, hourly impacts associated with workers should only be evaluated for the higher of the two hourly periods. For example, if a Folsom DS/FDR roadway carries approximately 1,200 vehicles from 1p.m. to 2p.m., and 1,800 vehicles from 2p.m. to 3p.m., then only the 2p.m. to 3p.m. hour would be evaluated since the number of new worker trips would be the same for each hour (i.e., ten workers will arrive from 1p.m. to 2p.m., ten workers will depart from 2p.m. to 3pm).

Trip Generation
Expected traffic volume increases associated with a development project are typically determined using the Institute of Transportation Engineers (ITE) Trip Generation Manual, 7th Edition land use trip generation rates. However, there are no empirical data sources in the Manual related to construction activities. Alternatively, projects will typically collect local data to develop empirical data representative of the proposed development project.

Unfortunately, the Folsom DS/FDR and prior studies associated with it do not have empirical data sources available to determine the expected traffic volume increases due to construction activities. Instead, new trips have been determined by calculating the amounts of aggregate or 'raw' materials, and 'offsite' materials required for the Folsom DS/FDR. In addition, trip calculations are required for equipment deliveries and labor forces.

Aggregate and Offsite Materials

Aggregate materials include fine filters, coarse filters, cement, fine aggregate (for concrete), coarse aggregate (for concrete), road base, and asphalt. Offsite materials include Slope U/S, Toe Drain, HDPE Pipe, Pipe Filter, U/S Filter, Seeding, and rebar (steel) (see Chapter 2 for definitions). In order to determine the number of trips necessary to deliver the materials required, certain assumptions were made in assigning the number of trucks per material required based on the weight of each material being hauled.

Table 3.9-10 illustrates the assumptions made with respect to the weight of each material being hauled.

Table 3.9-10
Assumptions for Total Truck Calculations

Material	Unit Weight		CY per Load	Use (CY/load)	Use Notes	Source
Fine Filter	2,400	#/cy	20.83	20		UNB Transportation Group
Coarse Filter	2,800	#/cy	17.86	17		UNB Transportation Group
Slope Protection U/S face	3,300	#/cy	15.15	15		UNB Transportation Group
Toe Drain Pipe	30.8	#/20 ft	276.00	276	# pipes/per load	ADS Pipe
Road Base	2,700	#/cy	18.52	18		UNB Transportation Group
Asphalt	3,919	#/cy	12.76	12		National Asphalt Paving Association
Seeding (assume 1" depth)	304	#/cy		150	#/acre	FHWA BPMs for Sediment and Erosion Control Univ. of Missouri Extension
8" HDPE Drain Pipe	30.8	#/20 ft	276.00	276	# pipes/per load	ADS Pipe
CIP Concrete	4,946	#/cy	10.11	10		See cement
Rebar (Steel Reinforcement)	490	#/cy		50,000	lbs. max	ASTM Standard (Rinker.com)
Cement	4,946	#/cy	10.11	10		Constructionwork.com
Coarse Filter for drain pipe	2,800	#/cy	17.86	17		UNB Transportation Group
Coarse Filter U/S bedding	2,800	#/cy	17.86	17		UNB Transportation Group

# = pounds
cy = cubic yards
ft = foot

Hauling materials will occur in two types of vehicles: the "California Transfer Dump" 20 cubic yard (CY) and a standard tractor trailer or flatbed. The capacity of each truck is not as critical in this exercise as is the weight limit of the proposed haul routes. Therefore, the following assumptions were made relative to the proposed truck use and weight limits:

- Standard hauling vehicle is a 20CY dump truck (10 wheel); weight =15 tons (30,000 pounds)
- Standard tractor weight = 7.5 tons (15,000 pounds)
- Standard flatbed trailer = 48 feet long x 102 inches wide; weight = 6.25 tons (12,500 pounds)
- Maximum allowed Gross Vehicle Weight (GVW) as per California Vehicle Code (CVC) = 40 tons (80,000 pounds)

However, additional weight restrictions on city and county streets can be imposed by the owning agency. For roadways with maximum allowed GVW less than 40 tons, waivers will be required. Table 3.9-11 illustrates the weight limits available for the proposed haul routes. Surface Transportation Assistance Act (STAA) routes require states to allow large trucks on identified routes. Large trucks include: (1) doubles with 28.5-foot trailers; (2) singles with 48-foot semi-trailers and unlimited kingpin-to-rear axle (KPRA) distance; (3) unlimited length for both vehicle combinations; and (4) widths up to 102 inches. California (Assembly Bill 866) increased the California legal vehicle length from 60 to 65 feet and its width from 8.0 to 8.5 feet.

Equipment

Equipment needs for the Folsom DS/FDR for each alternative have been illustrated in Appendix F. Each equipment-related trip will include fuel deliveries as well as the initial delivery of all equipment to each staging area for each Folsom DS/FDR feature. The initial delivery of equipment is expected to occur at the beginning of each Folsom DS/FDR feature sequence. The daily impact calculations represent a conservative analysis, as once the equipment has been delivered to each staging area, additional daily trips will not be incurred until removal or haul out of the equipment at the completion of each Folsom DS/FDR feature. The equipment deliveries include but are not limited to: Drill Rig for Setting Charges, Dozers, Rippers, Scrapers, Excavators, Loaders, Small Crane, Compactors, 20CY Dump Trucks, 50CY Dump Trucks, Fuel Trucks, and Water Trucks.

All equipment is expected to be delivered to the staging areas immediately adjacent to each Folsom DS/FDR feature.

Labor Forces

Labor force needs for the Folsom DS/FDR have been illustrated in Tables 3.9-12 through 3.9-16. The labor force numbers are doubled to represent two shifts per day and doubled again to represent four trips per day.

Table 3.9-11 *Truck Routes - Weight Limits*				
Local Access Routes				
Roadway	***Location***	***Designated Truck Route***	***Designation (or Weight Limit)***	***Exception***
Folsom Boulevard	Natoma Street to Blue Ravine Road	Yes	City of Folsom Route	n/a
Folsom Boulevard	US50 to Greenback Lane	Yes	City of Folsom Route	n/a
Folsom-Auburn Road	Oak Hill Drive to Folsom Dam Road	No	10,000 lbs	pick up/delivery allowed
Folsom-Auburn Road	Folsom Dam Road to Oak Avenue	No	10,000 lbs	pick up/delivery allowed
Auburn-Folsom (A-F) Road	Douglas Boulevard to Eureka Road	No	10,000 lbs	pick up/delivery allowed
Auburn-Folsom (A-F) Road	Eureka Road to Oak Hill Drive	No	10,000 lbs	pick up/delivery allowed
Blue Ravine Road	Folsom Boulevard to Sibley Street	Yes	City of Folsom Route	n/a
Blue Ravine Road	Sibley Street to Riley Street	Yes	City of Folsom Route	n/a
Blue Ravine Road	Oak Avenue Parkway to Green Valley Road/East Natoma Street	Yes	City of Folsom Route	n/a
East Natoma St	Cimmaron Circle to Folsom Dam Road	No	10,000 lbs	pick up/delivery allowed
East Natoma St	Folsom Dam Road to Green Valley Road	No	10,000 lbs	pick up/delivery allowed
Natoma St	Folsom Blvd to Cimmaron Circle	No	10,000 lbs	permit
Green Valley Road	East Natoma Street to Sophia Parkway	Yes	City of Folsom Route	n/a
Greenback Lane	Hazel Avenue to Madison Avenue	Yes	City of Folsom Route	n/a
Greenback Lane	Madison Avenue to Folsom Blvd	Yes	City of Folsom Route	n/a
Douglas Boulevard	Eureka Road to Sierra College	Yes	STAA - Federal	n/a
Douglas Boulevard	Barton Road to A-F Road	Yes	STAA - Federal	n/a
Sierra College Boulevard	between I-80 and Douglas Boulevard	Yes	CA Legal	n/a
Eureka Road	between I-80 and Douglas Boulevard	Yes	STAA - Federal	n/a
Oak Avenue	Hazel Avenue to Santa Juanita Avenue			
East Bidwell Street	Blue Ravine Road to Oak Avenue Parkway	Yes	City of Folsom Route	n/a
East Bidwell Street	Clarksville Road to Iron Point Road	Yes	City of Folsom Route	n/a
Oak Avenue Parkway	Blue Ravine Road to East Bidwell Street	No	10,000 lbs	permit
Oak Avenue Parkway	East Bidwell St to Riley St	No	10,000 lbs	permit
Scott Road (south)	south of White Rock Road	Yes	CA Legal	n/a
White Rock Road	between Scott Road (south) and Scott Road (north)	Yes	CA Legal	n/a
Scott Road (north)	north of White Rock Road	Yes	CA Legal	n/a
US50	Hazel Avenue to Folsom Boulevard	Yes	STAA - Federal	n/a
US50	Folsom Boulevard to Prairie City Road	Yes	STAA - Federal	n/a
US50	Prairie City Road to East Bidwell Street	Yes	STAA - Federal	n/a
US50				
Regional Access Routes				
Hammonton-Smartville (H-S) Road		Yes	CA Legal	n/a
N Beale Road		Yes	CA Legal	n/a
Feather River Blvd.		Yes	CA Legal	n/a
Highway 70	Yuba County, east of Feather River Boulevard interchange	Yes	STAA - Federal	n/a
Highway 65	Roseville, northeast of Route 80	Yes	STAA - Federal	n/a
Highway 65	Lincoln, northeast of 7th Street	Yes	STAA - Federal	n/a
Highway 65	Wheatland, northeast of Evergreen Drive	Yes	STAA - Federal	n/a
Interstate 80	Roseville, northeast of Route 65	Yes	STAA-Federal	n/a
Interstate 80	Rocklin, northeast of Sierra College Boulevard	Yes	STAA-Federal	n/a

Source: http://www.dot.ca.gov/hq/traffops/trucks/trucksize/truckmap/;
http://www.roseville.ca.us/civica/filebank/blobdload.asp?BlobID=2144;
http://ci.folsom.ca.us/agendas/MG65540/AS65552/AI66593/DO66829/DO_66829.PDF
STAA- Federal = Surface Transportation Assisstance Act

Table 3.9-12
Daily Number of Workers Trips Per Construction Year
Alternative 1

Project Feature	*Route Letter Designation*	*Number of Workers per day all alternatives*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
Granite Bay Borrow Development (913,000 cu yds max)	A	30								
Dikes 1, 2, 3 Stripping, Excavation and Construction	A	23								
Beals Point South/North Borrow Development (1,250,000 cu yd max)	B	20	20	20	20					
Dike 4&5 Stripping/Excavation and Construction	B	27		27						
Dike 6 Stripping/Excavation and Construction	B	20		20						
Mooney Ridge Stripping/Excavation and Construction	B	30								
Right Wing Dam Stripping/Excavation and Construction	C	60			60	60				
Auxiliary Spillway Borrow Development (3,190,000 cu yds)	D	32	32	32	32					
Auxiliary Spillway Construction	D	60			60	60	60			
Tunnel Construction	D	30								
Left Wing Dam Stripping/Excavation and Construction	D	60						60		
Dike 7 & 8 Stripping/Excavation and Construction	D	40								
Main Concrete Dam Raise	D	45								
Main Concrete Dam Tendons and Shears	D	40							40	
Folsom Point Area Borrow Development and processing (1,673,000 cu yd max)	E	25								
MIAD -Stripping/Excavation and Construction	E	30		30	30	30				
MIAD Jet Grouting	E	20			20	20				
		Total Number Workers per shift per year	52	129	222	170	60	60	40	0
		Total workers per day (two shifts per day)	104	258	444	340	120	120	80	0
		# of trips per day (two trips per worker)	**208**	**516**	**888**	**680**	**240**	**240**	**160**	**0**

Table 3.9-13
Daily Number of Workers Trips Per Construction Year
Alternative 2

Project Feature	*Route Letter Designation*	*Number of Workers per day all alternatives*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
Granite Bay Borrow Development (913,000 cu yds max)	A	30								
Dikes 1, 2, 3 Stripping, Excavation and Construction	A	23							23	
Beals Point South/North Borrow Development (1,250,000 cu yd max)	B	20	20	20	20					
Dike 4&5 Stripping/Excavation and Construction	B	27		27						
Dike 6 Stripping/Excavation and Construction	B	20		20						
Right Wing Dam Stripping/Excavation and Construction	C	60			60	60				
Auxiliary Spillway Borrow Development (3,190,000 cu yds)	D	32	32	32	32					
Auxiliary Spillway Construction	D	60			60	60	60			
Tunnel Construction	D	30			30	30	30			
Left Wing Dam Stripping/Excavation and Construction	D	60						60	60	
Dike 7 & 8 Stripping/Excavation and Construction	D	40						40		
Main Concrete Dam Raise	D	45					45			
Main Concrete Dam Tendons and Shears	D	40							40	
Folsom Point Area Borrow Development and processing (1,673,000 cu yd max)	E	25								
MIAD -Stripping/Excavation and Construction	E	30		30	30	30	30			
MIAD Jet Grouting	E	20								
		Total Number Workers per shift per year	52	129	232	180	165	100	153	0
		Total workers per day (two shifts per day)	104	258	464	360	330	200	306	0
		# of trips per day (two trips per worker)	**208**	**516**	**928**	**720**	**660**	**400**	**612**	**0**

The number of workers illustrated on this spreadsheet is equal to the number of workers as illustrated on Table 3-9 X Personnel Schedule.

Table 3.9-14
Daily Number of Workers Trips Per Construction Year
Alternative 3

Project Feature	*Route Letter Designation*	*Number of Workers per day all alternatives*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
Granite Bay Borrow Development (913,000 cu yds max)	A	30								
Dikes 1, 2, 3 Stripping, Excavation and Construction	A	23			23					
Beals Point South/North Borrow Development (1,250,000 cu yd max)	B	20								
Dike 4&5 Stripping/Excavation and Construction	B	27		27						
Dike 6 Stripping/Excavation and Construction	B	20		20						
Right Wing Dam Stripping/Excavation and Construction	C	60		60						
Auxiliary Spillway Borrow Development (3,190,000 cu yds)	D	32	32	32	32					
Auxiliary Spillway Construction	D	60			60	60	60			
Tunnel Construction	D	30								
Left Wing Dam Stripping/Excavation and Construction	D	60						60	60	
Dike 7 & 8 Stripping/Excavation and Construction	D	40						40		
Main Concrete Dam Raise	D	45					45			
Main Concrete Dam Tendons and Shears	D	40							40	
Folsom Point Area Borrow Development and processing (1,673,000 cu yd max)	E	25								
MIAD -Stripping/Excavation and Construction	E	30		30	30	30				
MIAD Jet Grouting	E	20			20	20				
		Total Number Workers per shift per year	32	169	165	110	105	100	100	0
		Total workers per day (two shifts per day)	64	338	330	220	210	200	200	0
		# of trips per day (two trips per worker)	**128**	**676**	**660**	**440**	**420**	**400**	**400**	**0**

Table 3.9-15
Daily Number of Workers Trips Per Construction Year
Alternative 4

Project Feature	*Route Letter Designation*	*Number of Workers per day all alternatives*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
Granite Bay Borrow Development (913,000 cu yds max)	A	30							30	
Dikes 1, 2, 3 Stripping, Excavation and Construction	A	23							23	
Beals Point South/North Borrow Development (1,250,000 cu yd max)	B	20	20	20	20					
Dike 4&5 Stripping/Excavation and Construction	B	27		27						
Dike 6 Stripping/Excavation and Construction	B	20		20						
Right Wing Dam Stripping/Excavation and Construction	C	60			60	60				
Auxiliary Spillway Borrow Development (3,190,000 cu yds)	D	32	32	32	32					
Auxiliary Spillway Construction	D	60			60	60	60			
Tunnel Construction	D	30								
Left Wing Dam Stripping/Excavation and Construction	D	60						60	60	
Dike 7 & 8 Stripping/Excavation and Construction	D	40						40		
Main Concrete Dam Raise	D	45					45			
Main Concrete Dam Tendons and Shears	D	40							40	
Folsom Point Area Borrow Development and processing (1,673,000 cu yd max)	E	25								
MIAD -Stripping/Excavation and Construction	E	30		30	30	30				
MIAD Jet Grouting	E	20			20	20				
		Total Number Workers per shift per year	52	129	222	170	105	100	183	0
		Total workers per day (two shifts per day)	104	258	444	340	210	200	366	0
		# of trips per day (two trips per worker)	**208**	**516**	**888**	**680**	**420**	**400**	**732**	**0**

Table 3.9-16
Daily Number of Workers Trips Per Construction Year
Alternative 5

Project Feature	*Route Letter Designation*	*Number of Workers per day all alternatives*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
Granite Bay Borrow Development (913,000 cu yds max)	A	30							30	30
Dikes 1, 2, 3 Stripping, Excavation and Construction	A	23							23	23
Beals Point South/North Borrow Development (1,250,000 cu yd max)	B	20	20	20	20	20	20	20		
Dike 4&5 Stripping/Excavation and Construction	B	27		27						
Dike 6 Stripping/Excavation and Construction	B	20		20						
Right Wing Dam Stripping/Excavation and Construction	C	60			60	60	60	60		
Auxiliary Spillway Borrow Development (3,190,000 cu yds)	D	32								
Auxiliary Spillway Construction	D	60								
Tunnel Construction	D	30								
Left Wing Dam Stripping/Excavation and Construction	D	60						60	60	
Dike 7 & 8 Stripping/Excavation and Construction	D	40						40		
Main Concrete Dam Raise	D	45					45	45		
Main Concrete Dam Tendons and Shears	D	40							40	40
Folsom Point Area Borrow Development and processing (1,673,000 cu yd max)	E	25	25	25	25	25	25	25	25	
MIAD -Stripping/Excavation and Construction	E	30		30	30	30	30			
MIAD Jet Grouting	E	20								
		Total Number Workers per shift per year	45	122	135	135	180	250	208	123
		Total workers per day (two shifts per day)	90	244	270	270	360	500	416	246
		# of trips per day (two trips per worker)	**180**	**488**	**540**	**540**	**720**	**1000**	**832**	**492**

Trip Distribution

Distributing the material, equipment and labor force trips throughout the Folsom DS/FDR study area roadway network is a complex task and one that employs a thorough knowledge of the Folsom DS/FDR area and Folsom DS/FDR features, recognizing that the specific details of each feature have not yet been defined, consequently some reasonable estimates, assumptions, and projections must due for now. The following describes how the expected trips generated by the Folsom DS/FDR are distributed and assigned to the Folsom DS/FDR area roadway network.

The Folsom DS/FDR site has been divided into two distinct areas:

- West Project Features include: Dikes 1 through 6, and RWD
- East Project Features include: Auxiliary Spillway, Tunnel, Main Concrete Dam, LWD, Dikes 7, 8 and MIAD.

Aggregate and Batch Plant Materials

Two sources for aggregate and batch plant materials have been identified for the Folsom DS/FDR:

- Tiechert Marysville Borrow Source located on Hammonton-Smartville Road in Marysville, Yuba County
- Tiechert Prairie City Borrow Source located on Scott Road south of White Rock Road in Sacramento County.

The following assumptions have been made to distribute the aggregate materials to each Folsom DS/FDR feature:

- West Project features will receive aggregate materials (sand, gravel, road base and paving) from the Tiechert Marysville Borrow.
- East Project Features will receive aggregate materials (sand, gravel, road base and paving) from the Tiechert Prairie City Borrow.

Pre-mixed concrete for West Project Features will come from Marysville Borrow to the project Features; Cement and concrete aggregates for East Project Features (except for MIAD) would come from Prairie City to Plant #2 (located at LWD); cement for MIAD would come from Prairie City to Plant #3 (located at MIAD). Plant #1 is limited to processing only.

Tables 3.9-17 and 3.9-18 illustrate the daily total truck numbers and the overall total truck trip numbers, respectively, required for each material for each Folsom DS/FDR feature per alternative.

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Table 3.9-17
Folsom Safety of Dams Offsite Material Haul Schedule

Project Feature	Year	Number of Workers	Raw Concrete Hauling					Filter Material Hauling					Reinforcement Steel Hauling					Pre-Cast Parapet Wall Hauling					Road Base Hauling					Asphalt Hauling				
		All Alts	Alt 1 No Raise	Alt 2 4-ft Raise/Tunnel	Alt 3 3.5-ft raise	Alt 4 7-ft raise	Alt 5 17-ft Raise	Alt 1 No Raise	Alt 2 4-ft Raise/Tunnel	Alt 3 3.5-ft raise	Alt 4 7-ft raise	Alt 5 17-ft Raise	Alt 1 No Raise	Alt 2 4-ft Raise/Tunnel	Alt 3 3.5-ft raise	Alt 4 7-ft raise	Alt 5 17-ft Raise	Alt 1 No Raise	Alt 2 4-ft Raise/Tunnel	Alt 3 3.5-ft raise	Alt 4 7-ft raise	Alt 5 17-ft Raise	Alt 1 No Raise	Alt 2 4-ft Raise/Tunnel	Alt 3 3.5-ft raise	Alt 4 7-ft raise	Alt 5 17-ft Raise	Alt 1 No Raise	Alt 2 4-ft Raise/Tunnel	Alt 3 3.5-ft raise	Alt 4 7-ft raise	Alt 5 17-ft Raise
Main Concrete Dam Raise	2011	45		14 trucks for 90 days	14 trucks for 90 days	15 trucks for 120 days	17 trucks for 180 days	0																								
Main Concrete Dam Tendons and Shears	2013-2014	40	4 trucks for 180 days	4 trucks for 180 days	4 trucks for 180 days	4 trucks for 180 days	4 trucks for 180 days						5 Trucks for 440 days	5 Trucks for 440 days	5 Trucks for 440 days	5 Trucks for 440 days	5 Trucks for 440 days															
Auxiliary Spillway Borrow Development (3,190,000 cu yd)	2007-2009	32						NA			NA																					
Auxiliary Spillway Construction	2009-2011	60	14 Trucks for 440 days	14 Trucks for 440 days	14 Trucks for 440 days	14 Trucks for 440 days							42 RT/day for 440 days	42 RT/day for 440 days	42 RT/day for 440 days	42 RT/day for 440 days																
Tunnel Construction	2009-2011	30		19 Trucks for 360 days																												
Right Wing Dam Construction	2009-2010	60		2 Trucks for 10 days				17 Trucks for 280 days	24 Trucks for 200 days	18 Trucks for 200 days	30 Trucks for 120 days	31 Trucks for 120 days		44 Trucks for 200 days					10 Trucks for 200 days				12 Trucks for 1 day	48 Trucks for 8 days	46 Trucks for 4 days	37 Trucks for 15 days	35 Trucks for 15 days	4 Trucks for 1 day	9 Trucks for 15 days	8 Trucks for 15 days	8 Trucks for 20 days	8 Trucks for 20 days
Left Wing Dam Construction	2012-2013	60		2 Trucks for 30 days				12 Trucks for 120 days	19 Trucks for 240 days	5 Trucks for 240 days	4 Trucks for 240 days	3 Trucks for 440 days		27 Trucks for 100 days					6 Trucks for 100 days				21 Trucks for 1 day	31 Trucks for 4 days	55 Trucks for 2 day	38 Trucks for 4 days	39 Trucks for 4 days	7 Trucks for 1 day	8 Trucks for 5 days	7 Trucks for 10 day	9 Trucks for 5 days	9 Trucks for 5 days
Beals Point/Mooney Ridge Borrow Development (1,250,000 cu yd max)	2007 -2010	20																														
Dike 5 Construction	2008	20						16 Trucks for 90 days	3 Trucks for 90 days	2 Trucks for 140 days	2 Trucks for 140 days	2 Trucks for 260 days											44 Trucks for 2 days	41 Trucks for 2 days	39 Trucks for 1 day	35 Trucks for 3 days	37 Trucks for 3 days	6 Trucks for 5 days	6 Trucks for 5 days	5 Trucks for 5 days	6 Trucks for 5 days	6 Trucks for 5 days
Dike 6 Construction	2008	20						20 Trucks for 45 days	2 Trucks for 45 days	7 Trucks for 120 days	2 Trucks for 100 days	2 Trucks for 150 days											32 Trucks for 2 days	39 Trucks for 2 days	33 Trucks for 1 day	48 Trucks for 2	50 Trucks for 2 days	7 Trucks for 3 days	5 Trucks for 5 days	5 Trucks for 5 days	6 Trucks for 5 days	6 Trucks for 5 days
Folsom Point Area Borrow Development and processing	2007-2012	25																														
MIAD Construction	2010-2011 (2012)	30						34 Trucks for 360 days	35 Trucks for 480 days	34 Trucks for 360 days	34 Trucks for 360 days	35 Trucks for 480 days											27 Trucks for 10 Days	27 Trucks for 10 Days	27 Trucks for 10 Days	27 Trucks for 10 Days	27 Trucks for 10 Days	8 Trucks for 10 Days	8 Trucks for 10 Days	8 Trucks for 10 Days	8 Trucks for 10 Days	8 Trucks for 10 Days
MIAD Jet Grouting	2008-2009	20	11 RT for 360 days		11 RT for 360 days	11 RT for 360 days																										
Dike 7 Construction	2012	20						[illegible] Trucks for 15 days	2 Trucks for 30 days	[illegible] Trucks for 45 days	[illegible] Trucks for 90 days	6 Trucks for 90 days											31 Trucks for 1 Day	38 Trucks for 1 Day	22 Trucks for 1 Day	[illegible] Trucks for 1 Day	53 Trucks for 1 Day	5 Trucks for 2 days	6 Trucks for 2 Days	6 Trucks for 4 Days	7 Trucks for 2 Days	7 Trucks for 2 Days
Dike 8 Construction	2012	20						0	9 Trucks for 2 days	7 Trucks for 45 days	12 Trucks for 45 days	7 Trucks for 90 days												32 Trucks for 1 Day	16 Trucks for 1 Day	42 Trucks for 1 Day	48 Trucks for 1 Day		6 Trucks for 2 Days	5 Trucks for 2 Days	7 Trucks for 2 Days	7 Trucks for 2 Days
Granite Bay Borrow Development (913,000 cu yd max)	2013-2014	30						NA			NA	NA																				
Dike 4 Construction	2013-2014	20						19 Trucks for 15 days	1 Trucks for 30 days	3 Trucks for 60 days	3 Trucks for 60 days	3 Trucks for 120 days											35 Trucks for 1 Day	38 Trucks for 2 Days	29 Trucks for 1 Day	48 Trucks for 2 Days	50 Trucks for 2 Days	5 Trucks for 5 days	5 Trucks for 5 Days	4 Trucks for 5 Days	5 Trucks for 5 Days	6 Trucks for 5 Days
Dikes 1, 2, 3, 4 Construction	2013-2014	20						0	2 Trucks for 60 days	0	9 Trucks for 240 days	7 Trucks for 400 days												48 Trucks for 5 Days	39 Trucks for 39 Days	48 Trucks for 8 Days	55 Trucks for 10 Days		8 Trucks for 10 Days	8 Trucks for 15 Days	7 Trucks for 15 Days	8 Trucks for 15 Days

Table 3.9-18
Folsom Safety of Dams Offsite Material Haul Schedule

		Number of Workers	***Raw Concrete Hauling***					***Filter Material Hauling***					Reinforcement Steel Hauling					Pre-Cast Parapet Wall Hauling					Road Base Hauling					Asphalt Hauling				
Project Feature	***Year***	All Alternatives	Alternative 1 - No Raise	2 - 4-ft Raise/Tunnel	Alternative 3 - 3.5-ft raise	Alternative 4 - 7-ft raise	Alternative 5 - 17-ft Raise	Alternative 1 - No Raise	2 - 4-ft Raise/Tunnel	Alternative 3 - 3.5-ft raise	Alternative 4 - 7-ft raise	Alternative 5 - 17-ft Raise	Alternative 1 - No Raise	2 - 4-ft Raise/Tunnel	Alternative 3 - 3.5-ft raise	Alternative 4 - 7-ft raise	Alternative 5 - 17-ft Raise	Alternative 1 - No Raise	2 - 4-ft Raise/Tunnel	Alternative 3 - 3.5-ft raise	Alternative 4 - 7-ft raise	Alternative 5 - 17-ft Raise	Alternative 1 - No Raise	Alternative 2 - 4-ft Raise/Tunnel	Alternative 3 - 3.5-ft raise	Alternative 4 - 7-ft raise	Alternative 5 - 17-ft Raise	Alternative 1 - No Raise	Alternative 2 - 4-ft Raise/Tunnel	Alternative 3 - 3.5-ft raise	Alternative 4 - 7-ft raise	Alternative 5 - 17-ft Raise
Main Concrete Dam Raise	2011-2012	45		1260		1260	3060	0																								
Main Concrete Dam Tendons and Shears	2013-2014	40	2500	720		720	720						166	2200		2200	2200															
Auxiliary Spillway Borrow Development (3,190,000 cu yd)	2007-2009	32						NA			NA																					
Auxiliary Spillway Construction	2009-2011	60	12481	6160	28081	6160		904					82	18480	367	18480							1250					92		92		
Tunnel Construction	2009-2011	30		6840																												
Right Wing Dam Construction	2008-2012	60		20	318			3522	4800	287	3600	3720		8800	6				2000				334	384		184	525	167	135		120	160
Left Wing Dam Construction	2012-2013	60		60	100			1111	4560	90	1200	1320		2700	2				600				100	124		110	156	50	40		70	45
Beals Point/Mooney Ridge Borrow Development (1,250,000 cu yd max)	2007 -2012	20																														
Dike 5 Construction	2008	20			89			1621	270	88	280	520			2								100	82		39	111	50	30		25	30
Dike 6 Construction	2008	20			75			973	90	68	840	300			2								73	78		33	100	36	25		25	30
Folsom Point Area Borrow Development and processing	2007-2013	25																														
MIAD Construction	2008-2011	30			228			18089	16800	206	12240	16800			4								295	270		270	270	127	80		80	80
MIAD Jet Grouting	2009-2010	20	4100			3960																										
Dike 7 Construction	2012	20			43			0	60	39	585	540			1								0	38		22	53	0	12		24	14
Dike 8 Construction	2012	20			43			0	18	38	315	630			1									32		16	48		12		10	14
Granite Bay Borrow Development (913,000 cu yd max)	2009-2014	30						NA			NA	NA																				
Dike 4 Construction	2008	20			65			785	30	58	180	360			2								78	76		29	100	39	25		20	30
Dikes 1, 2, 3 Construction	2009-2014	20			1203/926/880			0	120	1665/4088/1217	0	2800			39/34/1									240		195	550		80		120	120

Offsite Materials and Equipment

Offsite materials such as Slope U/S, Toe Drain, HDPE Pipe, Pipe Filter, U/S Filter, Seeding, Rebar will be delivered to the West Project Features from Interstate 80 and to the East Project Features (including Main Concrete Dam) via US Highway 50.

In addition, equipment needs, will be delivered to the west facilities from Interstate 80 and to the east facilities via US Highway 50.

Labor Force

According to data from the California Labor Market Info Data Library Unemployment rates 2005 data, there are 5,700 total unemployed workers in the region. Since 82% of the unemployed are located in Sacramento area, with 11% in Placer County and 7% in El Dorado County. Table 3.9-19 presents the assumptions used on where the workers are expected to originate their trips.

Table 3.9-19
Distribution of Labor Force

Region	*Folsom DS/FDR Worker Distribution*
Rocklin area (Placer County to the north)	5%
Roseville area (Placer County to the west)	5%
Folsom	5%
El Dorado area (Green Valley Road)	2.5%
El Dorado area (US50)	2.5%
Sacramento area (I-80)	40%
Sacramento area (US50)	40%
Total	100%

Based on California Unemployment Rates in 2005, Department of Finance

Trip Assignment

Figures 3.9-1 through 3.9-3 illustrate the proposed routes. Based on the existing traffic volume conditions, the truck route restrictions/designations and general knowledge of the Folsom DS/FDR area, Tables 3.9-20 and 3.9-21 illustrate the proposed access routes for the Folsom DS/FDR. The Local Access Routes and the Regional Access Routes have been further broken down into five types of routes:

- Aggregate Materials
- Offsite Materials
- Batch Plant

- Equipment
- Workers

Table 3.9-20 illustrates the proposed routes and their corresponding designations for hauling of aggregate, offsite, and batch plant materials. Equipment deliveries are expected to use the same routes as the offsite materials.

Table 3.9-21 illustrates the expected routes that workers would use for access/egress for each Folsom DS/FDR feature.

The following assumptions relate to the personnel access routes:

- Folsom DS/FDR personnel from Rocklin area would use Sierra College Boulevard to Douglas Boulevard and further south along Auburn-Folsom Road, Folsom-Auburn Road and East Natoma Street as required to access the Folsom DS/FDR area.
- Folsom DS/FDR personnel from Roseville area would use Douglas Boulevard and head south as required along Auburn-Folsom Road, Folsom-Auburn Road and East Natoma Street as required to access the Folsom DS/FDR area.
- Folsom DS/FDR personnel from Folsom would use East Natoma Street to access the east facilities and Folsom-Auburn Road, Auburn-Folsom Road, Douglas Boulevard to access West Project Features.
- Folsom DS/FDR personnel from Sacramento Interstate 80 would use Greenback Lane to Folsom-Auburn Road to East Natoma Street to access the East Project Features and Interstate 80 to Douglas Boulevard to access the West Project Features.
- Folsom DS/FDR personnel from Sacramento US Highway 50 would use Folsom Boulevard to Folsom-Auburn Road to Auburn-Folsom Road and Douglas Boulevard as required to reach the West Project Features.
- Folsom DS/FDR personnel from Sacramento US Highway 50 would use Folsom Boulevard to Folsom-Auburn Road to East Natoma Street to access the East Project Features.
- Folsom DS/FDR personnel from El Dorado US Highway 50 would use East Bidwell Street to Oak Avenue Parkway to Blue Ravine Road to East Natoma Street to access the East Project Features.

Table 3.9-20
Material Route Designations

AGGREGATE MATERIALS (from Marysville)																						
Route Designation	**ROUTE**																					**FACILITY**
A-1	From	Tiechert Borrow (hammonton-smartville	to	N. Beale Road	to	Feather River Boulevar	to	Highway 70	to	Highway 65	to	Interstate 80	to	Sierra College Boulevard	to	Douglas Boulevard	to					Dikes 1, 2, 3
A-2	From	Tiechert Borrow (hammonton-smartville	to	N. Beale Road	to	Feather River Boulevar	to	Highway 70	to	Highway 65	to	Interstate 80	to	Sierra College Boulevard	to	Douglas Boulevard	to	A-F Road	to			Mooney Ridge
A-3	From	Tiechert Borrow (hammonton-smartville	to	N. Beale Road	to	Feather River Boulevar	to	Highway 70	to	Highway 65	to	Interstate 80	to	Eureka Road	to	Douglas Boulevard	to	A-F Road	to			Dikes 4,5,6
A-4	From	Tiechert Borrow (hammonton-smartville	to	N. Beale Road	to	Feather River Boulevar	to	Highway 70	to	Highway 65	to	Interstate 80	to	Eureka Road	to	Douglas Boulevard	to	A-F Road	to	F-A Road	to	RWD
AGGREGATE MATERIALS (from Prairie City)																						
Route Designation	**ROUTE**															**FACILITY**						
A-5	From	Prairie City Borrow (White Rock/Scott Road)	to	Scott Road	to	East Bidwell St	to	Oak Ave. Parkway	to	Blue Ravine	to	E. Natoma Street	to			Main Dam, LWD, Dikes 7,8						
A-6	From	Prairie City Borrow (White Rock/Scott Road)	to	Scott Road	to	East Bidwell St	to	Oak Ave. Parkway	to	Blue Ravine	to	E. Natoma Street	to	Green Valley Road	to	MIAD						
BP-2	From	Prairie City Borrow (White Rock/Scott Road)	to	Scott Road	to	East Bidwell St	to	Oak Ave. Parkway	to	Blue Ravine	to	E. Natoma Street	to			Batch Plant 2						
BP-3	From	Prairie City Borrow (White Rock/Scott Road)	to	Scott Road	to	East Bidwell St	to	Oak Ave. Parkway	to	Blue Ravine	to	E. Natoma Street	to	Green valley Road	to	Batch Plant 3						
OFFSITE MATERIALS & EQUIPMENT (FROM I-80)																						
Route Designation	**ROUTE**											**FACILITY**										
O-1	From	Interstate 80	to	Boulevard	to	Douglas Boulevard	to					Site										
O-2	From	Interstate 80	to	Sierra College Boulevard	to	Douglas Boulevard	to	A-F Road	to			Mooney Ridge, Beals Point Borrow Site										
O-3	From	Interstate 80	to	Eureka Road	to	Douglas Boulevard	to	A-F Road	to			Dikes 4,5,6										
O-4	From	Interstate 80	to	Eureka Road	to	Douglas Boulevard	to	A-F Road	to	F-A Road	to	RWD										
OFFSITE MATERIALS & EQUIPMENT (FROM US50)																						
Route Designation	**ROUTE**													**FACILITY**								
O-5	From	US50	to	East Bidwell Street	to	Oak Avenue Parkway	to	Blue Ravine	to	E. Natoma	to			Main Dam, LWD, Dikes 7,8, Auxiliary Spillway, Bridge Spoils								
O-6	From	US50	to	East Bidwell Street	to	Oak Avenue Parkway	to	Blue Ravine	to	E. Natoma	to	Green Valley Road	to	MIAD, MIAD Borrow Site								

Assumptions:
Folsom Dam Road is not open to construction traffic
Aggregate materials include: Fine Filters, Coarse Fiters, Cement and Asphalt
Offsite materials include: Slope U/S, toe drain, HDPE Pipe, Pipe Filter, U/S Filter, Seeding, Rebar
Access to Dikes 7,8 via East Natoma Street - may require waiver from City of Folsom
Main Dam materials come from US 50 and are staged east of the dam

Table 3.9-21
Personnel Access Route Designations

WORKER ROUTE DESIGNATION	ROUTE															FACILITY
W-1A	Roseville area	Douglas Boulevard	to													Dikes 1,2,3
W-2A	Rocklin area	Sierra College Boulevard	to	Douglas Boulevard	to											Dikes 1,2,3
W-3A	Folsom	E Natoma Street	to	Folsom Boulevard	to	F-A Road	to	A-F Road	to	Douglas Boulevard	to					Dikes 1,2,3
W-4A	Sacramento I-80	Douglas Boulevard	to													Dikes 1,2,3
W-5A	Sacramento US50	Folsom Boulevard	to	F-A Road	to	A-F Road	to	Douglas Boulevard	to							Dikes 1,2,3
W-6A	El Dorado (US50)	US50	to	Folsom Boulevard	to	F-A Road	to	A-F Road	to	Douglas Boulevard	to					Dikes 1,2,3
W-7A	El Dorado (GVR)	Green Valley Road	to	E. Natoma Street	to	F-A Road	to	A-F Road	to	Douglas Boulevard	to					Dikes 1,2,3
W-1B	Roseville area	Douglas Boulevard	to	A-F Road	to											Mooney Ridge, Dikes 4,5,6
W-2B	Rocklin area	Sierra College Boulevard	to	Douglas Boulevard	to	A-F Road	to									Mooney Ridge, Dikes 4,5,6
W-3B	Folsom	E Natoma Street	to	Folsom Boulevard	to	F-A Road	to	A-F Road	to							Mooney Ridge, Dikes 4,5,6
W-4B	Sacramento I-80	Greenback Lane	to	F-A Road	to	A-F Road	to									Mooney Ridge, Dikes 4,5,6
W-5B	Sacramento US50	Folsom Boulevard	to	F-A Road	to	A-F Road	to									Mooney Ridge, Dikes 4,5,6
W-6B	El Dorado (US50)	US50	to	Folsom Boulevard	to	F-A Road	to	A-F Road	to							Mooney Ridge, Dikes 4,5,6
W-7B	El Dorado (GVR)	Green Valley Road	to	E. Natoma Street	to	F-A Road	to	A-F Road	to							Mooney Ridge, Dikes 4,5,6
W-1C	Roseville area	Douglas Boulevard	to	A-F Road	to	F-A Road	to									RWD
W-2C	Rocklin area	Sierra College Boulevard	to	Douglas Boulevard	to	A-F Road	to	F-A Road	to							RWD
W-3C	Folsom	E. Natoma Street	to	Folsom Boulevard	to	F-A Road	to									RWD
W-4C	Sacramento I-80	Greenback Lane	to	F-A Road	to											RWD
W-5C	Sacramento US50	Folsom Boulevard	to	F-A Road	to											RWD
W-6C	El Dorado (US50)	US50	to	Folsom Boulevard	to	F-A Road	to									RWD
W-7C	El Dorado (GVR)	Green Valley Road	to	E. Natoma Street	to	F-A Road	to									RWD
W-1D	Roseville area	Douglas Boulevard	to	A-F Road	to	F-A Road	to	E. Natoma Street	to							Auxilliary spillway, tunnel, Main Dam, LWD, Dikes 7,8
W-2D	Rocklin area	Sierra College Boulevard	to	Douglas Boulevard	to	A-F Road	to	F-A Road	to	E.Natoma Street	to					Auxilliary spillway, tunnel, Main Dam, LWD, Dikes 7,8
W-3D	Folsom	E. Natoma Street	to													Auxilliary spillway, tunnel, Main Dam, LWD, Dikes 7,8
W-4D	Sacramento I-80	Greenback Lane	to	F-A Road	to	E. Natoma Street	to									Auxilliary spillway, tunnel, Main Dam, LWD, Dikes 7,8
W-5D	Sacramento US50	Folsom Boulevard	to	F-A Road	to	E. Natoma Street	to									Auxilliary spillway, tunnel, Main Dam, LWD, Dikes 7,8
W-6D	El Dorado (US50)	US50	to	E. Bidwell St	to	Oak Ave. Parkway	to	Blue Ravine	to	E. Natoma Street	to					Auxilliary spillway, tunnel, Main Dam, LWD, Dikes 7,8
W-7D	El Dorado (GVR)	Green Valley Road	to	E. Natoma Street	to											Auxilliary spillway, tunnel, Main Dam, LWD, Dikes 7,8
W-1E	Roseville area	Douglas Boulevard	to	A-F Road	to	F-A Road	to	Folsom Boulevard	to	E. Natoma Street	to	Green Valley Road	to			MIAD
W-2E	Rocklin area	Sierra College Boulevard	to	Douglas Boulevard	to	A-F Road	to	F-A Road	to	Folsom Boulevard	to	E.Natoma Street	to	Green Valley Road	to	MIAD
W-3E	Folsom	E. Natoma Street	to	Green Valley Road	to											MIAD
W-4E	Sacramento I-80	Greenback Lane	to	Folsom Boulevard	to	E. Natoma Street	to	Green Valley Road	to							MIAD
W-5E	Sacramento US50	Folsom Boulevard	to	E. Natoma Street	to	Green Valley Road	to									MIAD
W-6E	El Dorado (US50)	US50	to	E. Bidwell St	to	Oak Ave. Parkway	to	Blue Ravine	to	E. Natoma Street	to	Green Valley Road	to			MIAD
W-7E	El Dorado (GVR)	Green Valley Road	to													MIAD

Assumptions:

5% orker population comes f Rocklin area
5% orker population comes f Roseville area
5% orker population comes f Folsom area
40% orker population comes f Sacramento I-80
40% orker population comes f Sacramento US50
2.5% orker population comes f El Dorado (US50)
2.5% orker population comes f El Dorado (GVR = Green Valley Road)

- Folsom DS/FDR personnel from El Dorado Green Valley Road (GVR) would use Green Valley Road to East Natoma Street to access east facilities, and East Natoma Street to Folsom-Auburn Road and Douglas Boulevard as required to reach the West Project Features.

Daily Trips

Materials and Equipment

Determination of daily truck trips associated with each Folsom DS/FDR alternative includes the following assumptions:

- Total truck trips are distributed evenly over multiple year construction periods.
- Daily trips are not applicable for the entire construction period. The daily trips illustrate conservative scenario at the beginning of each construction phase when both materials and equipment will be delivered to the site.
- Quantities of delivered materials will be met prior to the end of each construction period.
- Daily truck calculations assume 244 hauling days per year.

Tables 3.9-22 through 3.9-29 in Appendix F illustrate the daily trips associated with hauling in materials and equipment. Tables 3.9-30 through 3.9-37 in Appendix F illustrate the trips assigned to each route.

Personnel

- Determination of daily worker trips associated with all Folsom DS/FDR alternatives includes the following assumptions:
- Each worker number represents four daily trips (workers are illustrated per shift).
- Worse case scenario assumes each worker will travel alone and not carpool.
- Each worker will drive to each Folsom DS/FDR feature as opposed to meeting at a staging area to be dispersed to their respective work sites.

Tables 3.9-38 through 3.9-77 (included in Appendix F) illustrate the distribution of workers to each Folsom DS/FDR feature from each unemployment region as identified in *Trip Distribution.* Tables 3.9-38 through 3.9-77 illustrate slightly higher worker and trip numbers than the summary illustrated on Table 3.9-12 through 3.9-16 due to rounding.

Tables 3.9-78 through 3.9-85 (included in Appendix F) illustrate the assignment of truck and worker trips as well as the daily impacts of each alternative associated with hauling materials and equipment and personnel arrivals and departures. Tables 3.9-86 through 3.9-93 illustrate the expected changes in Average Daily Trips (ADT), if any, the changes, if any in LOS, the V/C ratios for all roadways experiencing LOS F, and the percent increase in ADT, if any, for each alternative for each construction year. Emergency operations are currently not included in this analysis and it is not yet determined if its inclusion will impact the analysis presented thus far.

3.9.2.2 Significance Criteria

Appendix G of the CEQA Guidelines provides general guidance that can be considered in determining whether a project would result in a significant impact related to transportation/traffic. Considerations identified therein include the following:

Would the project:

A. Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?

B. Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?

C. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

D. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

E. Result in inadequate emergency access?

F. Result in inadequate parking capacity?

G. Conflict with adopted policies, plans, and programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?

Relative to the Folsom DS/FDR, the CEQA considerations presented above, with the exception of Criterion C (i.e., none of the alternatives would have any influence on air traffic patterns), and the local significance thresholds presented earlier in Table 3.9-3 were taken into account in evaluating whether the Folsom DS/FDR's traffic impacts are significant.

Table 3.9-86
2007 Daily Project Impacts Alternatives 1 though 5

		ROUTE DESIGNATIONS		2007																													
				No Action/No Project				Alternative 1					Alternative 2					Alternative 3					Alternative 4					Alternative 5				
Roadway	Location	Materials/ Equip.	Worker Routes	ADT	V/C	code	LOS	New ADT	V/C	%	code	LOS	New ADT	V/C	%	code	LOS	New	V/C	%	code	LOS	New	V/C	%	code	LOS	New	V/C	%	code	LOS
Folsom Boulevard	Natoma Street to Blue Ravine Road		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C, W-3D, W-5D, W-3E, W-5E	37,800	1.01	4AD	F	37,900	1.01	0.26%	4AD	F	37,900	1.01	0.26%	4AD	F	37,860	1.01	0.16%	4AD	F	37,900	1.01	0.26%	4AD	F	37,884	1.01	0.22%	4AD	F
Folsom Boulevard	Leidesdorff Street to Greenback Lane		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C	32,600		4AD	D	32,640		0.12%	4AD	D	32,640		0.12%	4AD	D	32,600			4AD	D	32,640		0.12%	4AD	D	32,640		0.12%	4AD	D
Folsom-Auburn Road	Oak Hill Drive to Folsom Dam Road	A-4, O-4, BP-1	W-1C, 2C, 3C, 4C, 5C, 6C, 7C, 1D,2D, 2E, W-3A, 5A, 6A, 3B, 5B, 6B,1E	40,300	1.39	4AU	F	40,356	1.40	0.14%	4AU	F	40,316	1.40	0.04%	4AU	F	40,316	1.40	0.04%	4AU	F	40,356	1.40	0.14%	4AU	F	40,348	1.40	0.12%	4AU	F
Folsom-Auburn Road	Folsom Dam Road to Oak Avenue		W-3A, 5A, 6A, 7A, 3B, 4B, 5B, 6B, 7B, 1E, 2E, 5C	21,400		4AU	D	21,476		0.36%	4AU	D	21,476		0.36%	4AU	D	21,400			4AU	D	21,440		0.19%	4AU	D	21,452		0.24%	4AU	D
Auburn-Folsom (A-F) Road	Douglas Boulevard to Eureka Road	A-2,A-3,A-4, O-2, O-3, O-4, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	34,300	1.19	4AU	F	34,402	1.19	0.30%	4AU	F	34,402	1.19	0.30%	4AU	F	34,316	1.19	0.05%	4AU	F	34,402	1.19	0.30%	4AU	F	34,394	1.19	0.27%	4AU	F
Auburn-Folsom (A-F) Road	Eureka Road to Oak Hill Drive	A-2, A-3, O-2, O-3, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	30,500	1.63	2A	F	30,602	1.64	0.33%	2A	F	30,602	1.64	0.33%	2A	F	30,508	1.63	0.03%	2A	F	30,602	1.64	0.33%	2A	F	30,594	1.64	0.31%	2A	F
Sierra College Boulevard	north of Douglas Boulevard	A-1, A-2, O-1, O-2	W-2A, W-2B, W-2C, W-2D, W-2E	25,286		4AD	D	25,300		0.06%	4AD	D	25,300		0.06%	4AD	D	25,294		0.03%	4AD	D	25,300		0.06%	4AD	D	25,296		0.04%	4AD	D
Eureka Road	east of N. Sunrise Avenue	A-3, A-4, O-3, O-4, BP-1		38,908		6AD	D	38,908			6AD	D	38,908			6AD	D	38,908			6AD	D	38,908			6AD	D	38,908			6AD	D
Douglas Boulevard	east of A-F Road	A-1,O-1	W-1A, W-2A, W-3A, W-4A, W-5A, W-6A, W-7A	13,184		2A	D	13,184			2A	D	13,184			2A	D	13,184			2A	D	13,184			2A	D	13,184			2A	D
Douglas Boulevard	Barton Road to A-F Road	A-1, A-2, A-3, A-4, O-1, O-2, O-3, O-4, BP-1	W-1A, W-2A, W-4A, W-1B, W-2B, W-4B, W-1C,	40,200	1.07	4AD	F	40,258	1.08	0.14%	4AD	F	40,258	1.08	0.14%	4AD	F	40,216	1.08	0.04%	4AD	F	40,258	1.08	0.14%	4AD	F	40,250	1.08	0.12%	4AD	F
Douglas Boulevard	Barton to Sierra Colleg Blvd.			46,491	1.24	4AD	F	46,491	1.24		4AD	F	46,491	1.24		4AD	F	46,491	1.24		4AD	F	46,491	1.24		4AD	F	46,491	1.24		4AD	F
Blue Ravine Road	Oak Avenue Parkway to Green Valley Road/East Natoma Street	A-5, A-6,O-5, O-6, BP-2, BP3	W-6D, W-6E	19,500		4AD	D	19,504		0.02%	4AD	D	19,504		0.02%	4AD	D	19,504		0.02%	4AD	D	19,504		0.02%	4AD	D	19,504		0.02%	4AD	D
East Natoma St	Cimmaron Circle to Folsom Dam Road		W-1D, 3D, 4D, 5D, 1E, 2E, 3E, 4E, 5E	16,600		4AU	C	16,720		0.72%	4AU	C	16,720		0.72%	4AU	C	16,720		0.72%	4AU	C	16,720		0.72%	4AU	C	16,692		0.55%	4AU	C
East Natoma St	Folsom Dam Road to Green Valley Road	A-5, A-6,O-5, O-6, BP-2, BP3	W-7A, 7B, 7C, 1D,2D,3D,4D,5D,6D,7D, 1E, 2E, 3E, 4E, 5E, 6E	27,100		4AU	D	27,240		0.52%	4AU	D	27,236		0.50%	4AU	D	27,236		0.50%	4AU	D	27,240		0.52%	4AU	D	27,200		0.37%	4AU	D
Green Valley Road	East Natoma Street to Sophia Parkway	A-6, O-6	W-1E, W-2E, W-3E, W-4E, W-5E, W-6E	32,000	1.11	4AU	F	32,000	1.11		4AU	F	32,000	1.11		4AU	F	32,000	1.11		4AU	F	32,000	1.11		4AU	F	32,096	1.11	0.30%	4AU	F
Greenback Lane	Hazel Avenue to Madison Avenue		W-4B, W-4C, W-4D, W-4E	24,100		4AMD	B	24,184		0.35%	4AMD	B	24,184		0.35%	4AMD	B	24,152		0.22%	4AMD	B	24,184		0.35%	4AMD	B	24,172		0.30%	4AMD	B
East Bidwell Street	Clarksville Road to Iron Point Road	A-5, A-6, O-5, O-6, BP-2, BP-3	W-6D, W-6E	39,300		4AD	F	39,300			4AD	F	39,300			4AD	F	39,300			4AD	F	39,300			4AD	F	39,300			4AD	F
Oak Avenue Parkway	Blue Ravine Road to East Bidwell Street		W-6D, W-6E	22,200		6AD	C	22,204		0.02%	6AD	C	22,204		0.02%	6AD	C	22,204		0.02%	6AD	C	22,204		0.02%	6AD	C	22,244		0.20%	6AD	C
Scott Road (south)	south of White Rock Road	A-5, A-6, BP-2, BP-3		1,652		2C	A/B	1,652			2C	A/B	1,652			2C	A/B	1,652			2C	A/B	1,652			2C	A/B	1,652			2C	A/B
White Rock Road	between Scott Road (south) and Scott Road (north)	A-5, A-6, BP-2, BP-3		9,087		2C	E	9,087			2C	E	9,087			2C	E	9,087			2C	E	9,087			2C	E	9,087			2C	E
Scott Road (north)	north of White Rock Road	A-5, A-6, BP-2, BP-3		6,324		2C	D	6,324			2C	D	6,324			2C	D	6,324			2C	D	6,324			2C	D	6,324			2C	D
US50	Hazel Avenue to Folsom Boulevard	O-5, O-6	W-5A, W-5B, W-5C, W-5D, W-5E	116,800	1.16	4FA	F	116,884	1.16	0.07%	4FA	F	116,884	1.16	0.07%	4FA	F	116,852	1.16	0.04%	4FA	F	116,884	1.16	0.07%	4FA	F	116,872	1.16	0.06%	4FA	F
US50	Folsom Boulevard to Prairie City Road	O-5, O-6	W-6A, W-6B, W-6C	99,000	1.23	4F	F	99,004	1.23	0.00%	4F	F	99,004	1.23	0.00%	4F	F	99,000	1.23		4F	F	99,008	1.23	0.01%	4F	F	99,004	1.23	0.00%	4F	F
US50	Prairie City Road to East Bidwell Street	O-5, O-6	W-6A, W-6B, W-6C	71,800		4F	E	71,804		0.01%	4F	E	71,804		0.01%	4F	E	71,800			4F	E	71,808		0.01%	4F	E	71,804		0.01%	4F	E
US50	East Bidwell St to County Line		W-6A, W-6B, W-6C, W-6D, W-6E	81,900	1.02	4F	F	81,908	1.02	0.01%	4F	F	81,908	1.02	0.01%	4F	F	81,904	1.02	0.00%	4F	F	81,908	1.02	0.01%	4F	F	81,908	1.02	0.01%	4F	F
Regional Access Routes																																	
Hammonton-Smartville (H-S) Road	north of N. Beale Road	A-1, A-2		9,043		2C	E	9,043			2C	E	9,043			2C	E	9,043			2C	E	9,043			2C	E	9,043			2C	E
N Beale Road	south of H-S Road	A-1, A-2		27,805		4AU	E	27,805			4AU	E	27,805			4AU	E	27,805			4AU	E	27,805			4AU	E	27,805			4AU	E
Feather River Blvd. Ramp	south of N. Beale Street	A-1, A-2																															
				56,574	1.57	4AMD	F	56,574	1.57		4AMD	F	56,574	1.57		4AMD	F	56,574	1.57		4AMD	F	56,574	1.57		4AMD	F	56,574	1.57		4AMD	F
Highway 70	Yuba County, east of Feather River Boulevard interchange	A-1, A-2		100,046	1.25	4F	F	100,046	1.25		4F	F	100,046	1.25		4F	F	100,046	1.25		4F	F	100,046	1.25		4F	F	100,046	1.25		4F	F
Highway 65	Roseville, northeast of Route 80	A-1, A-2		22,153	1.18	2A	F	22,153	1.18		2A	F	22,153	1.18		2A	F	22,153	1.18		2A	F	22,153	1.18		2A	F	22,153	1.18		2A	F
Highway 65	Lincoln, northeast of 7th Street	A-1, A-2		23,225	1.24	2A	F	23,225	1.24		2A	F	23,225	1.24		2A	F	23,225	1.24		2A	F	23,225	1.24		2A	F	23,225	1.24		2A	F
Interstate 80	Roseville, northeast of Route 65	A-1, A-2, O-1, O-2		126,757	1.26	4FA	F	126,759	1.26	0.00%	4FA	F	126,759	1.26	0.00%	4FA	F	126,757	1.26		4FA	F	126,759	1.26	0.002%	4FA	F	126,759	1.26	0.002%	4FA	F
Interstate 80	Rocklin, south of Sierra College Boulevard	A-1, A-2, O-1, O-2		104,902	1.04	4FA	F	104,904	1.04	0.00%	4FA	F	104,904	1.04	0.00%	4FA	F	104,902	1.04		4FA	F	104,904	1.04	0.002%	4FA	F	104,904	1.04	0.002%	4FA	F

New Aggregate trips are those trips hauling aggregate materials (fine & coarse filters, road base and asphalt)
New Offsite trips are those trips hauling offsite materials (slope u/s, toe drain, hdpe pipe, pipe filter, u/s filter, seeding, rebar)
New BP trips are those trips hauling aggregate materials (cement, fine & coarse aggregates) directly to the batch plants. This does not include trips from the batch plants to the project
New Equipment trips are those trips hauling in equipment to each project feature staging area (staging area assumed adjacent to project feature for hauling evaluation).

Table 3.9-87
2008 Daily Project Impacts Alternatives 1 though 5

		DESIGNATIONS		2008																												
				No Action/No Project				Alternative 1					Alternative 2					Alternative 3					Alternative 4					Alternative 5				
Roadway	Location	Materials/ Equip. Routes	Worker Routes	ADT	V/C	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS
Folsom Boulevard	Natoma Street to Blue Ravine Road		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C, W-3D, W-5D, W-3E, W-5E	38,934	1.04	4AD	F	39,182	1.05	0.64%	4AD	F	39,182	1.05	0.64%	4AD	F	39,258	1.05	0.83%	4AD	F	39,182	1.05	0.64%	4AD	F	39,166	1.05	0.60%	4AD	F
Folsom Boulevard	Leidesdorff Street to Greenback Lane		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C	33,578		4AD	D	33,710		0.39%	4AD	D	33,710		0.39%	4AD	D	33,786		0.62%	4AD	D	33,710		0.39%	4AD	D	33,710		0.39%	4AD	D
Folsom-Auburn Road	Oak Hill Drive to Folsom Dam Road	A-4, O-4, BP-1	W-1C, 2C, 3C, 4C, 5C, 6C, 7C, 1D,2D, 2E, W-3A, 5A, 6A, 3B, 5B, 6B,1E	41,509	1.44	4AU	F	41,673	1.44	0.40%	4AU	F	41,673	1.44	0.40%	4AU	F	41,886	1.45	0.91%	4AU	F	41,673	1.44	0.40%	4AU	F	41,653	1.44	0.35%	4AU	F
Folsom-Auburn Road	Folsom Dam Road to Oak Avenue		W-3A, 5A, 6A, 7A, 3B, 4B, 5B, 6B, 7B, 1E, 2E, 5C	22,042		4AU	D	22,310		1.22%	4AU	D	22,310		1.22%	4AU	D	22,330		1.31%	4AU	D	22,310		1.22%	4AU	D	22,318		1.25%	4AU	D
Auburn-Folsom (A-F) Road	Douglas Boulevard to Eureka Road	A-2,A-3,A-4, O-2, O-3, O-4, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	35,329	1.22	4AU	F	35,666	1.23	0.95%	4AU	F	35,657	1.23	0.93%	4AU	F	35,595	1.23	0.75%	4AU	F	35,699	1.24	1.05%	4AU	F	35,649	1.23	0.91%	4AU	F
Auburn-Folsom (A-F) Road	Eureka Road to Oak Hill Drive	A-2, A-3, O-2, O-3, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	31,415	1.68	2A	F	31,737	1.70	1.02%	2A	F	31,725	1.70	0.99%	2A	F	31,669	1.69	0.81%	2A	F	31,737	1.70	1.02%	2A	F	31,723	1.70	0.98%	2A	F
Sierra College Boulevard	north of Douglas Boulevard	A-1, A-2, O-1, O-2	W-2A, W-2B, W-2C, W-2D, W-2E	26,045		4AD	D	26,065		0.08%	4AD	D	26,075		0.12%	4AD	D	26,081		0.14%	4AD	D	26,075		0.12%	4AD	D	26,071		0.10%	4AD	D
Eureka Road	east of N. Sunrise Avenue	A-3, A-4, O-3, O-4, BP-1		40,076		6AD	D	40,103		0.07%	6AD	D	40,094		0.04%	6AD	D	40,094		0.04%	6AD	D	40,136		0.15%	6AD	D	40,094		0.04%	6AD	D
Douglas Boulevard	east of A-F Road	A-1,O-1	W-1A, W-2A, W-3A, W-4A, W-5A, W-6A, W-7A	13,580		2A	D	13,580			2A	D	13,580			2A	D	13,580			2A	D	13,580			2A	D	13,580			2A	D
Douglas Boulevard	Barton Road to A-F Road	A-1, A-2, A-3, A-4, O-1, O-2, O-3, O-4, BP-1	W-1A, W-2A, W-4A, W-1B, W-2B, W-4B, W-1C, W-2C, W-1D, W-2D, W-1E, W-2E	41,406	1.11	4AD	F	41,599	1.11	0.47%	4AD	F	41,590	1.11	0.44%	4AD	F	41,572	1.11	0.40%	4AD	F	41,632	1.11	0.55%	4AD	F	41,582	1.11	0.43%	4AD	F
Douglas Boulevard	Barton to Sierra Colleg Blvd.			47,886	1.28	4AD	F	47,886	1.28		4AD	F	47,886	1.28		4AD	F	47,886	1.28		4AD	F	47,886	1.28		4AD	F	47,886	1.28		4AD	F
Blue Ravine Road	Oak Avenue Parkway to Green Valley Road/East Natoma Street	A-5, A-6,O-5, O-6, BP-2, BP3	W-6D, W-6E	20,085		4AD	D	20,190		0.52%	4AD	D	20,101		0.08%	4AD	D	20,102		0.08%	4AD	D	20,166		0.40%	4AD	D	20,169		0.42%	4AD	D
East Natoma St	Cimmaron Circle to Folsom Dam Road		W-1D, 3D, 4D, 5D, 1E, 2E, 3E, 4E, 5E	17,098		4AU	C	17,338		1.40%	4AU	C	17,338		1.40%	4AU	C	17,338		1.40%	4AU	C	17,338		1.40%	4AU	C	17,310		1.24%	4AU	C
East Natoma St	Folsom Dam Road to Green Valley Road	A-5, A-6,O-5, O-6, BP-2, BP3	W-7A, 7B, 7C, 1D,2D,3D,4D,5D,6D,7D, 1E, 2E, 3E, 4E, 5E, 6E	27,913		4AU	E	28,282		1.32%	4AU	E	28,193		1.00%	4AU	E	28,182		0.96%	4AU	E	28,258		1.24%	4AU	E	28,221		1.10%	4AU	E
Green Valley Road	East Natoma Street to Sophia Parkway	A-6, O-6	W-1E, W-2E, W-3E, W-4E, W-5E, W-6E	32,960	1.14	4AU	F	33,164	1.15	0.62%	4AU	F	33,158	1.15	0.60%	4AU	F	33,092	1.15	0.40%	4AU	F	33,140	1.15	0.55%	4AU	F	33,256	1.15	0.90%	4AU	F
Greenback Lane	Hazel Avenue to Madison Avenue		W-4B, W-4C, W-4D, W-4E	24,823		4AMD	B	25,031		0.84%	4AMD	B	25,031		0.84%	4AMD	B	25,095		1.10%	4AMD	B	25,031		0.84%	4AMD	B	25,019		0.79%	4AMD	B
East Bidwell Street	Clarksville Road to Iron Point Road	A-5, A-6, O-5, O-6, BP-2, BP-3	W-6D, W-6E	40,479		4AD	F	40,695		0.53%	4AD	F	40,695		0.53%	4AD		40,499		0.05%	4AD		40,647		0.42%	4AD		40,638		0.39%	4AD	
Oak Avenue Parkway	Blue Ravine Road to East Bidwell Street		W-6D, W-6E	22,866		6AD	C	22,874		0.03%	6AD	C	22,874		0.03%	6AD	C	22,874		0.03%	6AD	C	22,874		0.03%	6AD	C	22,874		0.03%	6AD	C
Scott Road (south)	south of White Rock Road	A-5, A-6, BP-2, BP-3		1,702		2C	A/B	1,794		5.41%	2C	A/B	1,702			2C	A/B	1,709		0.41%	2C	A/B	1,770		4.00%	2C	A/B	1,771		4.05%	2C	A/B
White Rock Road	between Scott Road (south) and Scott Road (north)	A-5, A-6, BP-2, BP-3		9,360		2C	E	9,452		0.98%	2C	E	9,360			2C	E	9,367		0.07%	2C	E	9,428		0.73%	2C	E	9,429		0.74%	2C	E
Scott Road (north)	north of White Rock Road	A-5, A-6, BP-2, BP-3		6,514		2C	D	6,594		1.23%	2C	D	6,519		0.08%	2C	D	6,515		0.02%	2C	D	6,519		0.08%	2C	D	6,521		0.11%	2C	D
US50	Hazel Avenue to Folsom Boulevard	O-5, O-6	W-5A, W-5B, W-5C, W-5D, W-5E	120,304	1.19	4FA	F	120,517	1.20	0.18%	4FA	F	120,517	1.20	0.18%	4FA	F	120,577	1.20	0.23%	4FA	F	120,517	1.20	0.18%	4FA	F	120,507	1.20	0.17%	4FA	F
US50	Folsom Boulevard to Prairie City Road	O-5, O-6	W-6A, W-6B, W-6C	101,970	1.27	4F	F	101,991	1.27	0.02%	4F	F	101,987	1.27	0.02%	4F	F	101,987	1.27	0.02%	4F	F	101,987	1.27	0.02%	4F	F	101,989	1.27	0.02%	4F	F
US50	Prairie City Road to East Bidwell Street	O-5, O-6	W-6A, W-6B, W-6C	73,954		4F	E	73,975		0.03%	4F	E	73,971		0.02%	4F	E	73,971		0.02%	4F	E	73,971		0.02%	4F	E	73,973		0.03%	4F	E
US50	East Bidwell St to County Line		W-6A, W-6B, W-6C, W-6D, W-6E	84,357	1.05	4F	F	84,377	1.05	0.02%	4F	F	84,377	1.05	0.02%	4F	F	84,381	1.05	0.03%	4F	F	84,377	1.05	0.02%	4F	F	84,377	1.05	0.02%	4F	F
Regional Access Routes																																
Hammonton-Smartville (H-S) Road	north of N. Beale Road	A-1, A-2		9,315		2C	E	9,315			2C	E	9,315			2C	E	9,315			2C	E	9,315			2C	E	9,315			2C	E
N Beale Road	south of H-S Road	A-1, A-2		28,639		4AU	E	28,639			4AU	E	28,639			4AU	E	28,639			4AU	E	28,639			4AU	E	28,639			4AU	E
Feather River Blvd. Ramp	south of N. Beale Street	A-1, A-2																														
Highway 70	Yuba County, east of Feather River Boulevard interchange	A-1, A-2		59,969	1.67	4AMD	F	59,969	1.67		4AMD	F	59,969	1.67		4AMD	F	59,969	1.67		4AMD	F	59,969	1.67		4AMD	F	59,969	1.67		4AMD	F
Highway 65	Roseville, northeast of Route 80	A-1, A-2		106,049	1.32	4F	F	106,049	1.32		4F	F	106,049	1.32		4F	F	106,049	1.32		4F	F	106,049	1.32		4F	F	106,049	1.32		4F	F
Highway 65	Lincoln, northeast of 7th Street	A-1, A-2		23,483	1.26	2A	F	23,483	1.26		2A	F	23,483	1.26		2A	F	23,483	1.26		2A	F	23,483	1.26		2A	F	23,483	1.26		2A	F
Highway 65	Wheatland, northeast of Evergreen Drive	A-1, A-2		24,619	1.32	2A	F	24,619	1.32		2A	F	24,619	1.32		2A	F	24,619	1.32		2A	F	24,619	1.32		2A	F	24,619	1.32		2A	F
Interstate 80	Roseville, northeast of Route 65	A-1, A-2, O-1, O-2		130,560	1.30	4FA	F	130,562	1.30	0.00%	4FA	F	130,566	1.30	0.00%	4FA	F	130,560	1.30		4FA	F	130,562	1.30	0.00%	4FA	F	130,566	1.30	0.00%	4FA	F
Interstate 80	Rocklin, south of Sierra College Boulevard	A-1, A-2, O-1, O-2		108,050	1.07	4FA	F	108,052	1.07	0.00%	4FA	F	108,056	1.07	0.01%	4FA	F	108,050	1.07		4FA	F	108,052	1.07	0.00%	4FA	F	108,056	1.07	0.01%	4FA	F

New Aggregate trips are those trips hauling aggregate materials (fine & coarse filters, road base and asphalt)
New Offsite trips are those trips hauling offsite materials (slope u/s, toe drain, hdpe pipe, pipe filter, u/s filter, seeding, rebar)
New BP trips are those trips hauling aggregate materials (cement, fine & coarse aggregates) directly to the batch plants. This does not
New Equipment trips are those trips hauling in equipment to each project feature staging area (staging area assumed adjacent

Table 3.9-88
2009 Daily Project Impacts Alternatives 1 though 5

		DESIGNATIONS		2009 No Action/No Project				Alternative 1					Alternative 2					Alternative 3					Alternative 4					Alternative 5				
Roadway	Location	Materials/ Equip. Routes	Worker Routes	ADT	V/C	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS
Folsom Boulevard	Natoma Street to Blue Ravine Road		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C, W-3D, W-5D, W-3E, W-5E	40,103	1.07	4AD	F	40,519	1.08	1.04%	4AD	F	40,539	1.08	1.09%	4AD	F	40,407	1.08	0.76%	4AD	F	40,519	1.08	1.04%	4AD	F	40,359	1.08	0.64%	4AD	F
Folsom Boulevard	Leidesdorff Street to Greenback Lane		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C	34,586		4AD	D	34,742		0.45%	4AD	D	34,742		0.45%	4AD	D	34,630		0.13%	4AD	D	34,742		0.45%	4AD	D	34,742		0.45%	4AD	D
Folsom-Auburn Road	Oak Hill Drive to Folsom Dam Road	A-4, O-4, BP-1	W-1C, 2C, 3C, 4C, 5C, 6C, 7C, 1D,2D, 2E, W-3A, 5A, 6A, 3B, 5B, 6B,1E	42,755	2.29	2A	F	43,123	2.31	0.86%	2A	F	43,183	2.31	1.00%	2A	F	42,866	2.29	0.26%	2A	F	43,122	2.31	0.86%	2A	F	43,085	2.30	0.77%	2A	F
Folsom-Auburn Road	Folsom Dam Road to Oak Avenue		W-3A, 5A, 6A, 7A, 3B, 4B, 5B, 6B, 7B, 1E, 2E, 5C	22,704		4AU	D	22,900		0.86%	4AU	D	22,892		0.83%	4AU	D	22,776		0.32%	4AU	D	22,868		0.72%	4AU	D	22,900		0.86%	4AU	D
Auburn-Folsom (A-F) Road	Douglas Boulevard to Eureka Road	A-2,A-3,A-4, O-2, O-3, O-4, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	36,389		4AU	E	36,581		0.53%	4AU	F	36,643		0.70%	4AU	F	36,504		0.32%	4AU	F	36,582		0.53%	4AU	F	36,545		0.43%	4AU	F
Auburn-Folsom (A-F) Road	Eureka Road to Oak Hill Drive	A-2, A-3, O-2, O-3, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	32,358	1.73	2A	F	32,530	1.74	0.53%	2A	F	32,541	1.74	0.57%	2A	F	32,473	1.74	0.36%	2A	F	32,532	1.74	0.54%	2A	F	32,492	1.74	0.41%	2A	F
Sierra College Boulevard	north of Douglas Boulevard	A-1, A-2, O-1, O-2	W-2A, W-2B, W-2C, W-2D, W-2E	26,827		4AD	D	26,875		0.18%	4AD	D	26,881		0.20%	4AD	D	26,876		0.18%	4AD	D	26,877		0.19%	4AD	D	26,857		0.11%	4AD	D
Eureka Road	east of N. Sunrise Avenue	A-3, A-4, O-3, O-4, BP-1		41,279		6AD	D	41,299		0.05%	6AD	D	41,351		0.17%	6AD	D	41,282		0.01%	6AD	D	41,298		0.05%	6AD	D	41,301		0.05%	6AD	D
Douglas Boulevard	east of A-F Road	A-1,O-1	W-1A, W-2A, W-3A, W-4A, W-5A, W-6A, W-7A	13,988		2A	D	13,988			2A	D	13,988			2A	D	14,093		0.75%	2A	D	13,988			2A	D	13,988			2A	D
Douglas Boulevard	Barton Road to A-F Road	A-1, A-2, A-3, A-4, O-1, O-2, O-3, O-4, BP-1	W-1A, W-2A, W-4A, W-1B, W-2B, W-4B, W-1C, W-2C, W-1D, W-2D, W-1E, W-2E	42,649	1.14	4AD	F	42,797	1.14	0.35%	4AD	F	42,859	1.15	0.49%	4AD	F	42,773	1.14	0.29%	4AD	F	42,798	1.14	0.35%	4AD	F	42,761	1.14	0.26%	4AD	F
Douglas Boulevard	Barton to Sierra Colleg Blvd.			49,323	1.32	4AD	F	49,323	1.32		4AD	F	49,323	1.32		4AD	F	49,323	1.32		4AD	F	49,323	1.32		4AD	F	49,323	1.32		4AD	F
Blue Ravine Road	Oak Avenue Parkway to Green Valley Road/East Natoma Street	A-5, A-6,O-5, O-6, BP-2, BP3	W-6D, W-6E	20,688		4AD	D	20,871		0.88%	4AD	D	20,883		0.94%	4AD	D	20,834		0.71%	4AD	D	20,839		0.73%	4AD	D	20,772		0.41%	4AD	D
East Natoma St	Cimmaron Circle to Folsom Dam Road		W-1D, 3D, 4D, 5D, 1E, 2E, 3E, 4E, 5E	17,611		4AU	D	18,143		3.02%	4AU	D	17,983		2.11%	4AU	D	18,143		3.02%	4AU	D	18,143		3.02%	4AU	D	17,823		1.20%	4AU	D
East Natoma St	Folsom Dam Road to Green Valley Road	A-5, A-6,O-5, O-6, BP-2, BP3	W-7A, 7B, 7C, 1D,2D,3D,4D,5D,6D,7D, 1E, 2E, 3E, 4E, 5E, 6E	28,751		4AU	E	29,510		2.64%	4AU	F	29,570		2.85%	4AU	F	29,465		2.48%	4AU	F	29,478		2.53%	4AU	F	29,059		1.07%	4AU	F
Green Valley Road	East Natoma Street to Sophia Parkway	A-6, O-6	W-1E, W-2E, W-3E, W-4E, W-5E, W-6E	33,949	1.17	4AU	F	34,233	1.18	0.84%	4AU	F	34,113	1.18	0.48%	4AU	F	34,157	1.18	0.61%	4AU	F	34,209	1.18	0.77%	4AU	F	34,245	1.18	0.87%	4AU	F
Greenback Lane	Hazel Avenue to Madison Avenue		W-4B, W-4C, W-4D, W-4E	25,568		4AMD	C	25,924		1.39%	4AMD	C	25,940		1.45%	4AMD	C	25,796		0.89%	4AMD	C	25,924		1.39%	4AMD	C	25,784		0.84%	4AMD	C
East Bidwell Street	Clarksville Road to Iron Point Road	A-5, A-6, O-5, O-6, BP-2, BP-3	W-6D, W-6E	41,694		4AD	F	42,104		0.98%	4AD		42,172		1.15%	4AD		42,071		0.90%	4AD		42,036		0.82%	4AD		41,853		0.38%	4AD	
Oak Avenue Parkway	Blue Ravine Road to East Bidwell Street		W-6D, W-6E	23,552		6AD	C	23,572		0.08%	6AD	C	23,572		0.08%	6AD	C	23,572		0.08%	6AD	C	23,572		0.08%	6AD	C	23,560		0.03%	6AD	C
Scott Road (south)	south of White Rock Road	A-5, A-6, BP-2, BP-3		1,754		2C	A/B	1,902		8.44%	2C	A/B	1,844		5.13%	2C	A/B	1,872		6.73%	2C	A/B	1,836		4.68%	2C	A/B	1,823		3.93%	2C	A/B
White Rock Road	between Scott Road (south) and Scott Road (north)	A-5, A-6, BP-2, BP-3		9,641		2C	E	9,789		1.54%	2C	E	9,731		0.93%	2C	E	9,759		1.22%	2C	E	9,723		0.85%	2C	E	9,710		0.72%	2C	E
Scott Road (north)	north of White Rock Road	A-5, A-6, BP-2, BP-3		6,710		2C	D	6,725		0.22%	2C	D	6,795		1.27%	2C	D	6,718		0.12%	2C	D	6,759		0.73%	2C	D	6,717		0.10%	2C	D
US50	Hazel Avenue to Folsom Boulevard	O-5, O-6	W-5A, W-5B, W-5C, W-5D, W-5E	123,914	1.23	4FA	F	124,285	1.23	0.30%	4FA	F	124,371	1.24	0.37%	4FA	F	124,186	1.23	0.22%	4FA	F	124,319	1.23	0.33%	4FA	F	124,137	1.23	0.18%	4FA	F
US50	Folsom Boulevard to Prairie City Road	O-5, O-6	W-6A, W-6B, W-6C	105,030	1.31	4F	F	105,057	1.31	0.03%	4F	F	105,127	1.31	0.09%	4F	F	105,042	1.31	0.01%	4F	F	105,091	1.31	0.06%	4F	F	105,049	1.31	0.02%	4F	F
US50	Prairie City Road to East Bidwell Street	O-5, O-6	W-6A, W-6B, W-6C	76,173		4F	E	76,200		0.04%	4F	E	76,270		0.13%	4F	E	76,185		0.02%	4F	E	76,234		0.08%	4F	E	76,192		0.02%	4F	E
US50	East Bidwell St to County Line		W-6A, W-6B, W-6C, W-6D, W-6E	86,888	1.08	4F	F	86,920	1.08	0.04%	4F	F	86,920	1.08	0.04%	4F	F	86,912	1.08	0.03%	4F	F	86,920	1.08	0.04%	4F	F	86,908	1.08	0.02%	4F	F
Regional Access Routes																																
Hammonton-Smartville (H-S) Road	north of N. Beale Road	A-1, A-2		9,594		2C	E	9,594			2C	E	9,594			2C	E	9,602		0.08%	2C	E	9,594			2C	E	9,594			2C	E
N Beale Road	south of H-S Road	A-1, A-2		29,499	1.02	4AU	F	29,499	1.02		4AU	F	29,499	1.02		4AU	F	29,507	1.02	0.03%	4AU	F	29,499	1.02		4AU	F	29,499	1.02		4AU	F
Feather River Blvd. Ramp	south of N. Beale Street	A-1, A-2																														
Highway 70	Yuba County, east of Feather River Boulevard interchange	A-1, A-2		63,568	1.77	4AMD	F	63,568	1.77		4AMD	F	63,568	1.77		4AMD	F	63,576	1.77	0.01%	4AMD	F	63,568	1.77		4AMD	F	63,568	1.77		4AMD	F
Highway 65	Roseville, northeast of Route 80	A-1, A-2		112,412	1.40	4F	F	112,412	1.40		4F	F	112,412	1.40		4F	F	112,420	1.40	0.01%	4F	F	112,412	1.40		4F	F	112,412	1.40		4F	F
Highway 65	Lincoln, northeast of 7th Street	A-1, A-2		24,892	1.33	2A	F	24,892	1.33		2A	F	24,892	1.33		2A	F	24,900	1.33	0.03%	2A	F	24,892	1.33		2A	F	24,892	1.33		2A	F
Highway 65	Wheatland, northeast of Evergreen Drive	A-1, A-2		26,097	1.40	2A	F	26,097	1.40		2A	F	26,097	1.40		2A	F	26,105	1.40	0.03%	2A	F	26,097	1.40		2A	F	26,097	1.40		2A	F
Interstate 80	Roseville, northeast of Route 65	A-1, A-2, O-1, O-2		134,477	1.34	4FA	F	134,477	1.34		4FA	F	134,483	1.34	0.00%	4FA	F	134,503	1.34	0.02%	4FA	F	134,483	1.34	0.00%	4FA	F	134,483	1.34	0.00%	4FA	F
Interstate 80	Rocklin, south of Sierra College Boulevard	A-1, A-2, O-1, O-2		111,292	1.11	4FA	F	111,292	1.11		4FA	F	111,294	1.11	0.00%	4FA	F	111,301	1.11	0.01%	4FA	F	111,292	1.11		4FA	F	111,292	1.11		4FA	F

New Aggregate trips are those trips hauling aggregate materials (fine & coarse filters, road base and asphalt)
New Offsite trips are those trips hauling offsite materials (slope u/s, toe drain, hdpe pipe, pipe filter, u/s filter, seeding, rebar)
New BP trips are those trips hauling aggregate materials (cement, fine & coarse aggregates) directly to the batch plants. This does not include trips from the batch plants to the project features
New Equipment trips are those trips hauling in equipment to each project feature staging area (staging area assumed adjacent to project feature for hauling evaluation).

Table 3.9-89
2010 Daily Project Impacts Alternatives 1 though 5

2010

		ROUTE		No Action/No Project				Alternative 1					Alternative 2					Alternative 3					Alternative 4					Alternative 5				
Roadway	Location	Materials/ Equip. Routes	Worker Routes	ADT	V/C	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS
Folsom Boulevard	Natoma Street to Blue Ravine Road		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C, W-3D, W-5D, W-3E, W-	40,906	1.09	4AD	F	41,222	1.10	0.77%	4AD	F	41,242	1.10	0.82%	4AD	F	41,106	1.10	0.49%	4AD	F	41,222	1.10	0.77%	4AD	F	41,162	1.10	0.63%	4AD	F
Folsom Boulevard	Leidesdorff Street to Greenback Lane		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-	35,278		4AD	D	35,394		0.33%	4AD	D	35,394		0.33%	4AD	D	35,278			4AD	D	35,394		0.33%	4AD	D	35,434		0.44%	4AD	E
Folsom-Auburn Road	Oak Hill Drive to Folsom Dam Road	A-4, O-4, BP-1	W-1C, 2C, 3C, 4C, 5C, 6C, 7C, 1D,2D, 2E, W-3A, 5A, 6A, 3B, 5B, 6B,1E	43,611	2.33	2A	F	43,923	2.35	0.72%	2A	F	43,983	2.35	0.85%	2A	F	43,659	2.33	0.11%	2A	F	43,922	2.35	0.71%	2A	F	43,941	2.35	0.76%	2A	F
Folsom-Auburn Road	Folsom Dam Road to Oak Avenue		W-3A, 5A, 6A, 7A, 3B, 4B, 5B, 6B, 7B, 1E, 2E, 5C	23,159		4AU	D	23,279		0.52%	4AU	D	23,271		0.48%	4AU	D	23,183		0.10%	4AU	D	23,279		0.52%	4AU	D	23,355		0.85%	4AU	D
Auburn-Folsom (A-F) Road	Douglas Boulevard to Eureka Road	A-2,A-3,A-4, O-2, O-3, O-4, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	37,117	1.28	4AU	F	37,209	1.29	0.25%	4AU	F	37,269	1.29	0.41%	4AU	F	37,165	1.29	0.13%	4AU	F	37,208	1.29	0.25%	4AU	F	37,273	1.29	0.42%	4AU	F
Auburn-Folsom (A-F) Road	Eureka Road to Oak Hill Drive	A-2, A-3, O-2, O-3, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	33,006	1.77	2A	F	33,078	1.77	0.22%	2A	F	33,087	1.77	0.25%	2A	F	33,054	1.77	0.15%	2A	F	33,078	1.77	0.22%	2A	F	33,140	1.77	0.41%	2A	F
Sierra College Boulevard	north of Douglas Boulevard	A-1, A-2, O-1, O-2	W-2A, W-2B, W-2C, W-2D, W-2E	27,364		4AD	D	27,400		0.13%	4AD	D	27,404		0.15%	4AD	D	27,388		0.09%	4AD	D	27,400		0.13%	4AD	D	27,394		0.11%	4AD	D
Eureka Road	east of N. Sunrise Avenue	A-3, A-4, O-3, O-4, BP-1		42,105		6AD	D	42,125		0.05%	6AD	D				6AD	D				6AD	D				6AD	D	42,105			6AD	D
Douglas Boulevard	east of A-F Road	A-1,O-1	W-1A, W-2A, W-3A, W-4A, W-5A, W-6A, W-7A	14,268		2A	D	14,268			2A	D	14,268			2A	D	14,268			2A	D	14,268			2A	D	14,268			2A	D
Douglas Boulevard	Barton Road to A-F Road	A-1, A-2, A-3, A-4, O-1, O-2, O-3, O-4, BP-1	W-1A, W-2A, W-4A, W-1B, W-2B, W-4B, W-1C, W-2C, W-1D, W-2D, W-1E, W-2E	43,502	1.16	4AD	F	43,594	1.17	0.21%	4AD	F	43,654	1.17	0.35%	4AD	F	43,550	1.16	0.11%	4AD	F	43,593	1.17	0.21%	4AD	F	43,614	1.17	0.26%	4AD	F
Douglas Boulevard	Barton to Sierra Colleg Blvd.			50,310	1.35	4AD	F	50,310	1.35		4AD	F				4AD	F				4AD	F				4AD	F	50,310	1.35		4AD	F
Blue Ravine Road	Oak Avenue Parkway to Green Valley Road/East Natoma Street	A-5, A-6,O-5, O-6, BP-2, BP3	W-6D, W-6E	21,102		4AD	D	21,280		0.84%	4AD	D	21,279		0.84%	4AD	D	21,243		0.67%	4AD	D	21,248		0.69%	4AD	D	21,183		0.38%	4AD	D
East Natoma St	Cimmaron Circle to Folsom Dam Road		W-1D, 3D, 4D, 5D, 1E, 2E, 3E, 4E, 5E	17,964		4AU	D	18,388		2.36%	4AU	D	18,412		2.49%	4AU	D	18,376		2.29%	4AU	D	18,376		2.29%	4AU	D	18,176		1.18%	4AU	D
East Natoma St	Folsom Dam Road to Green Valley Road	A-5, A-6,O-5, O-6, BP-2, BP3	W-7A, 7B, 7C, 1D,2D,3D,4D,5D,6D,7D, 1E, 2E, 3E, 4E, 5E, 6E	29,327	1.01	4AU	F	29,945	1.04	2.11%	4AU	F	29,992	1.04	2.27%	4AU	F	29,904	1.03	1.97%	4AU	F	29,913	1.04	2.00%	4AU	F	29,632	1.03	1.04%	4AU	F
Green Valley Road	East Natoma Street to Sophia Parkway	A-6, O-6	W-1E, W-2E, W-3E, W-4E, W-5E, W-6E	34,628	1.20	4AU	F	34,919	1.21	0.84%	4AU	F	34,824	1.20	0.57%	4AU	F	34,839	1.21	0.61%	4AU	F	34,887	1.21	0.75%	4AU	F	34,921	1.21	0.85%	4AU	F
Greenback Lane	Hazel Avenue to Madison Avenue		W-4B, W-4C, W-4D, W-4E	26,080		4AMD	C	26,352		1.04%	4AMD	C	26,368		1.10%	4AMD	C	26,256		0.67%	4AMD	C	26,352		1.04%	4AMD	C	26,296		0.83%	4AMD	C
East Bidwell Street	Clarksville Road to Iron Point Road	A-5, A-6, O-5, O-6, BP-2, BP-3	W-6D, W-6E	42,528		4AD	F	42,935		0.96%	4AD	F	42,528			4AD	F	42,902		0.88%	4AD	F	42,867		0.80%	4AD	F	42,678		0.35%	4AD	F
Oak Avenue Parkway	Blue Ravine Road to East Bidwell Street		W-6D, W-6E	24,024		6AD	C	24,040		0.07%	6AD	C	24,040		0.07%	6AD	C	24,040		0.07%	6AD	C	24,040		0.07%	6AD	C	24,032		0.03%	6AD	C
Scott Road (south)	south of White Rock Road	A-5, A-6, BP-2, BP-3		1,790		2C	A/B	1,938		8.27%	2C	A/B				2C	A/B				2C	A/B				2C	A/B	1,790			2C	A/B
White Rock Road	between Scott Road (south) and Scott Road (north)	A-5, A-6, BP-2, BP-3		9,834	1.00	2C	F	9,982	1.02	1.50%	2C	F				2C	F				2C	F				2C	F	9,834	1.00		2C	F
Scott Road (north)	north of White Rock Road	A-5, A-6, BP-2, BP-3		6,845		2C	D	6,859		0.20%	2C	D				2C	D				2C	D				2C	D	6,845			2C	D
US50	Hazel Avenue to Folsom Boulevard	O-5, O-6	W-5A, W-5B, W-5C, W-5D, W-5E	126,393	1.26	4FA	F	126,679	1.26	0.23%	4FA	F	126,764	1.26	0.29%	4FA	F	126,576	1.26	0.14%	4FA	F	126,713	1.26	0.25%	4FA	F	126,613	1.26	0.17%	4FA	F
US50	Folsom Boulevard to Prairie City Road	O-5, O-6	W-6A, W-6B, W-6C	107,131	1.34	4F	F	107,153	1.34	0.02%	4F	F	107,222	1.34	0.08%	4F	F	107,138	1.34	0.01%	4F	F	107,187	1.34	0.05%	4F	F	107,147	1.34	0.01%	4F	F
US50	Prairie City Road to East Bidwell Street	O-5, O-6	W-6A, W-6B, W-6C	77,697		4F	E	77,719		0.03%	4F	E	77,788		0.12%	4F	E	77,704		0.01%	4F	E	77,753		0.07%	4F	E	77,713		0.02%	4F	E
US50	East Bidwell St to County Line		W-6A, W-6B, W-6C, W-6D, W-6E	88,626	1.11	4F	F	88,650	1.11	0.03%	4F	F	88,650	1.11	0.03%	4F	F	88,642	1.11	0.02%	4F	F	88,650	1.11	0.03%	4F	F	88,646	1.11	0.02%	4F	F
											Regional Access Routes																					
Hammonton-Smartville (H-S) Road	north of N. Beale Road	A-1, A-2		9,786		2C	E	9,786			2C	E	9,786			2C	E	9,786			2C	E	9,786			2C	E	9,786			2C	E
N Beale Road	south of H-S Road	A-1, A-2		30,088	1.04	4AU	F	30,088	1.04		4AU	F	30,088	1.04		4AU	F	30,088	1.04		4AU	F	30,088	1.04		4AU	F	30,088	1.04		4AU	F
Feather River Blvd. Ramp	south of N. Beale Street	A-1, A-2																														
Highway 70	Yuba County, east of Feather River Boulevard interchange	A-1, A-2		67,383	1.87	4AMD	F	67,383	1.87		4AMD	F	67,383	1.87		4AMD	F	67,383	1.87		4AMD	F	67,383	1.87		4AMD	F	67,383	1.87		4AMD	F
Highway 65	Roseville, northeast of Route 80	A-1, A-2		119,157	1.49	4F	F	119,157	1.49		4F	F	119,157	1.49		4F	F	119,157	1.49		4F	F	119,157	1.49		4F	F	119,157	1.49		4F	F
Highway 65	Lincoln, northeast of 7th Street	A-1, A-2		26,386	1.41	2A	F	26,386	1.41		2A	F	26,386	1.41		2A	F	26,386	1.41		2A	F	26,386	1.41		2A	F	26,386	1.41		2A	F
Highway 65	Wheatland, northeast of Evergreen Drive	A-1, A-2		27,663	1.48	2A	F	27,663	1.48		2A	F	27,663	1.48		2A	F	27,663	1.48		2A	F	27,663	1.48		2A	F	27,663	1.48		2A	F
Interstate 80	Roseville, northeast of Route 65	A-1, A-2, O-1, O-2		138,512	1.38	4FA	F	138,512	1.38		4FA	F	138,512	1.38		4FA	F	138,512	1.38		4FA	F	138,512	1.38		4FA	F	138,518	1.38	0.00%	4FA	F
Interstate 80	Rocklin, south of Sierra College Boulevard	A-1, A-2, O-1, O-2		114,631	1.14	4FA	F	114,631	1.14		4FA	F	114,631	1.14		4FA	F	114,631	1.14		4FA	F	114,631	1.14		4FA	F	114,631	1.14		4FA	F

New Aggregate trips are those trips hauling aggregate materials (fine & coarse filters, road base and asphal
New Offsite trips are those trips hauling offsite materials (slope u/s, toe drain, hdpe pipe, pipe filter, u/s filter, seeding, reba
New BP trips are those trips hauling aggregate materials (cement, fine & coarse aggregates) directly to the batch plants. This does not include trips from the batch plants to the project featu
New Equipment trips are those trips hauling in equipment to each project feature staging area (staging area assumed adjacent to project feature for hauling evaluation

Table 3.9-90
2011 Daily Project Impacts Alternatives 1 though 5

				2011																												
		DESIGNATIONS		No Action/No Project				Alternative 1					Alternative 2					Alternative 3					Alternative 4					Alternative 5				
Roadway	Location	Materials/ Equip. Routes	Worker Routes	ADT	V/C	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New	V/C	% increase	code	LOS	New	V/C	% increase	code	LOS	New	V/C	% increase	code	LOS
Folsom Boulevard	Natoma Street to Blue Ravine Road		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C, W-3D, W-5D, W-3E, W-5E	41,725	1.12	4AD	F	41,833	1.12	0.26%	4AD	F	42,025	1.12	0.72%	4AD	F	41,913	1.12	0.45%	4AD	F	41,913	1.12	0.45%	4AD	F	42,061	1.12	0.81%	4AD	F
Folsom Boulevard	Leidesdorff Street to Greenback Lane		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C	35,984		4AD	E	35,984			4AD	E	35,984			4AD	E	35,984			4AD	E	35,984			4AD	E	36,140		0.43%	4AD	E
Folsom-Auburn Road	Oak Hill Drive to Folsom Dam Road	A-4, O-4, BP-1	W-1C, 2C, 3C, 4C, 5C, 6C, 7C, 1D,2D, 2E, W-3A, 5A, 6A, 3B, 5B, 6B,1E	44,484	2.38	2A	F	44,508	2.38	0.05%	2A	F	44,556	2.38	0.16%	2A	F	44,524	2.38	0.09%	2A	F	44,524	2.38	0.09%	2A	F	44,830	2.40	0.78%	2A	F
Folsom-Auburn Road	Folsom Dam Road to Oak Avenue		W-3A, 5A, 6A, 7A, 3B, 4B, 5B, 6B, 7B, 1E, 2E, 5C	23,623		4AU	D	23,623			4AU	D	23,639		0.07%	4AU	D	23,623			4AU	D	23,623			4AU	D	23,787		0.69%	4AU	D
Auburn-Folsom (A-F) Road	Douglas Boulevard to Eureka Road	A-2,A-3,A-4, O-2, O-3, O-4, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	37,860	1.31	4AU	F	37,884	1.31	0.06%	4AU	F	37,932	1.31	0.19%	4AU	F	37,900	1.31	0.11%	4AU	F	37,900	1.31	0.11%	4AU	F	38,032	1.32	0.45%	4AU	F
Auburn-Folsom (A-F) Road	Eureka Road to Oak Hill Drive	A-2, A-3, O-2, O-3, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	33,667	1.80	2A	F	33,691	1.80	0.07%	2A	F	33,739	1.80	0.21%	2A	F	33,707	1.80	0.12%	2A	F	33,707	1.80	0.12%	2A	F	33,817	1.81	0.45%	2A	F
Sierra College Boulevard	north of Douglas Boulevard	A-1, A-2, O-1, O-2	W-2A, W-2B, W-2C, W-2D, W-2E	27,912		4AD	D	27,924		0.04%	4AD	D	27,948		0.13%	4AD	D	27,932		0.07%	4AD	D	27,932		0.07%	4AD	D	27,950		0.14%	4AD	D
Eureka Road	east of N. Sunrise Avenue	A-3, A-4, O-3, O-4, BP-1		42,948		6AD	D	42,948			6AD	D				6AD	D				6AD	D				6AD	D	42,948			6AD	D
Douglas Boulevard	east of A-F Road	A-1,O-1	W-1A, W-2A, W-3A, W-4A, W-5A, W-6A, W-7A	14,554		2A	D	14,554			2A	D	14,554			2A	D	14,554			2A	D	14,554			2A	D	14,554			2A	D
Douglas Boulevard	Barton Road to A-F Road	A-1, A-2, A-3, A-4, O-1, O-2, O-3, O-4, BP-1	W-1A, W-2A, W-4A, W-1B, W-2B, W-4B, W-1C, W-2C, W-1D, W-2D, W-1E, W-2E	44,373	1.19	4AD	F	44,397	1.19	0.05%	4AD	F	44,445	1.19	0.16%	4AD	F	44,413	1.19	0.09%	4AD	F	44,413	1.19	0.09%	4AD	F	44,501	1.19	0.29%	4AD	F
Douglas Boulevard	Barton to Sierra Colleg Blvd.			51,317	1.37	4AD	F	51,317	1.37		4AD	F				4AD	F				4AD	F				4AD	F	51,317	1.37		4AD	F
Blue Ravine Road	Oak Avenue Parkway to Green Valley Road/East Natoma Street	A-5, A-6,O-5, O-6, BP-2, BP3	W-6D, W-6E	21,525		4AD	D	21,603		0.36%	4AD	D	21,714		0.88%	4AD	D	21,659		0.62%	4AD	D	21,603		0.36%	4AD	D	21,625		0.46%	4AD	D
East Natoma St	Cimmaron Circle to		W-1D, 3D, 4D, 5D, 1E, 2E,	18,324		4AU	D	18,540		1.18%	4AU	D	18,932		3.32%	4AU	D	18,700		2.05%	4AU	D	18,700		2.05%	4AU	D	18,696		2.03%	4AU	D
East Natoma St	Folsom Dam Road to Green Valley Road	A-5, A-6,O-5, O-6, BP-2, BP3	W-7A, 7B, 7C, 1D,2D,3D,4D,5D,6D,7D, 1E, 2E, 3E, 4E, 5E, 6E	29,914	1.04	4AU	F	30,224	1.05	1.04%	4AU	F	30,755	1.06	2.81%	4AU	F	30,456	1.05	1.81%	4AU	F	30,400	1.05	1.62%	4AU	F	30,410	1.05	1.66%	4AU	F
Green Valley Road	East Natoma Street to Sophia Parkway	A-6, O-6	W-1E, W-2E, W-3E, W-4E, W-5E, W-6E	35,321	1.22	4AU	F	35,321	1.22		4AU	F	35,519	1.23	0.56%	4AU	F	35,321	1.22		4AU	F	35,321	1.22		4AU	F	35,614	1.23	0.83%	4AU	F
Greenback Lane	Hazel Avenue to Madison Avenue		W-4B, W-4C, W-4D, W-4E	26,602		4AMD	C	26,698		0.36%	4AMD	C	26,866		0.99%	4AMD	C	26,770		0.63%	4AMD	C	26,770		0.63%	4AMD	C	26,890		1.08%	4AMD	C
East Bidwell Street	Clarksville Road to Iron Point Road	A-5, A-6, O-5, O-6, BP-2, BP-3	W-6D, W-6E	43,379		4AD	F	43,573		0.45%	4AD	F	43,610		0.53%	4AD	F	43,745		0.84%	4AD	F	43,577		0.46%	4AD	F	43,574		0.45%	4AD	F
Oak Avenue Parkway	Blue Ravine Road to East Bidwell Street		W-6D, W-6E	24,505		6AD	C	24,513		0.03%	6AD	C	24,525		0.08%	6AD	C	24,517		0.05%	6AD	C	24,517		0.05%	6AD	C	24,517		0.05%	6AD	C
Scott Road (south)	south of White Rock Road	A-5, A-6, BP-2, BP-3		1,826		2C	A/B	1,882		3.07%	2C	A/B				2C	A/B				2C	A/B				2C	A/B	1,826			2C	A/B
White Rock Road	between Scott Road (south) and Scott Road (north)	A-5, A-6, BP-2, BP-3		10,031	1.02	2C	F	10,087	1.03	0.56%	2C	F				2C	F				2C	F				2C	F	10,031	1.02		2C	F
Scott Road (north)	north of White Rock Road	A-5, A-6, BP-2, BP-3		6,982		2C	D	6,992		0.14%	2C	D				2C	D				2C	D				2C	D	6,982			2C	D
US50	Hazel Avenue to Folsom Boulevard	O-5, O-6	W-5A, W-5B, W-5C, W-5D, W-5E	128,921	1.28	4FA	F	129,027	1.28	0.08%	4FA	F	129,236	1.28	0.24%	4FA	F	129,095	1.28	0.13%	4FA	F	129,135	1.28	0.17%	4FA	F	129,215	1.28	0.23%	4FA	F
US50	Folsom Boulevard to Prairie City Road	O-5, O-6	W-6A, W-6B, W-6C	109,274	1.36	4F	F	109,284	1.36	0.01%	4F	F	109,325	1.36	0.05%	4F	F	109,280	1.36	0.01%	4F	F	109,320	1.36	0.04%	4F	F	109,292	1.36	0.02%	4F	F
US50	Prairie City Road to East Bidwell Street	O-5, O-6	W-6A, W-6B, W-6C	79,251		4F	E	79,261		0.01%	4F	E	79,302		0.06%	4F	E	79,257		0.01%	4F	E	79,297		0.06%	4F	E	79,269		0.02%	4F	E
US50	East Bidwell St to County Line		W-6A, W-6B, W-6C, W-6D, W-6E	90,399	1.13	4F	F	90,495	1.13	0.11%	4F	F	90,419	1.13	0.02%	4F	F	90,411	1.13	0.01%	4F	F	90,411	1.13	0.01%	4F	F	90,423	1.13	0.03%	4F	F
Regional Access Routes																																
Hammonton-Smartville (H-S) Road	north of N. Beale Road	A-1, A-2		9,982	1.02	2C	F	9,982	1.02		2C	F	9,982	1.02		2C	F	9,982	1.02		2C	F	9,982	1.02		2C	F	9,982	1.02		2C	F
N Beale Road	south of H-S Road	A-1, A-2		30,690	1.06	4AU	F	30,690	1.06		4AU	F	30,690	1.06		4AU	F	30,690	1.06		4AU	F	30,690	1.06		4AU	F	30,690	1.06		4AU	F
Feather River Blvd. Ramp	south of N. Beale Street	A-1, A-2																														
Highway 70	Yuba County, east of Feather River Boulevard interchange	A-1, A-2		71,426	1.98	4AMD	F	71,426	1.98		4AMD	F	71,426	1.98		4AMD	F	71,426	1.98		4AMD	F	71,426	1.98		4AMD	F	71,426	1.98		4AMD	F
Highway 65	Roseville, northeast of Route 80	A-1, A-2		126,307	1.57	4F	F	126,307	1.57		4F	F	126,307	1.57		4F	F	126,307	1.57		4F	F	126,307	1.57		4F	F	126,307	1.57		4F	F
Highway 65	Lincoln, northeast of 7th Street	A-1, A-2		27,970	1.50	2A	F	27,970	1.50		2A	F	27,970	1.50		2A	F	27,970	1.50		2A	F	27,970	1.50		2A	F	27,970	1.50		2A	F
Highway 65	Wheatland, northeast of Evergreen Drive	A-1, A-2		29,323	1.57	2A	F	29,323	1.57		2A	F	29,323	1.57		2A	F	29,323	1.57		2A	F	29,323	1.57		2A	F	29,323	1.57		2A	F
Interstate 80	Roseville, northeast of Route 65	A-1, A-2, O-1, O-2		141,283	1.40	4FA	F	141,283	1.40		4FA	F	141,283	1.40		4FA	F	141,283	1.40		4FA	F	141,283	1.40		4FA	F	141,289	1.40	0.00%	4FA	F
Interstate 80	Rocklin, south of Sierra College Boulevard	A-1, A-2, O-1, O-2		116,924	1.16	4FA	F	116,924	1.16		4FA	F	116,924	1.16		4FA	F	116,924	1.16		4FA	F	116,924	1.16		4FA	F	116,924	1.16		4FA	F

New Aggregate trips are those trips hauling aggregate materials (fine & coarse filters, road base and asphalt)
New Offsite trips are those trips hauling offsite materials (slope u/s, toe drain, hdpe pipe, pipe filter, u/s filter, seeding, rebar)
New BP trips are those trips hauling aggregate materials (cement, fine & coarse aggregates) directly to the batch plants. This does not include trips from the batch plants to the project features
New Equipment trips are those trips hauling in equipment to each project feature staging area (staging area assumed adjacent to project feature for hauling evaluation).

Table 3.9-91
2012 Daily Project Impacts Alternatives 1 though 5

				2012																												
		ROUTE DESIGNATIONS		No Action/No Project				Alternative 1					Alternative 2					Alternative 3					Alternative 4					Alternative 5				
Roadway	Location	Materials/ Equip. Rout	Worker Routes	ADT	V/C	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS
Folsom Boulevard	Natoma Street to Blue Ravine Road		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C, W-3D, W-5D, W-3E, W-5E	42,560	1.14	4AD	F	42,668	1.14	0.25%	4AD	F	42,740	1.14	0.42%	4AD	F	42,740	1.14	0.42%	4AD	F	42,740	1.14	0.42%	4AD	F	43,020	1.15	1.08%	4AD	F
Folsom Boulevard	Leidesdorff Street to Greenback Lane		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C	36,704		4AD	E	36,704			4AD	E	36,704			4AD	E	36,704			4AD	E	36,704			4AD	E	36,860		0.43%	4AD	E
Folsom-Auburn Road	Oak Hill Drive to Folsom Dam Road	A-4, O-4, BP-1	W-1C, 2C, 3C, 4C, 5C, 6C, 7C, 1D,2D, 2E, W-3A, 5A, 6A, 3B, 5B, 6B,1E	45,374	2.43	2A	F	45,398	2.43	0.05%	2A	F	45,414	2.43	0.09%	2A	F	45,414	2.43	0.09%	2A	F	45,414	2.43	0.09%	2A	F	45,744	2.45	0.82%	2A	F
Folsom-Auburn Road	Folsom Dam Road to Oak Avenue		W-3A, 5A, 6A, 7A, 3B, 4B, 5B, 6B, 7B, 1E, 2E, 5C	24,096		4AU	D	24,096			4AU	D	24,096			4AU	D	24,096			4AU	D	24,096			4AU	D	24,276		0.75%	4AU	D
Auburn-Folsom (A-F) Road	Douglas Boulevard to Eureka Road	A-2,A-3,A-4, O-2, O-3, O-4, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	38,618	1.34	4AU	F	38,642	1.34	0.06%	4AU	F	38,658	1.34	0.10%	4AU	F	38,658	1.34	0.10%	4AU	F	38,658	1.34	0.10%	4AU	F	38,812	1.34	0.50%	4AU	F
Auburn-Folsom (A-F) Road	Eureka Road to Oak Hill Drive	A-2, A-3, O-2, O-3, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	34,341	1.84	2A	F	34,365	1.84	0.07%	2A	F	34,381	1.84	0.12%	2A	F	34,381	1.84	0.12%	2A	F	34,381	1.84	0.12%	2A	F	34,513	1.85	0.50%	2A	F
Sierra College Boulevard	north of Douglas Boulevard	A-1, A-2, O-1, O-2	W-2A, W-2B, W-2C, W-2D, W-2E	28,471		4AD	D	28,483		0.04%	4AD	D	28,491		0.07%	4AD	D	28,491		0.07%	4AD	D	28,491		0.07%	4AD	D	28,519		0.17%	4AD	D
Eureka Road	east of N. Sunrise Avenue	A-3, A-4, O-3, O-4, BP-1		43,807		6AD	D	43,807			6AD	D				6AD	D				6AD	D				6AD	D	43,807			6AD	D
Douglas Boulevard	east of A-F Road	A-1,O-1	W-1A, W-2A, W-3A, W-4A, W-5A, W-6A,	14,846		2A	D	14,846			2A	D	14,846			2A	D	14,846			2A	D	14,846			2A	D	14,846			2A	D
Douglas Boulevard	Barton Road to A-F Road	A-1, A-2, A-3, A-4, O-1, O-2, O-3, O-4, BP-1	W-1A, W-2A, W-4A, W-1B, W-2B, W-4B, W-1C, W-2C, W-1D, W-2D, W-1E, W-2E	45,261	1.21	4AD	F	45,285	1.21	0.05%	4AD	F	45,301	1.21	0.09%	4AD	F	45,301	1.21	0.09%	4AD	F	45,301	1.21	0.09%	4AD	F	45,411	1.21	0.33%	4AD	F
Douglas Boulevard	Barton to Sierra Colleg Blvd.			52,344	1.40	4AD	F	52,344	1.40		4AD	F				4AD	F				4AD	F				4AD	F	52,344	1.40		4AD	F
Blue Ravine Road	Oak Avenue Parkway to Green Valley Road/East Natoma Street	A-5, A-6,O-5, O-6, BP-2, BP3	W-6D, W-6E	21,956		4AD	D	21,977		0.10%	4AD	D	22,017		0.28%	4AD	D	21,983		0.12%	4AD	D	21,990		0.15%	4AD	D	22,002		0.21%	4AD	D
East Natoma St	Cimmaron Circle to Folsom Dam Road		W-1D, 3D, 4D, 5D, 1E, 2E, 3E, 4E, 5E	18,691		4AU	C	18,907		1.16%	4AU	D	19,051		1.93%	4AU	D	19,051		1.93%	4AU	D	19,051		1.93%	4AU	D	19,303		3.27%	4AU	D
East Natoma St	Folsom Dam Road to Green Valley Road	A-5, A-6,O-5, O-6, BP-2, BP3	W-7A, 7B, 7C, 1D,2D,3D,4D,5D,6D,7D, 1E, 2E, 3E, 4E, 5E, 6E	30,513		4AU	D	30,757		0.80%	4AU	F	30,966		1.48%	4AU	F	30,932		1.37%	4AU	F	30,939		1.40%	4AU	F	31,227		2.34%	4AU	F
Green Valley Road	East Natoma Street to Sophia Parkway	A-6, O-6	W-1E, W-2E, W-3E, W-4E, W-5E, W-6E	36,028	1.25	4AU	F	36,028	1.25		4AU	F	36,028	1.25		4AU	F	36,028	1.25		4AU	F	36,028	1.25		4AU	F	36,124	1.25	0.27%	4AU	F
Greenback Lane	Hazel Avenue to Madison Avenue		W-4B, W-4C, W-4D, W-4E	27,135		4AMD	C	27,231		0.35%	4AMD	C	27,295		0.59%	4AMD	C	27,295		0.59%	4AMD	C	27,295		0.59%	4AMD	C	27,535		1.47%	4AMD	C
East Bidwell Street	Clarksville Road to Iron Point Road	A-5, A-6, O-5, O-6, BP-2, BP-3	W-6D, W-6E	44,247		4AD	F	44,269		0.05%	4AD	F	44,288		0.09%	4AD	F	44,289		0.09%	4AD	F	44,303		0.13%	4AD	F	44,313		0.15%	4AD	F
Oak Avenue Parkway	Blue Ravine Road to East Bidwell Street		W-6D, W-6E	24,996		6AD	C	25,004		0.03%	6AD	C	25,008		0.05%	6AD	C	25,008		0.05%	6AD	C	25,008		0.05%	6AD	C	25,016		0.08%	6AD	C
Scott Road (south)	south of White Rock Road	A-5, A-6, BP-2, BP-3		1,863		2C	A/B	1,868		0.27%	2C	A/B				2C	A/B				2C	A/B				2C	A/B	1,863			2C	A/B
White Rock Road	between Scott Road (south) and Scott Road (north)	A-5, A-6, BP-2, BP-3		10,232	1.04	2C	F	10,237	1.04	0.05%	2C	F				2C	F				2C	F				2C	F	10,232	1.04		2C	F
Scott Road (north)	north of White Rock Road	A-5, A-6, BP-2, BP-3		7,122		2C	D	7,126		0.06%	2C	D				2C	D				2C	D				2C	D	7,122			2C	D
US50	Hazel Avenue to Folsom Boulevard	O-5, O-6	W-5A, W-5B, W-5C, W-5D, W-5E	131,500	1.31	4FA	F	131,600	1.31	0.08%	4FA	F	131,687	1.31	0.14%	4FA	F	131,669	1.31	0.13%	4FA	F	131,672	1.31	0.13%	4FA	F	131,914	1.31	0.31%	4FA	F
US50	Folsom Boulevard to Prairie City Road	O-5, O-6	W-6A, W-6B, W-6C	111,460	1.39	4F	F	111,464	1.39	0.00%	4F	F	111,487	1.39	0.02%	4F	F	111,469	1.39	0.01%	4F	F	111,472	1.39	0.01%	4F	F	111,486	1.39	0.02%	4F	F
US50	Prairie City Road to East Bidwell Street	O-5, O-6	W-6A, W-6B, W-6C	80,837	1.01	4F	F	80,841	1.01	0.00%	4F	F	80,864	1.01	0.03%	4F	F	80,846	1.01	0.01%	4F	F	80,849	1.01	0.01%	4F	F	80,863	1.01	0.03%	4F	F
US50	East Bidwell St to County Line		W-6A, W-6B, W-6C, W-6D, W-6E	92,207	1.15	4F	F	92,303	1.15	0.10%	4F	F	92,219	1.15	0.01%	4F	F	92,219	1.15	0.01%	4F	F	92,219	1.15	0.01%	4F	F	92,239	1.15	0.03%	4F	F
Regional Access Routes																																
Hammonton-Smartville (H-S) Road	north of N. Beale Road	A-1, A-2		10,181	1.04	2C	F	10,181	1.04		2C	F	10,181	1.04		2C	F	10,181	1.04		2C	F	10,181	1.04		2C	F	10,181	1.04		2C	F
N Beale Road	south of H-S Road	A-1, A-2		31,304	1.08	4AU	F	31,304	1.08		4AU	F	31,304	1.08		4AU	F	31,304	1.08		4AU	F	31,304	1.08		4AU	F	31,304	1.08		4AU	F
Feather River Blvd. Ramp	south of N. Beale Street	A-1, A-2																														
Highway 70	Yuba County, east of Feather River Boulevard interchange	A-1, A-2		75,712	2.10	4AMD	F	75,712	2.10		4AMD	F	75,712	2.10		4AMD	F	75,712	2.10		4AMD	F	75,712	2.10		4AMD	F	75,712	2.10		4AMD	F
Highway 65	Roseville, northeast of Route 80	A-1, A-2		133,886	1.67	4F	F	133,886	1.67		4F	F	133,886	1.67		4F	F	133,886	1.67		4F	F	133,886	1.67		4F	F	133,886	1.67		4F	F
Highway 65	Lincoln, northeast of 7th Street	A-1, A-2		29,649	1.59	2A	F	29,649	1.59		2A	F	29,649	1.59		2A	F	29,649	1.59		2A	F	29,649	1.59		2A	F	29,649	1.59		2A	F
Highway 65	Wheatland, northeast of Evergreen Drive	A-1, A-2		31,083	1.66	2A	F	31,083	1.66		2A	F	31,083	1.66		2A	F	31,083	1.66		2A	F	31,083	1.66		2A	F	31,083	1.66		2A	F
Interstate 80	Roseville, northeast of Route 65	A-1, A-2, O-1, O-2		144,109	1.43	4FA	F	144,109	1.43		4FA	F	144,109	1.43		4FA	F	144,109	1.43		4FA	F	144,109	1.43		4FA	F	144,109	1.43		4FA	F
Interstate 80	Rocklin, south of Sierra College Boulevard	A-1, A-2, O-1, O-2		119,263	1.18	4FA	F	119,263	1.18		4FA	F	119,263	1.18		4FA	F	119,263	1.18		4FA	F	119,263	1.18		4FA	F	119,263	1.18		4FA	F

New Aggregate trips are those trips hauling aggregate materials (fine & coarse filters, road base and asphalt)
New Offsite trips are those trips hauling offsite materials (slope u/s, toe drain, hdpe pipe, pipe filter, u/s filter, seeding, rebar)
New BP trips are those trips hauling aggregate materials (cement, fine & coarse aggregates) directly to the batch plants. This does not include trips from the batch plants to the project features
New Equipment trips are those trips hauling in equipment to each project feature staging area (staging area assumed adjacent to project feature for hauling evaluation).

Table 3.9-92
2013 Daily Project Impacts Alternatives 1 though 5

				2013																												
		ROUTE DESIGNATIONS		No Action/No Project				Alternative 1					Alternative 2					Alternative 3					Alternative 4					Alternative 5				
Roadway	Location	Materials/ Equip. Routes	Worker Routes	ADT	V/C	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS	New ADT	V/C	% increase	code	LOS
Folsom Boulevard	Natoma Street to Blue Ravine Road		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C, W-3D, W-5D, W-3E, W-5E	43,412	1.16	4AD	F	43,484	1.16	0.17%	4AD	F	43,696	1.17	0.65%	4AD	F	43,592	1.17	0.41%	4AD	F	43,756	1.17	0.79%	4AD	F	43,800	1.17	0.89%	4AD	F
Folsom Boulevard	Leidesdorff Street to Greenback Lane		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C	37,439	1.00	4AD	F	37,439	1.00		4AD	F	37,543	1.00	0.28%	4AD	F	37,439	1.00		4AD	F	37,603	1.01	0.44%	4AD	F	37,603	1.01	0.44%	4AD	F
Folsom-Auburn Road	Oak Hill Drive to Folsom Dam Road	A-4, O-4, BP-1	W-1C, 2C, 3C, 4C, 5C, 6C, 7C, 1D,2D, 2E, W-3A, 5A, 6A, 3B, 5B, 6B, 6B,1E	46,282	2.47	2A	F	46,298	2.48	0.03%	2A	F	46,426	2.48	0.31%	2A	F	46,322	2.48	0.09%	2A	F	46,486	2.49	0.44%	2A	F	46,494	2.49	0.46%	2A	F
Folsom-Auburn Road	Folsom Dam Road to Oak Avenue		W-3A, 5A, 6A, 7A, 3B, 4B, 5B, 6B, 7B, 1E, 2E, 5C	24,578		4AU	D	24,578			4AU	D	24,738		0.65%	4AU	D	24,578			4AU	D	24,798		0.90%	4AU	D	24,810		0.94%	4AU	D
Auburn-Folsom (A-F) Road	Douglas Boulevard to Eureka Road	A-2,A-3,A-4, O-2, O-3, O-4, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	39,391	1.36	4AU	F	39,407	1.36	0.04%	4AU	F	39,612	1.37	0.56%	4AU	F	39,431	1.36	0.10%	4AU	F	39,673	1.37	0.72%	4AU	F	39,688	1.37	0.75%	4AU	F
Auburn-Folsom (A-F) Road	Eureka Road to Oak Hill Drive	A-2, A-3, O-2, O-3, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	35,028	1.87	2A	F	35,044	1.87	0.05%	2A	F	35,249	1.88	0.63%	2A	F	35,068	1.88	0.11%	2A	F	35,310	1.89	0.81%	2A	F	35,325	1.89	0.85%	2A	F
Sierra College Boulevard	north of Douglas Boulevard	A-1, A-2, O-1, O-2	W-2A, W-2B, W-2C, W-2D, W-2E	29,041		4AD	D	29,049		0.03%	4AD	D	29,095		0.19%	4AD	D	29,061		0.07%	4AD	D	29,097		0.19%	4AD		29,150		0.38%	4AD	D
Eureka Road	east of N. Sunrise Avenue	A-3, A-4, O-3, O-4, BP-1		44,684		6AD	D	44,684			6AD	D				6AD	D				6AD	D				6AD	D	44,684			6AD	D
Douglas Boulevard	east of A-F Road	A-1,O-1	W-1A, W-2A, W-3A, W-4A, W-5A, W-6A, W-7A	15,143		2A	D	15,143			2A	D	15,252		0.72%	2A		15,143			2A	D	15,377		1.55%	2A	D	15,419		1.82%	2A	D
Douglas Boulevard	Barton Road to A-F Road	A-1, A-2, A-3, A-4, O-1, O-2, O-3, O-4, BP-1	W-1A, W-2A, W-4A, W-1B, W-2B, W-4B, W-1C, W-2C, W-1D, W-2D, W-1E, W-2E	46,167	1.23	4AD	F	46,183	1.23	0.03%	4AD	F	46,337	1.24	0.37%	4AD	F	46,207	1.24	0.09%	4AD	F	46,395	1.24	0.49%	4AD	F	46,452	1.24	0.62%	4AD	F
Douglas Boulevard	Barton to Sierra Colleg Blvd.			53,391	1.43	4AD	F	53,391	1.43		4AD	F				4AD	F				4AD	F				4AD	F	53,391	1.43		4AD	F
Blue Ravine Road	Oak Avenue Parkway to Green Valley Road/East Natoma Street	A-5, A-6,O-5, O-6, BP-2, BP3	W-6D, W-6E	22,396		4AD	D	22,413		0.08%	4AD	D	22,457		0.27%	4AD	D	22,415		0.08%	4AD	D	22,427		0.14%	4AD	D	22,432		0.16%	4AD	D
East Natoma St	Cimmaron Circle to Folsom Dam Road		W-1D, 3D, 4D, 5D, 1E, 2E, 3E, 4E, 5E	19,065		4AU	D	19,209		0.76%	4AU	D	19,425		1.89%	4AU	D	19,425		1.89%	4AU	D	19,425		1.89%	4AU	D	19,517		2.37%	4AU	D
East Natoma St	Folsom Dam Road to Green Valley Road	A-5, A-6,O-5, O-6, BP-2, BP3	W-7A, 7B, 7C, 1D,2D,3D,4D,5D,6D,7D, 1E, 2E, 3E, 4E, 5E, 6E	31,124	1.08	4AU	F	31,297	1.08	0.56%	4AU	F	31,585	1.09	1.48%	4AU	F	31,535	1.09	1.32%	4AU	F	31,559	1.09	1.40%	4AU	F	31,656	1.10	1.71%	4AU	F
Green Valley Road	East Natoma Street to Sophia Parkway	A-6, O-6	W-1E, W-2E, W-3E, W-4E, W-5E, W-6E	36,749	1.27	4AU	F	36,749	1.27		4AU	F	36,749	1.27		4AU	F	36,749	1.27		4AU	F	36,749	1.27		4AU	F	36,845	1.27	0.26%	4AU	F
Greenback Lane	Hazel Avenue to Madison Avenue		W-4B, W-4C, W-4D, W-4E	27,678		4AMD	C	27,742		0.23%	4AMD	C	27,886		0.75%	4AMD	C	27,838		0.58%	4AMD	C	27,886		0.75%	4AMD	C	27,926		0.90%	4AMD	C
East Bidwell Street	Clarksville Road to Iron Point Road	A-5, A-6, O-5, O-6, BP-2, BP-3	W-6D, W-6E	45,132		4AD	F	45,171		0.09%	4AD	F	45,192		0.13%	4AD	F	45,152		0.04%	4AD	F	45,184		0.12%	4AD	F	45,186		0.12%	4AD	F
Oak Avenue Parkway	Blue Ravine Road to East Bidwell Street		W-6D, W-6E	25,496		6AD	C	25,500		0.02%	6AD	C	25,508		0.05%	6AD	C	25,508		0.05%	6AD	C	25,508		0.05%	6AD	C	25,512		0.06%	6AD	C
Scott Road (south)	south of White Rock Road	A-5, A-6, BP-2, BP-3		1,901		2C	A/B	1,912		0.58%	2C	A/B				2C	A/B				2C	A/B				2C	A/B	1,901			2C	A/B
White Rock Road	between Scott Road (south) and Scott Road (north)	A-5, A-6, BP-2, BP-3		10,437	1.07	2C	F	10,448	1.07	0.11%	2C	F				2C	F				2C	F				2C	F	10,437	1.07		2C	F
Scott Road (north)	north of White Rock Road	A-5, A-6, BP-2, BP-3		7,265		2C	D	7,267		0.03%	2C	D				2C	D				2C	D				2C	D	7,265			2C	D
US50	Hazel Avenue to Folsom Boulevard	O-5, O-6	W-5A, W-5B, W-5C, W-5D, W-5E	134,130	1.33	4FA	F	134,196	1.33	0.05%	4FA	F	134,401	1.33	0.20%	4FA	F	134,295	1.33	0.12%	4FA	F	134,432	1.33	0.23%	4FA	F	134,472	1.34	0.25%	4FA	F
US50	Folsom Boulevard to Prairie City Road	O-5, O-6	W-6A, W-6B, W-6C	113,690	1.42	4F	F	113,692	1.42	0.00%	4F	F	113,723	1.42	0.03%	4F	F	113,695	1.42	0.00%	4F	F	113,712	1.42	0.02%	4F	F	113,712	1.42	0.02%	4F	F
US50	Prairie City Road to East Bidwell Street	O-5, O-6	W-6A, W-6B, W-6C	82,454	1.03	4F	F	82,456	1.03	0.00%	4F	F	82,487	1.03	0.04%	4F	F	82,459	1.03	0.01%	4F	F	82,476	1.03	0.03%	4F	F	82,476	1.03	0.03%	4F	F
US50	East Bidwell St to County Line		W-6A, W-6B, W-6C, W-6D, W-6E	94,052	1.17	4F	F	94,056	1.17	0.00%	4F	F	94,072	1.17	0.02%	4F	F	94,064	1.17	0.01%	4F	F	94,076	1.17	0.03%	4F	F	94,080	1.17	0.03%	4F	F
Regional Access Routes																																
Hammonton-Smartville (H-S) Road	north of N. Beale Road	A-1, A-2		10,385	1.06	2C	F	10,385	1.06		2C	F	10,393	1.06	0.08%	2C	F	10,385	1.06		2C	F	10,385	1.06		2C	F	10,467	1.07	0.79%	2C	F
N Beale Road	south of H-S Road	A-1, A-2		31,930	1.10	4AU	F	31,930	1.10		4AU	F	31,938	1.11	0.03%	4AU	F	31,930	1.10		4AU	F	31,930	1.10		4AU	F	32,012	1.11	0.26%	4AU	F
Feather River Blvd. Ramp	south of N. Beale Street	A-1, A-2																														
Highway 70	Yuba County, east of Feather River Boulevard interchange	A-1, A-2		80,255	2.23	4AMD	F	80,255	2.23		4AMD	F	80,263	2.23	0.01%	4AMD	F	80,255	2.23		4AMD	F	80,255	2.23		4AMD	F	80,337	2.23	0.10%	4AMD	F
Highway 65	Roseville, northeast of Route 80	A-1, A-2		141,920	1.77	4F	F	141,920	1.77		4F	F	141,928	1.77	0.01%	4F	F	141,920	1.77		4F	F	141,920	1.77		4F	F	142,002	1.77	0.06%	4F	F
Highway 65	Lincoln, northeast of 7th Street	A-1, A-2		31,428	1.68	2A	F	31,428	1.68		2A	F	31,436	1.68	0.03%	2A	F	31,428	1.68		2A	F	31,428	1.68		2A	F	31,510	1.69	0.26%	2A	F
Highway 65	Wheatland, northeast of Evergreen Drive	A-1, A-2		32,948	1.76	2A	F	32,948	1.76		2A	F	32,956	1.76	0.02%	2A	F	32,948	1.76		2A	F	32,948	1.76		2A	F	33,030	1.77	0.25%	2A	F
Interstate 80	Roseville, northeast of Route 65	A-1, A-2, O-1, O-2		146,992	1.46	4FA	F	146,992	1.46		4FA	F	147,054	1.46	0.04%	4FA	F	146,992	1.46		4FA	F	147,040	1.46	0.03%	4FA	F	147,146	1.46	0.10%	4FA	F
Interstate 80	Rocklin, south of Sierra College Boulevard	A-1, A-2, O-1, O-2		121,649	1.21	4FA	F	121,649	1.21		4FA	F	121,667	1.21	0.01%	4FA	F	121,649	1.21		4FA	F	121,655	1.21	0.00%	4FA	F	121,649	1.21		4FA	F

New Aggregate trips are those trips hauling aggregate materials (fine & coarse filters, road base and asphalt)
New Offsite trips are those trips hauling offsite materials (slope u/s, toe drain, hdpe pipe, pipe filter, u/s filter, seeding, rebar)
New BP trips are those trips hauling aggregate materials (cement, fine & coarse aggregates) directly to the batch plants. This does not include trips from the batch plants to the project features
New Equipment trips are those trips hauling in equipment to each project feature staging area (staging area assumed adjacent to project feature for hauling evaluation).

Table 3.9-93
2014 Daily Project Impacts Alternatives 1 though 5

				2014																												
		DESIGNATIONS		*No Action/No Project*				*Alternative 1*					*Alternative 2*					*Alternative 3*					*Alternative 4*					*Alternative 5*				
Roadway	*Location*	*Materials/ Equip. Routes*	*Worker Routes*	*ADT*	*V/C*	*code*	*LOS*	*New ADT*	*V/C*	*% increase*	*code*	*LOS*	*New ADT*	*V/C*	*% increase*	*code*	*LOS*	*New ADT*	*V/C*	*% increase*	*code*	*LOS*	*New ADT*	*V/C*	*% increase*	*code*	*LOS*	*New ADT*	*V/C*	*% increase*	*code*	*LOS*
Folsom Boulevard	Natoma Street to Blue Ravine Road		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C, W-3D, W-5D, W-3E, W-5E	44,715	1.20	4AD	F	44,833	1.20	0.26%	4AD	F	44,715	1.20		4AD	F	44,715	1.20		4AD	F	44,715	1.20		4AD	F	44,951	1.20	0.53%	4AD	F
Folsom Boulevard	Leidesdorff Street to Greenback Lane		W-3A, W-5A, W-6A, W-3B, W-5B, W-6B, W-3C, W-5C, W-6C	38,563	1.03	4AD	F	38,563	1.03		4AD	F	38,563	1.03		4AD	F	38,563	1.03		4AD	F	38,563	1.03		4AD	F	38,727	1.04	0.43%	4AD	F
Folsom-Auburn Road	Oak Hill Drive to Folsom Dam Road	A-4, O-4, BP-1	W-1C, 2C, 3C, 4C, 5C, 6C, 7C, 1D,2D, 2E, W-3A, 5A, 6A, 3B, 5B, 6B,1E	47,671	2.55	2A	F	47,671	2.55		2A	F	47,671	2.55		2A	F	47,671	2.55		2A	F	47,671	2.55		2A	F	47,851	2.56	0.38%	2A	F
Folsom-Auburn Road	Folsom Dam Road to Oak Avenue		W-3A, 5A, 6A, 7A, 3B, 4B, 5B, 6B, 7B, 1E, 2E, 5C	25,316		4AU	D	25,316			4AU	D	25,316			4AU	D	25,316			4AU	D	25,316			4AU	D	25,540		0.88%	4AU	D
Auburn-Folsom (A-F) Road	Douglas Boulevard to Eureka Road	A-2,A-3,A-4, O-2, O-3, O-4, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	40,573	1.40	4AU	F	40,573	1.40		4AU	F	40,573	1.40		4AU	F	40,573	1.40		4AU	F	40,573	1.40		4AU	F	40,894	1.42	0.79%	4AU	F
Auburn-Folsom (A-F) Road		A-2, A-3, O-2, O-3, BP-1	W-3A, 5A, 6A, 7A, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 1C, 2C, 1D, 2D, 1E, 2E	36,079	1.93	2A	F	36,079	1.93		2A	F	36,079	1.93		2A	F	36,079	1.93		2A	F	36,079	1.93		2A	F	36,396	1.95	0.88%	2A	F
Sierra College Boulevard	north of Douglas Boulevard	A-1, A-2, O-1, O-2	W-2A, W-2B, W-2C, W-2D, W-2E	29,913		4AD	D	29,913			4AD	D	29,913			4AD	D	29,913			4AD	D	29,913			4AD	D	30,006		0.31%	4AD	D
Eureka Road	east of N. Sunrise Avenue	A-3, A-4, O-3, O-4, BP-1		46,025		6AD	D	46,025			6AD	D				6AD	D				6AD	D				6AD	D	46,025			6AD	D
Douglas Boulevard	east of A-F Road	A-1,O-1	W-1A, W-2A, W-3A, W-4A, W-5A, W-6A, W-7A	15,598		2A	D	15,598			2A	D	15,598			2A	D	15,598			2A	D	15,598			2A	D	15,874		1.77%	2A	D
Douglas Boulevard	Barton Road to A-F Road	A-1, A-2, A-3, A-4, O-1, O-2, O-3, O-4, BP-1	W-1A, W-2A, W-4A, W-1B, W-2B, W-4B, W-1C, W-2C, W-1D, W-2D, W-1E, W-2E	47,553	1.27	4AD	F	47,553	1.27		4AD	F	47,553	1.27		4AD	F	47,553	1.27		4AD	F	47,553	1.27		4AD	F	47,806	1.28	0.53%	4AD	F
Douglas Boulevard	Barton to Sierra Colleg Blvd.			54,993	1.47	4AD	F	54,993	1.47		4AD	F				4AD	F				4AD	F				4AD	F	54,993	1.47		4AD	F
Blue Ravine Road	Oak Avenue Parkway to Green Valley Road/East Natoma Street	A-5, A-6,O-5, O-6, BP-2, BP3	W-6D, W-6E	23,068		4AD	D	23,068			4AD	D	23,068			4AD	D	23,068			4AD	D	23,068			4AD	D	23,087		0.08%	4AD	D
East Natoma St	Cimmaron Circle to Folsom Dam Road		W-1D, 3D, 4D, 5D, 1E, 2E, 3E, 4E, 5E	19,637		4AU	D	19,637			4AU	D	19,637			4AU	D	19,637			4AU	D	19,637			4AU	D	19,781		0.73%	4AU	D
East Natoma St	Folsom Dam Road to Green Valley Road	A-5, A-6,O-5, O-6, BP-2, BP3	W-7A, 7B, 7C, 1D,2D,3D,4D,5D,6D,7D, 1E, 2E, 3E, 4E, 5E, 6E	32,058	1.11	4AU	F	32,058	1.11		4AU	F	32,058	1.11		4AU	F	32,058	1.11		4AU	F	32,058	1.11		4AU	F	32,245	1.12	0.58%	4AU	F
Green Valley Road	East Natoma Street to Sophia Parkway	A-6, O-6	W-1E, W-2E, W-3E, W-4E, W-5E, W-6E	37,852	1.31	4AU	F	37,852	1.31		4AU	F	37,852	1.31		4AU	F	37,852	1.31		4AU	F	37,852	1.31		4AU	F	37,852	1.31		4AU	F
Greenback Lane	Hazel Avenue to Madison Avenue		W-4B, W-4C, W-4D, W-4E	28,509		4AMD	C	28,509			4AMD	C	28,509			4AMD	C	28,509			4AMD	C	28,509			4AMD	C	28,705		0.69%	4AMD	C
East Bidwell Street	Clarksville Road to Iron Point Road	A-5, A-6, O-5, O-6, BP-2, BP-3	W-6D, W-6E	46,486		4AD	F	46,486			4AD	F	46,486			4AD	F	46,486			4AD	F	46,486			4AD	F	46,531		0.10%	4AD	F
Oak Avenue Parkway	Blue Ravine Road to East Bidwell Street		W-6D, W-6E	26,261		6AD	C	26,261			6AD	C	26,261			6AD	C	26,261			6AD	C	26,261			6AD	C	26,265		0.02%	6AD	C
Scott Road (south)	south of White Rock Road	A-5, A-6, BP-2, BP-3		1,959		2C	A/B	1,959			2C	A/B				2C	A/B				2C	A/B				2C	A/B	1,959			2C	A/B
White Rock Road	between Scott Road (south) and Scott Road (north)	A-5, A-6, BP-2, BP-3		10,751	1.10	2C	F	10,751	1.10		2C	F				2C	F				2C	F				2C	F	10,751	1.10		2C	F
Scott Road (north)	north of White Rock Road	A-5, A-6, BP-2, BP-		7,483		2C	D	7,483			2C	D				2C	D				2C	D				2C	D	7,483			2C	D
US50	Hazel Avenue to Folsom Boulevard	O-5, O-6	W-5A, W-5B, W-5C, W-5D, W-5E	138,154	1.37	4FA	F	138,154	1.37		4FA	F	138,154	1.37		4FA	F	138,154	1.37		4FA	F	138,154	1.37		4FA	F	138,362	1.37	0.15%	4FA	F
US50	Folsom Boulevard to Prairie City Road	O-5, O-6	W-6A, W-6B, W-6C	117,101	1.46	4F	F	117,101	1.46		4F	F	117,101	1.46		4F	F	117,101	1.46		4F	F	117,101	1.46		4F	F	117,125	1.46	0.02%	4F	F
US50	Prairie City Road to East Bidwell Street	O-5, O-6	W-6A, W-6B, W-6C	84,928	1.06	4F	F	84,928	1.06		4F	F	84,928	1.06		4F	F	84,928	1.06		4F	F	84,928	1.06		4F	F	84,952	1.06	0.03%	4F	F
US50	East Bidwell St to County Line		W-6A, W-6B, W-6C, W-6D, W-6E	96,874	1.21	4F	F	96,874	1.21		4F	F	96,874	1.21		4F	F	96,874	1.21		4F	F	96,874	1.21		4F	F	96,890	1.21	0.02%	4F	F
Regional Access Routes																																
Hammonton-Smartville (H-S) Road	north of N. Beale Road	A-1, A-2		10,593	1.08	2C	F	10,593	1.08		2C	F	10,593	1.08		2C	F	10,593	1.08		2C	F	10,593	1.08		2C	F	10,675	1.09	0.77%	2C	F
N Beale Road	south of H-S Road	A-1, A-2		32,569	1.13	4AU	F	32,569	1.13		4AU	F	32,569	1.13		4AU	F	32,569	1.13		4AU	F	32,569	1.13		4AU	F	32,651	1.13	0.25%	4AU	F
Feather River Blvd. Ramp	south of N. Beale Street	A-1, A-2																														
Highway 70	Yuba County, east of Feather River Boulevard interchange	A-1, A-2		85,071	2.36	4AMD	F	85,071	2.36		4AMD	F	85,071	2.36		4AMD	F	85,071	2.36		4AMD	F	85,071	2.36		4AMD	F	85,153	2.37	0.10%	4AMD	F
Highway 65	Roseville, northeast of Route 80	A-1, A-2		150,436	1.88	4F	F	150,436	1.88		4F	F	150,436	1.88		4F	F	150,436	1.88		4F	F	150,436	1.88		4F	F	150,518	1.88	0.05%	4F	F
Highway 65	Lincoln, northeast of 7th Street	A-1, A-2		33,314	1.78	2A	F	33,314	1.78		2A	F	33,314	1.78		2A	F	33,314	1.78		2A	F	33,314	1.78		2A	F	33,396	1.79	0.25%	2A	F
Highway 65	Wheatland, northeast of Evergreen Drive	A-1, A-2		34,925	1.87	2A	F	34,925	1.87		2A	F	34,925	1.87		2A	F	34,925	1.87		2A	F	34,925	1.87		2A	F	35,007	1.87	0.23%	2A	F
Interstate 80	Roseville, northeast of Route 65	A-1, A-2, O-1, O-2		149,932	1.49	4FA	F	149,932	1.49		4FA	F	149,932	1.49		4FA	F	149,932	1.49		4FA	F	149,932	1.49		4FA	F	150,086	1.49	0.10%	4FA	F
Interstate 80	Rocklin, south of Sierra College Boulevard	A-1, A-2, O-1, O-2		124,082	1.23	4FA	F	124,082	1.23		4FA	F	124,082	1.23		4FA	F	124,082	1.23		4FA	F	124,082	1.23		4FA	F	124,236	1.23	0.12%	4FA	F

New Aggregate trips are those trips hauling aggregate materials (fine & coarse filters, road base and asphalt)
New Offsite trips are those trips hauling offsite materials (slope u/s, toe drain, hdpe pipe, pipe filter, u/s filter, seeding, rebar
New BP trips are those trips hauling aggregate materials (cement, fine & coarse aggregates) directly to the batch plants. This does not include trips from the batch plants to the project features
New Equipment trips are those trips hauling in equipment to each project feature staging area (staging area assumed adjacent to project feature for hauling evaluation).

For the purpose of quantitatively determining significant traffic impacts, the analysis conducted for the Folsom DS/FDR applies the significance criteria described earlier in Section 3.9.3.1 to the Folsom DS/FDR related ADT increases occurring on roadways within the Folsom DS/FDR study area. Specifically, a significant impact is considered to occur if the addition of Folsom DS/FDR related traffic causes a roadway to experience an LOS deterioration (i.e., change of LOS grade downward), or experience an increase in the V/C ratio of more the 0.05 if it is currently operating at LOS F, or would experience an increase in daily traffic volumes of 2%. It is important to note that these significance thresholds are considered, for the purposes of this EIS/EIR analysis, to be extremely conservative (i.e., stringent) inasmuch as the standards from which they are derived, presented in Table 3.9-3, are intended to apply primarily to permanent increases in traffic such as from long-term operation of development projects and not necessarily to temporary increases associated with construction activities.

3.9.2.3 Environmental Consequences/Environmental Impacts

Environmental Consequences/Environmental Impacts of the No Action/No Project Alternative

There would be no impacts associated with implementation of the No Action/No Project Alternative. As illustrated in Table 3.9-8, the impact of not implementing the Folsom DS/FDR and not conducting the associated construction activities would have no impact on existing and future 'no build' traffic volumes. The CEQA baseline 2006 and the 2007 through 2014 'no build' conditions would not experience an increase in traffic aside from that of normal background growth due to other unrelated development projects as well as, general population, job and household growth in the area.

The No Action/No Project Alternative would have no effect on transportation resources.

Environmental Consequences/Environmental Impacts of Alternative 1

Project construction under this alternative would result in traffic impacts.

Tables 3.9-86 through 3.9-93 present the traffic impacts associated with each of the alternatives for each construction year from 2007 through 2014. Included therein are the ADT, V/C ratio, and LOS rating for each key roadway in the study area, as estimated for the No Action/No Project Alternative and each action alternative. Inasmuch as the No Action/No Project Alternative would result in no traffic impacts, as described above, it is considered to be, for both NEPA purposes and CEQA purposes, the basis of comparison for determining the impacts of each action alternative. Any deterioration in LOS rating, increase in V/C of 0.05 for roadways with an existing LOS of F, increase in ADT of more than 2% for an action alternative compared against the No Action/No Project Alternative is considered a significant impact.

According to the trip generation, distribution and assignment, each of the routes to be used for hauling routes, worker routes, or both, for Alternative 1, implementation of this alternative would result in significant impacts to traffic in the study area, as described below.

LOS Deterioration
No LOS deteriorations would occur in 2007, 2008, 2010, 2011, or 2013. In 2009, East Natoma Street from Folsom Dam Road to Green Valley Road would be expected to degrade LOS from E to F under Alternative 1. In 2012, traffic on East Natoma Street would decrease from a LOS C to LOS D and LOS D to LOS F.

ADT Increase > 2%
There would be some roadways in certain years that would experience an increase in ADT of greater than 2%, up to a maximum of approximately 8.44%; however the vast majority of roadways would experience ADT increases of far less than 2%, and there are some years (i.e., 2007, 2012, 2013, and 2014) with no roadways experience and ADT increase of 2% or more. The following roadways would be expected to experience an increase of 2% or more in ADT:

- East Natoma Street from Cimmaron Circle to Folsom Dam Road (2009 and 2010).
- East Natoma Street from Folsom Dam Road to Green Valley Road (2009 and 2010).
- Scott Road, south of White Rock Road (2008 through 2011).

LOS F V/C Increase >0.05
There are no instances of this occurring under Alternative 1.

Mitigation Measures T-1 through T-3 would address the potential traffic impacts presented above.

Increased traffic on roadways within the study area, including increased truck travel, could incrementally increase the risk of collisions or affect alternative transportation.

This would include increased traffic on Douglas Boulevard, East Bidwell Street, and Folsom Boulevard, which are identified in Section 3.9.1.3 as posing a possible safety concern. As such, the project-related increased traffic on those and other roadways in the study area is considered to have the potential for resulting in a significant safety impact.

Increased traffic resulting from the project, especially truck traffic, could ostensibly affect alternative transportation, to the extent that bike lanes and routes are temporarily constrained, if at all. Mitigation Measures T-1 to T-3 would address this impact.

Implementation of the proposed project will draw a large construction workforce, which, in turn, will create the need for worker vehicle parking areas.

It is anticipated that much of the needed parking area will be provided within open areas at/near Folsom Facility, in areas not currently used for parking. There may, however, be the need or opportunity for centralized off-site parking, with a shuttle to transport workers to and from the site. The designation and use of areas for parking would be coordinated with other existing demands, if any, for use of the same area. It is possible that existing parking along certain segments of designated truck haul routes may be temporarily restricted from time to time in order to enhance capacity and flow along the route during construction hours. Similar to above, any temporary restrictions on street parking would be designed, timed, and implemented in coordination with the existing needs for that parking, and would include provisions for temporary replacement parking nearby, if appropriate. Mitigation Measures T-1 through T-3 are intended to address such impacts.

Based on the above, implementation of this alternative poses the potential to result in significant traffic impacts.

Mitigation Measures T-1 through T-3 would address those significant impacts and are intended to reduce them to a less-than-significant level; however, the specific design, application, and degree of effectiveness of those measures requires certain detailed project information that is not yet available. In particular, more detailed information regarding the construction approach, phasing, timeframe, and other such considerations is required to confirm the exact nature and extent of impacts on the individual roads and intersections described above, which, in turn, provides the basis for identifying the specific traffic improvement measures tailored to the impacts measures. Such additional project details and traffic mitigation design would occur in conjunction with the further engineering and design that would occur for the selected alternative. Until that more detailed evaluation and traffic mitigation design is completed, and its effectiveness can be more fully assessed, the traffic impacts associated with this alternative are considered, for now, to remain potentially significant.

Construction activities at the Folsom Facility would not affect emergency vehicle access routes.

Some construction activities are within the City of Folsom. Construction vehicles could potentially impede emergency vehicles accessing emergency sites. Section 3.14 addresses potential effects to police and fire services and Section 3.17 addresses potential risks to public safety. All construction activities of the Folsom DS/FDR action would be coordinated with police and fire services to establish emergency routes before construction and avoid effects to emergency vehicle routes. A fire management plan will be developed to address potential public safety effects.

This impact would be less than significant.

Environmental Consequences/Environmental Impacts of Alternative 2
Project construction under this alternative would result in traffic impacts.

According to the trip generation, distribution and assignment, each of the routes to be used for hauling routes, worker routes, or both, for Alternative 2, implementation of this alternative would result in significant impacts to traffic in the study area, as described below.

LOS Deterioration
No LOS deteriorations would occur in 2007, 2008, 2010, 2011, or 2013. In 2009, East Natoma Street from Folsom Dam Road to Green Valley Road is expected to degrade LOS from E to F under Alternative 2 in 2009. In 2012, traffic on East Natoma Street would decrease from a LOS C to LOS D and LOS D to LOS F.

ADT Increase > 2%
According to the trip generation, distribution and assignment, each of the routes to be used for hauling routes, worker routes, or both, for Alternative 2, implementation of this alternative would result in an impact to traffic with an increase in ADT of approximately 5.13%, or less, on a daily basis during each construction year. Roads with an increase of 2% or more include:

- East Natoma Street in 2009, 2010, and 2011.
- Scott Road, south of White Rock Road in 2009.

LOS F V/C Increase >0.05
There are no instances of this occurring under Alternative 2.

Mitigation Measures T-1 through T-3 would address the potential traffic impacts presented above.

Other traffic related impacts under Alternative 2 would be similar to Alternative 1. Based on the above, implementation of this alternative poses the potential to result in significant traffic impacts. Mitigation Measures T-1 through T-3 would address those significant impacts and are intended to reduce them to a less than significant level; however, the specific design, application, and degree of effectiveness of those measures requires certain detailed project information that is not yet available. In particular, more detailed information regarding the construction approach, phasing, timeframe, and other such considerations is required to confirm the exact nature and extent of impacts on the individual roads and intersections described above, which, in turn, provides the basis for identifying the specific traffic improvement measures tailored to the impacts measures. Such additional project details and traffic mitigation design would occur in conjunction with the further engineering and design that would occur for the selected alternative. Until that more detailed evaluation and traffic mitigation design is completed, and its effectiveness can be more fully assessed, the traffic impacts associated with this alternative are considered, for now, to remain potentially significant.

Environmental Consequence/Environmental Impacts of Alternative 3
Alternative 3 would result in traffic impacts.

According to the trip generation, distribution and assignment, each of the routes to be used for hauling routes, worker routes, or both, for Alternative 3, implementation of this alternative would result in significant impacts to traffic in the study area, as described below.

LOS Deterioration
No LOS deteriorations would occur in 2007, 2008, 2010, 2011, or 2013. In 2009, East Natoma Street from Folsom Dam Road to Green Valley Road is expected to degrade LOS from E to F under Alternative 3 in 2009. In 2012, traffic on East Natoma Street would decrease from a LOS C to LOS D and LOS D to LOS F.

ADT Increase > 2%
According to the trip generation, distribution and assignment, each of the routes to be used for hauling routes, worker routes, or both for Alternatives 3, implementation of this alternative would result in an impact to traffic with an increase in ADT of 6.73% or less on a daily basis during each construction year. Roads with an increase of 2% or more include:

- East Natoma Street in 2009, 2010, and 2011. Alternative 3 would not affect the road segment from Folsom Dam Road to Green Valley Road in 2010 or 2011.
- Scott Road, south of White Rock Road in 2009.

LOS F V/C Increase >0.05
There are no instances of this occurring under Alternative 3.

Mitigation Measures T-1 through T-3 would address the potential traffic impacts presented above.

Other traffic related impacts under Alternative 3 would be similar to Alternative 1. Based on the above, implementation of this alternative poses the potential to result in significant traffic impacts. Mitigation Measures T-1 through T-3 would address those significant impacts and are intended to reduce them to a less than significant level; however, the specific design, application, and degree of effectiveness of those measures requires certain detailed project information that is not yet available. In particular, more detailed information regarding the construction approach, phasing, timeframe, and other such considerations is required to confirm the exact nature and extent of impacts on the individual roads and intersections described above, which, in turn, provides the basis for identifying the specific traffic improvement measures tailored to the impacts measures. Such additional project details and traffic mitigation design would occur in conjunction with the further engineering and design that would occur for the selected alternative. Until more detailed evaluation and traffic mitigation design is completed, and its effectiveness can be more fully assessed, the traffic impacts associated with this alternative are considered, for now, to remain potentially significant.

Environmental Consequences/Environmental Impacts of Alternative 4
Project alternative would result in traffic impacts.

According to the trip generation, distribution and assignment, each of the routes to be used for hauling routes, worker routes, or both for Alternative 4, implementation of this alternative would result in significant impacts to traffic in the study area, as described below.

LOS Deterioration
No LOS deteriorations would occur in 2007, 2008, 2010, 2011, or 2013. In 2009, East Natoma Street from Folsom Dam Road to Green Valley Road is expected to degrade LOS from E to F under Alternative 4 in 2009. In 2012, traffic on East Natoma Street would decrease from a LOS C to LOS D and LOS D to LOS F.

ADT Increase > 2%
According to the trip generation, distribution and assignment, each of the routes to be used for hauling routes, worker routes, or both for Alternatives 4, implementation of this alternative would result in an impact to traffic with an increase in ADT of 4.68% or less on a daily basis during each construction year. Roads with an increase of 2% or more include:

- East Natoma Street in 2009, 2010, and 2011. Alternative 4 would not affect the road segment from Folsom Dam Road to Green Valley Road in 2011.

- Scott Road, south of White Rock Road in 2008 and 2009.

LOS F V/C Increase >0.05
There are no instances of this occurring under Alternative 4.

Mitigation Measures T-1 through T-3 would address the potential traffic impacts presented above.

Other traffic related impacts under Alternative 4 would be similar to Alternative 1. Based on the above, implementation of this alternative poses the potential to result in significant traffic impacts. Mitigation Measures T-1 through T-3 would address those significant impacts and are intended to reduce them to a less than significant level; however, the specific design, application, and degree of effectiveness of those measures requires certain detailed project information that is not yet available. In particular, more detailed information regarding the construction approach, phasing, timeframe, and other such considerations is required to confirm the exact nature and extent of impacts on the individual roads and intersections described above, which, in turn, provides the basis for identifying the specific traffic improvement measures tailored to the impacts measures. Such additional project details and traffic mitigation design would occur in conjunction with the further engineering and design that would occur for the selected alternative. Until more detailed evaluation and traffic mitigation design is completed, and its effectiveness can be more fully assessed, the traffic impacts associated with this alternative are considered, for now, to remain potentially significant.

Environmental Consequences/Environmental Impacts of Alternative 5
Project alternative would result in traffic impacts.

According to the trip generation, distribution and assignment, each of the routes to be used for hauling routes, worker routes or both for Alternative 5, would result in significant impacts to traffic in the study area, as described below.

LOS Deterioration
No LOS deteriorations would occur in 2007, 2008, 2011, or 2013. In 2009, East Natoma Street from Folsom Dam Road to Green Valley Road is expected to degrade LOS from E to F under Alternative 2 in 2009. In 2010, Folsom Boulevard from Liedesdorff Street to Greenback Lane would decrease from LOS D to LOS E. In 2012, traffic on East Natoma Street would decrease from a LOS C to LOS D and LOS D to LOS F.

ADT Increase > 2%
According to the trip generation, distribution and assignment, each of the routes to be used for hauling routes, worker routes or both for Alternatives 5.Implementation of this alternative would result in an impact to traffic with an increase in ADT of 3.93% or less on a daily basis during each construction year. Roads with an increase of 2% or more include:

- East Natoma Street in 2011, 2012, and 2013
- Scott Road, south of White Rock Road in 2008 and 2009

LOS F V/C Increase >0.05

There are no instances of this occurring under Alternative 5.

Mitigation Measures T-1 through T-3 would address the potential traffic impacts presented above.

Other traffic related impacts under Alternative 5 would be similar to Alternative 1. Based on the above, implementation of this alternative poses the potential to result in significant traffic impacts. Mitigation Measures T-1 through T-3 would address those significant impacts and are intended to reduce them to a less than significant level; however, the specific design, application, and degree of effectiveness of those measures requires certain detailed project information that is not yet available. In particular, more detailed information regarding the construction approach, phasing, timeframe, and other such considerations is required to confirm the exact nature and extent of impacts on the individual roads and intersections described above, which, in turn, provides the basis for identifying the specific traffic improvement measures tailored to the impacts measures. Such additional project details and traffic mitigation design would occur in conjunction with the further engineering and design that would occur for the selected alternative. Until more detailed evaluation and traffic mitigation design is completed, and its effectiveness can be more fully assessed, the traffic impacts associated with this alternative are considered, for now, to remain potentially significant.

3.9.3 Comparative Analysis of Alternatives

Under all alternatives, Scott Road would be expected to experience the highest increase in traffic volumes, thereby establishing the upper limit of percentage increase impacts as illustrated above. However, Scott Road currently carries a minimal amount of traffic on a daily basis, and the percentage increase is somewhat skewed as compared with the remainder of the roadways analyzed.

During construction years 2007 and 2008, no roadways with the exception of Scott Road would be expected to experience a change in LOS, change in V/C if operating at LOS F, nor an increase in daily traffic volumes of 2% or more under all alternatives.

During 2009, Alternatives 1, 2, 3, and 4 would be expected to result in an increase of 3.02% or less along East Natoma Street. Also during 2009, all alternatives would result in East Natoma Street degrading from LOS E to LOS F.

During 2010 Alternatives 1, 2, 3, and 4 would be expected to result in an increase of 2.27% or less along East Natoma Street. During 2010 Folsom Boulevard between Leidesdorff Street and Greenback Lane would be expected to degrade from LOS D to E under Alternative 5 only.

During 2011, Alternatives 2, 3, 4, and 5 East Natoma Street would be expected to experience an increase in daily traffic of 3.32% or less, yet no change in LOS nor change in V/C if operating at LOS F.

During 2012, only Alternative 5 would be expected to increase traffic by more than 2% on all study roadways, with East Natoma Street experiencing an increase of 3.27%.

During 2013, only Alternative 5 would be expected to increase traffic by more than 2% on all study roadways, with East Natoma Street experiencing an increase of 2.37% or less.

During 2014, all Alternatives would result in less than a 2% increase in daily traffic, no change to LOS, nor a change to V/C if operating at LOS F.

Alternative 1 during construction year 2009 would result in the greatest total increase in use (8.44% increase) of the routes by trucks hauling daily material and equipment, and employees due to the Folsom DS/FDR. However, discounting Scott Road, during 2009, Alternatives 1, 3, and 4 would experience a similar increase of 3.02% in traffic along East Natoma Street between Cimmaron Circle and Folsom Dam Road. Alternative 2 and Alternative 5 experience almost one full percentage point less increase in traffic along East Natoma Street between Cimmaron Circle and Folsom Dam Road as compared with Alternatives 1, 3, and 4.

East Natoma Street between Folsom Dam Road and Green Valley Road during 2009 under Alternative 2 would be expected to experience an increase in daily traffic of 2.85%. Alternatives 1, 3, and 4 would be within one third percentage of Alternative 2 along East Natoma between Folsom Dam Road and Green Valley Road and Alternative 5 would be more than one and one half percentage point less in terms of increase in ADT at 1.07%.

Mitigation for each of the alternatives would the same and will be further refined during the next phase of engineering. Mitigation Measures T-1 through T-3 would reduce impacts to a less than significant level.

3.9.4 Mitigation Measures

Mitigation measures will be required of the Folsom DS/FDR whenever the impacts of the Folsom DS/FDR exceed the thresholds identified in Section 3.9.3.2.

The following mitigation measures will be implemented:

T-1: In conjunction with the development and review of more detailed project design and construction specifications, a peak hour capacity analysis will be performed on specific intersections to evaluate the need for changes to traffic signal timing, phasing modification, provision of additional turn lanes through restriping or physical improvements, as necessary and appropriate to reduce project-related impacts to an acceptable level. In conjunction with that assessment, the potential need for roadway improvements or operation modifications (i.e., temporary restrictions on turning movements, on-street parking, etc.) to enhance roadway capacity in light of additional traffic from the project will be evaluated. The completion of these evaluations and the identification of specific traffic improvement measures, as deemed necessary and appropriate in light of the temporary nature of impacts, will be coordinated with the transportation departments of the affected jurisdictions.

T-2: Construction contractor will prepare a transportation management plan, outlining proposed routes to be approved by the appropriate local entity, and implement it. High collision intersections will be identified and avoided if possible. Drivers will 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).

T-3: Construction contractor will develop and utilize appropriate signage to inform the general public of the haul routes and route changes, if applicable.

3.9.5 Cumulative Effects

Table 5-1 lists projects considered in the cumulative analysis. Most of the projects include construction within the study region that will require transport of materials to and from the site. In addition, population is increasing in the region, which will further increase traffic congestion in the study area. Under the cumulative condition, all Folsom Facility construction projects will have the potential for significant transportation and circulation effects should construction activities occur concurrently. Cumulative effects of traffic near the Main Concrete Dam will be limited by restricted access, staging, and closed construction areas. Also, cumulative effects of construction projects could be controlled through the scheduling and sequencing of haul truck traffic. Once completed, the new Folsom Bridge will greatly alleviate traffic congestion within the vicinity of the Folsom construction areas.

Alternatives of the Folsom DS/FDR would have significant impacts to transportation and circulation at select roads, including East Natoma Street and Scott Road, from increased trip generation. The Folsom DS/FDR would further increase traffic in a highly congested area along East Natoma Street.

This would be considered a cumulative considerable effect.

3.10 Noise

This section addresses potential noise impacts associated with construction of the Folsom DS/FDR features proposed under each of the six alternatives, including the No Action/No Project Alternative and Alternatives 1 through 5. The discussion herein includes an explanation of noise descriptors, to provide the reader with an understanding of the basic noise concepts and terminology reflected in the analysis, a delineation of the geographic analysis area, and a description the affected environment and existing conditions within the Folsom DS/FDR construction area and along the potential truck hauling routes. This discussion is followed by the noise impacts discussion, which includes the delineation of criteria used to define and determine significant noise impacts, an explanation of the assessment methodology, a discussion of the noise impacts associated with each alternative and comparison of alternatives, recommendations for noise mitigation measures, and an analysis of cumulative effects. The focus of the analysis is on potential noise impacts to local noise receptors resulting from construction activities. Whereas noise analyses for development projects also typically include an evaluation of the potential for noise impacts to the project, such as if a new residential development is proposed adjacent to a freeway, such analysis is not warranted for the Folsom DS/FDR, because the Folsom DS/FDR is not a noise-sensitive use and the focus of this EIS/EIR analysis is on the construction activities associated with the Folsom DS/FDR.

3.10.1 Affected Environment/Existing Conditions

3.10.1.1 Noise Descriptors

Noise is measured in decibels (dB) and is a measurement of sound pressure level. The human ear perceives sound, which is mechanical energy, as pressure on the ear. The sound pressure level is the logarithmic ratio of that sound pressure to a reference pressure, and is expressed in decibels. Environmental sounds are measured with the A-weighted scale of the sound level meter. The A scale simulates the frequency response of the human ear, by giving more weight to the middle frequency sounds, and less to the low and high frequency sounds. A-weighted sound levels are designated as dBA. Figure 3.10-1 shows the range of sound levels for common indoor and outdoor activities, in dBA.

COMMON OUTDOOR NOISES	Sound Pressure (uPa)	Sound Pressure (dB)	COMMON INDOOR NOISES
Jet Fly Over at 300 feet	6,324,555	110	Rock Band at 15 feet
Gas Lawn Mower at 3 feet	2,000,000	100	Inside Subway Train (New York)
Diesel Truck at 50 m	632,456	90	Food Blender at 3 feet
Noisy Urban Daytime	200,000	80	Garbage Disposal at 3 feet Shouting at 3 feet
Gas Lawn Mower at 100 feet Commercial Area	63,246	70	Vacuum Cleaner at 10 feet Normal Speech at 3 feet
	20,000	60	Large Business Office
Quiet Urban Daytime	6,325	50	Dishwasher Next Room
Quiet Urban Nighttime Quiet Suburban Nighttime	2,000	40	Small Theatre, Large Conference Room Library
Quiet Rural Nighttime	632	30	Bedroom at Night Concert Hall (Background)
	200	20	Broadcast and Recording Studio
	63	10	Threshold of Hearing
	20	0	

Source: FHWA, Noise Fundamentals Training Document, "Highway Noise Fundamentals," September 1980.

Figure 3.10-1
Common Indoor and Outdoor Noises

Because sounds in the environment usually vary with time they cannot simply be described with a single number. Two methods are used to describe variable sounds. These are exceedance levels and equivalent levels, both of which are derived from a large number of moment-to-moment A-weighted noise level measurements. Exceedance levels are values from the cumulative amplitude distribution of all the noise levels observed during a measurement period. Exceedance levels are designated L_n, where n represents a value from 0 to 100 percent. For example, L_{50} is the median noise level, or the noise level in dBA exceeded 50 percent of the time during the measurement period. Sacramento, El Dorado, and Placer Counties have established L_{50} noise limits for non-transportation noise sources in residential areas.

The equivalent noise level (L_{eq}) is the constant sound level that in a given period has the same sound energy level as the actual time-varying sound pressure level. L_{eq} provides a methodology for combining noise from individual events and steady state sources into a measure of cumulative noise exposure. It is used by local jurisdictions and the Federal Highway Administration (FHWA) to evaluate noise impacts.

The day-night noise level (L_{dn}) is the energy average sound level for a 24-hour day determined after the addition of a 10-dBA penalty to all noise events occurring at night between 10:00 p.m. and 7:00 a.m. The L_{dn} is a useful metric of community noise impact because people in their homes are much more sensitive to noise at night, when they are relaxing or sleeping, than they are to noise in the daytime. The L_{dn} is used by local jurisdictions to rate community noise impacts from transportation noise sources.

In the State of California, the community noise equivalent level (CNEL) is widely used. It is similar to the L_{dn} noise level, except it weights events occurring between the evening hours of 7:00 p.m. and 10:00 p.m. by increasing noise levels by 5 dBA.

In addition to evaluating noise impacts based on complying with noise standards, project noise impacts can also be assessed by annoyance criteria, or the incremental increases in existing noise levels. The impact of increasing or decreasing noise levels is presented in Table 3.10-1. For example, it shows that a change of 3 dBA is barely perceptible and that a 10-dBA increase or decrease would be perceived by someone to be a doubling or halving of the noise level (loudness).

Table 3.10-1 *Decibel Changes, Loudness, and Energy Loss*		
Sound Level Change (dBA)	***Relative Loudness***	***Acoustical Energy Loss (%)***
0	Reference	0
-3	Barely Perceptible Change	50
-5	Readily Perceptible Change	67
-10	Half as Loud	90
-20	1/4 as Loud	99
-30	1/8 as Loud	99.9

Source: FHWA, *Highway Traffic Noise Analysis and Abatement Policy and Guidance*, June 1995.

3.10.1.2 Area of Analysis

Potential sources of noise impacts from the Folsom DS/FDR actions include both construction- and transportation-related noise sources. The construction noise impact analysis focuses on the areas adjacent to construction sites and rock crushing areas adjacent to Folsom Reservoir. Proposed rock crushing and screening activities would occur at up to eight locations along the western and southern areas of Folsom Reservoir. In addition, concrete batch plant operations would occur near Beal's Point, Folsom Dam, and Mormon Island Auxiliary Dam (MIAD).

The transportation noise impacts associated with trucks hauling construction materials focuses on sensitive land uses along both local and regional roadways. Regional haul routes refer to potential routes for trucking earthen and construction materials into the Folsom DS/FDR site. From the north, these routes include State Routes 70 and 65 from Marysville to Folsom, using either Sierra College Boulevard or Douglas Boulevard to reach the site. From the south, US Highway 50 may also provide access to the local area for trucks hauling earthen and construction materials (i.e., concrete and steel).

Local haul routes refer to roadways in the vicinity of Folsom Dam that may be used for trucks hauling materials to and from borrow sites, as well as to the various dams and dikes from regional routes. Potential local haul routes include Folsom-Auburn Road, Folsom Boulevard, Douglas Boulevard, Sierra College Boulevard, East Natoma Road, Green Valley Road, Oak Avenue Parkway, Blue Ravine Road, East Bidwell Street and Eureka Road. Section 3.9, Transportation and Circulation, provides a detailed description of the regional and local access routes assumed for construction activities.

3.10.1.3 Regulatory Setting

The area of analysis includes noise-sensitive land uses in the following jurisdictions:

- Counties: Yuba, Sacramento, Placer, and El Dorado.
- Communities: Cities of Folsom, Roseville, Lincoln, Rocklin and Marysville and Communities of Wheatland and Granite Bay.

Most jurisdictions have adopted noise standards for both transportation and non-transportation noise sources in their Noise Element of their General Plan. In addition to the local Noise Elements, because this is a NEPA/CEQA action, it is also appropriate to apply federal and state traffic noise impact assessment criteria to evaluate haul truck noise impacts.

Presented below is a summary of the applicable noise standards for actions under the Folsom DS/FDR.

Local Jurisdictions

A project would have a potentially significant effect on the environment if it conflicts with the adopted noise standards, substantially increases the ambient noise levels for adjacent areas, or causes severe noise impacts for exposed people. All jurisdictions where construction or truck hauling would occur have adopted local ordinances regulating noise levels in order to minimize impacts on sensitive land uses. These local standards have been established for both non-transportation and transportation noise sources. Table 3.10-2 lists the non-transportation noise standards in the relevant jurisdictions, and Table 3.10-3 lists the transportation noise standards in those jurisdictions where actions may involve trucks hauling materials.

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. However, El Dorado and Placer Counties have also adopted noise standards for other sensitive land uses such as commercial areas and open space. All of the jurisdictions, except for Placer County, have established maximum allowable exterior one-hour noise limits for both daytime and nighttime hours. Placer County is the only jurisdiction that has adopted noise standards specific to non-transportation construction activities. These noise standards are based on maximum allowable L_{dn} noise levels. Furthermore, it is the only jurisdiction with a blasting noise standard, which states that blasting shall not exceed a peak linear overpressure of 122 dB, or a C-weighted Sound Exposure Level (SEL) of 98 dBC. The City of Folsom Noise Element exempts construction activities 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.

Table 3.10-2
Local Government Non-Transportation Noise Standards (dBA)

Noise Element Jurisdiction/Land Use Category	Maximum Allowable Exterior Noise Levels					
	Daytime 7a.m. - 7p.m.		**Evening 7 p.m. - 10 p.m.**		**Nighttime 10p.m. - 7 a.m.**	
	Hourly		**Hourly**		**Hourly**	
Sacramento County	**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	
	Hourly		**Hourly**		**Hourly**	
El Dorado County [1]	**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			
Residential Areas Adjacent to Industrial			60			
General Commerical			70			
Heavy Commercial/Industrial Park			75			
Recreation & 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 exeed 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 LC_{dn} 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)

Table 3.10-3
Local Government Transportation Noise Standards (dBA)

Noise Element Jurisdiction/Land Use Category	**Maximum Allowable Noise Levels** Exterior L_{dn}/CNEL[1]	Interior L_{dn}/CNEL
Sacramento County		
Residential areas	60	45
City of Folsom		
Residential areas including single- or multiple-family residence,school, church, hospital or public library)	60	45
El Dorado County, Placer County and Granite Bay Community[5]		
Residential areas	60	45
Commercial areas	--	
Other sensitive areas - Parks	70	
Other sensitive areas: hospitals, nursing homes, churches, transient lodging	60	45
City of Roseville[5]		
Residential areas	60	45
Commercial areas - office buildings	65	--
Other sensitive areas - parks	70	--
Other sensitive areas: hospitals, nursing homes, churches, transient lodging	60	45
City of Rocklin[5]		
Residential areas	60	45
Commercial areas - office buildings	--	--
Other sensitive areas - playground and parks	70	--
Hospitals and nursing homes	60	45
Non-commercial places of public assembly	60	
Yuba County	[2]	
City of Marysville	[3]	
City of Wheatland[5]		
Residential areas	60	45
Commercial areas - office buildings	--	--
Other sensitive areas - playground and parks	70	--
Other sensitive areas: hospitals, nursing homes, churches, transient lodging	60	45
City of Lincoln	[4]	

Notes:

[1] The jurisdictions along the haul routes with standards for transportation noise impacts have adopted a maximum L_{dn}/CNEL noise limit of 60 dBA for residential land uses, with a potential allowable L_{dn}/CNEL exceedance level 65 dBA, if 60 dBA is not practicable in a situation given the application of the best-available noise reduction measures.

[2] Yuba County General Plan Noise Element 1976, and County Ordinance on Noise Chapter 8.20. Maximum daytime ambient noise levels will be used as a guideline for transportation related noise impacts in the absence of transportation-specific guideline. There is no numeric noise standard.

[3] From General Plan 1985 Noise Goals and Policies: "To examine any new source of noise projected at or above 70 dB at 50 feet for compatibility with existing or projected planned neighboring land uses prior to the granting of a rezoning or building permit.

[4] There is no numermic noise standard.

[5] Interior spaces worst-case one hour L_{eq} noise standards of 35-45 dBA have been adopted for theaters, auditoriums, music halls, churches, meeting halls, office buildings, schools, libraries and museums.

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)
City of Roseville General Plan (1992, updated 2003)
City of Rocklin Draft General Plan, Noise Element (March 2005)
Yuba County General Plan, Noise Element (1976)
Yuba County Ordinance, 8.20 Noise Regulations
Marysville General Plan (August 1985)
City of Wheatland General Plan Update, Chapter 4.11 Noise (December 2005)
City of Lincoln General Plan, Noise Element (1988)

Noise generated by transportation sources is also regulated according to land use. All of the jurisdictions along the haul routes with standards for transportation noise impacts have adopted a maximum L_{dn}/CNEL noise limit of 60 dBA for residential land uses, with a potential allowable L_{dn}/CNEL exceedance level of 65 dBA, if 60 dBA is not practicable in a situation given the application of the best-available noise reduction measures. Many of the jurisdictions have adopted a maximum L_{dn}/CNEL noise limit of 70 dBA for playgrounds and parks.

FHWA and Caltrans Noise Impact Criteria

In addition to local noise standards, there are federal regulations that apply to the Folsom DS/FDR. These include the applicable FHWA noise abatement criteria (NAC) (23 CFR Part 772), which have been interpreted and implemented for projects in California by California Department of Transportation (Caltrans). These criteria are included in the *Caltrans Traffic Noise Analysis Protocol, October 1998* (herein referred to as the Protocol).

The FHWA noise abatement criteria (NAC), presented in Table 3.10-4, are based on specific land use categories. These NAC are based on one-hour average L_{eq} noise levels (FHWA, *Federal-Aid Highway Program Manual*, *Volume 7, Chapter 7, Section 3, August 9, 1980*).

Table 3.10-4
FHWA Noise Abatement Criteria (NAC)

Activity Category	***L_{eq}(1hr) [(1)] (dBA)***	***Description of Activity Category***
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

(1) No single hourly average L_{eq} in a 24-hour day can exceed this value.

Source: *23 CFR Part 772.*

Land uses along the local and regional haul routes are predominantly Activity Categories B and C, and, to a lesser degree, Activity Category E (i.e., residential). The FHWA noise standards indicate that noise mitigation must be considered when the Horizon Year project levels approach or exceed the stated NAC. In addition, the FHWA noise standards also indicate that noise mitigation must be considered when the Future-Year or Horizon-Year project levels “substantially” exceed existing noise levels. The Protocol defines “approach the noise abatement criteria” (23 CFR

772.5(g)) as 1 dBA below the NAC and defines "substantially" as a predicted incremental impact equal to or greater than 12 dBA over existing noise levels.

3.10.1.4 Existing Conditions

The Folsom DS/FDR study area is a very unique land use and noise setting. The southern portion of the site is more of an urban locale with constant noise generated from the Folsom Prison shooting range and traffic along busy arterial roadways. The area of analysis transitions to a more rural character heading to the north and east of the site where there is less human activity. Therefore, background noise levels are higher at the southern portion of Folsom Reservoir and trend lower as one heads north and east. In addition, there are seasonal variations with the reservoir being an active site for recreational boating and jet and water skis activities during the summer, which tends to increase background noise levels. During the winter months, human and recreational activity is less; therefore, background noise levels tend to be lower.

Noise data for the Folsom DS/FDR area available from recent noise studies in the Folsom Reservoir area were used to help define the existing noise conditions in the Folsom DS/FDR area and along proposed truck hauling routes. These recent noise studies include:

- Reclamation, *Folsom Dam Road Access Restriction, Final Environmental Impact Statement: Section 3.3* (April 2005);
- Wallace, Roberts, and Todd et al., *Folsom Lake State Recreation Area, Draft Resource Inventory, Environmental Conditions: Noise* (April 2003); and
- USACE, *Folsom Dam Bridge SEIR/SEIS* (Draft 2006).

These studies, along with United States Environmental Protection Agency (USEPA) documentation and the results of the roadway existing noise modeling analysis were used to describe ambient noise conditions.

Noise monitoring data presented in the *Draft Resources Inventory Folsom Lake State Recreational Area* (April 2003) were used to provide guidance for defining existing ambient noise conditions in the Folsom DS/FDR area. Noise monitoring data was collected at 10 locations around Folsom Reservoir. The closest locations to the proposed site included four locations on the southern, eastern, and western sides of the reservoir. Ambient noise monitoring conducted between 9:00 a.m. and 6:00 p.m. documented that daytime L_{eq} noise levels in the Folsom DS/FDR area ranged from 37.2 dBA at Granite Beach in Granite Bay to 65.3 dBA in near Lake Hills Drive in El Dorado. The monitoring locations with the highest noise levels were influenced by constant noise sources, such as traffic along local roads or by a single noisy activity, such as lawn mowing, construction activity or cement truck turning around near a monitoring location. At the monitoring locations with the lowest noise levels there was minimal human activity influencing ambient noise conditions. Since these noise level measurements only represented a 20-minute daytime sample at each location, and given the seasonal variability of noise conditions around Folsom Reservoir, background noise levels for this noise analysis were based on USEPA noise descriptors for various land uses.

Data provided in the USEPA Levels Document[1] was used to define average ambient daytime and nighttime L_{eq} and L_{dn} noise conditions around the Folsom Dam site. The L_{dn} noise levels are based on the various land use descriptors. The daytime and nighttime L_{eq} noise levels were estimated based on the L_{dn} noise levels. According to this USEPA document, typically, there is a 10-dBA change in noise levels between the daytime and nighttime. Table 3.10-5 presents summary of the ambient noise levels for various land uses.

Table 3.10-5
Average Ambient Noise Levels for Various Land Uses

Land Use Description	***Average L_{dn}[1] (dBA)***	***Daytime L_{eq} (dBA)***	***Nighttime L_{eq} (dBA)***
Wilderness	35	35	25
Rural Residential	40	40	30
Quiet Suburban Residential	50	50	40
Normal Suburban Residential	55	55	45
Urban Residential	60	60	50
Noisy Urban Residential	65	65	55
Very Noisy Urban Residential	70	70	60

Source: [1]U.S. EPA, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974.

A review of existing topographic and aerial photographs was used to select six noise-sensitive receptor locations that represent residential areas closest to the proposed construction sites. Furthermore, each noise-sensitive receptor represents the closest point to the proposed construction activities. Figure 3.10-2 shows the six noise-sensitive receptors that could be impacted by construction activities. The most appropriate land use descriptors and noise levels to describe the Folsom Dam area range from "rural residential/quiet suburban residential" to "urban residential." Table 3.10-6 presents the ambient noise levels representative of the Folsom DS/FDR site at each noise-sensitive receptors.

[1] U.S. EPA, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, March 1974.

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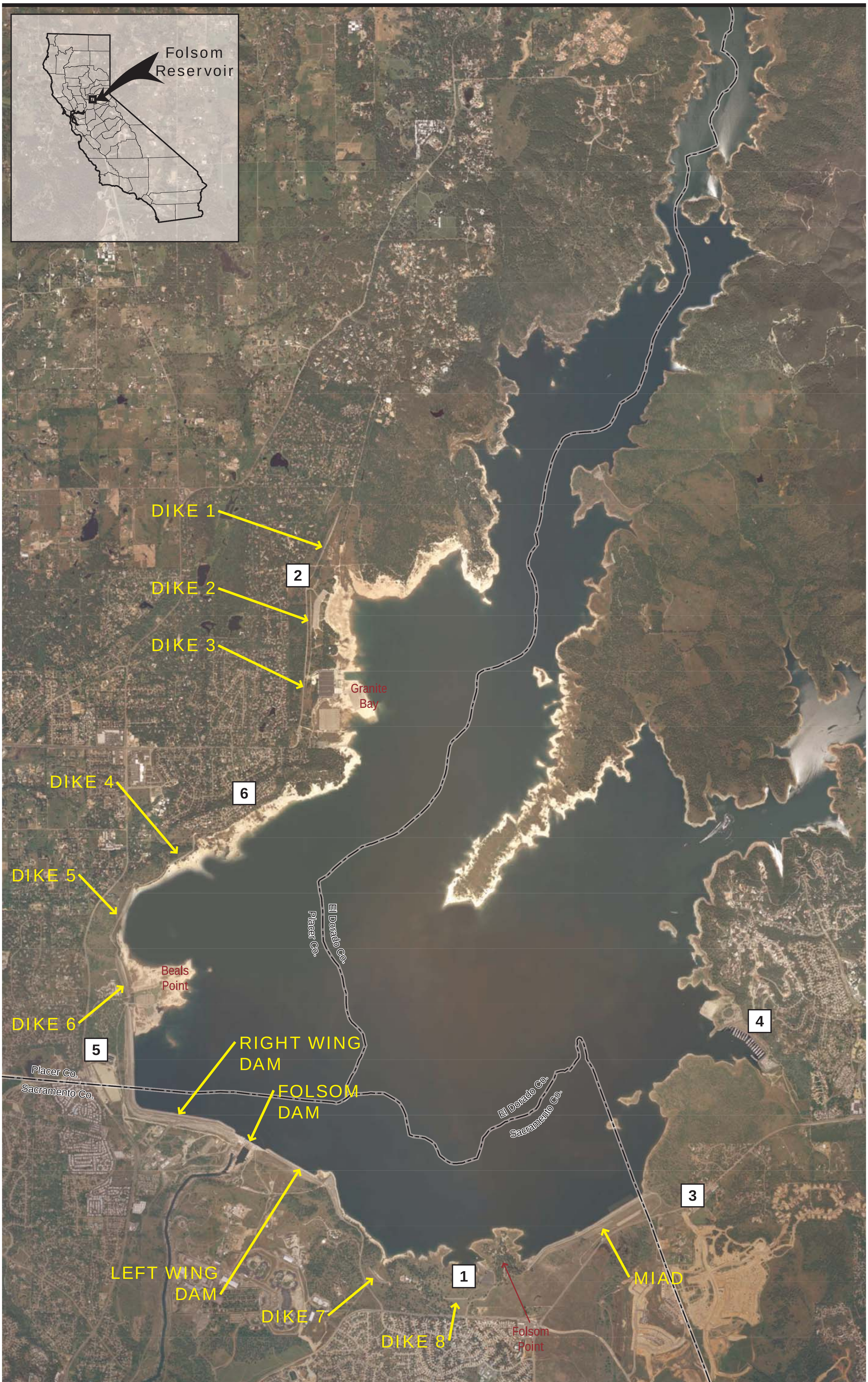

Figure 3.10-2
Construction Noise-Sensitive Receptors

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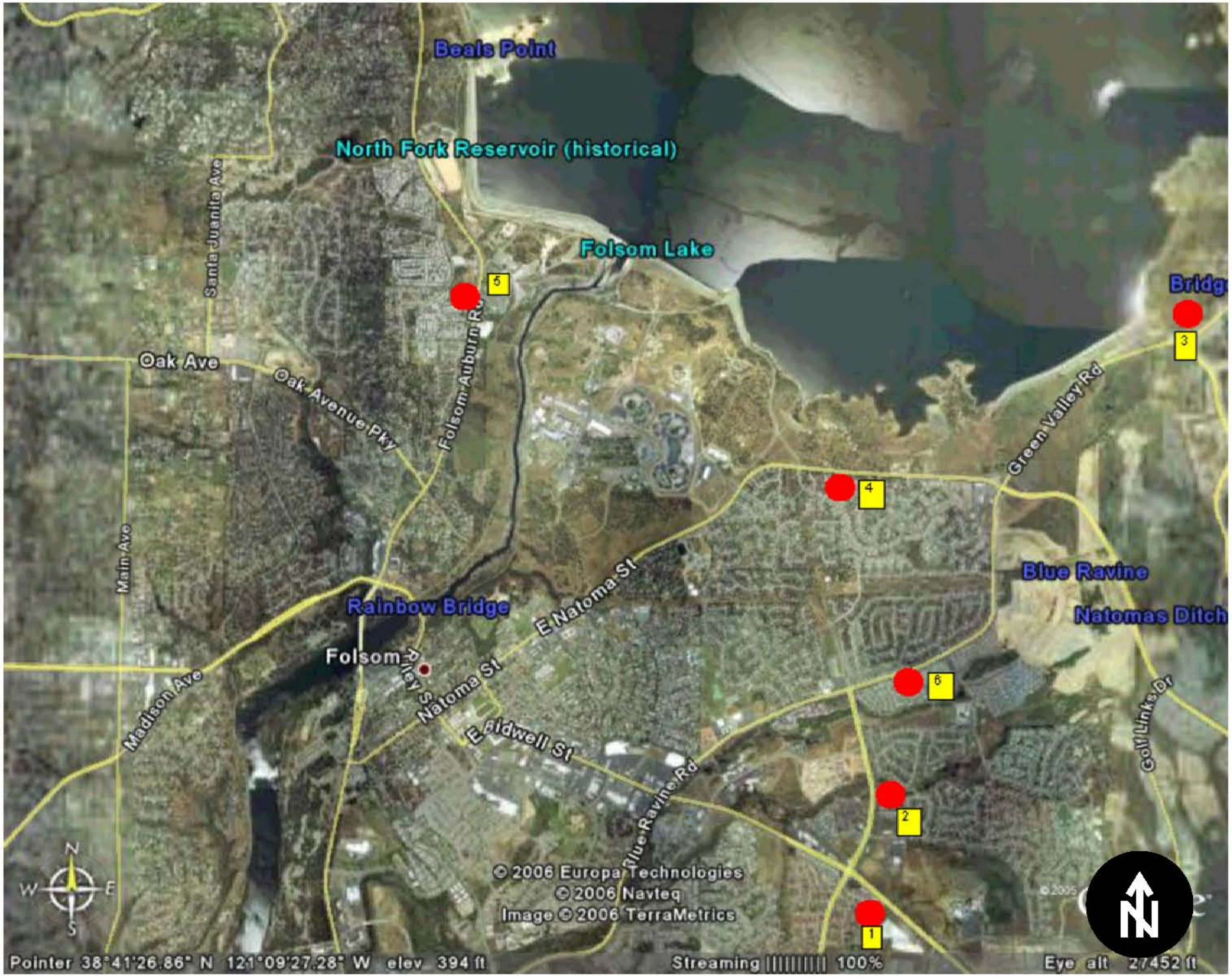
Table 3.10-6 **Folsom DS/FDR Site** **Estimated Average Ambient Noise Conditions**				
Noise- Sensitive Receptors		***Daytime***	***Nighttime***	
Receptor Id. (See Figure 3.10-2)	***Description***	***L_{eq} (dBA)***	***L_{eq} (dBA)***	***L_{dn} (dBA)***
1	East Natoma St. Residential Area, Folsom	60	50	60
2	Haley Drive Near Granite Beach, Granite Bay	45	35	45
3	Vista Mar Drive, El Dorado Hills	50	40	50
4	400 Lake Ridge Court, El Dorado Hills	50	40	50
5	Oak Leaf and Auburn-Folsom Road	60	50	60
6	Lake Shore Drive, Granite Bay	45	35	45

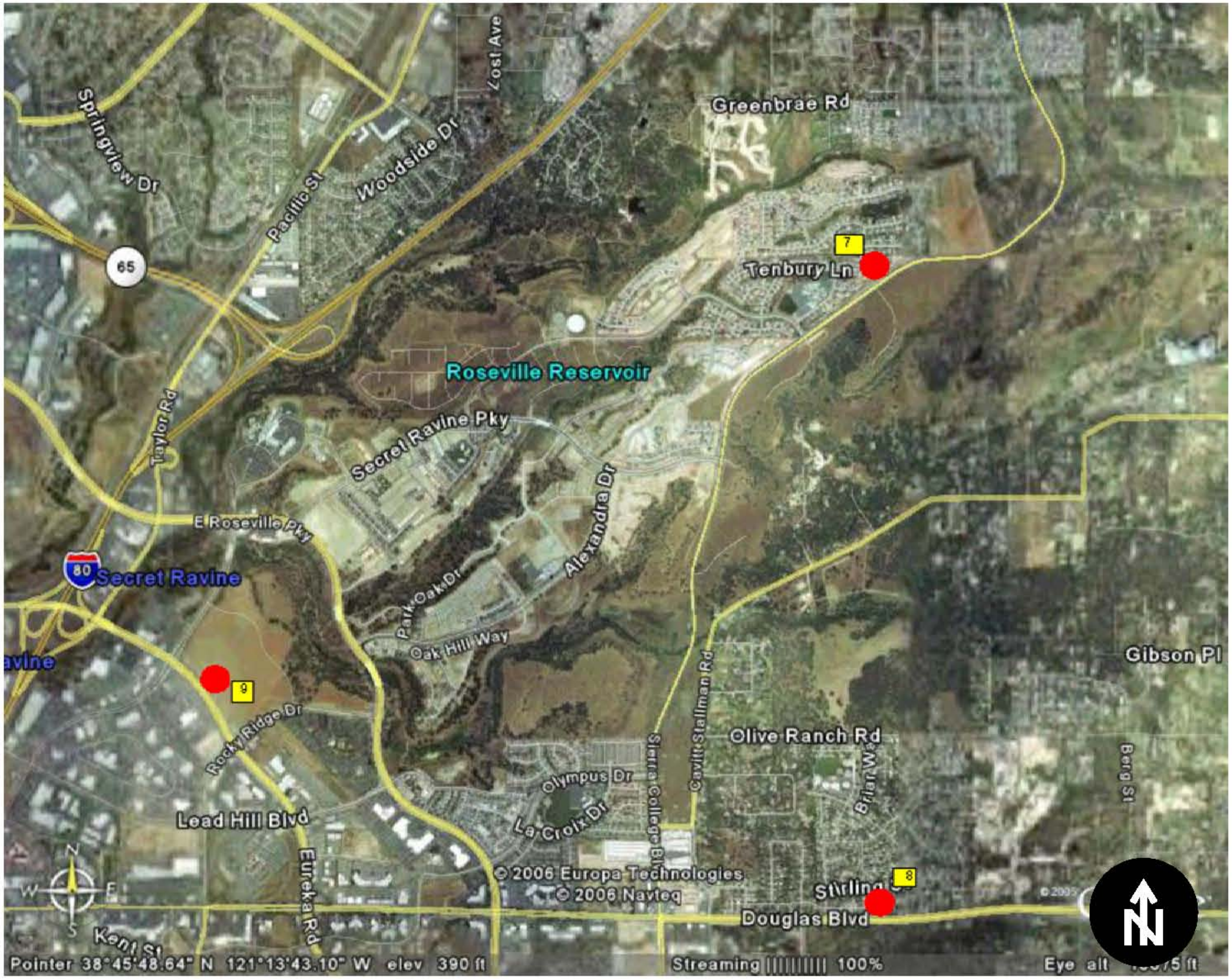
Noise monitoring and traffic data presented in Reclamation's *Folsom Dam Road Access Restriction, Final Environmental Impact Statement* (April 2005) were used to provide guidance for defining existing ambient conditions along the proposed local truck hauling routes. A traffic noise modeling analysis, based on 2006 traffic data, was conducted to estimate existing peak hour and 24-hour noise levels at nine noise-sensitive receptors adjacent to the proposed local truck hauling routes. These nine locations represent residential areas adjacent to the proposed local truck hauling routes. Figures 3.10-3 and 3.10-4 show the roadway noise-sensitive receptor locations. The noise monitoring and traffic data, provided in the Reclamation document, were used to calibrate the traffic noise model. Section 3.10.2.2 presents the methodologies and assumptions used to estimate existing traffic noise levels. Existing peak hour daytime and nighttime L_{eq} and L_{dn} noise levels were estimated at each noise sensitive receptor. Daytime L_{eq} noise levels ranged from 66.9 to 72.5 dBA and nighttime L_{eq} noise levels ranged from 60.2 to 66.0 dBA. The L_{dn} noise levels ranged from 68.4 to74.2 dBA. The lowest noise levels were estimated along East Natoma Street and the highest noise levels were estimated for Folsom-Auburn Road and East Bidwell Street. These noise levels are typical for noise-sensitive receptors located near busy secondary and arterial roadways. Table 3.10-7 presents a summary of the existing ambient noise levels.



CDM

Source: Google Earth.com, 2006.

Figure 3.10-3
Roadway Noise-Sensitive Receptors in Sacramento and El Dorado Counties



CDM

Source: Google Earth.com, 2006.

Figure 3.10-4
Roadway Noise-Sensitive Receptors in Placer County

Table 3.10-7
Potential Local Hauling Routes
Existing Ambient Noise Conditions

Receptor Id.	***Local Roadway***	***Description***	***Daytime Peak Hour L_{eq} (dBA)***	***Nighttime Peak Hour L_{eq} (dBA)***	***L_{dn} (dBA)***
1 (Figure 3.10-3)	East Bidwell Street	Along Albright Road, adjacent to southbound lanes in Folsom, Sacramento County	72.5	66.0	74.2
2 (Figure 3.10-3)	Oak Avenue Parkway	Along Thorndike Way, residential area adjacent to northbound lanes in Folsom, Sacramento County	68.9	62.4	70.6
3 (Figure 3.10-3)	Green Valley Road	Residential area along Kipps Lane, north of Green Valley Road in El Dorado Hills, El Dorado County	71.6	65.0	73.2
4 (Figure 3.10-3)	East Natoma Street	End of Sanborn Court, residential area along eastbound lanes in Folsom, Sacramento County	66.9	60.2	68.4
5 (Figure 3.10-3)	Folsom-Auburn Road	7013 Folsom-Auburn Road in a residential area along southbound lanes in Folsom, Sacramento County	72.5	66.0	74.2
6 (Figure 3.10-3)	Blue Ravine Road	End of Cobblefields Court, residential area along the southbound lanes in Folsom, Sacramento County	69.3	62.7	70.9
7 (Figure 3.10-4)	Sierra College Boulevard	Tenbury Lane in a residential area adjacent to northbound lanes in Rocklin, Placer County	70.6	64.0	72.2
8 (Figure 3.10-4)	Douglas Boulevard	4600-4699 Rolling Oaks Drive, residential area adjacent to westbound lanes in Granite Bay, Placer County	72.5	65.9	74.1
9 (Figure 3.10-4)	Eureka Road	1445 Eureka Road, multi-family residential development (225 units) adjacent to northbound lanes in Roseville, Placer County	72.4	65.8	74.0

3.10.2 Environmental Consequences/Environmental Impacts

This section describes the methods, significance criteria, and analysis results of the potential noise impacts from construction and transportation activities. The construction noise analysis is presented first, followed by the transportation noise analysis.

3.10.2.1 Construction Noise Analysis

Assessment Methods

Construction activities are expected to begin in 2007 and last approximately eight years. The construction schedule includes 17 construction activities, which would be staggered in the construction timeline. Not all action alternatives would involve all the construction activities. For example, Alternative 1 would not include a raise to the Main Concrete Dam, Granite Bay or Browns Ravine borrow developments, or construction of Dikes 1, 2, and 3. It is anticipated that potential construction noise impacts would be of a longer duration along the southern portion of Folsom Reservoir compared the northwestern portion of the reservoir. Table 3.10-8 presents the proposed construction activities and schedule for the main features of the Folsom DS/FDR action. Each of these construction activities were analyzed for their potential noise impacts on six noise-sensitive receptors, which are shown in Figure 3.10-2. The noise impacts associated with each alternative were then identified in terms of the specific features included in each alternative and the associated construction-related noise impacts were characterized accordingly.

Table 3.10-8
Proposed Construction Activities and Schedule

Construction Activity	*Schedule*
Auxiliary Spillway and Borrow Development	2007 – 2009
Auxiliary Spillway Construction	2009 – 2011
Folsom Point Borrow Development	2007 - 2013
Tunnel Construction (optional under Alternative 2)	2009 – 2011
Right Wing Dam Construction*	2009 – 2010/2012
Left Wing Construction	2012 – 2013
Beal's Point Borrow Development*	2007 – 2009/2012
Dike 5 & 6 Construction	2008
MIAD – Stripping, Excavation & Construction*	2008 – 2010/2011
MIAD Jet Grouting	2009-2010
Dike 7 & 8 Construction	2012
Granite Bay Borrow Development*	2013 – 2014
Dike 1, 2, & 3 Construction*	2013 – 2014
Dike 4 Construction	2008
Main Concrete Dam Raise*	2011-2012
Main Concrete Dam Tendons and Shears*	2013 - 2014

Note: * Alternative 5 would require additional years of construction.

The construction operations, such as concrete and rock crushing, screening operations, and blasting activities, and the types of construction equipment that are expected to be used for all of the alternatives are presented in Table 3.10-9. It is also anticipated that the Corps may dredge the Auxiliary Spillway approach 40 feet deeper than planned by Reclamation under Alternative 3. Because the details of the dredging operation are not known at the time of development of this EIS/EIR, noise impacts associated with dredging operation are generally considered at a programmatic level for now, as reasonable and appropriate at this level of planning and environmental review, and may be further evaluated and described in supplemental documentation should that alternative, or variation thereof, be approved and proceed to more detailed engineering and design. Table 3.10-9 was based on information provided the Reclamation and the Corps, *Folsom Dam Raise and Auxiliary Spillway Alternative PASS II Draft Report* (February 2006). It also presents the L_{max} sound level and percent of time the equipment would be operated at full power (usage factor) for each piece of construction equipment used. The L_{max} sound levels represent typical maximum noise that normally occurs during full power operation of the equipment. These levels typically only occur for a short duration, since the equipment is not operated at full power for an entire workday. A detailed discussion of the construction noise modeling methodology is presented in Appendix G.

Table 3.10-9
Construction Operations, Equipment Types and Their Noise Levels

Equipment Types	***Usage Factor***	***Lmax @ 50'***
Scrapers	40%	81
Dozers	40%	82
Vibratory Compactors	20%	83
Haul Trucks	40%	76
Excavator	40%	81
Small Crane	16%	81
Drill Rigs	20%	84
Loaders	40%	79
Blasting	1%	94
Rock/Screening Crushing Operations	80%	94
Concrete Batch Plant	15%	83

Sources:
U.S. Bureau of Reclamation, September 2006.
U.S. Army Corps, Folsom Dam Raise and Auxiliary Spillway Alternative PASSII Draft Report, February 2006a.
U.S. DOT, FHWA, Roadway Construction Noise Model, January 2006.
P. Yastrow, Laku Landing Sound Level Analysis, April 1990.

The methodology used to compare each action alternative's long-term construction noise impacts was based on the projected L_{dn} noise level at each sensitive receptor and the duration of the construction. For major construction phases that would be adjacent to noise-sensitive receptors, the construction duration, in total number of days, and the projected L_{dn} noise level at each noise-sensitive receptor were used to calculate a construction period average L_{dn} noise level for each action alternative.

For the alternatives that involve the raising of Folsom Dam and dike structures which could result in temporary increases of maximum flood flows in the reservoir, a number of auxiliary mini dikes would be required. Because the details on the number and placement of the mini dikes are not known at the time of development of this EIS/EIR, only a qualitative noise evaluation is presented in this section.

Rock Blasting Noise and Vibration Assessment Methods

Construction and rock blasting activities have the potential to produce noise and vibration levels that may be annoying or disturbing to humans and may cause damage to structures. The rock blasting noise impacts were addressed in the construction noise impact analysis. Vibration from construction projects is caused by general equipment operations, and is usually highest during pile driving, soil compacting, jack hammering and construction related demolition and blasting activities. Measurements of vibration are expressed in terms of the peak particle velocity (PPV) in the unit of inches per second (ips). The PPV, a quantity commonly used for vibration measurements, is the maximum velocity experienced by any point in a structure during a vibration event. It is an indication of the magnitude of energy transmitted through vibration. PPV is an indicator often used in determining potential damage to buildings from stress associated with blasting and other construction activities.

Table 3.10-10 summarizes the levels of vibration and the usual effect on people and buildings based on the U.S. Department of Transportation (USDOT) guidelines for vibration levels from construction-related activities. Blasting procedures would be dictated by site-specific conditions as determined by the construction contractor prior to construction, through monitoring during construction. Therefore, a quantitative assessment of potential vibration impacts from blasting is not provided. Rather, the blasting is discussed in the context of protective measures that would be put in place to minimize or avoid adverse vibration effects in the Mitigation Measures section (see Appendix G). Table 3.10-11 presents the vibration levels for typical construction equipment used to assess potential vibration impacts from the Folsom DS/FDR action.

Table 3.10-10 ***Summary of Vibration Levels and Effects on Humans and Buildings***		
Peak Particle Velocity (in/sec)	***Effects on Humans***	***Effects on Buildings***
<0.005	Imperceptible	No effect on buildings
0.005 to 0.015	Barely perceptible	No effect on buildings
0.02 to 0.05	Level at which continuous vibrations begin to annoy people in buildings	No effect on buildings
0.1 to 0.5	Vibrations considered unacceptable for people exposed to continuous or long-term vibration	Minimal potential for damage to weak or sensitive structures.
0.5 to 1.0	Vibrations considered bothersome by most people, however tolerable if short-term in length	Threshold at which there is a risk of architectural damage to buildings with plastered ceilings and walls. Some risk to ancient monuments and ruins.
1.0 to 2.0	Vibrations considered unpleasant by most people	U.S. Bureau of Mines data indicates that blasting vibration in this range will not harm most buildings. Most construction vibration limits are in this range.
>3.0	Vibration is unpleasant	Potential for architectural damage and possible minor structural damage.

Source: Michael Minor & Associates, Vibration Primer http://www.drnoise.com/ PDF_files/Vibration%20Primer.pdf, downloaded May 2006.

Table 3.10-11 ***Vibration Levels for Typical Construction Equipment***		
Equipment		***PPV at 25 (in./sec)***
Pile Driver (impact)	upper range	1.518
	typical	0.644
Pile Driver (sonic)	upper range	0.734
	typical	0.170
Clam Shovel Drop (slurry wall)		0.202
Hydromill (slurry wall)	in soil	0.008
	in rock	0.017
Large Bulldozer		0.089
Caisson Drilling		0.089
Loaded Trucks		0.076
Jackhammer		0.035
Small Bulldozer		0.003

Source: FTA, Transit Noise and Vibration Impact Assessment, April 1995.

Construction Noise Control Considerations

As part of the construction noise impact analysis, a Best Available Control Technology (BACT) analysis was prepared to evaluate the extent and likelihood that unmitigated noise levels associated with certain types of construction equipment could be feasibly reduced. In particular, noise associated with quasi-stationary and stationary sources, such as drill rigs, blasting, and rock crushing/screening operations was evaluated in terms whether provision of a portable or stationary barrier as part of the operation of such equipment would be necessary and appropriate to reduce construction-related noise at the nearest noise-sensitive receptor to an acceptable level. The application of BACT for the subject types of equipment was directed at those situations where the overall unmitigated increase in ambient noise level, resulting from construction activities, was estimated to exceed 5 dB (i.e., the threshold of significance for construction-related noise - see paragraph below).

Construction Noise Significance Criteria

There are two principal criteria for evaluating noise impacts of a project: 1) evaluating the increase in noise levels above the existing ambient levels as a result of the project, and 2) compliance with relevant standards and regulations. CEQA requires comparing project-related noise impacts with existing noise levels and NEPA requires comparing project-related noise levels with the noise levels of the No Action/No Project Alternative. For the purposes of complying with CEQA and NEPA requirements, it was conservatively assumed that the existing and the future no-action noise levels would be same, not including future background noise increases associated with potential growth in the area of analysis. The applicable CEQA significance criteria for noise include: a substantial increase in ambient noise levels in the project vicinity above existing levels, or a substantial temporary or periodic increase in ambient noise levels in the project vicinity. Because there are no specific construction noise limits defined under CEQA, the following general guidelines were used to assess short-term (hourly and daily) construction noise impacts, as compared to existing ambient levels:

- A less than 3 dBA increase in sound level is considered no impact;
- A 3 to 5 dBA increase in sound level is considered a slight impact;
- A 6 to 10 dBA increase in sound level is considered a moderate impact; and
- A greater than 10 dBA increase in sound level is considered a severe impact.

This analysis assumes that an increase greater than 5 dBA would be potentially significant and would require evaluating construction noise mitigation measures.

Several county and local jurisdictions have established noise standards that are applicable to construction activities related to the Folsom DS/FDR. Projected construction noise levels were compared with exterior noise standards for the City of Folsom, Sacramento County, El Dorado County, Placer County, and the Granite Bay Community to assess potential noise impacts, and to identify and evaluate noise control measures to reduce potential noise impacts.

Construction Noise Environmental Consequences/Environmental Impacts

Environmental Consequences/Environmental Impacts of the No Action/No Project Alternative

The No Action/No Project Alternative would not generate construction activity noise impacts relative to the existing conditions.

Under the No Action/No Project Alternative, the Folsom DS/FDR action would not be constructed. This analysis assumes that construction noise under the No Action/No Project Alternative would be the same as existing conditions. In some instances, noise levels under the existing conditions exceed existing noise standards. This is not attributable to the Folsom DS/FDR. There would be no impact of the No Action/No Project Alternative.

Environmental Consequences/Environmental Impacts of Alternative 1

Construction activities would generate noise impacts under Alternative 1.

The results of the construction noise impact analysis were compared to the significance criteria and local regulations in the five jurisdictions with non-transportation noise standards. It should be noted that the results of the construction noise impact analysis represent average noise impact conditions. There would be times during construction activities when construction noise levels at each of the noise-sensitive receptors could be higher and lower than those presented below. This would be true when construction activities occur either closer to or further way from noise-sensitive receptors than at the center of the proposed construction activities, as assumed for this noise impact analysis. Furthermore, noise impacts would be higher during the fall and winter months when background noise levels are lower due to less recreational activities at the reservoir. It is also possible during certain atmospheric conditions that construction noise could be heard at locations further away than the six noise-sensitive receptors during the nighttime. This could occur under clear skies and very light winds when there would be a temperature inversion above the ground surface, which acts as a “ceiling.” This causes the sound waves to be redirected back to the ground level and travel further distances.

Table 3.10-12 presents a summary of the projected daytime and nighttime unmitigated noise levels for each alternative at each noise-sensitive receptor and compares them to the significance criteria.

Table 3.10-12
Summary of Construction Noise Impacts Results

COMPARISON OF DAYTIME UNMITIGATED NOISE LEVELS (dBA)

Receptor ID.	Receptor Location	No-Action/ Existing Daytime L_{eq}	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Noise Impact Descriptor
			Unmitigated Daytime L_{eq}	Increase Above Existing	Unmitigated Daytime L_{eq}	Increase Above Existing	Unmitigated Daytime L_{eq}	Increase Above Existing	Unmitigated Daytime L_{eq}	Increase Above Existing	Unmitigated Daytime L_{eq}	Increase Above Existing	
1	East Natoma St. Residential Area, Folsom	60	61	1	61	1	61	1	61	1	61	1	None
2	Haley Drive Near Granite Beach, Granite Bay	45	45	0	47	2	48	3	48	3	47	2	None to Slight
3	Vista Mar Drive, El Dorado Hills	50	50	0	50	0	50	0	50	0	50	0	None
4	400 Lakeridge Ct, El Dorado Hills	50	50	0	50	0	50	0	50	0	50	0	None
5	Oak Leaf and Auburn-Folsom Road	60	60	0	60	0	60	0	60	0	60	0	None
6	Lake Shore Drive, Granite Bay	45	47	2	47	2	47	2	47	2	47	2	None

COMPARISON OF DAYTIME BACT NOISE LEVELS (dBA)

Receptor ID.	Receptor Location	No-Action/ Existing Daytime L_{eq}	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Noise Impact Descriptor
			BACT Daytime L_{eq}	Increase Above Existing	BACT Daytime L_{eq}	Increase Above Existing	BACT Daytime L_{eq}	Increase Above Existing	BACT Daytime L_{eq}	Increase Above Existing	BACT Daytime L_{eq}	Increase Above Existing	
1	East Natoma St. Residential Area, Folsom	60	61	1	61	1	61	1	61	1	60	0	None
2	Haley Drive Near Granite Beach, Granite Bay	45	45	0	46	1	46	1	46	1	46	1	None
3	Vista Mar Drive, El Dorado Hills	50	50	0	50	0	50	0	50	0	50	0	None
4	400 Lakeridge Ct, El Dorado Hills	50	50	0	50	0	50	0	50	0	50	0	None
5	Oak Leaf and Auburn-Folsom Road	60	60	0	60	0	60	0	60	0	60	0	None
6	Lake Shore Drive, Granite Bay	45	46	1	46	1	46	1	46	1	46	1	None

COMPARISON OF NIGHTTIME UNMITIGATED NOISE LEVELS (dBA)

Receptor ID.	Receptor Location	No-Action/ Existing Nighttime L_{eq}	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Noise Impact Descriptor
			Unmitigated NIghttime L_{eq}	Increase Above Existing	Unmitigated NIghttime L_{eq}	Increase Above Existing	Unmitigated NIghttime L_{eq}	Increase Above Existing	Unmitigated NIghttime L_{eq}	Increase Above Existing	Unmitigated NIghttime L_{eq}	Increase Above Existing	
1	East Natoma St. Residential Area, Folsom	50	57	7	56	6	56	6	56	6	55	5	Moderate
2	Haley Drive Near Granite Beach, Granite Bay	35	35	0	44	9	45	10	45	10	44	9	None to Severe
3	Vista Mar Drive, El Dorado Hills	40	40	0	40	0	40	0	40	0	40	0	None
4	400 Lakeridge Ct, El Dorado Hills	40	41	1	41	1	41	1	41	1	41	1	None
5	Oak Leaf and Auburn-Folsom Road	50	50	0	50	0	50	0	50	0	50	0	None
6	Lake Shore Drive, Granite Bay	35	42	7	42	7	42	7	42	7	42	7	Moderate

COMPARISON OF NIGHTTIME BACT NOISE LEVELS (dBA)

Receptor ID.	Receptor Location	No-Action/ Existing Nighttime L_{eq}	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Noise Impact Descriptor
			BACT NIghttime L_{eq}	Increase Above Existing	BACT NIghttime L_{eq}	Increase Above Existing	BACT NIghttime L_{eq}	Increase Above Existing	BACT NIghttime L_{eq}	Increase Above Existing	BACT NIghttime L_{eq}	Increase Above Existing	
1	East Natoma St. Residential Area, Folsom	50	54	4	53	3	53	3	53	3	52	2	None to Slight
2	Haley Drive Near Granite Beach, Granite Bay	35	35	0	39	4	40	5	40	5	39	4	None to Slight
3	Vista Mar Drive, El Dorado Hills	40	40	0	40	0	40	0	40	0	40	0	None
4	400 Lakeridge Ct, El Dorado Hills	40	40	0	40	0	40	0	40	0	40	0	None
5	Oak Leaf and Auburn-Folsom Road	50	50	0	50	0	50	0	50	0	50	0	None
6	Lake Shore Drive, Granite Bay	35	39	4	39	4	39	4	39	4	39	4	Slight

The unmitigated daytime L_{eq} noise levels ranged from 45 dBA to 61 dBA under Alternative 1. These noise levels would represent no change compared to the No Action/No Project Alternative (i.e., existing noise level) at Noise-Sensitive Receptors 2, 3, 4 and 5 and a 1- to 2-dBA increase at Noise-Sensitive Receptors 1 and 6.

These impacts to daytime noise levels would be less than significant.

Under Alternative 1, the unmitigated nighttime L_{eq} noise levels ranged from 35 dBA at Noise-Sensitive Receptor 2 up to 57 dBA at Noise-Sensitive Receptor 1. At Noise-Sensitive Receptor 1, noise levels under Alternative 1 would increase by 7 dBA relative to the No Action/No Project Alternative.

This impact at Noise-Sensitive Receptor 1 would be significant. The inclusion of a noise barrier with the operation of stationary/quasi-stationary equipment and activities (i.e., BACT for drill rigs, blasting, rock crushing/screening) would reduce the unmitigated increase of 7 dBA to 4 dBA. This measure or other types of noise control measures, as reflected in Mitigation Measures N-1 to N-10, would reduce the construction noise associated with Alternative 1 to a less than significant level.

In addition to evaluating the potential incremental increase in noise levels over existing/No Action/No Project Alternative noise levels, the projected construction noise levels for each noise-sensitive receptor were compared to their respective non-transportation noise standards. These noise standards include daytime and nighttime L_{max}, L_{eq} and L_{50} noise limits and 24-hour L_{dn} noise limits. For the purposes of this analysis, it was conservatively assumed that L_{50} noise levels would be the same as the L_{eq} noise levels. Table 3.10-13 presents the maximum noise levels for all five alternatives and compares them with the respective noise standards to identify any exceedances of the noise standards.[2] The projected daytime construction L_{max}, L_{50} and L_{eq} noise levels at each noise-sensitive receptor were below the community noise standards, except for Natoma Street residences (Noise-Sensitive Receptor 1) where the daytime L_{50} noise level exceeds the Sacramento County L_{50} noise standard. However, this exceedance is not due to the noise impacts related action under the Folsom DS/FDR, but that the existing L_{50} daytime noise level at Natoma Street already exceeds the noise standard. Similarly, the projected nighttime construction L_{max}, L_{50} and L_{eq} noise levels at each noise-sensitive receptor were below the community noise standards, except for Natoma Street residences where the nighttime L_{50} noise level exceeds the Sacramento County L_{50} noise standard of 45 dBA. However, this exceedance is also because the existing nighttime L_{50} noise level at Natoma Street already exceeds the noise standard of 45 dBA.

[2] The differences in noise levels between the individual alternatives are relatively small and do not alter the basic conclusions of Table 3.10-13 relative to whether or not the applicable standard is exceeded.

Table 3.10-13

Comparison of Construction Noise Levels to Community Noise Standards

Receptor Locations		L_{max} Level (dBA)		Exceedance	L_{50}/L_{eq} Level (dBA)		Exceedance
Station Id.	**Description**	**Daytime**	**Standard**	**Yes/No**	**Daytime**	**Standard**	**Yes/No**
1	Natoma St. Residential Area, Folsom	62	**70**	**No**	61*	**50**	**Yes**
2	Haley Drive Near Granite Beach, Granite Bay	46	**--**	**--**	46	--	**--**
3	Vista Mar Drive, El Dorado Hills	50	**75**	**No**	50	**55**	**No**
4	400 Lakeridge Ct, El Dorado Hills	50	**75**	**No**	50	**55**	**No**
5	Oak Leaf and Auburn-Folsom Road	60	**--**	**No**	60	--	**No**
6	Lake Shore Drive, Granite Bay	47	**--**	**--**	46	**--**	**--**

Receptor Locations		L_{max} Level (dBA)		Exceedance	L_{50}/L_{eq} Level (dBA)		Exceedance
Station Id.	**Description**	**Nighttime**	**Standard**	**Yes/No**	**Nighttime**	**Standard**	**Yes/No**
1	Natoma St. Residential Area, Folsom	58	**65**	**No**	54*	**45**	**Yes**
2	Haley Drive Near Granite Beach, Granite Bay	42	**--**	**--**	40	--	**--**
3	Vista Mar Drive, El Dorado Hills	40	**60**	**No**	40	**45**	**No**
4	400 Lakeridge Ct, El Dorado Hills	40	**60**	**No**	40	**45**	**No**
5	Oak Leaf and Auburn-Folsom Road	50	**--**	**No**	50	--	**No**
6	Lake Shore Drive, Granite Bay	42	**--**	**--**	39	**--**	**--**

Receptor Locations		L_{dn} Level (dBA)		Exceedance
Station Id.	**Description**	**Projected**	**Standard**	**Yes/No**
1	Natoma St. Residential Area, Folsom	--	--	--
2	Haley Drive Near Granite Beach, Granite Bay	46	**50**	**No**
3	Vista Mar Drive, El Dorado Hills	--	--	--
4	400 Lakeridge Ct, El Dorado Hills	--	--	--
5	Oak Leaf and Auburn-Folsom Road	60*	**50**	**Yes**
6	Lake Shore Drive, Granite Bay	46	**50**	**No**

Notes: Exceedances are due to existing background noise levels at or above the standards before adding in project noise levels.
Conservatively assumed that L50 noise level is equivalent to Leq noise level.
Noise levels represent maximum BACT noise level for all five action alternatives.
The differences in noise levels between the individual alternatives do not alter the conclusions of the table relative to whether or not the standard is exceeded.
* = BACT applied to stationary/quasi-stationary equipment

For Noise-Sensitive Receptors 2, 5 and 6, located in Placer County and the Granite Bay community, the applicable noise standard is based on an L_{dn} noise limit. The projected BACT noise L_{dn} noise levels ranged from 46 dBA at Noise-Sensitive Receptor 2 and 6 and 60 dBA at Noise-Sensitive Receptor 5. The projected L_{dn} noise level at Noise-Sensitive Receptors 2 and 6 were below the L_{dn} standard, but Noise-Sensitive Receptor 5 exceeded the L_{dn} noise standard of 50 dBA by 10 dBA. However, this exceedance is not due to noise impacts related to action under the Folsom DS/FDR, but that the existing L_{dn} noise levels of 50 to 60 dBA meet or exceed the noise standard of 50 dBA. Although noise impacts at residential areas would be below the Placer County applicable noise standard, construction and borrow activities conducted at Beal's Point would generate noise levels that could periodically exceed the Placer County Ldn noise limit of 70 dBA established for recreational areas at the Beal's Point campground area due to its close proximity to construction activities. However, all reasonable mitigation measures would be used to reduce to noise impacts, which would include, but would not be limited to using portable noise barriers, limiting construction work to daytime (7:00 a.m. to 7:00 p.m.) and off-season periods (October through April), and erecting staging areas as far from the campground as possible. A detailed list mitigation measures is presented in Section 3.10.4.

This impact at Noise-Sensitive Receptors 1 and 5 would be potentially significant, even with the application of BACT to stationary/quasi-stationary construction equipment. Mitigation Measures N-1 to N-10 would reduce the impact to less than significant.

Blasting and vibration activities would generate construction noise impacts.

The peak rock blasting noise level would be 94 dBA at 50 feet away. Placer County is the only county or community with blasting noise limits. It limits impulse noise levels from blasting to a peak linear noise level of 122 dB at the property line of a receiving land use, which is equivalent to 113 dBA. This noise standard was used to assess potential noise blasting impacts at both noise-sensitive receptors within and outside of Placer County. Blasting activities would occur in the proposed borrow sites located at the Folsom Reservoir shoreline. The distance between the center of the construction activities and the noise-sensitive receptors was used to conservatively represent the distance from potential blasting activities. Those distances range from 935 feet to 4,100 feet from the noise-sensitive receivers. Based on those distances the noise impacts from blasting operations could range from 46 to 63 dBA. These noise levels are well below the Placer County blasting noise limit and are considered to be less than significant.

Vibration impacts associated with construction equipment were calculated for four types of construction equipment that would be similar to the equipment anticipated to be used during construction. This equipment includes small and large bulldozers, loaded trucks, and jackhammers. Vibration levels from each piece of equipment measured at a reference distance of 25 feet away were obtained from Table 3.10-11. The only noise-sensitive receptor that could be impacted by construction equipment vibration would be at the Natoma Street residences during excavation activities occurring adjacent to Natoma Street. The nearest point to the residences is approximately 150 feet away. Vibration levels calculated at the 150-foot distance for each piece of equipment ranged from 0.0002 to 0.06 in/sec. These vibration levels are considered imperceptible to barely perceptible by humans and are, therefore, considered to be less than significant. Table 3.10-14 presents the calculated vibration levels at 25 feet away and 150 feet away for the four types of construction equipment.

Impacts from vibration would be less than significant.

Table 3.10-14
Construction Equipment Vibration Impacts

Equipment	***PPV at 25 ft (in./sec)***	***PPV at 150 ft (in./sec)***	***Effects on Humans***
Large Bulldozer	0.089	0.006	Barely Perceptible
Loaded Trucks	0.076	0.005	Barely Perceptible
Jackhammer	0.035	0.002	Imperceptible
Small Bulldozer	0.003	0.0002	Imperceptible

Environmental Consequences/Environmental Impacts of Alternative 2
<u>Construction activities would generate noise impacts under Alternative 2.</u>

Table 3.10-12 presents a summary of the projected daytime and nighttime unmitigated noise levels for each alternative at each noise-sensitive receptor and compares them to the significance criteria.

The unmitigated daytime L_{eq} noise levels ranged from 47 dBA to 61 dBA under Alternative 2. These noise levels would represent no change compared to the No Action/No Project Alternative (i.e., existing noise level) at Noise-Sensitive Receptors 3, 4 and 5 and a 1- to 2-dBA increase at Noise-Sensitive Receptors 1, 2, and 6.

These impacts to daytime noise levels would be less than significant.

Under Alternative 2, the unmitigated nighttime L_{eq} noise levels ranged from 40 dBA at Noise-Sensitive Receptor 3 up to 56 dBA at Noise-Sensitive Receptor 1. At Noise-Sensitive Receptor 1, noise levels under Alternative 2 would increase by 6 dBA relative to the No Action/No Project Alternative. At Noise-Sensitive Receptor 2, noise levels under Alternative 2 would increase by 9 dBA relative to the No Action/No Project Alternative. At Noise-Sensitive Receptor 6, noise levels under Alternative 2 would increase by 7 dBA relative to the No Action/No Project Alternative.

These impacts at Noise-Sensitive Receptors 1, 2 and 6 would be significant. The inclusion of a noise barrier with the operation of stationary/quasi-stationary equipment and activities (i.e., BACT for drill rigs, blasting, rock crushing/screening) would reduce the unmitigated increases of 6 dB to 3 dB, 9 dBA to 4 dBA, and 7 dBA to 4 dBA. This measure or other types of noise control measures, as reflected in Mitigation Measures N-1 to N-10, would reduce the construction noise associated with Alternative 2 to a less than significant level.

As described above in the discussion of Alternative 1, construction activity associated with any of the alternatives would result in noise levels that exceed local noise standards at Noise-Sensitive Receptors 1 and 5.

This impact at Noise-Sensitive Receptors 1 and 5 would be potentially significant, even with the application of BACT to stationary/quasi-stationary construction equipment. Mitigation Measures N-1 to N-10 would reduce the impact to less than significant.

<u>*Blasting and vibration activities would generate construction noise impacts.*</u>

Impacts under this alternative would be similar to those described under Alternative 1.

Impacts from vibration and blasting would be less than significant.

<u>*Construction of new embankments would generate construction noise.*</u>

Alternative 2 would require the raising of Folsom Facility structures, which could result in the temporary increase of maximum flood flows in the reservoir. A number of new embankments would need to be constructed at various locations around Folsom Reservoir to control these flood flows. The construction of the embankments would require using standard earthmoving and construction equipment, such as backhoes, dump trucks, cranes and loaders. The construction of embankments would occur during the daytime and would take 1 to 2 weeks to construct. The noise associated with construction of new embankments is included within the overall construction noise levels estimated for Alternative 2, as presented above.

Environmental Consequences/Environmental Impacts of Alternative 3
Construction activities would generate noise impacts under Alternative 3.

Table 3.10-12 presents a summary of the projected daytime and nighttime unmitigated noise levels for each alternative at each noise-sensitive receptor and compares them to the significance criteria.

The unmitigated daytime L_{eq} noise levels ranged from 47 dBA to 61 dBA under Alternative 3. These noise levels would represent no change compared to the No Action/No Project Alternative (i.e., existing noise levels) at Noise-Sensitive Receptors 3, 4, and 5 and a 1 to 3 dBA increase at Noise-Sensitive Receptors 1, 2, and 6.

These impacts to daytime noise levels would be less than significant.

Under Alternative 3, the unmitigated nighttime L_{eq} noise levels ranged from 40 dBA at Noise-Sensitive Receptor 3 up to 56 dBA at Noise-Sensitive Receptor 1. At Noise-Sensitive Receptor 1, noise levels under Alternative 3 would increase by 6 dBA relative to the No Action/No Project Alternative. At Noise-Sensitive Receptor 2, noise levels under Alternative 3 would increase by 10 dBA relative to the No Action/No Project Alternative. At Noise-Sensitive Receptor 6, noise levels under Alternative 3 would increase by 7 dBA relative to the No Action/No Project Alternative.

These impacts at Noise-Sensitive Receptors 1, 2 and 6 would be potentially significant. The inclusion of a noise barrier with the operation of stationary/quasi-stationary equipment and activities (i.e., BACT for drill rigs, blasting, rock crushing/screening) would reduce the unmitigated increases of 6 dB to 3 dB, 10 dBA to 5 dBA, and 7 dBA to 4 dBA. This measure or other types of noise control measures, as reflected in Mitigation Measures N-1 to N-10, would reduce the construction noise associated with Alternative 3 to a less than significant level.

As described above in the discussion of Alternative 1, construction activity associated with any of the alternatives would result in noise levels that exceed local noise standards at Noise-Sensitive Receptors 1 and 5.

This impact at Noise-Sensitive Receptors 1 and 5 would be potentially significant, even with the application of BACT to stationary/quasi-stationary construction equipment. Mitigation Measures N-1 to N-10 would reduce the impact to less than significant.

Blasting and vibration activities would generate construction noise impacts.

Impacts under this alternative would be similar to those described under Alternative 1.

Impacts from vibration and blasting would be less than significant.

Construction of new embankments would generate construction noise.

Construction noise impacts under Alternative 3 would be similar to those described for Alternative 2.

Environmental Consequences/Environmental Impacts of Alternative 4

Construction activities would generate noise impacts under Alternative 4.

Table 3.10-12 presents a summary of the projected daytime and nighttime unmitigated noise levels for each alternative at each noise-sensitive receptor and compares them to the significance criteria.

The unmitigated daytime L_{eq} noise levels ranged from 47 dBA to 61 dBA under Alternative 4. These noise levels would represent no change compared to the No Action/No Project Alternative (i.e., existing noise levels) at Noise-Sensitive Receptors 3, 4 and 5 and a 1 to 3 dBA increase at Noise-Sensitive Receptors 1, 2, and 6.

These impacts to daytime noise levels would be less than significant.

Under Alternative 4, the unmitigated nighttime L_{eq} noise levels ranged from 40 dBA at Noise-Sensitive Receptor 3 up to 56 dBA at Noise-Sensitive Receptor 1. At Noise-Sensitive Receptor 1, noise levels under Alternative 4 would increase by 6 dBA relative to the No Action/No Project Alternative. At Noise-Sensitive Receptor 2, noise levels under Alternative 4 would increase by 10 dBA relative to the No Action/No Project Alternative. At Noise-Sensitive Receptor 6, noise levels under Alternative 4 would increase by 7 dBA relative to the No Action/No Project Alternative.

These impacts at Noise-Sensitive Receptors 1, 2 and 6 would be significant. The inclusion of a noise barrier with the operation of stationary/quasi-stationary equipment and activities (i.e., BACT for drill rigs, blasting, rock crushing/screening) would reduce the unmitigated increases of 6 dB to 3 dB, 10 dBA to 5 dBA, and 7 dBA to 4 dBA. This measure or other types of noise control measures, as reflected in Mitigation Measures N-1 to N-10, would reduce the construction noise associated with Alternative 4 to a less than significant level.

As described above in the discussion of Alternative 1, construction activity associated with any of the alternatives would result in noise levels that exceed local noise standards at Noise-Sensitive Receptors 1 and 5.

This impact at Noise-Sensitive Receptors 1 and 5 would be potentially significant, even with the application of BACT to stationary/quasi-stationary construction equipment. Mitigation Measures N-1 to N-10 would reduce the impact to less than significant.

Blasting and vibration activities would generate construction noise impacts.

Impacts under this alternative would be similar to those described under Alternative 1.

Impacts from vibration and blasting would be less than significant. Nonetheless, Mitigation Measures N-1 through N-10 are recommended to minimize and avoid any potential impacts.

Construction of new embankments would generate construction noise.

Construction noise impacts under Alternative 4 would be similar to those described for Alternative 2. Alternative 4 would include require higher embankments because the alternative proposes a 7-foot raise to Folsom Facility structures.

Environmental Consequences/Environmental Impacts of Alternative 5

Construction activities would generate slight noise impacts under Alternative 5.

Table 3.10-12 presents a summary of the projected daytime and nighttime unmitigated noise levels for each alternative at each noise-sensitive receptor and compares them to the significance criteria.

The unmitigated daytime L_{eq} noise levels ranged from 47 dBA to 61 dBA under Alternative 5. These noise levels would represent no change compared to the No Action/No Project Alternative (i.e., existing noise levels) at Noise-Sensitive Receptors 3, 4 and 5 and a 1 to 2 dBA increase at Noise-Sensitive Receptors 1, 2, and 6.

These impacts to daytime noise levels would be less than significant.

Under Alternative 5, the unmitigated nighttime L_{eq} noise levels ranged from 40 dBA at Noise-Sensitive Receptor 3 up to 55 dBA at Noise-Sensitive Receptor 1. At Noise-Sensitive Receptor 2, noise levels under Alternative 5 would increase by 9 dBA relative to the No Action/No Project Alternative. At Noise-Sensitive Receptor 6, noise levels under Alternative 4 would increase by 7 dBA relative to the No Action/No Project Alternative.

These impacts at Noise-Sensitive Receptors 2 and 6 would be significant. The inclusion of a noise barrier with the operation of stationary/quasi-stationary equipment and activities (i.e., BACT for drill rigs, blasting, rock crushing/screening) would reduce the unmitigated increases of 9 dB to 4 dB, and 7 dBA to 4 dBA. This *measure or other types of noise control measures, as reflected in Mitigation Measures N-1 to N-10, would reduce the construction noise associated with Alternative 5 to a less than significant level.*

As described above in the discussion of Alternative 1, construction activity associated with any of the alternatives would result in noise levels that exceed local noise standards at Noise-Sensitive Receptors 1 and 5.

This impact at Noise-Sensitive Receptors 1 and 5 would be potentially significant, even with the application of BACT to stationary/quasi-stationary construction equipment. Mitigation Measures N-1 to N-10 would reduce the impact to less than significant.

<u>Blasting and vibration activities would generate construction noise impacts.</u>

Impacts under this alternative would be similar to those described under Alternative 1.

Impacts from vibration and blasting would be less than significant. Nonetheless, Mitigation Measures N-1 through N-11 are recommended to minimize and avoid any potential impacts.

<u>Construction of new embankments would generate construction noise.</u>

Construction noise impacts under Alternative 5 would be similar to those described for Alternative 2. Alternative 5 would include require higher embankments because the alternative proposes a 17-foot raise to Folsom Facility structures.

Comparison of Alternatives Construction Noise Impacts

The results of the construction noise impact analysis presented in Table 3.10-12 showed that there would be no daytime impact at any of the noise-sensitive receptors, but potentially significant nighttime noise impacts (6 to 10 dBA noise level increases over existing/No Action/No Project Alternative conditions) at Noise-Sensitive Receptors 1, 2 and 6. The highest nighttime noise impacts for all alternatives would occur at Noise-Sensitive Receptor 2 (in the Granite Bay area) where existing/No Action/No Project Alternative noise levels are the lowest. Overall, Alternatives 3 and 4 would produce slightly higher noise impacts and Alternative 1 would produce slightly lower nighttime noise impacts compared to the other alternatives. Alternatives 2, 3, 4 and 5, in addition to generating moderate noise impacts at Noise-Sensitive Receptors 1 and 6, would generate a severe noise impact at Noise-Sensitive Receptor 2. Alternative 1 would not generate a noise impact at Noise-Sensitive Receptor 2 because there would be no construction activity at Granite Bay. However, the differences in nighttime noise levels between Alternatives 2, 3, 4 and 5 at each noise-sensitive receptor are 1 dBA or less, which would be imperceptible by most people. Therefore, there would be no perceptible difference in noise impacts between action alternatives, except for Alternative 1 at Noise-Sensitive Receptor 2.

Since there is no notable difference in daily construction noise impacts between action alternatives, except at Noise-Sensitive Receptor 2 for Alternative 1, the other approach to distinguish noise impacts between the alternatives would be to factor in the duration of construction schedule (total number of days) for each alternative. Table 3.10-15 presents a comparison of action alternative construction noise impacts at each noise sensitive receptor. The L_{dn} noise levels represent average noise levels over the duration of closest major construction phase to each noise-sensitive receptor. The table also presents which action alternatives would produce lower or higher noise impacts at each noise-sensitive receptor. Overall, it shows that there is no substantial difference in L_{dn} noise levels between the alternatives. In addition, when comparing the noise impacts of the action alternatives to the No Action/No Project Alternative the difference in noise levels at each noise-sensitive receptor would range from 2 to 6 dBA. These incremental differences would be considered imperceptible to readily perceptible by most people. The readily perceptible unmitigated noise impacts (increase of more than 5 dBA) would occur at Noise-Sensitive Receptor 2 (Alternative 5), and Noise-Sensitive Receptor 6 (Alternative 5).

3.10.2.2 Transportation Noise Analysis

The following sections describe assessment methods, significance criteria, and potential impacts to transportation noise of the Folsom DS/FDR alternatives.

Assessment Methods

Traffic noise levels generated from construction worker vehicles and trucks hauling materials on local roads were evaluated for nine noise-sensitive receptors and compared with existing ambient and No Action/No Project Alternative noise levels to determine the need to evaluate noise mitigation measures. An initial screening analysis was also conducted to evaluate any impacts on regional access routes for trucks hauling materials, such as interstates and state highway roads. Section 3.9 provides traffic data used to estimate traffic noise levels for each model scenario. Presented below is the methodology used to evaluate transportation noise impacts.

Traffic Noise on Local Roads

Traffic noise levels were estimated for construction workers' commuting vehicles, delivery trucks and trucks hauling aggregate materials using the FHWA Traffic Noise Model, Version 2.5 (TNM2.5). As of January 15, 2005, Caltrans requires all new projects to use TNM2.5 to model potential noise impacts for highway projects. TNM2.5 was used to estimate noise levels for the existing, No Action/No Project

Table 3.10-15
Comparison of Alternatives Construction Noise Impacts

Receptor Locations		Construction Period Average L_{dn} Noise Level						Impact Evaluation*	
Station Id.	**Description**	**No-Action**	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**	**Lower**	**Higher**
1	Natoma St. Residential Area, Folsom	60	65	64	64	65	63	Alt. 5	Alt. 1 & 4
2	Haley Drive Near Granite Beach, Granite Bay	45	47	49	50	50	51	Alt. 1	Alt. 5
3	Vista Mar Drive, El Dorado Hills	50	53	52	53	52	52	Alt. 2, 4 & 5	Alt. 1 & 3
4	400 Lakeridge Ct, El Dorado Hills	50	53	52	53	52	52	Alt. 2, 4 & 5	Alt. 1 & 3
5	Oak Leaf and Auburn-Folsom Road	60	62	62	62	63	63	Alt. 1, 2 & 3	Alt. 4 & 5
6	Lake Shore Drive, Granite Bay	45	50	50	50	50	51	Alt. 1, 2, 3 & 4	Alt. 5

Note: * Impact evaluation compares Alternatives 1 through 5 amongst each other.

Alternative and Alternatives 1 through 5 along the proposed truck haul routes. TNM2.5 is capable of modeling noise impacts from automobiles, medium trucks (2 axles), heavy trucks (3 or more axles), buses, and motorcycles factoring in vehicle volume, vehicle speed, roadway configuration, distance to the noise-sensitive receptors, atmospheric absorption, and ground attenuation characteristics. When predicting noise levels, TNM2.5 accounts for the effects of different pavement types, changes in roadway grades and attenuation due to rows of buildings and dense vegetation. TNM2.5 is used to predict hourly L_{eq} and L_{dn} noise levels for both free-flowing and interrupted-flow conditions (i.e., intersections, and traffic control devices). The model is generally considered to be accurate within +/- 3 dB.

As part of the traffic noise modeling analysis, TNM2.5 was calibrated based on the noise level and traffic data collected in the field in order to make any necessary adjustments to the Existing Year (2006) and peak construction year modeling results based on the results of the calibration modeling analysis. The analysis used traffic and noise data for two Folsom-Auburn Road receptors presented in Reclamation's *Folsom Dam Road Access Restriction, Final Environmental Impact Statement* (April 2005). Appendix G presents the traffic data and results of the calibration modeling analysis. It shows that TNM2.5 reasonably predicted traffic noise levels at both receptor locations. Therefore, no adjustments were made to the other TNM2.5 model results.

Existing, No Action/No Project Alternative, and Alternatives 1 through ADT volumes were obtained from Section 3.9. Vehicle classification data by vehicle type was based on actual traffic data for Folsom-Auburn Road provided by the City of Folsom. These vehicle distributions were applied to all local roadway ADT volumes. Additional assumptions used in the traffic noise modeling analysis are presented in Appendix G. Traffic noise modeling for the action alternatives was conducted only for those construction years with the highest projected number of construction worker vehicles and truck trips, since these would be the years that would generate the highest traffic noise impacts. Based on the projected ADT volumes for each action alternative, it is projected that 2009 would have the highest combined construction workers and truck ADT volumes for all alternatives, except for Alternative 5. For Alternative 5, the highest number of combined ADT volumes would occur in 2013. The No Action/No Project Alternative was modeled for both years. Table 3.10-16 presents a summary of the combined worker and truck ADT volumes by year for each alternative.

Table 3.10-16
Projected Construction Employee and Truck ADT Volumes

Year	Action Alternatives				
	Alt 1	**_Alt 2_**	**_Alt 3_**	**_Alt 4_**	**_Alt 5_**
2007	1,004	960	496	976	1,064
2008	3,805	3,270	3,252	3,615	3,451
2009	**5,393**	**5,592**	**4,275**	**5,049**	3,377
2010	4,411	4,238	2,913	3,834	3,315
2011	1,284	2,736	1,952	1,056	1,438
2012	1,051	1,816	1,594	1,636	4,206
2013	716	3,248	1,534	3,558	**4,860**
2014	0	0	0	0	3,822

Highest ADT volume for each Alternative indicated in bold.

For this traffic noise analysis, a single reference point based on a 50-foot distance from the roadway centerline to each noise-sensitive receptor was used. This distance was selected because the distances from the roadway centerlines to the noise-sensitive receptors ranged from 40 to 70 feet, and the incremental difference in predicted noise levels at this range of distance is less than 3 dBA. This difference in noise levels is considered to be barely perceptible by humans. Therefore, the 50-foot distance was selected as a median distance and will represent a uniform evaluation of noise impacts for all nine noise-sensitive receptor locations. In addition, since this analysis primarily compares traffic noise levels with and without action, those differences between receptors would remain constant. The most notable variable between alternatives is the projected traffic volume.

Regional Haul Routes Noise

The proposed regional haul routes in the Cities of Marysville, Wheatland, Lincoln, Rocklin and Roseville include Highways 70 and 65, Interstate 80 and US Highway 50. The existing and future No Action/No Project Alternative ADT volumes along these highways would not be substantially affected by any vehicle additions as a result of the Folsom DS/FDR action. The combined construction workers and haul truck ADT volumes represent less than one percent of the total ADT volume along these proposed regional haul routes. In order to project an appreciable noise level increase of 3 dBA or greater would require the traffic volumes to double the existing or No Action/No Project Alternative traffic volumes. The projected increase in ADT volumes due to the actions would generate less than 0.3 dBA increase in existing noise levels. Therefore, a detailed traffic noise modeling analysis was not conducted for the regional haul routes.

Transportation Noise Impacts Significance Criteria

The existing peak hour noise levels (daytime L_{eq}) exceed FHWA NAC of 66 dBA at all nine noise-sensitive receptors. In addition, existing L_{dn} noise levels also exceed the each of the county and community exterior L_{dn}/CNEL maximum allowable noise levels of 60 dBA at all nine noise-sensitive receptors. Therefore, noise effects on noise-sensitive receptors were considered significant and would require evaluating noise mitigation measures if either of the following were predicted by the noise modeling results:

- The increase in existing (2006) noise levels, as a result of construction-related traffic associated with any of the action alternatives, would be 12 dBA or more per Caltrans noise policy; or

- The incremental change in traffic noise levels due to construction-related traffic from actions related to the Folsom DS/FDR would, at any noise-sensitive receptor, increase the peak hour L_{eq} and L_{dn} noise levels by 5 dBA or more above those of the No-Action/No Project Alternative. A 5-dBA threshold was selected since this change in noise levels is considered readily perceptible by humans.

Transportation Noise Environmental Impacts/Environmental Consequences

Environmental Consequences/Environmental Impacts of the No Action/No Project Alternative

The No Action/No Project Alternative would not generate construction traffic noise impacts relative to the existing conditions.

Under the No Action/No Project Alternative, the Folsom DS/FDR action would not be constructed. This analysis assumes that construction traffic under the No Action/No Project Alternative would be the same as under existing conditions (i.e., there would be none). There would be no impact of the No Action/No Project Alternative.

Environmental Consequences/Environmental Impacts of Alternative 1

Truck and construction worker traffic would generate transportation noise impacts.

Tables 3.10-17 through 3.10-25 present a summary of the projected daytime and nighttime peak hour L_{eq} and L_{dn} noise levels for each noise-sensitive receptor and each action alternative, and compare them to the existing and No Action/No Project Alternative noise levels. The details behind results of the traffic noise modeling analysis are presented in Appendix G.

The transport of construction workers, materials, and equipment to the construction and borrow sites under Alternative 1 would generate daytime and nighttime peak hour L_{eq} and L_{dn} noise levels increases of less than 4 dBA when compared to existing noise levels at each Noise-Sensitive Receptor. These noise level increases would be well below the Caltrans noise policy of a 12-dBA allowable noise level increase over existing conditions. Similarly, Alternative 1 would generate less than a 2 dBA increase in peak hour L_{eq} and L_{dn} noise levels when compared to the No Action/No Project Alternative noise levels for 2009. These small incremental changes are well below the 5-dBA significance criterion threshold. The highest noise impact under Alternative 1 would occur at Noise-Sensitive Receptor 4 on East Natoma Street, which would be a 3.1 dBA increase over existing conditions.

This impact would be less than significant and would not require mitigation.

Environmental Consequences/Environmental Impacts of Alternative 2
Truck and construction worker traffic would generate transportation noise impacts.

Tables 3.10-17 through 3.10-25 present a summary of the projected daytime and nighttime peak hour L_{eq} and L_{dn} noise levels for each noise-sensitive receptor and each action alternative, and compare them to the existing and No Action/No Project Alternative noise levels.

The transport of construction workers, materials, and equipment to the construction and borrow sites under Alternative 2 would generate daytime and nighttime peak hour L_{eq} and L_{dn} noise levels increases of less than 4 dBA when compared to existing noise levels at each Noise-Sensitive Receptor. These noise level increases would be well below the Caltrans noise policy of a 12-dBA allowable noise level increase over existing conditions. Similarly, Alternative 2 would generate less than a 2 dBA increase in peak hour L_{eq} and L_{dn} noise levels when compared to the No Action/No Project Alternative noise levels for 2009. These small incremental changes are well below the 5-dBA significance criterion threshold. The highest noise impact under Alternative 2 would occur at Noise-Sensitive Receptor 4 on East Natoma Street, which would be a 3.1 dBA increase over existing conditions.

This impact would be less than significant and would not require mitigation.

Table 3.10-17
Summary of Daytime Peak Hour Results
Daytime Peak Hour L_{eq} Noise Levels at 50 Feet from Local Roadways

Sensitive Noise Receiver Number	Local Roadway	Description	EXISTING: 2006	NO ACTION: 2009	Alternative 1	Alternative 2	Alternative 3	Alternative 4	NO ACTION: 2013	Alternative 5
			L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)
1	East Bidwell Street	Along Albrighton Drive, residential area adjacent to south bound lanes in Folsom	72.5	73.1	74.0	74.0	73.9	73.9	73.4	73.6
2	Oak Avenue Parkway	Along Thorndike Way, residential area adjacent to north bound lanes in Folsom	68.9	70.0	70.3	70.3	70.3	70.3	70.3	70.6
3	Green Valley Road	Parking lot adjacent to residential area along Kipps Lane, north of Green Valley Road in El Dorado Hills, El Dorado County	71.6	72.7	73.8	72.9	72.8	73.0	73.0	73.1
4	East Natoma Road	End of Pomine Court, residential area along east bound lanes in Folsom	66.8	68.9	69.9	69.9	69.7	69.7	69.2	69.6
5	Folsom-Auburn Road	7550 Folsom-Auburn Road is in a residential area along the south bound lanes in Folsom	72.5	73.8	73.9	73.9	73.8	73.9	74.1	74.2
6	Blue Ravine Road	Blackberry Circle, residential area along north bound lanes in Folsom	69.3	69.7	70.5	70.5	70.3	70.3	70.0	70.2
7	Sierra College Boulevard	End of Kilmartin Court, residential street adjacent to south bound lanes in Rocklin, Placer County	70.6	71.0	71.5	71.5	71.6	71.5	71.3	72.1
8	Douglas Boulevard	4600-4699 Rolling Oaks Drive, residential area adjacent to west bound lanes in Granite Bay, Placer County	72.5	73.0	73.1	73.3	73.1	73.1	73.3	73.6
9	Eureka Road	1445 Eureka Road, multi-family residential development (225 units) on north bound lanes in Roseville, Placer County	72.4	72.7	72.8	72.9	72.8	72.8	73.1	73.1

Table 3.10-18
Comparison of Alternatives to Existing Noise Levels in 2006
Change in Daytime L_{eq} Noise Levels at 50 Feet from Local Roadways

Sensitive Noise Receiver Number	Local Roadway	Description	EXISTING: 2006	NO ACTION: 2009	Alternative 1	Alternative 2	Alternative 3	Alternative 4	NO ACTION: 2013	Alternative 5
			L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)
1	East Bidwell Street	Along Albrighton Drive, residential area adjacent to south bound lanes in Folsom	--	0.6	1.5	1.5	1.4	1.4	0.9	1.1
2	Oak Avenue Parkway	Along Thorndike Way, residential area adjacent to north bound lanes in Folsom	--	1.1	1.4	1.4	1.4	1.4	1.4	1.7
3	Green Valley Road	Parking lot adjacent to residential area along Kipps Lane, north of Green Valley Road in El Dorado Hills, El Dorado County	--	1.1	2.2	1.3	1.2	1.4	1.4	1.5
4	East Natoma Road	End of Pomine Court, residential area along east bound lanes in Folsom	--	2.1	3.1	3.1	2.9	2.9	2.4	2.8
5	Folsom-Auburn Road	7550 Folsom-Auburn Road is in a residential area along the south bound lanes in Folsom	--	1.3	1.4	1.4	1.3	1.4	1.6	1.7
6	Blue Ravine Road	Blackberry Circle, residential area along north bound lanes in Folsom	--	0.4	1.2	1.2	1.0	1.0	0.7	0.9
7	Sierra College Boulevard	End of Kilmartin Court, residential street adjacent to south bound lanes in Rocklin, Placer County	--	0.4	0.9	0.9	1.0	0.9	0.7	1.5
8	Douglas Boulevard	4600-4699 Rolling Oaks Drive, residential area adjacent to west bound lanes in Granite Bay, Placer County	--	0.5	0.6	0.8	0.6	0.6	0.8	1.1
9	Eureka Road	1445 Eureka Road, multi-family residential development (225 units) on north bound lanes in Roseville, Placer County	--	0.3	0.4	0.5	0.4	0.4	0.7	0.7

Table 3.10-19
Comparison of Alternatives to Projected No Action Noise Levels in 2009 and 2013
Daytime L_{eq} Noise Levels at 50 Feet from Local Roadways

Sensitive Noise Receiver Number	Local Roadway	Description	EXISTING: 2006	NO ACTION: 2009	Alternative 1	Alternative 2	Alternative 3	Alternative 4	NO ACTION: 2013	Alternative 5
			L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)
1	East Bidwell Street	Along Albrighton Drive, residential area adjacent to south bound lanes in Folsom	--	--	0.9	0.9	0.8	0.8	--	0.2
2	Oak Avenue Parkway	Along Thorndike Way, residential area adjacent to north bound lanes in Folsom	--	--	0.3	0.3	0.3	0.3	--	0.3
3	Green Valley Road	Parking lot adjacent to residential area along Kipps Lane, north of Green Valley Road in El Dorado Hills, El Dorado County	--	--	1.1	0.2	0.1	0.3	--	0.1
4	East Natoma Road	End of Pomine Court, residential area along east bound lanes in Folsom	--	--	1.0	1.0	0.8	0.8	--	0.4
5	Folsom-Auburn Road	7550 Folsom-Auburn Road is in a residential area along the south bound lanes in Folsom	--	--	0.1	0.1	0.0	0.1	--	0.1
6	Blue Ravine Road	Blackberry Circle, residential area along north bound lanes in Folsom	--	--	0.8	0.8	0.6	0.6	--	0.2
7	Sierra College Boulevard	End of Kilmartin Court, residential street adjacent to south bound lanes in Rocklin, Placer County	--	--	0.5	0.5	0.6	0.5	--	0.8
8	Douglas Boulevard	4600-4699 Rolling Oaks Drive, residential area adjacent to west bound lanes in Granite Bay, Placer County	--	--	0.1	0.3	0.1	0.1	--	0.3
9	Eureka Road	1445 Eureka Road, multi-family residential development (225 units) on north bound lanes in Roseville, Placer County	--	--	0.1	0.2	0.1	0.1	--	0.0

Table 3.10-20
Summary of Nighttime Peak Hour Results
Nighttime Peak Hour L_{eq} Noise Levels at 50 Feet from Local Roadways

Sensitive Noise Receiver Number	Local Roadway	Description	EXISTING: 2006 L_{eq} (dBA)	NO ACTION: 2009 L_{eq} (dBA)	Alternative 1 L_{eq} (dBA)	Alternative 2 L_{eq} (dBA)	Alternative 3 L_{eq} (dBA)	Alternative 4 L_{eq} (dBA)	NO ACTION: 2013 L_{eq} (dBA)	Alternative 5 L_{eq} (dBA)
1	East Bidwell Street	Along Albrighton Drive, residential area adjacent to south bound lanes in Folsom	66.0	66.5	66.5	66.5	66.5	66.5	66.8	66.8
2	Oak Avenue Parkway	Along Thorndike Way, residential area adjacent to north bound lanes in Folsom	62.4	63.3	63.7	63.7	63.7	63.7	63.7	64.1
3	Green Valley Road	Parking lot adjacent to residential area along Kipps Lane, north of Green Valley Road in El Dorado Hills, El Dorado County	65.0	66.1	66.2	66.5	66.7	66.7	66.4	66.7
4	East Natoma Road	End of Pomine Court, residential area along east bound lanes in Folsom	60.2	62.3	63.9	64.1	63.9	63.9	62.6	63.9
5	Folsom-Auburn Road	7550 Folsom-Auburn Road is in a residential area along the south bound lanes in Folsom	66.0	67.3	67.7	67.7	67.4	67.7	67.6	68.1
6	Blue Ravine Road	Blackberry Circle, residential area along north bound lanes in Folsom	62.7	63.0	63.2	63.2	63.2	63.2	63.4	63.4
7	Sierra College Boulevard	End of Kilmartin Court, residential street adjacent to south bound lanes in Rocklin, Placer County	64.0	64.3	65.0	65.1	65.0	65.0	64.6	65.3
8	Douglas Boulevard	4600-4699 Rolling Oaks Drive, residential area adjacent to west bound lanes in Granite Bay, Placer County	65.9	66.4	66.7	66.7	66.7	66.7	66.8	67.3
9	Eureka Road	1445 Eureka Road, multi-family residential development (225 units) on north bound lanes in Roseville, Placer County	65.8	66.2	66.2	66.2	66.2	66.2	66.5	66.5

Table 3.10-21
Comparison of Alternatives to Existing Noise Levels in 2006
Change in Nighttime L_{eq} Noise Levels at 50 Feet from Local Roadways

Sensitive Noise Receiver Number	Local Roadway	Description	EXISTING: 2006 L_{eq} (dBA)	NO ACTION: 2009 L_{eq} (dBA)	Alternative 1 L_{eq} (dBA)	Alternative 2 L_{eq} (dBA)	Alternative 3 L_{eq} (dBA)	Alternative 4 L_{eq} (dBA)	NO ACTION: 2013 L_{eq} (dBA)	Alternative 5 L_{eq} (dBA)
1	East Bidwell Street	Along Albrighton Drive, residential area adjacent to south bound lanes in Folsom	--	0.5	0.5	0.5	0.5	0.5	0.8	0.8
2	Oak Avenue Parkway	Along Thorndike Way, residential area adjacent to north bound lanes in Folsom	--	0.9	1.3	1.3	1.3	1.3	1.3	1.7
3	Green Valley Road	Parking lot adjacent to residential area along Kipps Lane, north of Green Valley Road in El Dorado Hills, El Dorado County	--	1.1	1.2	1.5	1.7	1.7	1.4	1.7
4	East Natoma Road	End of Pomine Court, residential area along east bound lanes in Folsom	--	2.1	3.7	3.9	3.7	3.7	2.4	3.7
5	Folsom-Auburn Road	7550 Folsom-Auburn Road is in a residential area along the south bound lanes in Folsom	--	1.3	1.7	1.7	1.4	1.7	1.6	2.1
6	Blue Ravine Road	Blackberry Circle, residential area along north bound lanes in Folsom	--	0.3	0.5	0.5	0.5	0.5	0.7	0.7
7	Sierra College Boulevard	End of Kilmartin Court, residential street adjacent to south bound lanes in Rocklin, Placer County	--	0.3	1.0	1.1	1.0	1.0	0.6	1.3
8	Douglas Boulevard	4600-4699 Rolling Oaks Drive, residential area adjacent to west bound lanes in Granite Bay, Placer County	--	0.5	0.8	0.8	0.8	0.8	0.9	1.4
9	Eureka Road	1445 Eureka Road, multi-family residential development (225 units) on north bound lanes in Roseville, Placer County	--	0.4	0.4	0.4	0.4	0.4	0.7	0.7

Table 3.10-22
Comparison of Alternatives to Projected No Action Noise Levels in 2009 and 2013
Nighttime L_{eq} Noise Levels at 50 Feet from Local Roadways

Sensitive Noise Receiver Number	Local Roadway	Description	EXISTING: 2006	NO ACTION: 2009	Alternative 1	Alternative 2	Alternative 3	Alternative 4	NO ACTION: 2013	Alternative 5
			L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)	L_{eq} (dBA)
1	East Bidwell Street	Along Albrighton Drive, residential area adjacent to south bound lanes in Folsom	--	--	0.0	0.0	0.0	0.0	--	0.0
2	Oak Avenue Parkway	Along Thorndike Way, residential area adjacent to north bound lanes in Folsom	--	--	0.4	0.4	0.4	0.4	--	0.4
3	Green Valley Road	Parking lot adjacent to residential area along Kipps Lane, north of Green Valley Road in El Dorado Hills, El Dorado County	--	--	0.1	0.4	0.6	0.6	--	0.3
4	East Natoma Road	End of Pomine Court, residential area along east bound lanes in Folsom	--	--	1.6	1.8	1.6	1.6	--	1.3
5	Folsom-Auburn Road	7550 Folsom-Auburn Road is in a residential area along the south bound lanes in Folsom	--	--	0.4	0.4	0.1	0.4	--	0.5
6	Blue Ravine Road	Blackberry Circle, residential area along north bound lanes in Folsom	--	--	0.2	0.2	0.2	0.2	--	0.0
7	Sierra College Boulevard	End of Kilmartin Court, residential street adjacent to south bound lanes in Rocklin, Placer County	--	--	0.7	0.8	0.7	0.7	--	0.7
8	Douglas Boulevard	4600-4699 Rolling Oaks Drive, residential area adjacent to west bound lanes in Granite Bay, Placer County	--	--	0.3	0.3	0.3	0.3	--	0.5
9	Eureka Road	1445 Eureka Road, multi-family residential development (225 units) on north bound lanes in Roseville, Placer County	--	--	0.0	0.0	0.0	0.0	--	0.0

Table 3.10-23
Summary of 24 Hour Ldn Results
L_{dn} Noise Levels at 50 Feet from Local Roadways

Sensitive Noise Receiver Number	Local Roadway	Description	EXISTING: 2006	NO ACTION: 2009	Alternative 1	Alternative 2	Alternative 3	Alternative 4	NO ACTION: 2013	Alternative 5
			L_{dn} (dBA)	L_{dn} (dBA)	L_{dn} (dBA)	L_{dn} (dBA)	L_{dn} (dBA)	L_{dn} (dBA)	L_{dn} (dBA)	L_{dn} (dBA)
1	East Bidwell Street	Along Albrighton Drive, residential area adjacent to south bound lanes in Folsom	74.2	74.7	75.1	75.1	75.1	75.1	75.0	75.1
2	Oak Avenue Parkway	Along Thorndike Way, residential area adjacent to north bound lanes in Folsom	70.6	71.5	71.9	71.9	71.9	71.9	71.9	72.3
3	Green Valley Road	Parking lot adjacent to residential area along Kipps Lane, north of Green Valley Road in El Dorado Hills, El Dorado County	73.2	74.3	74.9	74.6	74.7	74.8	74.6	74.8
4	East Natoma Road	End of Pomine Court, residential area along east bound lanes in Folsom	68.4	70.5	71.9	72.0	71.8	71.8	70.8	71.7
5	Folsom-Auburn Road	7550 Folsom-Auburn Road is in a residential area along the south bound lanes in Folsom	74.2	75.5	75.7	75.7	75.5	75.7	75.8	76.1
6	Blue Ravine Road	Blackberry Circle, residential area along north bound lanes in Folsom	70.9	71.2	71.7	71.7	71.6	71.6	71.6	71.7
7	Sierra College Boulevard	End of Kilmartin Court, residential street adjacent to south bound lanes in Rocklin, Placer County	72.2	72.5	73.2	73.2	73.2	73.2	72.8	73.6
8	Douglas Boulevard	4600-4699 Rolling Oaks Drive, residential area adjacent to west bound lanes in Granite Bay, Placer County	74.1	74.6	74.8	74.9	74.8	74.8	75.0	75.4
9	Eureka Road	1445 Eureka Road, multi-family residential development (225 units) on north bound lanes in Roseville, Placer County	74.0	74.4	74.4	74.4	74.4	74.4	74.7	74.7

Table 3.10-24
Comparison of Alternatives to Existing Noise Levels in 2006
Change in L_{dn} Noise Levels at 50 Feet from Local Roadways

Sensitive Noise Receiver Number	Local Roadway	Description	EXISTING: 2006	NO ACTION: 2009	Alternative 1	Alternative 2	Alternative 3	Alternative 4	NO ACTION: 2013	Alternative 5
			L_{dn} (dBA)	L_{dn} (dBA)	L_{dn} (dBA)	L_{dn} (dBA)	L_{dn} (dBA)	L_{dn} (dBA)	L_{dn} (dBA)	L_{dn} (dBA)
1	East Bidwell Street	Along Albrighton Drive, residential area adjacent to south bound lanes in Folsom	--	0.5	1.0	1.0	0.9	0.9	0.8	0.9
2	Oak Avenue Parkway	Along Thorndike Way, residential area adjacent to north bound lanes in Folsom	--	1.0	1.3	1.3	1.3	1.3	1.3	1.7
3	Green Valley Road	Parking lot adjacent to residential area along Kipps Lane, north of Green Valley Road in El Dorado Hills, El Dorado County	--	1.1	1.7	1.4	1.5	1.6	1.4	1.6
4	East Natoma Road	End of Pomine Court, residential area along east bound lanes in Folsom	--	2.1	3.5	3.6	3.4	3.4	2.4	3.3
5	Folsom-Auburn Road	7550 Folsom-Auburn Road is in a residential area along the south bound lanes in Folsom	--	1.3	1.6	1.6	1.4	1.6	1.6	1.9
6	Blue Ravine Road	Blackberry Circle, residential area along north bound lanes in Folsom	--	0.3	0.8	0.8	0.7	0.7	0.7	0.8
7	Sierra College Boulevard	End of Kilmartin Court, residential street adjacent to south bound lanes in Rocklin, Placer County	--	0.3	1.0	1.0	1.0	1.0	0.6	1.4
8	Douglas Boulevard	4600-4699 Rolling Oaks Drive, residential area adjacent to west bound lanes in Granite Bay, Placer County	--	0.5	0.7	0.8	0.7	0.7	0.9	1.3
9	Eureka Road	1445 Eureka Road, multi-family residential development (225 units) on north bound lanes in Roseville, Placer County	--	0.4	0.4	0.4	0.4	0.4	0.7	0.7

Table 3.10-25
Comparison of Alternatives to Projected No Action Noise Levels in 2009 and 2013
L_{dn} Noise Levels at 50 Feet from Local Roadways

Sensitive Noise Receiver Number	Local Roadway	Description	EXISTING: 2006 L_{dn} (dBA)	NO ACTION: 2009 L_{dn} (dBA)	Alternative 1 L_{dn} (dBA)	Alternative 2 L_{dn} (dBA)	Alternative 3 L_{dn} (dBA)	Alternative 4 L_{dn} (dBA)	NO ACTION: 2013 L_{dn} (dBA)	Alternative 5 L_{dn} (dBA)
1	East Bidwell Street	Along Albrighton Drive, residential area adjacent to south bound lanes in Folsom	--	--	0.4	0.4	0.4	0.4	--	0.1
2	Oak Avenue Parkway	Along Thorndike Way, residential area adjacent to north bound lanes in Folsom	--	--	0.4	0.4	0.4	0.4	--	0.4
3	Green Valley Road	Parking lot adjacent to residential area along Kipps Lane, north of Green Valley Road in El Dorado Hills, El Dorado County	--	--	0.6	0.3	0.4	0.5	--	0.2
4	East Natoma Road	End of Pomine Court, residential area along east bound lanes in Folsom	--	--	1.4	1.5	1.3	1.3	--	0.9
5	Folsom-Auburn Road	7550 Folsom-Auburn Road is in a residential area along the south bound lanes in Folsom	--	--	0.3	0.3	0.1	0.3	--	0.3
6	Blue Ravine Road	Blackberry Circle, residential area along north bound lanes in Folsom	--	--	0.5	0.5	0.4	0.4	--	0.1
7	Sierra College Boulevard	End of Kilmartin Court, residential street adjacent to south bound lanes in Rocklin, Placer County	--	--	0.6	0.7	0.7	0.6	--	0.7
8	Douglas Boulevard	4600-4699 Rolling Oaks Drive, residential area adjacent to west bound lanes in Granite Bay, Placer County	--	--	0.2	0.3	0.2	0.2	--	0.4
9	Eureka Road	1445 Eureka Road, multi-family residential development (225 units) on north bound lanes in Roseville, Placer County	--	--	0.0	0.1	0.0	0.0	--	0.0

Environmental Consequences/Environmental Impacts of Alternative 3
Truck and construction worker traffic would generate transportation noise impacts.

Tables 3.10-17 through 3.10-25 present a summary of the projected daytime and nighttime peak hour L_{eq} and L_{dn} noise levels for each noise-sensitive receptor and each action alternative, and compare them to the existing and No Action/No Project Alternative noise levels.

The transport of construction workers, materials, and equipment to the construction and borrow sites under Alternative 3 would generate daytime and nighttime peak hour L_{eq} and L_{dn} noise levels increases of less than 3 dBA when compared to existing noise levels at each Noise-Sensitive Receptor. These noise level increases would be well below the Caltrans noise policy of a 12-dBA allowable noise level increase over existing conditions. Similarly, Alternative 3 would generate less than a 2 dBA increase in peak hour L_{eq} and L_{dn} noise levels when compared to the No Action/No Project Alternative noise levels for 2009. These small incremental changes are well below the 5-dBA significance criterion threshold. The highest noise impact under Alternative 3 would occur at Noise-Sensitive Receptor 4 on East Natoma Street, which would be a 2.9 dBA increase over existing conditions.

This impact would be less than significant and would not require mitigation.

Environmental Consequences/Environmental Impacts of Alternative 4
Truck and construction worker traffic would generate transportation noise impacts.

Tables 3.10-17 through 3.10-25 present a summary of the projected daytime and nighttime peak hour L_{eq} and L_{dn} noise levels for each noise-sensitive receptor and each action alternative, and compare them to the existing and No Action/No Project Alternative noise levels.

The transport of construction workers, materials, and equipment to the construction and borrow sites under Alternative 4 would generate daytime and nighttime peak hour L_{eq} and L_{dn} noise levels increases of less than 3 dBA when compared to existing noise levels at each Noise-Sensitive Receptor. These noise level increases would be well below the Caltrans noise policy of a 12-dBA allowable noise level increase over existing conditions. Similarly, Alternative 4 would generate less than a 2 dBA increase in peak hour L_{eq} and L_{dn} noise levels when compared to the No Action/No Project Alternative noise levels for 2009. These small incremental changes are well below the 5-dBA significance criterion threshold. The highest noise impact under Alternative 4 would occur at Noise-Sensitive Receptor 4 on East Natoma Street, which would be a 2.9 dBA increase over existing conditions.

This impact would be less than significant and would not require mitigation.

Environmental Consequences/Environmental Impacts of Alternative 5
Truck and construction worker traffic would generate transportation noise impacts.

Tables 3.10-17 through 3.10-25 present a summary of the projected daytime and nighttime peak hour L_{eq} and L_{dn} noise levels for each noise-sensitive receptor and each action alternative, and compare them to the existing and No Action/No Project Alternative noise levels.

The transport of construction workers, materials, and equipment to the construction and borrow sites under Alternative 4 would generate daytime and nighttime peak hour L_{eq} and L_{dn} noise levels increases of less than 3 dBA when compared to existing noise levels at each Noise-Sensitive Receptor. These noise level increases would be well below the Caltrans noise policy of a 12-dBA allowable noise level increase over existing conditions. Similarly, Alternative 5 would generate less than a 2 dBA increase in peak hour L_{eq} and L_{dn} noise levels when compared to the No Action/No Project Alternative noise levels for 2013. These small incremental changes are well below the 5-dBA significance criterion threshold. The highest noise impact under Alternative 5 would occur at Noise-Sensitive Receptor 4 on East Natoma Street, which would be a 2.8 dBA increase over existing conditions.

This impact would be less than significant and would not require mitigation.

Comparison of Alternatives Transportation Noise

Projected daytime and nighttime peak hour L_{eq} and L_{dn} noise level increases for each alternative would be well below the Caltrans noise policy of a 12-dBA allowable noise level increase over existing conditions. Similarly, all five action alternatives would generate less than a 2-dBA increase in peak hour L_{eq} and L_{dn} noise levels when compared to the noise levels of the No Action/No Project Alternative. These small incremental changes are well below the 5 dBA significance criterion threshold.

3.10.2.3 Combined Construction and Traffic Noise Impacts

The potential for combined construction and traffic noise impacts would only occur at those noise-sensitive receptors located on the southern portion of Folsom Reservoir and in particular noise-sensitive receptors along Folsom-Auburn Road, East Natoma Street and adjacent to Green Valley Road. The background noise levels at these noise-sensitive receptors are dominated by traffic along adjacent roadways. On average, the construction employee vehicles and haul trucks would contribute less than a 4-dBA increase over existing and No Action/No Project Alternative daytime noise levels. Similarly, construction activities would generate less than 1 dBA increase over existing and No Action/No Project Alternative conditions during the daytime, and therefore, would not significantly increase noise impacts (i.e., less than a 5 dBA increase). During peak construction activities when construction would be occurring at its closest point to the noise-sensitive receptors would be when combined noise impact of both construction activities and traffic could elevate noise levels, but this would occur for only a short period of time during peak-hour traffic conditions.

During the nighttime, it is expected that construction activities would be the dominant noise source at East Natoma Street residential area because there would be less background and Folsom DS/FDR action related traffic and because the construction activities are closer to the noise-sensitive receptor then the other two locations. The projected L_{eq} noise level increase from construction activities would be approximately 2 to 4 dBA. At the Folsom-Auburn and Green Valley Road noise-sensitive receptors the existing and future No Action/No Project Alternative local traffic conditions would be the dominant noise source. Therefore, the increase in noise levels at these two locations associated with construction activities should be minor.

3.10.3 Mitigation Measures

The following measures will be implemented to reduce noise impacts. These measures will be incorporated into a Noise Control Plan (NCP) to address increased night time noise levels as a result of the Folsom DS/FDR action. The NCP will identify the procedures for predicting construction noise levels at the six noise-sensitive receptors prior to performing construction activities and describe the noise reduction measures required to meet the noise level limitations. The NCP will be based on construction activities planned and will be prepared by and bear the signature of the Acoustical Engineer. The noise mitigation measures will be implemented prior to any construction activity.

N-1: Appropriate level of sound attenuation will be utilized or constructed to meet local ordinances. Potential sound attenuation measures that could be considered include, but are not limited to, temporary sound barriers near the noise source, such as those considered in the impacts analysis relative to BACT for stationary/quasi-stationary equipment, or otherwise placed between the source(s) of construction noise and noise-sensitive receptors, as appropriate.

N-2: Contractor will be responsible for maintaining equipment to comply with noise standards (e.g., exhaust mufflers, acoustically attenuating shields, shrouds, or enclosures)

N-3: If necessary to meet local noise ordinances, enclosing above-ground conveyor systems in acoustically-treated enclosures

N-4: If necessary to meet local noise ordinances, lining or covering hoppers, conveyor transfer points, storage bins and chutes with sound-deadening material

N-5: Scheduling truck loading, unloading, and hauling operations so as to reduce nighttime noise impacts to less than noticeable levels

N-6: For nighttime or after-hour construction, the Contractor will obtain a permit from the City and County

N-7: Schedule restrictions on blasting will be implemented per City and County ordinances. Permits will be obtained if necessary or appropriate

N-8: Monitoring blasting vibration will be implemented as per Reclamation and Corps safety guidelines

N-9: Using blasting mats to cover blasts in order to minimize the possibility of fly rock

N-10: Examining of any properties, structures and conditions where complaints of damages have been filed will be performed within three weeks of rock excavation and blasting work

3.10.4 Cumulative Effects

The potential for cumulative noise impacts from other nearby projects occurring concurrently with the Folsom DS/FDR include the New Folsom Bridge project. Construction activities associated with Folsom DS/FDR would be similar to those anticipated for the New Folsom Bridge project. Similar construction activities include: earthwork, concrete work, blasting operations and truck hauling operations. Cumulative noise impacts would occur for residential areas along Folsom-Auburn Road south of Folsom Reservoir and along East Natoma Street in particular when the Auxiliary Spillway work and the New Folsom Bridge project would be under construction during the same period beginning 2008. Both projects include mitigation measures to minimize noise impacts and are anticipated to reduce the impacts to a less than significant level.

3.11 Cultural Resources

This section presents potential impacts to cultural resources from construction of the Folsom DS/FDR alternatives.

3.11.1 Affected Environment/Existing Conditions

3.11.1.1 Area of Analysis

This section is based on the results of a record search of documents at the North Central Information Center (California State University, Sacramento), documents supplied by Reclamation, and archaeological surveys conducted by Pacific Legacy (2006) and URS (2006). The results of the records review and archaeological surveys document the numbers and types of archaeological and historical resources recorded within the Folsom DS/FDR area of analysis.

The features in the area of analysis are listed beginning in the vicinity of Granite Bay and moving counter clockwise around Folsom Reservoir (see Figure 2-1). Following this order, the features include: Dike 1 Contractor Staging Area; Dikes 1, 2, and 3; Beal's / Granite Bay Borrow Site; Dike 4 Contractor Staging Area; Dike 4; Dike 5; Dike 5 Contractor Staging Area 1; Dike 5 Contractor Staging Area 2; Beal's / Dam Borrow Site and Right Wing Dam Haul Area; Dike 6; Dike 6 Contractor Staging Area; Right Wing Dam; Right Wing Dam Contractor Staging Area; Below Left Wing Dam; Dike 7; Dike 7 Contractor Staging Area; Dike 8; Dike 8 / MIAD Borrow Site and Left Wing Dam Haul Area; MIAD Borrow Site 2 (D2); MIAD Borrow Site 1 (D1); MIAD; and, Brown's Ravine Borrow Site. Additionally, the Main Concrete Dam, raised retention area, and new embankments/flood easements were included within the area of analysis.

3.11.1.2 Regulatory Setting

The National Historic Preservation Act (NHPA) of 1966, as amended through 1992, establishes a program for the preservation of historic properties throughout the nation. The State Historic Preservation Officer (SHPO) administers the national historic preservation program at the state level, reviews National Register of Historic Places (NRHP) nominations, maintains data on historic properties that have been identified but not yet nominated, and provides consultation for federal agencies during NHPA Section 106 review.

Reclamation, as lead Federal agency, and the Corps, as a cooperating agency, are responsible for compliance with Section 106 of the NRHP and its implementing regulations found at 36 CFR Part 800. Reclamation and the Corps have to take in account the effects of its undertaking on historic properties as defined in 36 CFR Part 60.4 and 36 CFR Part 800.16 (l). The criteria of determining historic properties are found at 36 CFR Part 800.4. When the effects of an undertaking are not fully known or the project extends over a period of years, Reclamation and the Corps may elect to follow an alternative process following procedures found in 36 CFR Part 800.14

which allows for the development of a programmatic agreement between consulting parties.

Under the National Environmental Policy Act (NEPA) (42 USC) Sections 4321-4327, Reclamation and the Corps are required to consider potential environmental impacts and appropriate mitigation measures for projects with Federal involvement.

A complete list of pertinent Federal laws, regulations and guidance that direct Reclamation cultural resources policies and responsibilities is found in Reclamation's Directives and Standards Manual LND 02-01 for Cultural Resource Management.

Project undertakings by Reclamation must follow directives and guidelines found in Reclamation Manuals LND P01, LND 02-01, LND 07-01. LND P01 establishes policy and authority for cultural resource identification, evaluation and management of cultural resources. LND 02-01 provides directives and standards and clarifies the role of Reclamation regarding implementation of its cultural resources management responsibilities. LND 07-01provides procedures for inadvertent discoveries on Reclamation land for cultural items which are under the authority of the Native American Graves Protection and Repatriation Act (NAGPRA).

Project undertakings by the Corps must follow guidelines found in the Planning Guidance Notebook. ER 1105-2-100 provides guidance for consideration of cultural resources in Civil Works planning studies, along with compliance requirements relevant to the identification, evaluation, and treatment of these cultural resources.

Assessment of effects focuses on properties listed or eligible for listing on the NRHP, properties known as historic properties, or sites designated as either historical resources or "unique archeological resources" as per the California Environmental Quality Act (CEQA) Guidelines. [1] Under CEQA, the evaluation of impacts on historical resources parallels federal law. Properties protected under CEQA include those eligible for listing or listed on the California Register of Historical Resources (CRHR) or those properties determined "unique archaeological resources." It should be noted that a property found not eligible for listing on the NRHP may be found to have historical significance for listing on the CRHR.

The CEQA Guidelines state that if a project follows the Secretary of Interior's Standards for the Treatment of Historic Properties, the impacts are considered "mitigated to a level of less than a significant impact" (CEQA Guidelines 15064.5[b][3]). Section 106 of the NHPA and its implementing regulations (36 CFR Part 800) require that the Advisory Council on Historic Preservation (ACHP),

[1] As defined either in 36 Code of Federal Regulations (CFR) 800.16(l) for federal actions or in the State CEQA Public Resources Code (PRC) (21084.1 and 21083.2) and the CEQA Guidelines (15064.5[a])

SHPO, and the interested public, including Native Americans, be provided an opportunity to comment on the effects that the proposed action may have on historic properties.

3.11.1.3 Environmental Setting

Ethnographic Overview

The area of analysis 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 (Beals 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); Beals (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 discussion 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). Beals (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, and 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. Beals (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 (Beals 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 (Hill 1972). 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. In fact, 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; Beals 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 Indians 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). Indian “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.

Historical Overview

Exploration into the interior of present-day California began in 1808 with an expedition led by the Spanish explorer Gabriel Moraga, who sought 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 1988). 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.

In the 1840s, fur trappers were followed by military expeditions, which were charged with exploring the region in advance of American westward expansion. A detachment of the Wilkes expedition, led by Lieutenant 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 twice in the 1840s on two separate expeditions.

The area surrounding the Folsom Reservoir was first settled by Euroamericans 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 quickly developed into communities to provide for the 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. 1990; Peak and Associates 1990; Waechter and Mikesell 1994).

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 that connected Sutter's Fort in Sacramento to his sawmill in Coloma. "By 1853, the camp had some 2,500 inhabitants and had three dry good 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). 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.

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 Natoma Water and Mining Company; and, the American River Ditch Company. Although several smaller companies, 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, were involved in the creation of water conveyance systems in the region, 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 Natoma 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 Natoma 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). As part of this move to waterpower 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 Folsom DS/FDR area 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 Natoma Vineyards Company and the North Fork Ditch Company. In the twentieth century, through a series of reorganizations and sales, the Natoma Water and Mining Company became simply the Natoma 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 in the area provided for the cultivation of grain, hay, wine grapes, oranges, and other fruits (Peak and Associates 1990). Although a small community existed at Salmon Falls, none of the numerous mining communities that existed in the area in the nineteenth century remained. By the early 1950s, when the federal government acquired the land for the construction of Folsom Dam, few people inhabited the Folsom DS/FDR area.

Construction of 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.

Archaeological Overview

The Folsom DS/FDR area of analysis lies within the eastern Sacramento Valley and western Sierra Nevada slope regions. Archaeologists have developed distinct cultural histories for each of these regions.

Sacramento Valley

Archaeological evidence suggests that the Sacramento Valley was initially settled in the terminal Pleistocene or early Holocene. Isolated finds of fluted projectile points are perhaps the best evidence for occupation of northern California between 12,000 and 10,000 Before Present (BP), although firm evidence has been elusive. Archaeological sites dated to the latter half of the Holocene have been documented in much greater numbers and detail in the Sacramento / San Joaquin Delta region than the preceding periods.

The first documented archaeological excavations were those of amateur archaeologists J.A. Barr, H.C. Meredith, and E.J. Dawson, who conducted archaeological investigations in the Central Valley of California between 1893 and

1901. Barr's excavations, which focused on mounds near Stockton, were later synthesized and published by H.C. Meredith (Meredith 1900). The first diachronic overview of the Northern San Joaquin Valley was published by E.J. Dawson and W.E. Schenck, who presented the findings of investigations of more than 90 archaeological sites in the region (Schenck and Dawson 1929).

Numerous investigations of the Central Valley were undertaken in the 1930s by Sacramento Junior College. Initial research focused on the mounds above the floodplain of the Cosumnes River (Lillard et al. 1939; Lillard and Purves 1936). Investigations of the Augustine (CA-SAC-127), Booth (CA-SAC-126), and Windmiller (CA-SAC-107) Mounds yielded a variety of features and artifacts including burials, shell beads, charmstones, and ornaments. Artifact typologies, burial patterns, and the "condition of human bones" (Moratto 1984) were used to distinguish cultural strata. Based on their findings, Lillard and Purves (1936) developed a three-stage cultural sequence comprised of "cultural levels:" *Early, Intermediate, and Late*.

This sequence was later elaborated by Lillard, Heizer, and Fenenga (1939). A *Delta Sequence*, composed of periods, was proposed by Lillard et al. (1939). The three periods, *Early*, *Transitional*, and *Late*, were distinguished based on mortuary patterns and ornamental artifacts. Beardsley (1948, 1954), Heizer (1949), and Ragir (1972) elaborated the *Delta Sequence*, which eventually evolved into the Central California Taxonomic System (CCTS). The CCTS proposed three cultural horizons: *Early, Middle,* and *Late*.

- The Early Horizon is characterized by ventrally extended, westward-oriented burials; highly mineralized skeletal material; perforated charmstones; quartz crystals in burials; *Olivella* and abalone beads and ornaments; large and heavy stemmed and leaf-shaped, flaked-stone projectile points commonly made of non-obsidian materials; and, rare milling equipment. Sites tended to be very compact and away from present water resources.

- The Middle Horizon is characterized by tightly flexed burials in varying orientation, some with powdered red ocher; imbedded projectile points in many of the burials (Beardsley 1948); diagnostic *Olivella* and *Haliotis* beads and ornaments; perforated canid teeth and bear claws; distinctively shaped charmstones lacking perforation; cobble mortars and chisel-ended pestles, seen by some as evidence of wooden mortars; an elaborate bone industry; large foliate and lanceolate concave base projectile points made of obsidian and other lithic materials; and, baked clay objects.

- The Late Horizon is characterized by various types of primary burial and cremations as well as pre-interment burning of funerary articles; light and friable skeletal material; animals skeletons with burials; an abundance of baked clay artifacts; distinctive shell and stone beads and ornaments; flanged tubular smoking pipes; small side-notched arrow points commonly made of obsidian; shaped flat-bottom mortars and cylindrical pestles; and, incised bird bone tubes. Sites are located near present water sources.

The CCTS has largely fallen out of favor with researchers because it does not reflect the great diversity in the archaeological record of central California. Smaller spheres of culture were largely ignored by the CCTS due to its bias towards material remains (Waechter and Mikesell 1994).

Fredrickson (1972, 1973) addressed many of the shortcomings of the CCTS when he proposed the use of *patterns,* modified by distinctive *aspects* and *phases*, which are not confined by temporal positions and serve to outline a general way of life. Such patterns are characterized by particular technological skills, economic forms, exchange networks, and ceremonial practices. Fredrickson identifies six such patterns in central California, and places them in a chronological framework. Three of these patterns are relevant to the prehistory of the Central Valley.

- The Windmiller Pattern (4,500-3,000 BP) encompasses components ascribed to the Early Horizon of the CCTS, and is characterized by a mixed economy that includes both game and plant exploitation. The Windmiller Pattern suggests a seasonal adaptation of winter habitation sites in the valley and summer camps in the foothills (Fredrickson 1973).

- The Berkeley Pattern (3,500-1,500 BP) corresponds with the Middle Horizon, and suggests a shift in milling equipment to a mortar and pestle technology and increased dependence on acorns. Projectile points and atlatls suggest that hunting game remained an important part of subsistence (Fredrickson 1973).

- The Augustine Pattern (1,500 BP - Contact) is widespread in central California, and represents a mixture of traits retained from the Berkeley Pattern as well as a number of introduced traits, including bow and arrow technology as reflected in Gunther Barbed and other small projectile points.

Sierra Nevada
Sierra Nevada prehistoric archaeological deposits were first found during the Gold Rush era. Deposits consisting of mortars, charmstones, pestles, and human remains were among the cultural resources discovered in the 1850s and 1860s (Moratto 1984). In the mid nineteenth century, mining led to the discovery of prehistoric sites. In the later nineteenth and twentieth centuries, dam construction within the Sierra also caused the discovery of numerous archaeological sites.

In 1952, a total of 26 northern Sierra sites were recorded by University of California Berkeley archaeologists, T. Bolt, A.B. Elsasser, and R.F. Heizer. Two archaeological cultures were identified from this survey, the Martis Complex (centered in the Martis Valley) and the Kings Beach Complex (Lake Tahoe area). The Martis Complex was unusual for its use of basalt rather than obsidian for tool making. Dates from the tools suggest the complex is dated from 4000-2000 years BC to AD 500 (Moratto 1984).

The Kings Beach Complex (AD 500-1800) was distinguished by flaked obsidian and silicate implements, small projectile points, the bow and arrow, and occasional scrapers and bedrock mortars (Moratto 1984). Two archaeologists, W.A. Davis and R. Elston, continued to piece together the connection between these two complexes and expanded testing. Jacks Lake and Spooner Lake Summit were two of the primary sites they used to develop a chronology that spanned about 7000 years (Moratto 1984).

In 1970, Ritter compared various Lake Oroville area sites to the Martis Valley and Kings Beach sites to help develop a chronology for the Lake Oroville area. The Lake Oroville chronology consists of the Mesilla, Bidwell, Sweetwater, and Oroville Complexes, as well as the ethnographic Maidu era, and spans a period of about 3000 years (Moratto 1984).

The Mesilla Complex was identified as a sporadic occupation of the foothills. People who created this complex hunted with atlatls and processed their food in mortar bowls and on millingstones. Shell beads, charmstones, and bone pins show a close relationship between the Mesilla Complex and the Sacramento Valley cultures between 1000 BC and AD 1 (Moratto 1984).

After the Mesilla Complex occupation, the cultural sequence continued with the Bidwell Complex from AD 1 to AD 800. The Bidwell Complex people lived in permanent villages, hunted deer and smaller game with slate and basalt projectile points, fished, ground acorns on millingstones, and collected fresh water mussels. A new cultural element for this complex was the manufacture of steatite cooking vessels (Moratto 1984).

The Sweetwater Complex (AD 800-1500) is defined by new cultural items and forms, which include: particular shell ornament types; wider use of steatite for cups, bowls and smoking pipes; and, small, lighter projectile points that indicate the use of bows and arrows for hunting (Moratto 1984).

The Oroville Complex is significant because it represents the protohistoric Nisenan (AD 1500 to 1833) (Moratto 1984). The Nisenan culture was characterized by bedrock mortars for acorn processing, dance halls, and burials placed in tightly flexed positions on their sides marked with stone cairns. The Lake Oroville Chronology sequence ended with the historic era and abandonment of traditional settlements in the nineteenth century (Moratto 1984).

Previous Research and Identified Cultural Resources

Folsom DS/FDR features were listed beginning in the vicinity of Granite Bay and moving counter clockwise around Folsom Reservoir (see Figure 2-1). Additionally, the Main Concrete Dam, raised retention area, and new embankments/flood easements were included within the area of analysis.

Dike 1 Contractor Staging Area

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

Dikes 1, 2, and 3

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

Reclamation is in the process of completing a NRHP nomination for the Central Valley Project (CVP). This nomination concludes that the dikes are non-contributing elements to the CVP Multiple Property Nomination (MPN). This determination will be reviewed by the Keeper of the NRHP.

Beal's / Granite Bay Borrow Site

The portion of this area located to the north of Mooney Ridge was surveyed by Far Western Anthropological Research Group (1992). The portion of this area located along and to the south of Mooney Ridge was surveyed by URS (2006).

The Far Western survey resulted in the discovery of 24 cultural resources. These cultural resources are listed in Table 3.11-1. The URS survey resulted in the discovery of four new sites, two new isolates, and the re-recording or re-visiting of four previously known sites. These cultural resources are listed in Table 3.11-2. An additional four sites were identified in the records search provided to Pacific Legacy by Reclamation. These cultural resources are listed in Table 3.11-3 and are located in the area south of Mooney Ridge.

Dike 4 Contractor Staging Area

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. Accessible/visible portions of the surface area were inspected. No cultural resources were located in this area.

Dike 4

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

Table 3.11-1 ***Cultural Resources within Beal's /Granite Bay Borrow Site (Far Western 1992)***				
Trinomial / Temporary No.	***Description***	***Date Recorded***	***Elevation (ft)***	***Management Recommendation (Far Western 1992)***
CA-PLA-158/ 255	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1975	435-460	Auger and test excavations
CA-PLA-248	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1977	420	Surface collect, record, analyze, and auger to test midden potential
CA-PLA-254	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1977	380	Auger and test excavations
CA-PLA-746	PREHISTORIC: Lithics	1992	410	Apply Sparse Lithic Scatter Data Acquisition Program (Jackson et al. 1988)
CA-PLA-747	PREHISTORIC: Groundstone and Lithics	1992	410	Surface collect, record, analyze, and auger to test midden potential
CA-PLA-748	PREHISTORIC: Lithics	1992	400	Apply Sparse Lithic Scatter Data Acquisition Program (Jackson et al. 1988)
CA-PLA-749/H	PREHISTORIC AND HISTORIC: Lithics and Historic Debris	1992	420	Surface collect, record, analyze, and auger to test midden potential
CA-PLA-750H	HISTORIC: Historic Debris	1992	410	Data potential exhausted by recordation
CA-PLA-751	PREHISTORIC: Lithics	1992	425	Surface collect, record, analyze, and auger to test midden potential
CA-PLA-752	PREHISTORIC: Lithics	1992	420	Apply Sparse Lithic Scatter Data Acquisition Program (Jackson et al. 1988)
CA-PLA-753	PREHISTORIC: Lithics	1992	415	Apply Sparse Lithic Scatter Data Acquisition Program (Jackson et al. 1988)
CA-PLA-754	PREHISTORIC: Groundstone and Lithics	1992	405	Surface collect, record, analyze, and auger to test midden potential
CA-PLA-755	PREHISTORIC: Lithics	1992	418	Apply Sparse Lithic Scatter Data Acquisition Program (Jackson et al. 1988)
CA-PLA-756	PREHISTORIC: Lithics	1992	420	Apply Sparse Lithic Scatter Data Acquisition Program (Jackson et al. 1988)
CA-PLA-759	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1992	440	Surface collect, record, analyze, and auger to test midden potential
CA-PLA-760	PREHISTORIC: Lithics (Potential Subsurface)	1992	405	Apply Sparse Lithic Scatter Data Acquisition Program (Jackson et al. 1988)
CA-PLA-761	PREHISTORIC: Groundstone and Lithics	1992	395	Surface collect, record, analyze, and auger to test midden potential
CA-PLA-762	PREHISTORIC: Groundstone and Lithics	1992	425	Surface collect, record, analyze, and auger to test midden potential
CA-PLA-763	PREHISTORIC: Groundstone and Lithics	1992	440	Apply Sparse Lithic Scatter Data Acquisition Program (Jackson et al. 1988)
CA-PLA-764	PREHISTORIC: Groundstone and Lithics	1992	430	Surface collect, record, analyze, and auger to test midden potential
CA-PLA-765	PREHISTORIC: Groundstone and Lithics	1992	425	Surface collect, record, analyze, and auger to test midden potential
CA-PLA-768	PREHISTORIC: Groundstone and Lithics	1992	405	Surface collect, record, analyze, and auger to test midden potential
CA-PLA-769/H	HISTORIC: Historic Debris	1992	480	Auger and test excavations
FD-23/90-1	PREHISTORIC: Groundstone and Lithics	1991	440	Surface collect, record, analyze, and auger to test midden potential

Table 3.11-2 ***Cultural Resources Within Beal's /Granite Bay Borrow Site (URS 2006)***				
Trinomial / Temporary No.	***Description***	***Date Recorded***	***Elevation (ft)***	***Management Recommendation***
CA-PLA-243	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1977	424	Not relocated during survey
CA-PLA-244	PREHISTORIC: Groundstone and Lithics	1977	426	None provided
CA-PLA-247H	HISTORIC: Historic Structure and Historic Debris	Unknown	390	Not relocated during survey
CA-PLA-520H	HISTORIC: Large Earthen Ditch	1992	460	Not relocated during survey
Site M-1	PREHISTORIC: Bedrock Mortars and Lithics	2005	420	None provided
Site M-2	PREHISTORIC: Groundstone and Lithics	2005	420	None provided
Site M-3	PREHISTORIC: Groundstone and Lithics	2005	420	None provided
Site M-4	PREHISTORIC: Groundstone and Lithics	2005	420	None provided
Isolate I-18	PREHISTORIC: Groundstone Fragment	2005	435	None provided
Isolate I-19	PREHISTORIC: Portable Anvil Stone	2005	460	None provided

Table 3.11-3 ***Cultural Resources Within Beal's /Granite Bay Borrow Site (North Central Information Center (NCIC) 2005)***				
Trinomial / Temporary No.	***Description***	***Date Recorded***	***Elevation (ft)***	***Management Recommendation***
CA-PLA-246	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1977	390	None provided
CA-PLA-249	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1977	415	None provided
CA-PLA-250H	HISTORIC: Concrete Structure near Flume	Unknown	400	None provided
CA-PLA-251H	HISTORIC: Historic Dump	Unknown	400	None provided

Dike 5 Contractor Staging Area 1

Portions of this area were surveyed by Welch (2005). The entire area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. Two cultural resources were recorded by Welch (2005) and re-recorded by Pacific Legacy (2006). These cultural resources are listed in Table 3.11-4.

Table 3.11-4
Cultural Resources Within Dike 5 Contractor Staging Area 1 (Pacific Legacy 2006)

Trinomial / Temporary No.	***Description***	***Date Recorded***	***Elevation (ft)***	***Management Recommendation***
Dike 5-1	HISTORIC: Concrete-lined rectangular pit with no associated artifacts or features	2005	400	Flag and avoid. Document and evaluate through historical research and test excavation.
Dike 5-2	HISTORIC: Water conveyance system consisting of earthen ditch, concrete intake, and six concrete supports for an approximately 24-inch pipe, which no longer is extant	2005	400	Flag and avoid. Document and evaluate through historical research.

Dike 5

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

Dike 5 Contractor Staging Area 2

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

Beal's / Dam Borrow Site and Right Wing Dam Haul Area

The portion of this area located to the south and east of Beal's Point was surveyed by Far Western Anthropological Research Group (1993). The portion of this area located along Beal's Point and to the north and west was surveyed by URS (2006).

The Far Western survey resulted in the discovery of ten cultural resources within the current Folsom DS/FDR area and the re-recording of two previously known cultural resources. These cultural resources are listed in Table 3.11-5. The URS survey resulted in the discovery of two new isolates. These cultural resources are listed in Table 3.11-6. An additional seven previously recorded sites were also noted on the records search provided to Pacific Legacy by Reclamation. The documents provided to Pacific Legacy by Reclamation did not include site records for six of these cultural resources. These cultural resources are listed in Table 3.11-7.

Dike 6

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

Dike 6 Contractor Staging Area

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

Right Wing Dam

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. Two previously recorded cultural resources were noted in the records search, but were not relocated during Pacific Legacy's survey. CA-SAC-412 is close to, but does not extend into, the present Folsom DS/FDR area. P-31-60 is an isolated find that was not relocated during Pacific Legacy's survey. The find was reported in fill on a bike path on top of the dam. The cultural resources are listed in Table 3.11-8.

Folsom Dam, including the Right Wing Dam, was found eligible for listing on the NRHP by the Corps in the report titled Cultural Resources Archaeological Survey and NRHP Evaluation of Folsom Dam and Properties for the Folsom Bridge Project and, on June 26, 2006, SHPO concurred with the finding that the dam is eligible under Criterion A.

Reclamation is in the process of completing a NRHP nomination for the CVP. This nomination concludes that Folsom Dam, including the central concrete structure and both adjacent wing dams, is considered a contributing element to the CVP MPN. This determination will be reviewed by the Keeper of the NRHP.

Table 3.11-5
Cultural Resources within Beal's / Dam Borrow Site and Right Wing Dam Haul Area (Far Western 1993)

Trinomial / Temporary No.	Description	Date Recorded	Elevation (ft)	Management Recommendation (Far Western 1992)
CA-PLA-253H	HISTORIC: Historic Structure	1993	380	Historical research, surface collection, and subsurface testing
CA-PLA-520H	HISTORIC: Large Earthen Ditch	1992	460	None provided
FD-3(I)	PREHISTORIC: Shale Stemmed Projectile Point Basal Fragment	1993	410	None provided
FD-47	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1993	422	Auger and test excavations
FD-48	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1993	429	Auger and test excavations
FD-50/H	PREHISTORIC AND HISTORIC: Groundstone and Lithics (Potential Subsurface) and Historic Debris	1993	405	Auger and test excavations
FD-52	PREHISTORIC: Lithics (Potential Subsurface)	1993	410	Auger to test for subsurface deposit and, if none, apply Sparse Lithic Scatter Data Acquisition Program (Jackson et al. 1988)
FD-55	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1993	370	Auger and test excavations
FD-56/H	PREHISTORIC AND HISTORIC: Lithics (Potential Subsurface) and Historic Debris	1993	390	Auger to test for subsurface deposit and, if none, apply Sparse Lithic Scatter Data Acquisition Program (Jackson et al. 1988)
FD-57	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1993	410	Auger and test excavations
FD-58	PREHISTORIC: Lithics (Potential Subsurface)	1993	412	Apply Sparse Lithic Scatter Data Acquisition Program (Jackson et al. 1988)
FD-59	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1993	410	Auger and test excavations

Table 3.11-6
Additional Cultural Resources within Beal's / Dam Borrow Site and Right Wing Dam Haul Area (URS 2006)

Trinomial / Temporary No.	Description	Date Recorded	Elevation (ft)	Management Recommendation
Isolate I-17	HISTORIC: Fourteen-inch-diameter Ferrous Pipe	2005	425	None provided
Isolate I-20	PREHISTORIC: Basalt Biface	1977	425	None provided

Table 3.11-7
Additional Cultural Resources within Beal's / Dam Borrow Site and Right Wing Dam Haul Area (NCIC 2005)

Trinomial / Temporary No.	Description	Date Recorded	Elevation (ft)	Management Recommendation
CA-PLA-435	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1987	400-410	None provided
CA-PLA-947	Unknown	Unknown	400	None provided
CA-PLA-948	Unknown	Unknown	420	None provided
CA-PLA-949	Unknown	Unknown	420	None provided
CA-PLA-950	Unknown	Unknown	400	None provided
CA-PLA-955	Unknown	Unknown	400	None provided
CA-PLA-959	Unknown	Unknown	420	None provided

Table 3.11-8
Cultural Resources within Right Wing Dam

Trinomial / Temporary No.	Description	Date Recorded	Elevation (ft)	Management Recommendation
CA-SAC-412	HISTORIC: Right-of-way of the Sacramento, Placer, and Nevada Railroad	1986	330	Resource recorded approximately one mile to southwest of Folsom DS/FDR area and does not exist in projected location within Folsom DS/FDR area
P-31-60	HISTORIC: One dressed stone noted in fill of American River Bike Path	1987	430	Data potential exhausted by recordation

Right Wing Dam Contractor Staging Area

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

Below Left Wing Dam
This area was surveyed by Bell (2004). No cultural resources were located during the survey. The area was greatly disturbed from dam construction. No cultural resources were located in this area.

Folsom Dam, including the Left Wing Dam, was found eligible for listing on the NRHP by the Corps in the report titled Cultural Resources Archaeological Survey and National Register Evaluation of Folsom Dam and Properties for the Folsom Bridge Project and, on June 26, 2006, SHPO concurred with the finding that the dam is eligible under Criterion A.

Dike 7
This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

Dike 7 Contractor Staging Area
This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

Dike 8
This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

Dike 8 / MIAD Borrow Site and Left Wing Dam Haul Area
This area was surveyed by URS (2006). The URS survey resulted in the discovery of seven new isolates. These cultural resources are listed in Table 3.11-9.

Table 3.11-9 Cultural Resources within Dike 8/MIAD Borrow Site and Left Wing Dam Haul Area (URS 2006)				
Trinomial / Temporary No.	***Description***	***Date Recorded***	***Elevation (ft)***	***Management Recommendation***
Isolate I-6	HISTORIC: Concrete Barrier Post	2005	450	None provided
Isolate I-7	HISTORIC: Iron Ferry Platform at end of Dike 8	2005	470	None provided
Isolate I-8	HISTORIC: Concrete Blocks at north end of Dike 8	2005	470	None provided
Isolate I-9	PREHISTORIC: Basalt Core	2005	450	None provided
Isolate I-21	PREHISTORIC: Basalt Flake and Quartzite Hammerstone	2005	450	None provided
Isolate I-22	PREHISTORIC: Obsidian Biface	2005	440	None provided
Isolate I-23	PREHISTORIC: Quartzite Flake	2005	440	None provided

MIAD Borrow Site 2 (AKA D2)

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. One cultural resource was located during survey of area by Pacific Legacy. This resource is listed in Table 3.11-10.

Table 3.11-10 Cultural Resource within MIAD Borrow Site 2 (D2) (Pacific Legacy 2006)				
Trinomial / Temporary No.	***Description***	***Date Recorded***	***Elevation (ft)***	***Management Recommendation***
PL-FDEIS-1	HISTORIC: Small Prospect Pit (3 m by 3 m) with no associated artifacts or features	2006	500	Flag and avoid. Document and evaluate through historical research and test excavation.

MIAD Borrow Site 1 (AKA D1)

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

MIAD

This area was surveyed by Pacific Legacy (2006). The entire area was walked in transects of no greater than ten meters. The entire surface was inspected. No cultural resources were located in this area.

Brown's Ravine Borrow Site

This area was surveyed by URS (2006), Welch et al. (2004), and West (1990). The URS survey resulted in the discovery of ten new isolates and the re-recording of one previously known site. These cultural resources are listed in Table 3.11-11. An additional six previously recorded sites were also noted on the records search provided to Pacific Legacy by Reclamation. The documents provided to Pacific Legacy by Reclamation did not include site records for these cultural resources. These cultural resources are listed in Table 3.11-12.

Table 3.11-11
Cultural Resources within Brown's Ravine Borrow Site (URS 2006)

Trinomial / Temporary No.	Description	Date Recorded	Elevation (ft)	Management Recommendation
Site FDSOD-3	PREHISTORIC: Bedrock Mortars, Groundstone, and Lithic Scatter	2004	443	None provided
Isolate I-1	HISTORIC: Red Brick Fragment	2005	400	None provided
Isolate I-2	HISTORIC: Two-inch-diameter Iron Pipe Fragment and White Ceramic	2005	400	None provided
Isolate I-3	HISTORIC: Wooden Platform, Iron Braces, and Willows	2005	400	None provided
Isolate I-4	HISTORIC: Two-inch-diameter Iron Pipe	2005	430	None provided
Isolate I-11	HISTORIC: Beer Can	2005	450	None provided
Isolate I-12	HISTORIC: Ovate Schist Rock Pile and Red Brick Fragments	2005	450	None provided
Isolate I-13	HISTORIC: Red Brick Fragment	2005	450	None provided
Isolate I-14	HISTORIC: Corrugated Metal Pipe	2005	430	None provided
Isolate I-16	HISTORIC: One-half-inch-diameter Iron Pipe	2005	450	None provided
Isolate I-17	HISTORIC: Fourteen-inch-diameter Ferrous Pipe	2005	450	None provided

Table 3.11-12
Previously Recorded Cultural Resources within Brown's Ravine Borrow Site (NCIC 2005)

Trinomial / Temporary No.	Description	Date Recorded	Elevation (ft)	Management Recommendation
CA-ELD-261	PREHISTORIC: Groundstone and Lithics (Potential Subsurface)	1977	430-435	None, resource previously determined ineligible for NRHP
CA-ELD-1238/H	HISTORIC: Natoma Ditch	1996	Unknown	None Provided
Site FDSOD-1	HISTORIC: Historic Foundation, Trash Pit, and Historic Debris	2004	405	None provided
Site FDSOD-2	HISTORIC: Historic Foundation, Footings, Orchard, and Historic Debris	2004	410	None provided
Site FDSOD-4	PREHISTORIC: Groundstone and Lithics	2004	422	None provided
Site FDSOD-5	PREHISTORIC: Groundstone and Lithics	2004	422	None provided

Main Concrete Dam

As part of Alternatives 1 through 5, as outlined in Section 2.2, modifications would be made to the Main Concrete Dam structure. Folsom dam was found eligible for listing on the NRHP by the Corps in the report titled Cultural Resources Archaeological Survey and National Register Evaluation of Folsom Dam and Properties for the Folsom Bridge Project and, on June 26, 2006, SHPO concurred with the finding that the dam is eligible under Criterion A. If one and/or portions of Alternatives 1 through 5 are chosen, Reclamation and the Corps will follow the requirements of Section 106 of the NHPA as implemented in 36 CFR Part 800. Reclamation will follow the Policies and Directives found in LND P01, LND 02-01, LND 07-01, and the Corps will follow guidelines found in the Planning Guidance Notebook, ER 1105-2-100.

Raised Impoundment Area

As part of Alternatives 2 through 5 as outlined in Section 2.2, there exists a potential for an increased retention area for the reservoir. This increased retention area has not been subject to inventory for cultural resources. If one and/or portions of Alternatives 2 through 5 are chosen, Reclamation and the Corps will follow the requirements of Section 106 of the NHPA as implemented in 36 CFR Part 800. Reclamation will follow the Policies and Directives found in LND P01, LND 02-01, LND 07-01, and the Corps will follow guidelines found in the Planning Guidance Notebook, ER 1105-2-100.

New Embankments/Flood Easements

As part of Alternatives 2 through 5 as outlined in Section 2.2, new embankments/flood easements may need to be constructed at low points surrounding the reservoir due to the raised retention area. The locations of the new embankments/flood easements have not been subject to inventory for cultural resources. If one and/or portions of Alternatives 2 through 5 are chosen, Reclamation and the Corps will follow the requirements of Section 106 of the NHPA as implemented in 36 CFR Part 800. Reclamation will follow the Policies and Directives found in LND P01, LND 02-01, LND 07 01, and the Corps will follow guidelines found in the Planning Guidance Notebook, ER 1105-2-100.

3.11.2 Environmental Consequences/Environmental Impacts

A historic property and/or a historical resource must possess at least one of the criterion of eligibility and retain the quality of integrity. The concept of integrity is usually interpreted to mean "intactness" of physical characteristics, but in terms of the NRHP and the CRHR, integrity is a measure of the degree to which a property retains or is able to convey the essential characteristics defined under one of the four eligibility criteria. These characteristics may be expressed through integrity of location, design, setting, materials, workmanship, feeling, and association of a property. An archaeological property may retain sufficient integrity to qualify it for the NRHP or CRHR if the property retains the ability to yield information important to an understanding of history or prehistory

The standard for integrity for NRHP eligible properties is more stringent than that for CRHR eligible cultural resources. It should be noted that a property found to not retain sufficient integrity to be NRHP eligible may be found to possess sufficient integrity to be CRHR eligible. One identified cultural resource within the Folsom DS/FDR area, the Folsom Dam, has been found eligible for listing on the NRHP and is considered a historic property and historical resource. None of the other identified cultural resources within the Folsom DS/FDR area have been formally evaluated as to their eligibility for listing on either the NRHP or the CRHR, with the exception of ELD-261 which was found to be not eligible for listing in the NRHP.

Federal significance criteria apply because the proposed action constitutes a federal undertaking that requires compliance with Section 106 of the NHPA. Cultural resource significance is evaluated in terms of eligibility for listing on the NRHP. NRHP criteria for eligibility are defined as follows:

> The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association, and that:
>
> a) are associated with events that have made a contribution to the broad pattern of our history;
>
> b) are associated with the lives of people significant in our past;

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

d) have yielded, or are likely to yield, information important in prehistory or history (36 CFR Part 60.4).

Section 106 of the NHPA and its implementing regulations (36 CFR Part 800) require that the ACHP, SHPO, and the interested public, including Native Americans, be provided an opportunity to comment on the effects that the proposed action may have on historic properties.

CEQA defines a significant historical resource as “a resource listed or eligible for listing on the California Register of Historical Resources” (Pub. Res. Code Section 5024.1). For a historical resource to be eligible for listing on the CRHR, it must be significant at the local, state, or national level under one or more of the following four criteria:

1) it is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States;

2) it is associated with the lives of persons important to local, California, or national history;

3) it embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master or possesses high artistic values; or,

4) it has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California, or the nation.

Historical resources automatically listed on the CRHR include those historic properties listed on, or formally determined eligible for listing on the NRHP.

3.11.2.1 Assessment Methods

The criteria for determining the historical significance of cultural resources are the NRHP eligibility criteria as defined at 36 CFR Part 60.4, and the CRHR eligibility criteria as defined at Section 5024.1 of the California Public Resources Code. One identified cultural resource within the Folsom DS/FDR area, the Folsom Dam, has been found eligible for listing on the NRHP and is considered a historic property and historical resource. None of the other identified cultural resources within the Folsom DS/FDR area have been evaluated as to their eligibility for listing on either the

NRHP or the CRHR, with the exception of ELD-261 which was found to be not eligible for listing in the NRHP. Federal agencies are responsible to make determinations of NRHP eligibility for cultural resources that will be affected by an undertaking. SHPO concurrence with the agencies' NRHP determinations is necessary for a formal determination. Alternatively, an evaluation of a historic property may be submitted to the Keeper of the NRHP for a formal determination of NRHP eligibility.

The analysis of potential impacts to historic properties employs the Criteria of Adverse Effect as developed by the ACHP in its regulations for the "Protection of Historic Properties" (36 CFR Part 800.5). Adverse effects and/or significant impacts can occur when NRHP eligible or listed sites, structures, buildings, objects, or districts are subjected to one or more of the following effects:

- physical destruction or alteration of all or part of the property;
- isolation of the property from or alteration of the property's setting when that character contributes to the property's qualification for the NRHP;
- introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
- neglect of a property resulting in its deterioration or destruction; and,
- transfer, lease, or sale of the property (36 CFR Part 800.6).

Because the proposed action must also comply with CEQA, an impact is considered potentially significant if an action would have an effect that may change the historical significance of the resource (Pub. Res. Code Section 21084.1). Demolition, replacement, substantial alteration, and relocation of historic properties are actions that would change the historical significance of a property eligible for listing or listed on the CRHR.

3.11.2.2 Environmental Consequences/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

Under the No Action/No Project Alternative as outlined in Section 2.2, no construction-related activities or changes in current operation would take place. Therefore, no construction-related effects would occur. No new operation-related effects would result from this alternative. Current existing conditions, such as disturbance to cultural resources by looters, vehicles, wave action erosion, sedimentation, changing water levels, and redistribution of cultural materials would continue.

The No Action/No Project Alternative would have no effect on cultural resources.

Environmental Consequences/Environmental Impacts of Alternative 1
Construction would lead to adverse effects to historic properties and/or historical resources.

All of the Folsom DS/FDR areas associated with Alternative 1, as outlined in Section 2.2, have been subject to cultural resources survey and inventory. Under this alternative, a number of the cultural resources listed in Tables 3.11-1 through 3.11-12 would be impacted. The exact number of cultural resources that would be impacted is dependent upon the water elevation at the time of implementation of the alternatives and also the area subject to ground disturbance during construction. One identified cultural resource within the Folsom DS/FDR area, the Folsom Dam (including the Left Wing Dam and Right Wing Dam), has been found eligible for listing on the NRHP and is considered a historic property and historical resource. However, none of the other identified cultural resources have been evaluated as to NRHP and CRHR eligibility, with the exception of ELD-261 which was found to be not eligible for listing in the NRHP. Thus, the total number of historic properties (NRHP) or historical resources (CRHR) that would be impacted by implementation of Alternative 1 is unknown. Reclamation and the Corps will ensure that those cultural resources located within the area of potential effects (APE) will be evaluated for possible inclusion within the NRHP and the CRHR. Once historic properties and/or historical resources are identified, Reclamation and the Corps will invoke the criteria of effect to determine the level of alternative effects to each historic property and historical resource. Adverse effects will be resolved, under the NHPA, through development of an agreement document. Under NEPA and CEQA, construction-related impacts to historic properties and/or historical resources would be significant.

This impact would be potentially significant if historic properties or historical resources are identified. Implementation of Mitigation Measure CR-1 would reduce this impact to a less than significant level.

Construction would lead to adverse effects to previously unknown historic properties and/or historical resources.

There always exists the possibility that ground disturbing activities could result in the inadvertent discovery of potential historic properties and/or historical resources.

This impact would be potentially significant if historic properties or historical resources are identified. Implementation of Mitigation Measure CR-1, as appropriate, would reduce this impact to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 2
Alternative 2, as outlined in Section 2.2, would have the same effect on cultural resources as Alternative 1 with exception to one additional impact.

Construction would lead to adverse effects upon previously undiscovered and potential historic properties and/or historical resources within the area of the increased reservoir elevation, and locations of new embankment, or footprints of construction work at existing Folsom Facilities.

Portions of the shoreline around the retention area as well as the locations of the necessary new embankments/flood easements have not been subject to cultural resources survey and inventory. The remaining Folsom DS/FDR areas associated with Alternative 2 have been subject to cultural resources survey and inventory. However, identified cultural resources have not been subject to evaluation as to NRHP and CRHR eligibility.

This impact would be potentially significant. Implementation of Mitigation Measure CR-1, as appropriate, would reduce this impact to a less than significant level.

Environmental Consequence/Environmental Impacts of Alternative 3
Alternative 3, as outlined in Section 2.2, would have the same effect on cultural resources as Alternative 2. Implementation of Mitigation Measure CR-1, as appropriate, would reduce this impact to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 4
Alternative 4, as outlined in Section 2.2, would have the same effect on cultural resources as Alternative 2. A 7 foot dam raise could result in more areas of inundation during high storm events. Implementation of Mitigation Measure CR-1, as appropriate, would reduce this impact to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 5
Alternative 5, as outlined in Section 2.2, would have the same effect on cultural resources as Alternative 2. A 17 foot dam raise could result in more areas of inundation during high storm events. Implementation of Mitigation Measure CR-1, as appropriate, would reduce this impact to a less than significant level.

3.11.3 Comparative Analysis of Alternatives

Of the six alternatives presented, only the No Action/No Project Alternative would pose no new impacts to potential historic properties and/or historical resources. However, impacts associated with the current operation of the facilities (i.e., disturbance to cultural resources by looters, vehicles, wave action erosion, sedimentation, changing water levels, redistribution of cultural materials, etc.) would continue. The remaining five action alternatives pose varying degrees of potential impacts to potential historic properties and/or historical resources depending on the height of the dam raise and extent of construction activities. All alternative impacts would be mitigated to less than significant levels.

Of the five action alternatives, Alternative 1 poses the least amount of potential impacts to historic properties and/or historical resources. Alternative 1 would not increase the reservoir maximum surface elevation and, thus, would not result in impacts to potential historic properties and/or historical resources located within the increased retention area or footprints of the new embankments/flood easements, which would not be constructed under this alternative. In addition to impacts associated with current operation of the facilities, Alternative 1 would impact potential historic properties and/or historical resources, if found, that have been identified within the Folsom DS/FDR area. Ground disturbing activities may also impact previously unknown historic properties and/or historical resources inadvertently discovered.

Alternative 2 poses greater potential impacts than Alternative 1 because this alternative would extend the Maximum Flood Zone and require the construction dam raises and new embankments/flood easements. The increase in Maximum Flood Zone may lead to impacts to sites as a result of inundation, wave action, and/or erosion. In addition to the impacts posed by Alternative 1, Alternative 2 would result in potential impacts to potential historic properties and/or historical resources located within the increased retention area and the footprints of the new embankments/flood easements. The potential impacts of Alternative 2 are less than those of Alternatives 4 and 5 due. Alternative 3 poses similar impacts to Alternative 2.

Alternative 4 poses greater potential impacts than Alternatives 1 through 3. This alternative would extend the Maximum Flood Zone to a greater level than that of Alternatives 2 and 3. Alternative 4 would result in potential impacts to potential historic properties and/or historical resources located within the increased retention area and the footprints of the new embankments/flood easements. Alternative 5 poses greater potential impacts than Alternatives 1 through 4 because this alternative would extend the Maximum Flood Zone to a greater level than that of Alternatives 2 through 4.

3.11.4 Mitigation Measures

Implementation of Mitigation Measure CR-1 would reduce all potential impacts to a less than significant level. Adverse effects to historic properties, under Section 106, are resolved through development of an agreement document.

CR-1: Identification, Evaluation and Mitigation (Treatment) of Impacts to Historic Properties and/or Historical Resources.

All cultural resources located within the APE will be evaluated for inclusion in the NRHP and the CRHR using criteria found at 36 CFR Part 800.4 or CRHR

Guidelines. A memorandum of agreement or a programmatic agreement will be developed, in consultation with SHPO and consulting parties, to mitigate impacts to any identified historic properties or historic resources. The implementation of the agreement document will reduce impacts to historic properties or historic resources to less than significant levels, per NEPA and CEQA. Cultural resources that are determined to be not eligible for inclusion in the NRHP or the CRHR require no further management. It should be noted that some cultural resources may not meet NRHP eligibility criteria, but still may be CRHR eligible and could be managed per CEQA but not per NEPA.

If human remains are discovered on federal land, procedures outlined in 35 CFR 800.13(b) 'Discoveries without prior planning' and Reclamation's Directive and Standards for the Inadvertent Discovery of Human Remains (LND 07-01) will be followed.

The standard contract specifications contain directions to follow in the unlikely event of the discovery of other cultural resources during the construction phase of this project. Any such discovery will also be considered under the provisions of 36 CFR Part 800.13.

3.11.5 Cumulative Effects

Table 5-1 presents the projects that were considered in the analysis of cumulative effects. These are the New Folsom Bridge, Future Redundant Water Supply Intake and Pipeline for Roseville, Folsom and San Juan Water District, Folsom Dam Road Closure, L.L. Anderson Dam, Lower American River Common Features Project, Long Term Reoperation of Folsom Reservoir, and Sacramento Municipal Utility District Transmission Line Relocation. In addition to these projects, continued county, municipal, and private development in the region surrounding Folsom Dam should also be considered in this cultural resources analysis. Non-federal development in the surrounding region, not subject to NEPA or CEQA, has resulted in impacts to historic and prehistoric resources.

For some of the cumulative projects listed above, the impacts on historic properties would not be known until further site-specific historic resource studies have been undertaken, project designs have been more fully developed, and projects implemented. For federal projects, the lead federal agency would carry out any necessary inventories and evaluations of NRHP significance; consultation with the SHPO and Native American groups and interested parties; and treatment/mitigation required by Section 106 of the NRHP.

Cultural resources have been affected by past actions since Folsom Dam was constructed in 1956. Cultural resources could be subject to damage from ongoing maintenance, new construction, demolition, rehabilitation of existing facilities, and natural processes (e.g., wave erosion). The No Action/No Project Alternative would not result in a substantial change to the current condition of known or previously undiscovered cultural resources. Alternatives 1 through 5 have the potential to contribute to the loss of regional cultural resources as a consequence of disturbance or degradation of known or previously undiscovered archaeological sites. Alternative 1 would have the least potential to impact cultural resources. Alternatives 2 through 5 would incrementally increase the potential to impact cultural resources.

With the growth potential of the area around the Folsom DS/FDR, private development in El Dorado, Placer, and Sacramento Counties may lead to incremental adverse impacts to cultural resources. However, provided that proper mitigation consistent with Section 106 of the NHPA for federal actions and CEQA for state, county and municipal actions, is implemented in conjunction with development of related projects in these counties and the surrounding region, no significant cumulative impacts are anticipated. The Folsom DS/FDR, in conjunction with the cumulative projects listed above, and the growth potential of the region, could lead to cumulative impacts to cultural resources. However, provided that proper mitigation consistent with Section 106 of the NHPA for federal actions and CEQA for state, county and municipal actions, is implemented for all projects, cumulative impacts would likely be avoided. The Folsom DS/FDR would implement appropriate mitigation measures and would therefore not contribute to a significant cumulative impact to cultural resources.

3.12 Land Use, Planning, and Zoning

This section discusses existing land uses, local General Plan Land Use designations and Zoning, and non-Federal land that could potentially be affected by the Folsom DS/FDR action. The Folsom DS/FDR action proposes construction modifications to the Folsom Facility. As described in Chapter 2, Project Description and Project Alternatives, this includes a variety of improvements to dams, dikes and spillways within El Dorado, Placer and Sacramento Counties. Portions of the Folsom Lake State Recreation Area (FLSRA) are within Placer, Sacramento and El Dorado Counties. The City of Folsom directly abuts the FLSRA to the south within Sacramento County. Folsom State Prison/California State Prison, Sacramento is adjacent to the project area within the City of Folsom.

3.12.1 Affected Environment/Existing Conditions

This section presents existing land uses and local General Plan Land Use designations and Zoning in the area around the Folsom Facility. It also includes properties and neighborhoods in or adjacent to proposed transportation haul routes. The project construction area and haul routes are defined in Chapter 2.

The affected environment includes many public recreation uses within the study area. This Land Use Section describes the various public recreation uses in general terms. A full analysis of the Folsom DS/FDR's impacts on recreation uses is included in Section 3.13, Recreation Resources.

3.12.1.1 Area of Analysis

The area of analysis is broken down into various federal, state, county and city jurisdictions. These include: Folsom Dam, jointly managed by Reclamation and the Corps; FLSRA, owned by Reclamation and managed under a lease by the California Department of Parks and Recreation (DPR); and adjacent local jurisdictions of Placer, El Dorado, and Sacramento Counties and the City of Folsom, through which material would be transported. Figure 3.12-1 shows Folsom Reservoir and adjacent jurisdictions.

3.12.1.2 Regulatory Setting

The FLSRA is managed by DPR in accordance with the FLSRA General Plan. An update to the FLSRA General Plan (1979) is currently being prepared by CDPR in partnership with Reclamation, and with a substantial amount of public participation. Since 1976, DPR has managed the land by lease or contract with Reclamation for the purpose of providing recreation opportunities to the public. The FLSRA General Plan discusses management of various environmental resources including: vegetation, wildlife, geology, soils, cultural resources, and land use. Tree removal policies are also included within the General Plan. The Land Use Element of the General Plan discusses planning concepts for General Land Use, Transportation and

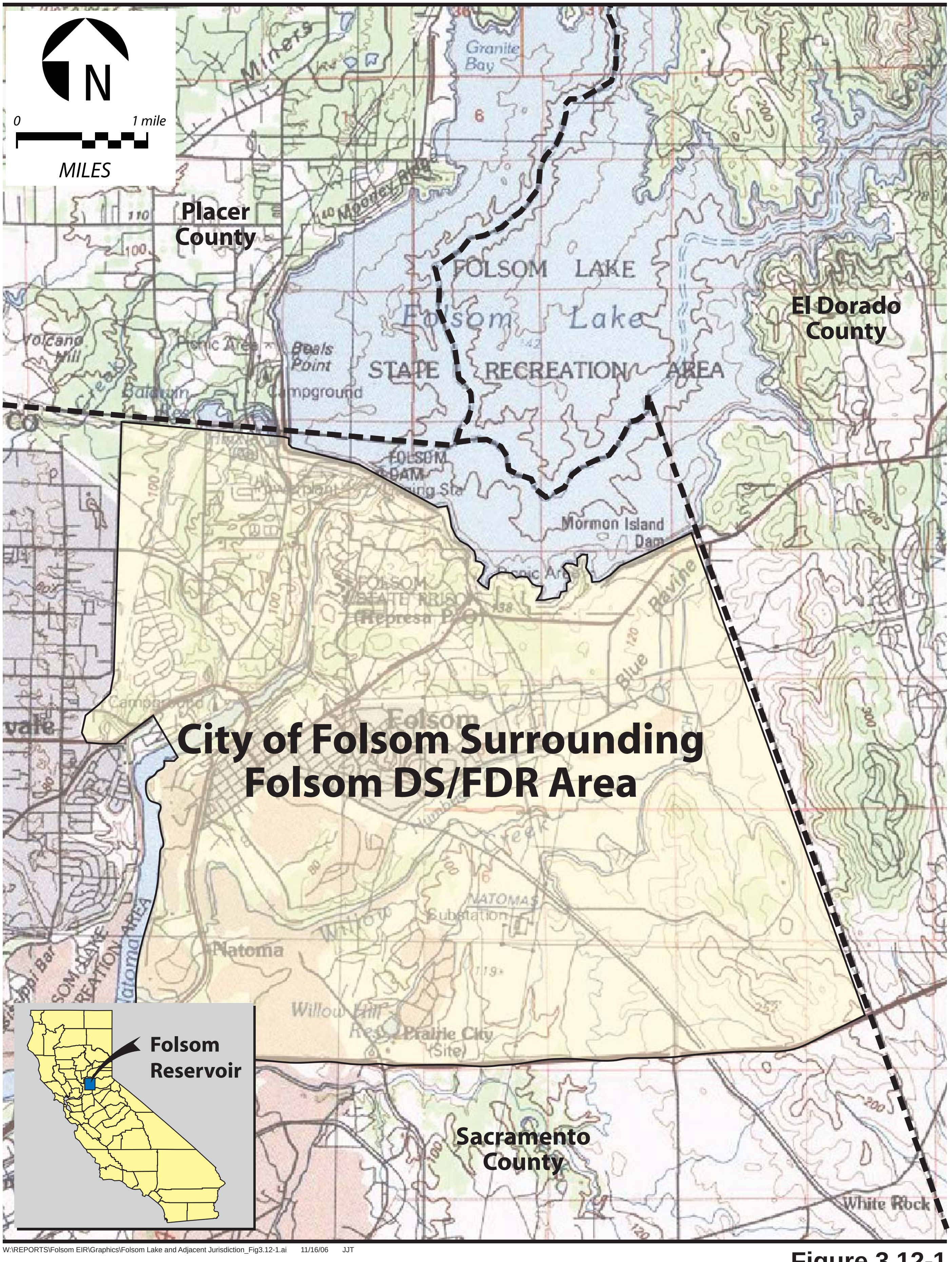


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Figure 3.12-1
Folsom Reservoir and Adjacent Jurisdiction

CDM

Circulation, Water Use, Recreational Opportunities, Interpretation and Acquisition as they apply to recreational uses at Folsom Reservoir (DPR 1979).

Placer County has jurisdiction over a portion of the affected environment. Several planning documents pertain to this area. These documents include: Placer County General Plan, Placer County Zoning Ordinance, Placer County Tree Preservation Ordinance, and Granite Bay Community Plan. The General Plan Draft EIR was also reviewed for information.

Several planning documents pertain to the El Dorado County portion of the study area and include: El Dorado County General Plan, El Dorado County Zoning Ordinance, El Dorado County Interim Interpretive Guidelines for General Plan Policy 7.4.4.4 – Forest and Oak Woodland Resources (Public Review Draft), and Northwest El Dorado Hills Specific Plan. The General Plan Draft EIR was also reviewed for information.

A portion of the Folsom DS/FDR study area is within Sacramento County; however, this portion of the study area falls entirely within the City of Folsom. Therefore, Sacramento County planning agencies do not have jurisdiction within the Folsom DS/FDR study area.

City of Folsom planning documents pertaining to the Folsom DS/FDR study area include: City of Folsom General Plan, City of Folsom Zoning Ordinance, and City of Folsom Tree Preservation Ordinance. The Folsom General Plan Draft EIR was also reviewed for information.

3.12.1.3 Environmental Setting

Folsom Reservoir and Folsom Lake State Recreation Area

The primary land uses within the FLSRA are recreation, flood management, water supply, and power generation. Recreation land uses are managed by DPR and include: water-related activities such as swimming, boating, fishing, waterskiing, and windsurfing; and non-water-related activities such as camping, hiking, mountain biking, the American River Bikeway, horseback riding, and picnicking. The park includes many facilities throughout all areas providing for boat launching and marina storage, day-use parking, camping areas, public restrooms and chemical toilets, equestrian staging areas, riding and hiking trails, bicycle trails, picnic areas with barbecues, and the Park Headquarters near the main dam. A paved road provides access throughout the park and to Folsom Reservoir (Wallace, Roberts, and Todd et al. 2003).

The FLSRA General Plan is the key planning document for this area. DPR is currently in the process of updating the FLSRA General Plan and Resource Management Plan. Information from the *Draft Resource Inventory for the Folsom Lake State Recreation Area*, April 2003 has been used for preparation of this section.

Placer County

The western portion of Folsom Reservoir is within Placer County from below Beal's Point at the southern end and includes approximately 15 miles of the western portion of the North Fork American River up to the City of Auburn. Several unincorporated communities exist adjacent to Folsom Reservoir. These include Granite Bay, Horseshoe Bar, Penryn, and Newcastle. According to the Placer County General Plan, adjacent generalized land uses to Folsom Reservoir include primarily Rural Residential, north of Horseshoe Bar Road; and Urban Residential, south of Horseshoe Bar Road to the Sacramento County line, with a small portion designated as agriculture. Granite Bay, Horseshoe Bar, and Penryn communities have their own Community Plans (Placer County 1994). Figure 3.12-2 shows the land use in Placer County.

The Folsom DS/FDR study area within Placer County includes existing roadways proposed for transport of construction materials from within the Folsom Reservoir boundary to dams and dikes in the FLSRA. These roads include:

- Auburn-Folsom Road from the Placer County line north to Douglas Boulevard.
- Douglas Boulevard from the intersection of Auburn-Folsom Road east to the Folsom Reservoir park entrance.
- The main park road from the park entrance north, then meandering down to Doton's Point located within the FLSRA.

Land uses adjacent to the FLSRA and east of Auburn-Folsom Road within the Folsom DS/FDR study area include urban and suburban residential, and commercial and public recreation. The areas along the western portion of Folsom Reservoir, north of Douglas Boulevard, include high-end custom estate homes with some smaller high-end homes within subdivisions. This area is commonly known as Granite Bay. Auburn-Folsom Road is a major arterial and scenic road that spans the entire western portion of Folsom Reservoir from the City of Auburn to the Sacramento County/City of Folsom line. Land uses along the proposed haul route on Auburn-Folsom Road include a mix of general commercial and urban residential. The urban residential portion includes a mix of high-end custom homes, older tract homes and new homes, and mobile home parks. The route along Douglas Boulevard to the State Park entrance includes a mix of older and newer subdivisions of single family homes. Several accessory uses exist within the residential areas including: schools, parks, churches, child-care facilities and necessary public and safety facilities. The general commercial land use areas include but are not limited to shopping centers, retail stores, restaurants, office buildings, and medical facilities (Placer County 1994).

Public recreation facilities include the American River Bike Trail, hiking and multi-use trails, horse assembly areas, and parking. These areas are between Folsom Reservoir and developed residential areas.

Zoning
Placer County zoning districts adjacent to the Folsom DS/FDR study area within the FLSRA and along proposed transportation routes are listed below.

- Residential Single-Family (RS) along Douglas Boulevard. The intent for this zoning district is to provide for residential development of detached single family homes within subdivisions.

- Residential Multi-Family (RM) along Auburn-Folsom Road, south of Douglas Boulevard. The purpose of this zoning district is to provide for multi-family development on one lot, halfplexes, duplexes, apartments and other multi-family attached dwelling units such as condominiums and onsite recreational amenities. It is also the intent to have these developments located near community facilities, business centers and major streets.

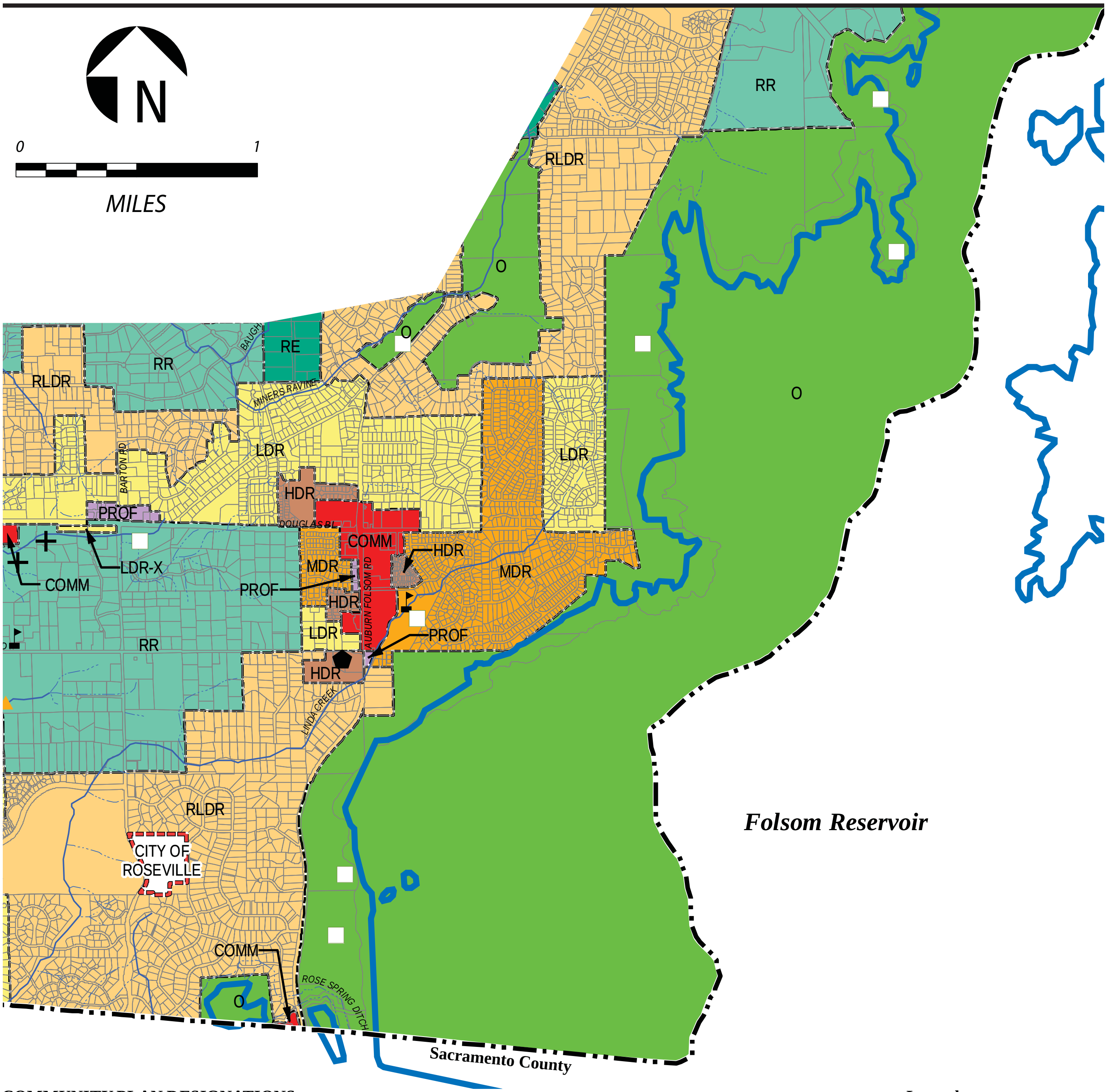
- The Residential Agriculture (RA) zoning district is at the northern end of the study area adjacent to the FLSRA. The intent of this zoning district is to stabilize and protect the rural residential characteristics of the area and provide an environment suitable for family life including agricultural uses.

- Office Professional (OP) within districts requiring Conditional Use (CU) Permit and Design Review approval (Dc) are along Auburn-Folsom Road. The OP zoning district is intended for development and operation of professional and administrative offices and personnel services instead of retail trade.

- Neighborhood Commercial (C1) is along Auburn-Folsom Road. The purpose of this zoning district is to provide areas for small-scale, day to day shopping and services for residents within an immediate neighborhood.

- Commercial Planned Development (CPD), Design Review required (Dc), CPD-Dc is along Auburn-Folsom Road and Douglas Boulevard. The intent of this zoning district is to provide excellence in site planning and building design for mixed-use community shopping centers, office parks, and other similar developments.

- Open Space (O) is between the FLSRA and all developed areas. The intent of this zoning district is to preserve open space areas by limiting allowable land uses to low intensity agricultural and public recreational uses (Placer County 2003).



COMMUNITY PLAN DESIGNATIONS

COMM	Commercial
PROF	Professional Office
HDR	High Density Residential 4 - 10 DU/Ac.
MDR	Medium Density Residential 2 - 4 DU/Ac.
LDR	Low Density Residential 0.4 - 0.9 Ac. Min.
RLDR	Rural Low Density Residential 4.6 - 20 Ac. Min.
RR	Rural Residential 2.3 - 4 Ac. Min.
RE	Rural Estate 4.6 - 20 Ac. Min.
O	Open Space
- DL	Density Limit
- X	Density Transfer Parcels

Density Receptor Parcel
Fire Station
Golf
Park
School

Legend

County Boundary
CityLimits
Parcels
Lakes
Intermittent
Perennial

Source: Placer County Community Development Resource Agency IT/GIS Division

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Figure 3.12-2
Placer County Land Uses Surrounding Folsom DS/FDR Area

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El Dorado County

The eastern portion of Folsom Reservoir is within El Dorado County. This includes the eastern portion of the North Fork American River within the reservoir boundary; and the South Fork American River within Folsom Reservoir down to the eastern edge of the Mormon Island Auxiliary Dam (MIAD). According to the El Dorado County General Plan, existing land uses adjacent to the Folsom DS/FDR study area include: Medium Residential, High Density Residential, Low Density Residential, Tourist Recreational, and Commercial. Figure 3.12-3 shows the land use in El Dorado County.

The study area within El Dorado County outside of the FLSRA includes Green Valley Road from the Folsom City line to the Folsom Reservoir Marina entrance road. This route would be used for transport of material to and from areas within the FLSRA. Land uses along this route include new planned unit developments, some currently under construction.

Zoning

El Dorado County zoning districts adjacent to the FLSRA and along proposed transportation routes include the following:

- Recreational Facilities between FLSRA and developed areas of El Dorado County. The intent of this zoning district is to allow for the development and maintenance of land suitable for public recreation and to protect lands from uses having an adverse effect on natural resources.
- One Family Residential at the north end of the El Dorado County study area within the Northwest El Dorado Hills Specific Plan area, north of the Specific Plan area, and along Green Valley Road. Planned unit developments are also located along Green Valley Road.
- Commercial uses along Green Valley Road. Allowed uses include commercial uses serving surrounding residential areas.
- Estate Residential 5 Acres along Green Valley Road. The purpose of this zoning district is to allow enough land for a one-family home and the ability to pursue horticulture and agriculture endeavors.
- One Half Acre Residential along Green Valley Road. The purpose of this zoning district is to allow enough land for a one-family home and limited ability to pursue horticulture and agriculture endeavors.

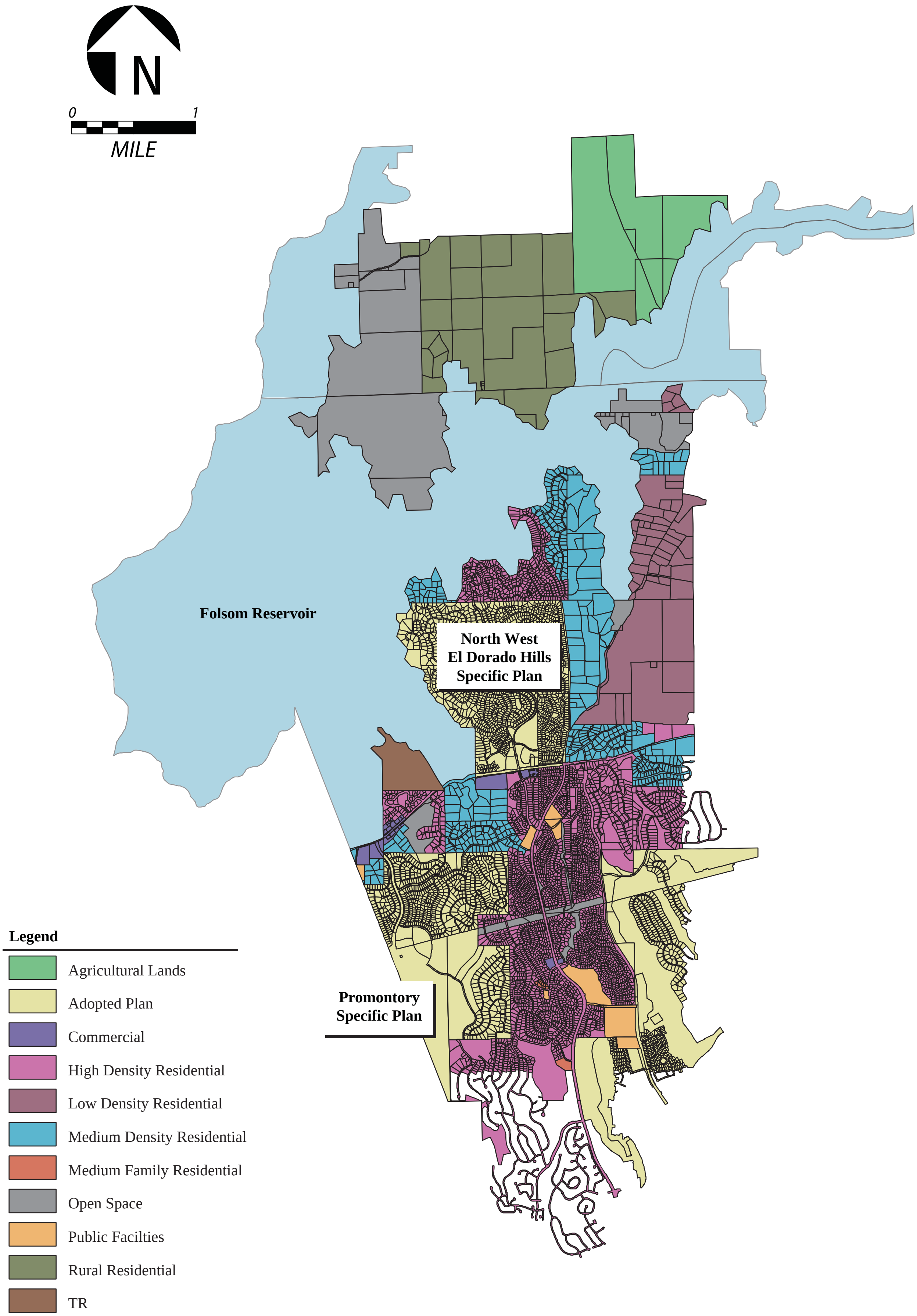

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Figure 3.12-3
El Dorado County Land Uses Surrounding Folsom DS/FDR Area

- Single Family Two Acres along Green Valley Road. The purpose of this zoning district is to allow for low-density suburban development with sufficient space for residents to pursue limited horticulture and agriculture endeavors.

Sacramento County
A portion of the Folsom DS/FDR study area is within Sacramento County; however, this portion of the study area falls entirely within the City of Folsom. Therefore, Sacramento County planning agencies do not have jurisdiction within the Folsom DS/FDR study area.

City of Folsom
The City of Folsom is within Sacramento County along the southern end of the FLSRA down to State Route 50. The City borders El Dorado County to the east and Placer County to the north. Folsom Dam is within the city limits and the American River flows from Folsom Reservoir through the City of Folsom to Lake Natoma. Figure 3.12-4 shows the zoning for the City of Folsom near the Folsom DS/FDR study area.

The study area within the Folsom City limits includes existing roadways where material would be transported to and from sites within the FLSRA.

Adjacent land uses outside of the FLSRA and within the City of Folsom include: Folsom Prison/California State Prison, Sacramento, which are two state facilities adjacent to one another located south of Folsom Dam Road and north of Natoma Street; a gated community located at the southern end of Folsom Reservoir and east of Folsom State Prison; single family small lot subdivisions and new and older planned unit developments along East Natoma Street and Green Valley Road; and public recreation.

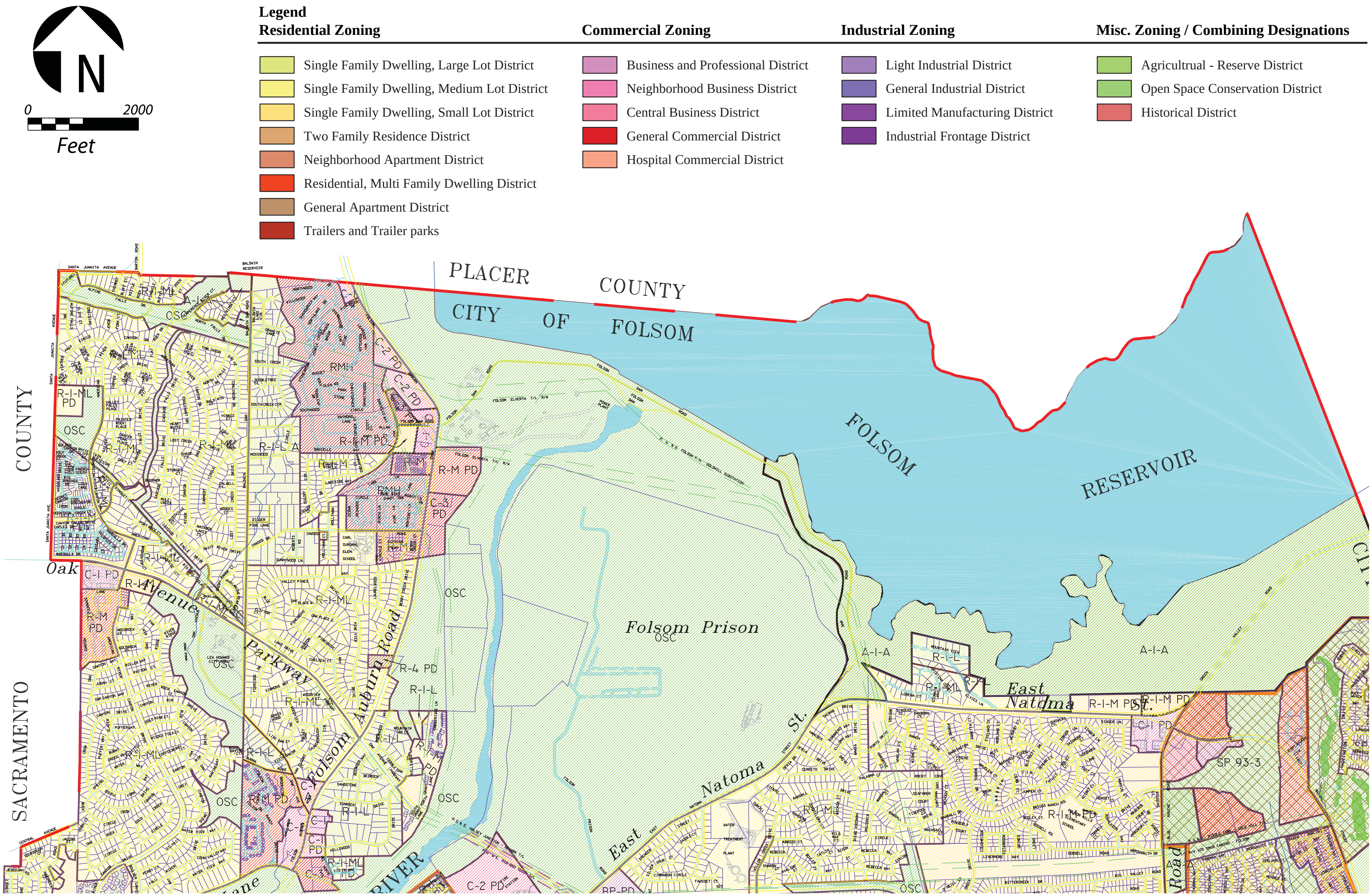

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Figure 3.12-4
City of Folsom Zoning Surrounding Folsom DS/FDR Area

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Zoning

According to the City of Folsom Zoning Ordinance, zoning districts adjacent to FLSRA and along proposed transportation routes include the following:

- A-1-A – Agricultural Reserve District is east of the prisons and provides a buffer between Folsom Reservoir and developed area 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. Minimum allowed lot area is 50 acres.

- R-1-L – Single Family Large Lot District north of East Natoma. This zoning district is intended for low-density, large-lot residential living.

- R-1-M PD – Single Family Dwelling Small Lot District Planned Development north and south of East Natoma to the intersection with Green Valley Road. This zoning district is intended for medium-density, small-lot residential living.

- OSC – Open Space Conservation District is at Folsom State Prison and California State Prison, Sacramento. The intent of this zoning district is to maintain these properties as open or undeveloped, or developed for permanent open uses such as parks and greenbelts.

- C-2-PD Central Business District Planned Development is along Auburn-Folsom Road north and south of the intersection with Folsom Dam Road. This zoning district is appropriate for a wide range of commercial activities serving the entire community including all sizes of shopping centers.

- RMH – Trailers and trailer parks are along Auburn-Folsom Road near the Placer County line. This zoning district is designated for mobile home parks defined as any tract of land where space is rented or held out for rent to one or more owners of mobile homes.

- C-1 – Neighborhood Business District on Auburn-Folsom Road at the Placer County line. This zoning district is for low-intensity commercial retail activities serving nearby residential areas.

3.12.2 Environmental Consequences/ Environmental Impacts

3.12.2.1 Assessment Methods

This environmental effects analysis uses both qualitative and quantitative methods to determine potential impacts to land use from construction of the project alternatives. Preliminary planning-level analyses from the PASS II Study Real Estate Plan are used to estimate the numbers and extent of parcels potentially affected by the various alternatives (Reclamation 2005g). However, as the preliminary parcel impacts from the various raise alternatives may be overestimated, a site-specific analysis would be conducted to accurately assess impacts to any potentially affected parcel, if a raise feature is selected. It is anticipated that the site-specific analysis would conclude that the numbers and extent of parcels potentially affected would actually be less than estimated through the PASS II Study Real Estate Plan; hence, the impacts analysis presented herein is considered to be conservative.

This analysis also examines potential conflicts with local land use plans and zoning policies from the Folsom DS/FDR alternatives. The City of Folsom, Placer County and El Dorado County planning documents were used to determine if the action alternatives and the No Action/No Project Alternative would be in conflict with County and City plans and policies. Local agency conservation plans were used to determine if the project would be in conflict with any habitat or natural community conservation plan. Local Community Plans were also reviewed. General Plan Land Use designations refer to areas designated by the General Plan to allow for certain uses, based upon existing land uses and proposed future land uses. Consideration is given to trends in development and population increases. Zoning refers to areas defined as zoning districts, which allow for specific uses such as residential and commercial. Zoning districts define permitted uses, discretionary permitting requirements for other uses, development standards, and other issues determined by the local Planning Commission.

3.12.2.2 Significance Criteria

Implementation of the Folsom DS/FDR would result in a significant land use impact if it would:

- Conflict with an applicable land use plan, zoning policy, ordinance or regulation of an agency with jurisdiction over the project area that was adopted for the purpose of avoiding or mitigating an environmental effect;

- Conflict with any applicable habitat conservation plan or natural community conservation plan; or

- Create land use incompatibility or alter the existing land use function.

3.12.2.3 Environmental Consequence/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

The No Action/No Project Alternative could conflict with local planning policies related to Public Health and Safety goals.

The No Action/No Project Alternative would result in no improvements to the Folsom Facility. The conditions at Folsom Reservoir would remain similar to existing conditions and no additional flood damage reduction measures would be implemented. The risks to public safety from a catastrophic flood or an earthquake capable of damaging the existing Folsom Facility would remain similar to existing conditions, but could actually increase over time because of future population growth and development.

The General Plan documents for Placer and El Dorado Counties, the City of Folsom, and the Granite Bay Community Plan all address the need to protect the public from flood inundation. There is a need to implement measures to improve public safety and to provide flood damage reduction in the area around the Folsom Facility. The expected future population growth in the region will only increase the need for these dam safety and flood damage reduction measures. The No Action/No Project Alternative would not result in the construction or implementation of the actions under the Folsom DS/FDR and the risks associated with flooding would remain similar to or greater than existing conditions; therefore, the No Action/No Project Alternative would be in conflict with these planning documents. The local planning policies, goals, objective and ordinance related to this issue are listed below.

Placer County

Flood Protection

- *Goal 4.F:* To protect the lives and property of the citizens of Placer County from hazards associated with development in floodplains and manage floodplains for their natural resource values.

Policies

- 4.F.6. The County shall continue to coordinate efforts with local, state, and federal agencies to achieve adequate water quality and flood protection.

- 4.F.7. The County shall cooperate with the Placer County Flood Control and Water Conservation District, surrounding jurisdictions, the cities in the County, and other public agencies in planning and implementing regional flood protection improvements.

Public Safety and Emergency Management Facilities

Flood Hazards

- *Goal 8.B:* To minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from flood hazards.

Placer County - Granite Bay Community Plan

Flood Hazard

- *Goal:* Protect the lives and property of the citizens of the Granite Bay area from unacceptable risk resulting from flood hazards.

- *Policies:* Continue to work closely with the U.S. Army Corps of Engineers and Resource Conservation District in defining existing and potential flood problem areas.

El Dorado County

Flood Hazards

- *Goal 6.4:* Protect the residents of El Dorado County from flood hazards.

- *Objective 6.4.1*: Development Regulations

  Minimize loss of life and property by regulating development in areas subject to flooding in accordance with Federal Emergency Management Agency (FEMA) guidelines, California law, and the El Dorado County Flood Damage Prevention Ordinance.

City of Folsom

Safety Element Goals and Policies

- *Goal 29:* To protect the lives and property from unacceptable risks resulting from natural and manmade hazards.

- *Policy 29.4* – The City shall work with the U.S. Army Corp of Engineers in developing standards for development within the inundation boundary resulting from a failure of Folsom Dam or the dikes retaining Folsom Reservoir.

The No Action/No Project Alternative would not conflict with local zoning policies or conservation or habitat management plans, nor would it result in any land use incompatibility issues. However, the No Action/No Project Alternative could conflict with local planning policies related to Public Health and Safety goals. The Placer County General Plan, Granite Bay Community Plan, El Dorado County General Plan and City of Folsom General Plan all state the importance of protecting lives and property from flood hazards. While Folsom Reservoir provides a substantial amount of existing flood protection, the need for additional flood damage reduction measures have been identified by the Corps and Reclamation. The No Action/No Project Alternative would preclude the construction of additional dam safety and flood control measures at this time.

Therefore, the impacts of the No Action/No Project Alternative on land use would be potentially significant. Based on the analysis presented above, it is anticipated that the environmental impacts of the No Action/No Project Alternative (i.e., future environmental conditions if no action is taken relative to the Folsom DS/FDR) would exceed the significance criteria defined herein. However, unlike a significant impact associated with an action alternative, no mitigation can be required for significant impacts associated with the No Action/No Project (i.e., within the regulatory framework of NEPA and CEQA, a project applicant cannot be required to mitigate the impacts that would result from taking no action). As such, the impacts identified above for the No Action/No Project Alternative are considered to be significant, adverse, and unmitigable.

3.12.2.4 Environmental Consequences/Environmental Impacts

The following information applies to all Folsom DS/FDR alternatives and would have the same effect for each alternative. The sections following this provide qualitative and preliminary quantitative impact analysis for each individual alternative.

All Folsom DS/FDR alternatives are described in detail in Chapter 2. The Folsom DS/FDR includes the transport of material to and from construction sites around the Folsom Facility. The transport of material along city and county roads would not result in the need for road improvements or widening. A new connector road intersecting with Auburn-Folsom Road may be constructed on Reclamation property, however, to access the Dike 5 area.

All of the alternatives as proposed would be beneficial to local jurisdictions for meeting flood protection policies and goals described in their General Plans. Placer and El Dorado Counties, the Granite Bay Community, and the City of Folsom each have policies and goals within their General Plan documents expressing the need to continue to provide or improve flood protection. Some of the goals are listed above in Section 3.12.2.3.

Placer and El Dorado Counties and the City of Folsom include conservation policies within their General Plan documents. The FLSRA General Plan also includes policies for conservation of resource areas within its boundary. There is no formal conservation planning document specifically for Folsom Reservoir and the surrounding area. There are no conflicts to these plans with mitigation incorporated, according to state and federal guidelines and permitting requirements for wetlands, vegetation, and wildlife protection.

Table 3.12-1 summarizes potential land use actions by project alternative.

Environmental Consequences/Environmental Impacts of Alternative 1
<u>*Construction activities under Alternative 1 could affect existing land use policies.*</u>

Construction activities under Alternative 1 would not interfere with existing land use or zoning designations in the study area, as described in the affected environment section. The only potential impacts to land use plans and policies would be scenic and noise issues that could result from construction activities. Section 3.7, Visual Resources, and Section 3.10, Noise, discuss these impacts and provide appropriate mitigation. Alternative 1 would not conflict with local General Plan documents.

Table 3.12-1
Potential Land Use Actions for Folsom DS/FDR Alternatives

Main Features Having Potential to Result in Land Use Impacts	Implementation of Those Features Under Alternative 1	Implementation of Those Features Under Alternative 2	Implementation of Those Features Under Alternative 3	Implementation of Those Features Under Alternative 4	Implementation of Those Features Under Alternative 5
New embankment, easement, or potential parcel acquisition (Mooney Ridge and other impacted areas)	None	Construction of flood damage reduction berms (and acquisition of associated flood protection structure and access easements if on non-Federal property)	Construction of flood damage reduction berms (and acquisition of associated flood protection structure and access easements if on non-Federal property)	Construction of flood damage reduction berms (and acquisition of associated flood protection structure and access easements if on non-Federal property)	Construction of flood damage reduction berms (and acquisition of associated flood protection structure and access easements if on non-Federal property)
		Acquisition of flood easements (occasional flowage easements) on impacted property	Acquisition of flood easements (occasional flowage easements) on impacted property	Acquisition of flood easements (occasional flowage easements) on impacted property	Acquisition of flood easements (occasional flowage easements) on impacted property
		Possible acquisition in fee title (less than 5 parcels affected) , including 1 possible relocation*	Possible acquisition in fee title (less than 5 parcels affected), including 1 possible relocation*	Possible acquisitions in fee title (less than 10 parcels affected) , including 6 possible relocations*	Property acquisition likely (45 parcels affected) , including 37 possible relocations*

*The estimated numbers and extent to which parcels are potentially impacted by the various raise alternatives are the result of preliminary planning-level analyses from the PASS II Study Real Estate Plan. As the preliminary parcel impacts from the raise alternatives may be overestimated, more accurate site-specific analyses would be conducted if a raise feature is selected. As such, the impacts analysis reflected in the table above is considered to be conservative, and the actual impacts of the selected alternative would probably be less, depending on the results of the site-specific analyses.

Definitions of terms used in Table 3.12-1 are provided below:

- Access easement = Grants the right of access.
- Acquisition in fee title = Acquisition of ownership. Parcel would be acquired in its entirety, probably in fee at appraised value.
- Flood easement = see "occasional flowage easement" below.
- Flood damage reduction berm = Also referred to as a new embankment. A flood damage reduction berm is a small embankment built in low elevation areas as a flood protection measure to reduce or eliminate the flooding of non-federal property. These flood protection features would be simple berms constructed of earthen material excavated at a specific site or imported from within the boundaries of the reservoir, from the closest area with stockpiled material. These flood protection features could also be constructed as a parapet wall or another type of suitable structure.
- Flood damage reduction berm easement = Grants the right to build, maintain, repair, operate, and replace a flood damage reduction berm.
- New embankment = see flood damage reduction berm above.
- Occasional flowage easement = Flood easement; grants the right to occasionally flood, as determined necessary and appropriate during extreme storm events. Property owner retains fee ownership; however, such an easement may restrict the construction of new structures and/or uses for human habitation within the easement area.
- Relocation = The impacted property owner is paid fair market value for their property, provided assistance to locate comparable housing and is entitled to relocation benefits and services in accordance with Public Law 91-646.

Therefore, construction activities under Alternative 1 would have no effect on existing land use or zoning designations. Construction impacts of Alternative 1 on land use policies related to noise and scenic resources would be less than significant with mitigation.

Construction of Alternative 1 may conflict with local tree preservation ordinances, specifically as a result of direct or indirect impacts to protected oak woodlands.

Oak woodlands are present within the construction areas and staging areas for Alternative 1 and may be affected by construction activities. These woodlands are protected under county and city tree ordinances.

Activities implemented for Alternative 1 may result in indirect adverse impacts to vegetation and wetlands identified as sensitive by the state, counties, or cities, including increased erosion and sedimentation, damage to roots of oaks and other tree species adjacent to areas where heavy equipment would be operated, dust impacts to roadside vegetation, and colonization of exposed substrate by exotic plant species.

These impacts would be potentially significant but mitigable. Mitigation measures related to sensitive wetlands and vegetation including native oak trees, erosion and sedimentation control, protective fencing, dust control, and invasive non-native plant species control described in Section 3.5, Terrestrial Vegetation and Wildlife, would reduce these impacts to less than significant levels.

Therefore, the effects of Alternative 1 on land use would be less than significant..

Environmental Consequences/Environmental Impacts of Alternatives with Raise features (Alternatives 2 through 5)

The following text applies to all project alternatives with raise features (i.e., Alternatives 2 through 5; Alternative 1 does not include any raise features) and would have a potential increase in impact related to raise height. For each alternative with a raise feature, qualitative impact assessments as well as preliminary quantitative impact analysis of potentially affected parcels are provided in the following sections.

Effects to Federal Parcels

Under an extreme flood or Probable Maximum Flood (PMF) event, an emergency increase in reservoir water surface elevation would cause a temporary inundation of lands surrounding Folsom Reservoir.

The effect of emergency inundation of undeveloped federal parcels would be an indirect, temporary, physical change to land use. Therefore, the impact to land use would be less than significant.

Temporary inundation of undeveloped federal parcels during an extreme storm event would be less than significant.

If necessary to prevent flooding of non-federal property surrounding Folsom Reservoir in an extreme flood or PMF event, a new flood damage reduction berm(s) could be constructed on undeveloped federal property.

The construction of a flood damage reduction berm(s) on undeveloped federal property would not preclude existing land use function or operation. Therefore, the effect of a flood damage reduction berm(s) on undeveloped federal property would be less than significant on land use.

Construction of new flood damage reduction berm(s) on federal property in relation to current land use would be less than significant.

A flood damage reduction berm on a federal parcel could affect existing land use policies related to scenic impacts.

The construction of new flood damage reduction berm(s) could change the visual nature of the affected areas.

This impact would be potentially significant to land use. Mitigation Measures LU-1 through LU-3 would be implemented as needed to reduce this impact to a less than significant level.

Effects to Non-Federal Parcels

If necessary to prevent flooding of non-federal property surrounding Folsom Reservoir in an extreme flood or PMF event, a flood easement (occasional flowage easement) would be acquired and/or a new flood damage reduction berm would be constructed on impacted non-federal parcel(s). The construction of a flood damage reduction berm on a non-federal parcel would also require the acquisition of associated flood protection structure and access easements.

These actions could change the existing land use function or operation of an impacted non-federal parcel if, and to the extent that, the associated physical improvements and/or use restrictions effectively preclude continuation of the existing day-to-day (i.e., normal) land use function or operation. A flood damage reduction berm on a non-federal parcel could affect existing land use policies related to current land uses.

These impacts would be potentially significant to land use. Mitigation Measures LU-1 through LU-3 would be implemented as needed to reduce these impacts to a less than significant level.

If substantial inundation of non-federal property surrounding Folsom Reservoir could not be avoided through other flood protection measures (such as a flood damage reduction berm) under an extreme flood or PMF event, fee title would be acquired for the impacted non-federal parcel.

The acquisition in fee title of an impacted non-federal parcel could preclude the existing land use function if, and to the extent, it is determined that existing day-to-day land use function or operation would no longer continue once acquired.

The effect of acquiring fee title for an impacted non-federal parcel and associated discontinuation of the existing land use function or operation would be a significant and unavoidable impact to land use.

Environmental Consequences/Environmental Impacts of Alternative 2

Actions under Alternative 2 would have the potential to change existing land use for parcels that could be inundated under a severe storm event.

A 4-foot raise could result in an increase in the reservoir pool elevation during extreme storm events, and this could flood lower elevation areas beyond the boundaries of the Folsom Facility. The lower elevation areas are primarily located in Mooney Ridge, north of Granite Bay, and certain areas along the eastern shoreline.

To address the potential for flooding related to a 4-foot raise, Reclamation, the Corps, or SAFCA, as the Corps non-Federal sponsor, and any one of these referred to in the discussion below as the responsible agency, would pursue structural or real estate remedies, or a combination of both, in cooperation with affected non-federal property owners. Probable remedies in lower elevation areas would include construction of new flood damage reduction berms (and associated access and flood damage reduction structure easements if berms are located on non-federal property) and/or acquisition of flood easements on impacted non-federal parcels. A potential easement acquisition area in Placer County at Mooney Ridge is within the Medium Density Residential (MDR) and Open Space (O) land use designations according to the Granite Bay Community Plan. Placer County Zoning for this area is Residential-Single Family (RS-B-10 and RS-B-20) and Open Space. A potential easement acquisition area north of Granite Bay in Placer County is within the Rural Residential (RR) and O land use designations according to the Granite Bay Community Plan and the Placer County General Plan. Placer County Zoning for these areas is O and RA-BX-20. A potential easement acquisition area in El Dorado County at the New York Creek area is within the High Density Residential land use designation according to the El Dorado County General Plan. El Dorado County Zoning for this area is One-Family Residential (R1), Open Space and Recreational Facilities. A potential easement acquisition area in El Dorado County at the Browns Ravine area is within the Northwest El Dorado Hills Specific Plan Single Family Residential land use designation, according to the Northwest El Dorado Hills

Specific Plan, and Commercial and Medium Density Residential, according to the El Dorado County General Plan. El Dorado County Zoning for these areas is One-Family Residential and One-Family Residential Planned Development (R1-PD), Recreational Facilities, Commercial along Green Valley Road, Estate Residential Five-Acre, One-Half Acre Residential, and Single-family Two-Acre.

Where flood easements are acquired and/or where flood damage reduction berms are constructed (and associated flood damage reduction structure and access easements acquired if berms are located on non-Federal property) in order to address the potential for flooding, the responsible agency would acquire such easements according to State and Federal guidelines.

According to Corps guidelines (Corps 2006), properties encumbered by flood easement would be restricted as follows:

- No structure for human habitation shall be constructed or maintained on the easement premises.
- No other structure shall be constructed or maintained on the land except those that have been approved in writing by the responsible agency.
- No excavation shall be conducted or fill placed on the land without approval of the responsible agency.

With a 4-foot raise, Reclamation's preliminary planning-level analysis also indicates the acquisition in fee title of approximately four non-federal properties as a possible scenario, including one residential property, for which the property owner would be entitled to fair market value, assistance with replacement housing and relocation benefits and services in accordance with Public Law 91-646. If property were acquired in fee by the United States, land use and zoning would be Federal use only. However, efforts would be made to develop a structural solution that would eliminate the need for acquisition of real estate rights (easements or fee title) or relocation. Because the non-federal parcels potentially impacted by this alternative are identified through the use of coarse planning-level analyses, the number and extent of parcels potentially affected by this alternative may be overestimated. Detailed site-specific analyses would be conducted should this raise feature be selected. The need for, location, number, and impacts of flood damage reduction berms and/or acquisition of real estate rights (easements or fee title) would be further analyzed and disclosed in more detail in a supplemental environmental compliance document, if this raise feature is selected and further designed.

Because this alternative could potentially change the existing land use of parcels around Folsom Reservoir, this impact would be potentially significant to land use.

Mitigation Measures LU-1 through LU-3 would be implemented as needed to reduce this impact to a less than significant level.

Construction of new flood damage reduction berms under Alternative 2 may conflict with existing land use policies related to scenic impacts.

New flood damage reduction berms would be a potentially significant impact to scenic resources and may not comply with Granite Bay design guidelines. However since these would be for the purpose of improving dam safety and flood damage reduction, it is likely that the effects of this alternative would not conflict with local General Plan documents. Mitigation measures discussed in Section 3.12.4 would be implemented as needed to assist in reducing these impacts to a less than significant level.

Therefore, this impact to scenic resource policies would be less than significant.

Construction activities under Alternative 2 could affect existing land use policies related to noise and scenic impacts.

Potential impacts to land use plans and policies would be scenic and noise issues that could result from construction activities. Section 3.7, Visual Resources, and Section 3.10, Noise, discuss these impacts and provide appropriate mitigation.

Therefore, the effect of construction activities under Alternative 2 on existing land use policies related to noise and scenic impacts would be less than significant with mitigation.

Construction of the project may conflict with local tree preservation ordinances, specifically as a result of direct or indirect impacts to protected oak woodlands.

Oak woodlands are present within the construction areas and staging areas for Alternative 2 and may be affected by construction activities. These woodlands are protected under county and city tree ordinances.

Activities implemented for Alternative 2 may result in indirect adverse impacts to vegetation and wetlands identified as sensitive by the state, counties, or cities, including increased erosion and sedimentation, damage to roots of oaks and other tree species adjacent to areas where heavy equipment would be operated, dust impacts to roadside vegetation, and colonization of exposed substrate by exotic plant species.

These impacts would be potentially significant but mitigable. Mitigation Measures related to sensitive wetlands and vegetation including native oak trees, erosion and sedimentation control, protective fencing, dust control, and invasive non-native plant *species control described in Section 3.5, Terrestrial Vegetation and Wildlife, would reduce these impacts to less than significant levels.*

Inundation caused by an increase in the reservoir pool elevation during extreme storm events could adversely affect native oaks.

Inundation caused by an increase in the reservoir pool elevation during extreme storm events could adversely affect native oaks if the inundation is of sufficient duration. Blue oaks can be sensitive to inundation for as few as seven days, and evergreen oaks are likely to be more sensitive. Inundation above the ordinary high water mark (OHWM) is anticipated to be a rare event and even for a 151 to 200-year flood would last 2.5 to 4 days.

This impact would be potentially significant but mitigable. Mitigation Measures related to emergency inundation of oak woodlands and described in Section 3.5, Terrestrial Vegetation and Wildlife, would reduce the impact to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 3

A potential 3.5-foot parapet wall raise could result in an increase in the reservoir pool elevation during extreme storm events, and this could flood lower elevation areas beyond the boundaries of the Folsom Facility. The lower lying areas are primarily located in Mooney Ridge, north of Granite Bay, and along the eastern shoreline.

The environmental consequences/environmental impacts from construction of Alternative 3 would be essentially the same for land use as those described for Alternative 2 (Section 3.12.2.7).

Environmental Consequences/Environmental Impacts of Alternative 4

A 7-foot raise could result in an increase in the reservoir pool elevation during extreme storm events, and this could flood lower elevation areas beyond the boundaries of the Folsom Facility. The lower lying areas are primarily located in Mooney Ridge, north of Granite Bay, and along the eastern shoreline.

The environmental consequences/environmental impacts from construction of Alternative 4 would be the same for land use as those described for Alternative 2 (Section 3.12.2.7), with the following exceptions:

- More potentially impacted parcels due to the 7-foot raise height. Additional acquisition of flood easements and/or construction of larger flood damage reduction berms (and acquisition of associated flood damage reduction structure and access easements if necessary). Affected Placer County and El Dorado

County land use designations and zoning designations for Alternative 4 are the same as those described under Alternative 2 (Section 3.12.2.7).

- With a 7-foot raise, Reclamation's preliminary planning-level analysis also indicates the acquisition in fee title of approximately nine non-federal properties as a possible scenario, including approximately six residential properties, for which the property owners would be entitled to fair market value, assistance with replacement housing and relocation benefits and services in accordance with Public Law 91-646. If property were acquired in fee by the United States, land use and zoning would be Federal use only. However, efforts would be made to develop a structural solution that would eliminate the need for acquisition of real estate rights (easements or fee title) or relocation. Because the non-federal parcels potentially impacted by this alternative are identified through coarse planning-level analyses, the number and extent of parcels actually affected by this alternative may be overestimated. Detailed site-specific analyses would be conducted should this raise feature be selected. The need for, location, number, and impacts of flood damage reduction berms and/or acquisition of real estate rights (easements or fee title) would be further analyzed and disclosed in more detail in a supplemental environmental compliance document, if this raise feature is selected and further designed.

Because this alternative could potentially change the existing land use of parcels around Folsom Reservoir, this impact would be potentially significant to land use. Mitigation Measures LU-1 through LU-3 would be implemented as needed to assist in reducing this impact to a less-than-significant level.

Environmental Consequences/Environmental Impacts of Alternative 5
The 17-foot earthen raise could result in an increase in the reservoir pool elevation during extreme storm events, and this could flood lower elevation areas beyond the boundaries of the Folsom Facility. The lower lying areas are primarily located in Mooney Ridge, north of Granite Bay, and along the eastern shoreline.

The environmental consequences/environmental impacts from construction of Alternative 5 would be the same for land use as those described for Alternative 2 (Section 3.12.2.7), with the following exceptions:

- More potentially impacted parcels due to the 17-foot raise height. Additional acquisition of flood easements and/or construction of larger flood damage reduction berms (and acquisition of associated flood damage reduction structure and access easements if necessary). Affected Placer County and El Dorado County land use designations and zoning designations for Alternative 5 are the same as those described under Alternative 2 (Section 3.12.2.7), except in the Mooney Ridge area where additional land use and zoning designations are affected. Parcels within the Low Density Residential (LDR) land use designation would also be affected which includes the RS-B-X (10,000 sf min.) zoning district according to the Placer County Zoning Ordinance.

- With a 17-foot raise, Reclamation's preliminary planning-level analysis also indicates the acquisition in fee title of approximately 45 non-federal properties as a possible scenario, including as many as 37 residential properties, for which the property owners would be entitled to fair market value, assistance with replacement housing, and relocation benefits and services in accordance with Public Law 91-646. If property were acquired in fee by the United States, land use and zoning would be Federal use only. However, efforts would be made to develop a structural solution that would eliminate the need for acquisition of real estate rights (easements or fee title) or relocation. Because the non-federal parcels potentially impacted by this alternative are identified through coarse planning-level analyses, the number and extent of parcels actually affected by this alternative may be overestimated. Detailed site-specific analyses would be conducted should this raise feature be selected. The need for, location, number, and impacts of flood damage reduction berms and/or acquisition of real estate rights (easements or fee title) would be further analyzed and disclosed in more detail in a supplemental environmental compliance document, if this raise feature is selected and further designed.

Because this alternative could potentially change the existing land use of parcels around Folsom Reservoir, this impact would be potentially significant to land use. Mitigation Measures LU-1 through LU-3 would be implemented as needed to assist in reducing this impact to a less than significant level.

<u>*If substantial inundation of non-federal property surrounding Folsom Reservoir under an extreme flood or PMF event could not be avoided through other flood damage reduction measures (such as a flood damage reduction berm), fee title would be acquired for the impacted non-federal parcel(s).*</u>

The acquisition in fee title of some impacted non-federal parcel(s) under Alternative 5 is probably unavoidable and this action would preclude the existing land use function.

Thus, the effect of acquiring fee title of impacted non-federal parcel(s) would be a significant and unavoidable impact to land use under Alternative 5.

3.12.3 Comparative Analysis of Alternatives

The No Action/No Project Alternative would likely conflict with local General Plans because it would not reduce safety risks associated with flooding and it would not implement any dam safety or flood damage reduction measures.

Table 3.12-1 compares the potential land use actions of each of the alternatives including construction of new flood damage reduction berms, acquisition of easements, and/or fee title acquisition. Alternative 1 would not affect land use since no new flood damage reduction berms would be constructed, and real estate rights (easements or fee title) would not be acquired. From preliminary planning-level analyses, the land use effects of Alternatives 2 and 3 would be the same: approximately 64 potentially impacted parcels (via easement and/or flood damage reduction berm, or fee title acquisition), with less than five parcels possibly involving acquisition in fee title, including one possible relocation. Alternative 4 would result in approximately 92 potentially impacted parcels but less than 10 parcels affected by possible acquisition in fee title, including six possible relocations. Alternative 5 potentially impacts approximately 175 parcels, with 45 parcels affected by possible acquisition in fee title, including 37 possible relocations. Depending upon the real estate and/or construction solution(s) selected to mitigate for potential inundation due to raise heights of Alternatives 2 through 5, the impacts to land use could be significant. If a raise feature is selected, efforts would be made to avoid, or mitigate, significant land use impacts. Additionally, the need for, location, number, and impacts of flood damage reduction berms and/or acquisition of real estate rights (easements or fee title) would be further analyzed and disclosed in more detail in a supplemental environmental compliance document if a raise feature is selected.

All of the action alternatives could result in impacts to native oak trees and woodlands which are considered special status or protected species according to Placer County, El Dorado County, and the City of Folsom. Oak woodland vegetation impacted by construction will be compensated for at a ratio stipulated in the USFWS Coordination Act Report. By mitigating impacts identified in Section 3.12.2 according to measures identified in Section 3.5.4, the impact resulting from construction of the project would be less than significant.

3.12.4 Mitigation Measures

The following mitigation measures would reduce potentially significant impacts to a less than significant level:

LU-1: If a raise feature is selected, the determination regarding structural solutions (i.e., flood damage reduction berms) and/or acquisition of real estate rights (easements or fee title) for any impacted non-federal parcel will be made on a case by case basis and will depend upon feasibility, cost, and acceptability to the landowner(s). Efforts will be made to design and construct flood damage reduction structures that will reduce or eliminate the need for building flood damage reduction berms and/or acquiring real estate rights (easements or fee title), including potential relocation of residents, on impacted non-federal parcels.

LU-2: The responsible agency will follow the procedures of local jurisdictions for zoning district changes, as needed to provide flood damage reduction measures.

LU-3: To lessen visual impacts of flood damage reduction berms and reduce potential conflict with local visual resource policies, a berm will be located on a parcel so as to conceal it in the viewshed, if practical, and/or construction materials will be used to make the berm less visually conspicuous.

3.12.5 Cumulative Effects

Table 5-1 provides a list of past, present and probable future projects in the general vicinity of the Folsom DS/FDR study area that are included in the cumulative effects analysis. Any land use action taken, such as building a flood damage reduction structure and/or acquisition of real estate rights (easements or fee title), that could change the existing land use operation or function of an impacted parcel would be a potentially significant impact to land use. It is unlikely that the projects identified in Table 5-1 would have any notable adverse impact on local land use designations or zoning designations. Therefore, the cumulative effect of the Folsom DS/FDR action would be less than significant.

3.13 Recreation Resources

This section presents potential impacts to recreation resources from construction of the Folsom DS/FDR alternatives.

3.13.1 Affected Environment/Existing Conditions

3.13.1.1 Area of Analysis

The study area assessed as part of the evaluation of recreational resources included all portions of the Folsom Lake State Recreation Area (FLSRA) available for recreational use. This area consists of Folsom Reservoir, including marinas, boat launching facilities, whitewater rafting facilities, and terrestrial facilities, including campgrounds, day use facilities, other facilities (i.e., Folsom Dam, the California State University Sacramento [CSUS] Aquatic Center at Nimbus Flat), and numerous hiking trails throughout the FLSRA. Terrestrial areas outside of trails and developed sites are generally not accessible to recreational users. Therefore, these areas are not a focus of this study.

3.13.1.2 Regulatory Setting

Reclamation holds title to virtually all lands and all recreation areas immediately surrounding Folsom Reservoir. One exception is certain land underlying the Jedediah Smith Bike Trail (also known as the American River Bike Trail), which is owned by the California Department of Parks and Recreation (DPR). Reclamation has a long-term agreement with DPR to manage recreation on Reclamation's lands designated as part of the FLSRA.

The DPR planning process is integrated with Reclamation's Resource Management Planning (RMP) Process. The DPR, in partnership with Reclamation, recently began work on the integrated FLSRA General Plan and Resource Management Plan Update. This process will update the current general plan, as well as the long-range vision for the area. The General Plan will guide the protection of natural and cultural resources, provide for and manage recreational opportunities, and outline the future development of public facilities. Alternative plan concepts have been developed, with general direction common to all alternatives. Resource and visitor capacity issues have been identified for major use areas within the FLSRA, as well as ways of addressing them. The revised joint integrated project is being prepared to meet the requirements of both agency planning processes. A draft of the General Plan/RMP and DEIR/DEIS are currently being finalized and will soon be distributed to the public. For additional details refer to http://www.parks.ca.gov. For details on the RMP process, refer to the RMP handbook, http://www.usbr.gov/pmts/planning/RMPG/rmpg.pdf.

3.13.1.3 Environmental Setting

FLSRA is an important local, regional, and state recreation resource (Figure 3.13-1).

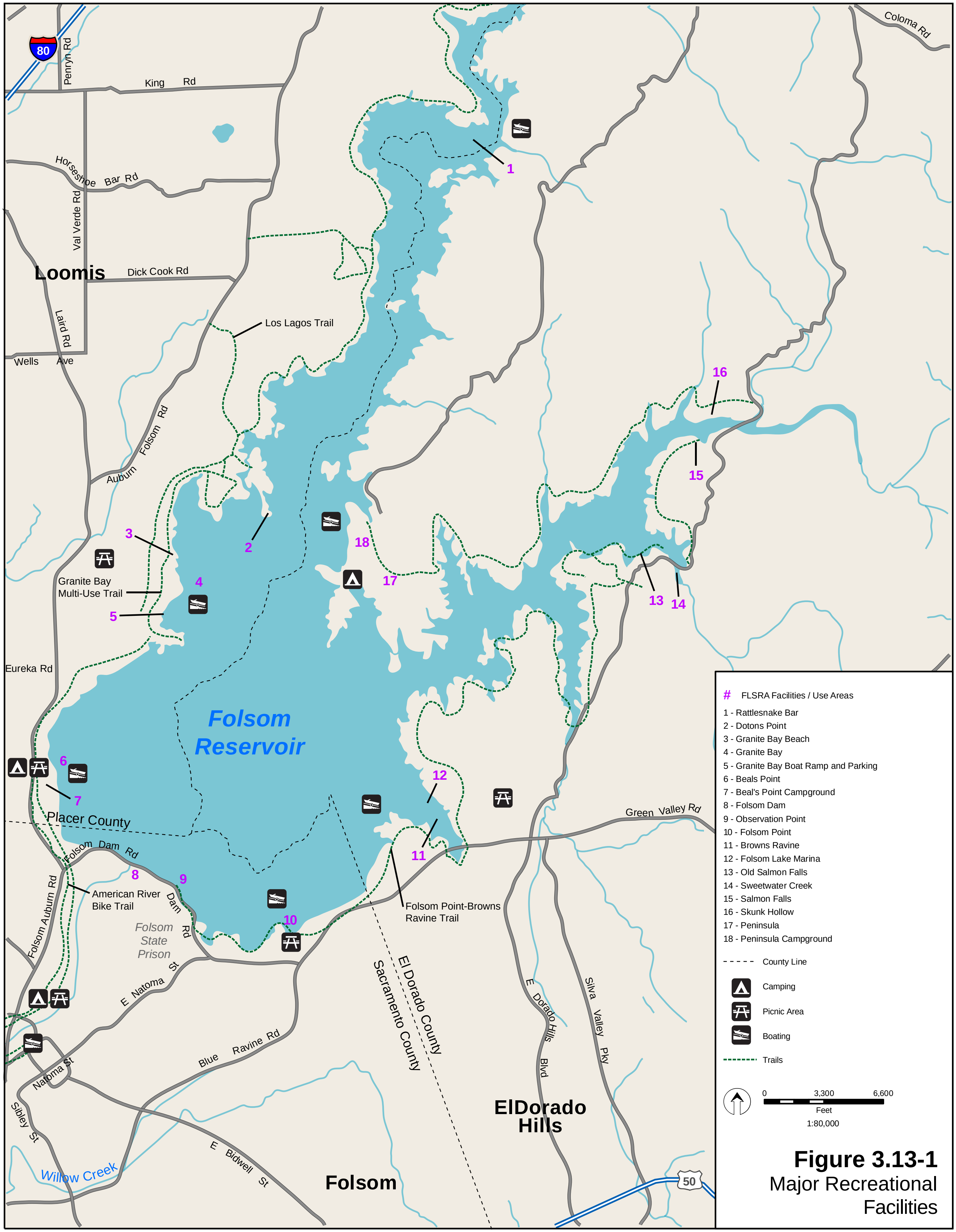

Figure 3.13-1
Major Recreational Facilities

Source: ENTRIX

Folsom Reservoir, the primary feature in the FLSRA, supports numerous water-based activities, such as boating, waterskiing, and fishing. The reservoir's upper arms are designated slow zones for quiet cruising, fishing, and nature appreciation. The shoreline provides sandy swimming beaches, both formal (with lifeguard services) and informal. Summer water temperatures average 72ºF, enhancing both water-oriented and shoreline activities. Land-based activities such as hiking, biking, picnicking, camping, and horseback riding also attract visitors. The reservoir serves flood control, water supply, and power generation purposes, and as a result reservoir levels typically fluctuate from a high of 466 feet in late winter or early spring to 405 feet during late fall.

With more than 1.5 million visitors in 2000, the FLSRA is one of the most popular sites within California for recreation in the DPR system. Recreation activities in the FLSRA have changed significantly since the first facilities were opened to the public in 1958, and even since the first General Plan for the FLSRA was adopted in 1979. The popularity of personal watercraft (jet skis), wake boarding, sailing, and bass fishing tournaments has transformed the boating environment on Folsom Reservoir. Land-based recreational activities have also changed over the years. When the FLSRA first opened, the trails were used primarily by equestrians and hikers. The popularity of running in the 1970s and mountain biking in the 1980s have greatly increased trail use. With urban development surrounding the southern half of the FLSRA, paved trails now play an important part in the region's growing transportation network as more people commute via bicycle. These changes affect the character and level of use in the FLSRA, how existing facilities are used, and what future facilities may be needed.

Throughout the year, permitted special events are held at various locations in the FLSRA. Events include bass fishing tournaments, yacht races, mountain bike races, triathlons, mountain bike triathlons, adventure races, running races, and summer camps. Past race events have included, but are not limited to: Future Pro Tour Amateur Bash Fishing Tournament at Granite Bay, Big Blue Adventure's Folsom Lake Sports Adventure Race at Granite Beach, Nissan Xterra USA Championship Real Mountain Bike Triathlon at Granite Bay and surrounding trails, Folsom Lake Yacht Club Series at Browns Ravine, American Bass Tournament at Browns Ravine, California State University Sacramento operates an aquatic center at Lake Natoma. During the summer CSUS utilizes Folsom Point at Folsom Reservoir for their youth wake board and water ski camp.

This section discusses existing conditions for recreation resources in the Folsom Reservoir area. It describes existing recreation resources in terms of attendance levels, visitor capacity, types of facilities present, activities available, and management issues. Much of the information cited is from a Resource Inventory for FLSRA prepared by Wallace, Roberts, and Todd, et. al 2003 under a contract with DPR for revision of the General Plan/RMP. DPR provided most of the resource information to Wallace, Roberts, and Todd for preparation of the resource inventory document. Recreation resources are divided into aquatic-based day use areas, other types of day use areas, camping areas, and areas that support use of the North and South Forks of the American River. A discussion of trails is also provided, describing their connections to other adjacent parks and nearby communities.

Folsom Reservoir Areas

Browns Ravine

The Folsom Lake Marina is the only marina facility in the FLSRA (Figure 3.13-1). Annual attendance in 2000 was 66,856 visitors. On the east side of the reservoir, at Browns Ravine, the facility includes 685 wet slips and 175 dry storage slips. Currently, there is a five-year waiting list for one of the 72 sixteen-foot slips and 368 twenty-foot slips. A nine-year wait currently exists for one of the 245 twenty-four-foot slips. In recent years, interest in slip rentals has increased significantly due to the difficulty in launching during peak season weekends due to the lack of ramp and parking capacity at the main launch area. The maximum usable elevation for boat ramp facilities at Browns Ravine is 468 feet. Based on 1985 to 2004 California Data Exchange Center (CDEC) data, the elevation of Folsom Reservoir has not been over 466 feet. There is an alternative boat ramp at Hobie Cove that only has a maximum usable elevation of 426 feet. The alternative boat launch at Hobie Cove provides no relief during the peak season for use at Browns Ravine, since it only becomes available in the fall when reservoir levels have dropped sufficiently to make this facility operational.

Folsom Point

Folsom Point is off East Natoma Street between Folsom Dam Road and Green Valley Road. This is the most popular day use area on the eastern shore of Folsom Reservoir. Attendance in 2000 was 112,120 visitors. Facilities here include a shaded picnic area with tables and barbeques, two vault toilets, and parking for 77 vehicles. Folsom Point also includes the largest formal boat launch facilities on this side of the reservoir. The Folsom Point boat launch facility has 129 parking spaces. The maximum usable boat ramp elevation at Folsom Point is 468 feet. The popularity of Folsom Point for the staging of special aquatic events causes both the aquatic and day use facilities to reach capacity quickly during peak season weekends.

The picnic area at Folsom Point appears to be eroded and worn due to heavy foot traffic and informal parking off paved surfaces. Access to the shoreline is informal.

CSUS uses the Dike 8 area of Folsom Reservoir for waterskiing lessons.

Observation Point

The Observation Point parking lot is on the Folsom Dam Road at the eastern end of the Dam. This area offers a panoramic view of Folsom Reservoir. In the past, Observation Point was a popular place for meeting, fishing and swimming. When reservoir levels are low, the Observation Point also provides a good starting place for hiking. The informal trail along the eastern shoreline leads to Browns Ravine. However, Observation Point is now closed to public access and has been since September 11, 2001, due to security concerns associated with threats to Folsom Dam.

Observation Point was previously used as a staging area for the installation of a temperature control intake device, and the construction of the Corp's Folsom Modifications Project offices and formal staging area. The Observation Point parking lot site was slated for use as a staging area for the outlet modifications phase of the Corp's projects at the Folsom Reservoir to improve flood damage reduction for Sacramento.

It is doubtful that the paved portion of the Observation Point area will be available for public use in the future, due to current security restrictions that are not likely to be relaxed. The area below the paved portion of Observation Point is still open to fishing, but only from a boat.

Beal's Point Day Use Area

Attendance at Beal's Point in 2000 was 219,986 visitors. This facility provides a 1,000-foot long swim beach (summer season only) and concessions facility with a snack bar, beach equipment rentals, restrooms, and paved parking for about 400 vehicles. 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. This is a national recreation trail. The unpaved multi-use Granite Bay Trail connects Beal's Point to other facilities along Folsom Reservoir. The aquatic facilities at Beal's Point include an informal boat launch ramp, but the area does not have separate parking for vehicles and boat trailers. The informal boat launch ramp is an unpaved ramp that is available for use at specific reservoir elevations only. Ski/wake board boats and larger boats cannot use the ramp. Ramp use is available for personal watercraft and other very light boats.

There are two management issues with respect to this recreation area, visitor capacity and unrestricted access to the shoreline. 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. Regarding unrestricted access to the shoreline area, when reservoir levels fall, the shoreline becomes exposed allowing motorized vehicles to access the shoreline.

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.

Granite Bay

The most popular day use facility in the FLSRA is Granite Bay with a series of facilities spread over three distinct subareas. It is on the west side of the reservoir off Folsom-Auburn Road. Attendance in 2000 was 507,712 visitors. The Main Beach area includes a 1,200-ft long guarded swim beach (summer season only), snack bar and beach equipment concessions, restrooms, a grassy picnic area, tot lot, and a paved parking area for vehicles. The North Granite area is popular for fishing, horseback riding, and hiking. This area includes an informal beach area at Oak Point, equestrian staging area, Doton’s Point, and Beek's Bight. An activity center just north of the Main Beach is available by reservation for group use and includes a small picnic area.

Trail facilities at Granite Bay include the equestrian and pedestrian Pioneer Express Trail running north to Auburn State Recreation Area (SRA), 8 miles of unpaved multi-use trails running through the area, and a unpaved pedestrian and Americans with Disabilities Act (ADA) only trail in the Beek's Bight area.

The boat launch area capacity varies with water levels (Table 3.13-1). At high water, there are 10 lanes available, while at low water only two lanes available. 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 area and launch ramps at the launch area fill by midday. Access is another concern: 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. 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 in the North Granite area. 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 400 to 470 feet. Currently, when the reservoir surface level is at 466 feet, only one 12-lane ramp and the two-lane boat launch ramp are usable. Elevations of the structures (other than the boat launch ramps), parking lot, and roads at Granite Bay range from approximately 465 to 475 feet.

Table 3.13-1
Boat Launch Capacity at Granite Bay Day Use Area

	Lanes	Slope (%)	Width (feet)	Minimum useable reservoir level (feet)	Maximum useable reservoir level (feet)
Stage 1	2	15	60	395	420
Stage 2	10	10	700	426	435
Stage 3	10	10	700	435	450
Stage 4	14	15	330	425	466
5 percent	4	5	60	408	466
Low water	2	15	45	360	410

Source: Wallace, Roberts, and Todd, et. al 2003, DPR 2006

Other Day Use Areas

Old Salmon Falls

Old Salmon Falls is on Salmon Falls Road in El Dorado County between Browns Ravine and the whitewater rafting facilities at the South Fork of the American River. The upper portion of the facility is just off Salmon Falls Road, commonly referred to as Falcon Crest, and includes an informal parking area used as an equestrian staging area and access to a hiking and horseback riding trail that drops down to the site of the old (closed) Monte Vista campground about one mile to the west. From Falcon Crest, a narrow road drops down to a lower area on the shore of Folsom Reservoir. Facilities here include a small, unpaved parking area and portable toilet. This area is used for fishing, swimming, and as a trailhead for the Browns Ravine and Sweetwater Trails.

Issues related to the Old Salmon Falls area include unrestricted vehicle access to the shoreline, particularly when reservoir levels are low, that could lead to damage and erosion, and possible erosion problems on State land and trails resulting from the country-estate residential subdivision currently under construction on the nearby hills above the reservoir. The north and south parking lots, restroom facilities, and trail access points would be completely inundated at 475 feet. Under existing conditions, the reservoir has not reached this level.

Sweetwater Creek

Sweetwater Creek is midway between Old Salmon Falls and the Salmon Falls Bridge. A widened shoulder just off Salmon Falls Road doubles as an informal parking area where a gate marks the trailhead for the Sweetwater Trail. This unpaved multi-use trail runs east about 2 miles to the Salmon Falls Bridge and the Darrington Trail. An informal trail runs west from here to Old Salmon Falls and the Browns Ravine Trail.

Rattlesnake Bar on the northeast shore of Folsom Reservoir provides two boat launch lanes and an equestrian staging area. Portions of the road accessing the launch lanes would be inundated at 470 feet; and the boat launch areas become unusable at elevations greater than 468 feet.

Peninsula
The Peninsula day use facility is about 1 mile north of the Peninsula Campground on the eastern shore of Folsom Reservoir. Due to its remote location, this facility is used primarily by boat-in users. The site consists of a small concrete boat ramp, pre-cast concrete vault toilet, picnic tables with ramadas and barbeques, and a small informal beach area.

The south boat ramp elevations range between 410 and 466 feet and the north ramp between 434 and 467 feet.

Peninsula Campground
The Peninsula Campground is at the tip of the peninsula that separates the North and South Forks of the American River. This facility occurs in what is the most natural and least disturbed portion of the FLSRA. The area is characterized by rolling hills, open grasslands, and scattered oak and pine groves. Access to the site is provided by Rattlesnake Bar Road, which connects to Highway 49 at Pilot Hill about 9 miles away. The campground includes 104 sites that can accommodate a maximum trailer length of 18 feet and RV length of 24 feet. The facility also includes five restrooms (no showers), one boat ramp, and a small amphitheater suitable for group use. Located nearby is temporary seasonal housing for four DPR employees, a permanent park ranger residence, and a small maintenance yard. The maximum usable boat ramp elevation at Pennisula Campground is 466 feet. Most of the campsites would be inundated at 475 feet.

Beal's Point Campground
The Beal's Point Campground is adjacent to the popular Beal's Point day use area. The facility includes 49 single campsites, 20 RV sites with electrical hook-ups, a sanitary dump station, two restrooms, and showers. 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, boat launch, picnic area, and snack bar.

Folsom Reservoir River Access Areas
Commercial and private whitewater rafting are popular activities on the South Fork of the American River. The 21-mile run between Chili Bar Dam near Highway 193 and Salmon Falls Road at the upper extent of Folsom Reservoir is the highest use river segment in the West. The river offers a diversity of rafting experiences, with Class I through Class III rapids, along with classic scenery and narrow rocky gorges all within relatively easy reach of Sacramento. Several agencies have jurisdiction in this run of the American River: the U.S. Bureau of

Land Management (BLM) owns 12.5 miles of river frontage; Reclamation owns 1.5 miles of river frontage between Hospital Bar and Salmon Falls Road, which is managed by DPR; and El Dorado County is responsible for permitting river use by commercial outfitters.

There are currently about 40 commercial rafting outfitters on the South Fork with 67 permits in existence. These outfitters must obtain river use permits from El Dorado County which specify, among other things, the number of weekday and weekend trips permitted, the number of rafts and rafters per group, and insurance requirements. Permits are not required for private boats. The current daily boater total threshold is 3,200 boaters on two days during any one season.

Skunk Hollow and Salmon Falls

The FLSRA facilities at Salmon Falls and Skunk Hollow (in El Dorado County where Salmon Falls Road crosses the South Fork) are specifically intended to accommodate rafting activity on the river. According to DPR staff, approximately 9,000 commercial boats take-out at the Salmon Falls facility (they are prohibited to do so at Skunk Hollow), or between 50,000 and 60,000 boaters. Facilities here include a large area for bus parking and queuing, informal take-out area, four vault toilets, and drinking water. It is estimated that as many as 4,000 additional private boats (roughly 24,000 boaters) take-out at the Skunk Hollow facility. Facilities here include a small paved parking area for 37 vehicles, a raft loading zone with drying rails, two vault toilets, a paved path from the river up to the parking area, and several picnic tables. A total of 45 parking spaces are provided at Salmon Falls. Both the Skunk Hollow and Salmon Falls facilities receive heavy use during peak season weekends. Both facilities are often used as a parking area for the nearby Darrington and Sweetwater Trails in addition to the 20 parking spaces at the Darrington Trailhead.

Folsom Reservoir Trails

The trail system in the FLSRA is extensive, linking most of the FLSRA's facilities, and accommodating a variety of users including walkers and hikers, horseback riders, cyclists, and mountain bikers. Although there are over 90 miles of existing trails within the FLSRA, there are many areas that are not accessible by trail and there is not a continuous trail connection around the reservoir. Due to the narrow land base and steep topography around both Folsom Reservoir and Lake Natoma, the opportunities to develop new trail facilities are limited. Within this context, the demand for trail access continues to increase for all types of trail uses, including pedestrian, equestrian, mountain bikes, and hard-surface bicycling. The increased demand also results in a growing concern about conflicts between the different kinds of trail users, particularly on multi-use trails, which are open to all users. The following is a description of trails in the FLSRA that are in the vicinity of Folsom Reservoir.

Pioneer Express Trail

The Pioneer Express Trail connects the cities of Auburn and Sacramento and passes through the FLSRA. This segment of the Pioneer Express Trail is also part of the American Discovery Trail, the nation's first coast-to-coast non-motorized recreation trail. The trail enters the northeastern corner of the FLSRA at Cardiac Hill and follows the western shoreline of the North Fork of the American River through Rattlesnake Bar and Granite Bay to Beal's Point. This 21 mile segment of dedicated unpaved trail is for equestrian and pedestrian users only. From Beal's Point west, the Pioneer Express Trail follows the American River Bike Trail along the western shore of Lake Natoma to Nimbus Dam (10 miles), and continues west along the American River Parkway 23 miles to Discovery Park in downtown Sacramento. The lower American River between Nimbus Dam and the confluence with the Sacramento River at Discovery Park has been designated as a National Wild and Scenic River. The Folsom DS/FDR would not affect flows and recreation resources on the lower American River or affect the Wild and Scenic River designation.

Los Lagos Trail

This 1.5-mile equestrian and pedestrian trail is on a 200-foot wide strip of land that extends through the residential subdivision of Los Lagos. The trail begins at Auburn-Folsom Road and runs south into the FLSRA connecting with the Pioneer Express Trail just north of Granite Bay at Beek's Bight.

Doton's Point ADA Trail

This pedestrian-only trail is a scenic 1-mile spur that extends from a trailhead near the Granite Bay equestrian staging area at Beek's Bight to the end of Doton's Point on Folsom Reservoir.

Granite Bay Multi-Use Trails

There are 8 miles of unpaved multi-use trails in the sprawling Granite Bay area of the FLSRA. The 2-mile Granite Bay/Beal's Point Trail connects Granite Bay and the day use area at Beal's Point. The Granite Bay Trail extends 5 miles from the main entrance to Granite Bay at Douglas Boulevard to Beek's Bight and Doton's Point in the northern area of the facility. The 1-mile Center Trail is essentially a shortcut across Oak Point instead of following the Granite Bay Trail along the shoreline.

Folsom Point/Browns Ravine Trail

This unpaved multi-use trail extends 4 miles between Folsom Point and Browns Ravine. The trail begins in the day use area at Folsom Point and ends at the Browns Ravine/Old Salmon Falls trailhead at Browns Ravine.

Browns Ravine/Old Salmon Falls Trail
This unpaved equestrian and pedestrian trail begins at the Browns Ravine equestrian staging area and trends north along the eastern shoreline of Folsom Reservoir to the trailhead parking area at Old Salmon Falls about 12 miles away.

Sweetwater Trail
A widened shoulder just off Salmon Falls Road between Old Salmon Falls and Salmon Falls Bridge doubles as an informal parking area where a gate marks the trailhead for the Sweetwater Trail. This unpaved multi-use trail extends east about 2 miles to the commercial raft take-out facility at Salmon Falls Bridge and the Darrington Trail. An informal trail extends west from here to Old Salmon Falls and the Browns Ravine Trail.

Darrington Trail
The trailhead for this popular trail is at a small unpaved parking area at the north end of the Salmon Falls Road bridge over the American River just above the whitewater rafting facility at Skunk Hollow. This rugged 9-mile trail for mountain bikers and pedestrians follows the western shoreline of the South Fork high above the waterline, rounds the peninsula that separates the North and South Forks, and terminates at the Peninsula Campground.

Peninsula ADA (pedestrian only)
The Peninsula trail is at the Peninsula Campground and extends from the south boat launch south along the Folsom Reservoir shoreline about 1 mile.

Mormon Island Cove Trailhead
The Mormon Island Cove Trailhead is located at the east end of MIAD. Parking is provided for approximately 30-40 vehicles. This facility was constructed by El Dorado County as mitigation for the Green Valley Road widening project.

Connections to External Trail Systems
There are several connections to the FLSRA's trail system from outside jurisdictions. In Placer County, a multi-use trail enters the FLSRA at Sterling Pointe running along Lomida Lane off Auburn-Folsom Road. In El Dorado County, the 1997 Trails Master Plan includes a proposal to create the 10-mile Salmon Falls-Knickerbocker Trail that would connect with the Sweetwater Trail at the Salmon Falls Bridge. The trail would generally follow Salmon Falls Road to Pilot Hill and then Pilot View north to the Knickerbocker Trail.

In the City of Folsom, several connections to the FLSRA's trail systems exist. Folsom-Auburn Road provides a Class II bike lane that allows easy access to the West Lake Natoma Bike Trail and the FLSRA facilities along it, such as Beal's Point, American River Water Education Center, Negro Bar, and Lake Overlook. Access points include Berry Creek Drive and Crestridge Lane. Class II bike lanes along Greenback Lane provide access to facilities at Negro Bar and the West Lake Natoma Bike Trail at American River Canyon Drive and at Folsom-Auburn Road. Class II bike lanes along East Natoma Street and Green Valley Road provide access to Folsom Point and Browns Ravine. Finally, Class II bike lanes along Folsom Boulevard essentially parallel the East Lake Natoma Bike Trail, with access points at the Lake Natoma Crossing, Young Wo Circle, Parkshore Drive, Natoma Station Drive, and Nimbus Flat.

There are many locations in the FLSRA where private landowners have established informal connections to the existing trail network. These connections often involve the installation of a gate in fences along property lines that abut DPR land.

3.13.2 Environmental Consequences/Environmental Impacts

3.13.2.1 Assessment Methods

This analysis evaluates impacts to recreation by estimating the potential loss of visitors at each site as a result of construction of any of the alternatives. The analysis estimates total annual impacts and impacts during the peak recreation season based on monthly visits. Based on average 2002 to 2005 visitation, about 78 percent of total recreation at the FLSRA occurs during the peak season of May through September and 22 percent of recreation occurs during the off-peak season of October through April (DPR 2006). Therefore, any effects to recreation sites during the peak season months would affect substantially more visitors than effects during off-peak season months.

Construction of any of the alternatives is expected to occur from late 2007 to 2013 or 2014, depending on the alternative. Granite Bay, Beal’s Point, and/or Folsom Point would be used as staging areas for construction activities and processing of materials. The sites used vary for each alternative; Section 2.2.4.11 describes activities at each of these sites. The length of the construction period varies at each location and by alternative. Table 3.13-2 shows the expected timeframe of construction activities at Granite Bay, Beal’s Point, and Folsom Point under each alternative.

Construction activities could affect recreation by temporarily interrupting recreation or fully closing a facility, increasing truck traffic in the facility, impeding access to the facility, or impeding use of trails within the FLSRA. This analysis assumes varying levels of effects at each facility. Each alternatives discussion presents these assumptions. In summary, all recreation at Folsom Point would be interrupted under all alternatives, between 0 and 50 percent of recreation at Beal’s Point would be interrupted, and between 0 and 50 percent of recreation at Granite Bay would be interrupted. Some trail related recreation between Browns Ravine and Folsom Point and at Mooney Ridge could be affected.

Table 3.13-2 *Construction Activity Timeframe*	
Granite Bay	
Alternative 1	None
Alternative 2	Late summer (August, September) 2013
Alternative 3	Late summer 2009
Alternative 4	Late summer 2013 to end 2014
Alternative 5	Late summer 2013 to end 2014
Beal's Point	
Alternative 1	Fall 2007 to early Summer (May, June) 2009
Alternative 2	Fall 2007 to early Summer 2009
Alternative 3	Spring 2008 through Summer 2008
Alternative 4	Fall 2007 to end 2009
Alternative 5	Fall 2007 to end 2012
Folsom Point	
Alternative 1	Fall 2007 to end 2012
Alternative 2	Fall 2007 to end 2013
Alternative 3	Fall 2007 to end 2013
Alternative 4	Fall 2007 to end 2013
Alternative 5	Fall 2007 to end 2013

This analysis assumes that recreation use would not change at Rattlesnake Bar, Skunk Hollow/Salmon Falls, the Peninsula area, and at Lake Natoma. Water related recreation use at Folsom Lake Marina would not change as a result of implementing any alternative and water surface elevations would not change substantially at Folsom Reservoir as a result of any of the action alternatives.

Potential impacts to recreation are evaluated based on average visitation during the years 1996 to 2005 visitation levels and projected future visitation levels through 2014, the end of scheduled construction. Visitation data from 1996 to 2005 were provided for the entire FLSRA, not separated by facility. Instead, data was separated by paid day use, free day use, overnight camping, and total attendance. Many day use areas do not have entrance stations and many users enter by foot or bicycle. These free day users generally do not get counted; therefore, DPR estimates likely underestimate the actual number of visitors at FLSRA. From 1996 to 2005, average total visitation was 1,232,197 visitors. This was the best available data to use for this analysis. To estimate visitation at Granite Bay, Beal's Point, and Folsom Point in 2005, this analysis uses the percentage of total visitors at the affected facilities in year 2000. In 2000, total attendance at FLSRA was more than 1.5 million. Table 3.13-3 shows 2000 visitation levels at Granite Bay, Beal's Point, and Folsom Point and the respective percentages of total visits.

Table 3.13-3 Attendance at Granite Bay, Beal's Point, and Folsom Point as a Percentage of Total FLSRA 2000 Attendance		
	Attendance	***Percentage of Total FLSRA Facility Attendance***
Granite Bay	507,712	46%
Beal's Point	219,986	20%
Folsom Point	112,120	10%
Total (above facilities)	839,818	76%
Total FLSRA facility attendance	1,111,260	-

Based on the above percentages and 10 year average visitation (1996 to 2005), visitation levels in 2006 were estimated to be 566,811 at Granite Bay, 246,439 at Beal's Point, and 123,220 at Folsom Point. These values are used to project future use at the FLSRA.

The California Department of Finance (DOF) provides population estimates and projections for all California counties. This analysis relies on DOF population data to estimate future visitation at the FLSRA. The analysis assumes that visitation at FLSRA will increase relative to population growth in Sacramento, El Dorado, and Placer Counties. From 2001 to 2005, population increased an average of 2.24 percent per year. DOF projections indicate that population in the three counties will grow an average of 2.07 percent per year from 2007 to 2014. Therefore, this analysis assumes that during the 2007 to 2014 construction period, visitation at FLSRA will increase 2.1 percent per year.

3.13.2.2 Significance Criteria

Impacts from the action alternatives would be significant if:

- Recreational use at major recreation sites and trails would be substantially reduced (more than 10 percent loss in annual visitation or any long-term reductions in visitation[1]) as a result of construction.
- Truck traffic or other construction activities would substantially reduce access to or interfere with recreational activities at the FLSRA.
- Special events at the FLSRA would require cancellation.
- Displaced recreation from sites affected by construction would substantially contribute to overcrowding or exceed the facility capacity at other recreation sites (including sites within the FLSRA).

[1] For this analysis, long-term is defined as greater than 1 year.

3.13.2.3 Environmental Consequences/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

Under the No Action/No Project Alternative, construction of staging and recreation centers and development of borrow areas within the reservoir would not occur. Various corrective actions to Folsom Dam and related facilities would not occur. Therefore there would be no impact to recreation.

Table 3.13-4 displays estimated recreation use from 2007 through 2014. Based on DOF population projections, visitation is estimated to increase 2.1 percent per year. Therefore, total visitation at Granite Bay, Beal's Point, and Folsom Point would increase from about 956,000 visitors in 2007 to about 1,106,000 visitors in 2014. Under the No Action/No Project Alternative, the DPR would complete their RMP, which would result in improved recreation infrastructure. Some of the major improvements include: converting some of the campgrounds at Beal's Point to group campsites, and improving traffic flow at the Beal's Point and Granite Bay entrance stations to avoid traffic problems on Folsom-Auburn Road. New and improved facilities could attract even more visitors to the FLSRA than estimated in Table 3.13-4.

Table 3.13-4
Recreation Use at Granite Bay, Beal's Point, and Folsom Point under the No Action/No Project Alternative

Site/area	2007	2008	2009	2010	2011	2012	2013	2014
Granite Bay	578,714	590,867	603,275	615,944	628,878	642,085	655,569	669,336
Beal's Point	251,615	256,899	262,293	267,802	273,425	279,167	285,030	291,015
Folsom Point	125,807	128,449	131,147	133,901	136,713	139,584	142,515	145,508
Total	956,136	976,215	996,715	1,017,647	1,039,016	1,060,836	1,083,114	1,105,859

Environmental Consequences/Environmental Impacts of Alternative 1

Table 3.13-5 summarizes assumptions about the percentage of recreation affected at each facility under Alternative 1 and the proposed construction period. Under Alternative 1, there would be no construction activity at Granite Bay. Table 3.13-6 shows estimated losses in visitation to Granite Bay, Beal's Point, and Folsom Point during the construction period, compared to the No Action/No Project Alternative. The following sections identify and evaluate potential recreation impacts of Alternative 1.

Table 3.13-5 ***Timeframe of Construction at FLSRA Facilities under Alternative 1***			
FLSRA Site	***% of Visitors Affected***	***Construction Timeframe***	***# of Peak Recreation Season Affected***
Granite Bay	0%	None	0
Beal's Point	10%	Fall 2007 to early Summer (May, June) 2009	1.5
Folsom Point	100%	Fall 2007 to end 2012	5

Table 3.13-6 ***Loss of Visitors During Construction Period Under Alternative 1***								
Facility	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***
Granite Bay	-	-	-	-	-	-	-	-
Beal's Point	742	25,690	13,143	-	-	-	-	-
Folsom Point	3,712	128,449	131,147	133,901	136,713	139,584	-	-
Total	4,455	154,139	144,290	133,901	136,713	139,584	-	-

Construction could result in a substantial loss of recreational use at Granite Bay

Granite Bay would not be affected by this alternative; therefore, there would be no impacts to recreation at Granite Bay from Alternative 1.

Construction could result in a substantial loss of recreational day use at Beal's Point

Construction at Beal's Point is scheduled to begin in Fall 2007, or later. All efforts would be made to start major construction at Beal's Point after the peak recreation season is over. Depending on when construction begins, work in this area would continue through early summer of 2009. There would be an in-reservoir staging area at the southwest end of Beal's Point so that no public parking is used for construction activities. Beal's Point would include contractor's offices, parking, stockpiling of and equipment, as well as other staging area-related activities. During the preparation of the plans and specifications, the lead construction agency would coordinate with DPR on the potential to use temporary construction access, staging areas, haul routes and permanent stockpiles as future recreation areas. There could be some borrow development at Beal's Point that could affect recreation. If excavation at Beal's Point is necessary, a processing plant could potentially be constructed in-reservoir, south of the Beal's Point parking lot, adjacent to the RWD. The picnic facilities and restrooms on the south end of Beal's Point would be open to the public during construction. The boat launch facility at Beal's Point would be closed to the public. The staging area would more than likely block access to the boat launch.

It is assumed that about 10 percent of recreation at Beal's Point would be interrupted each year during the construction period. The major recreational facilities at the north end of Beal's Point would still be accessible to the public. The north end area includes a beach, restrooms, picnic tables, and concessionaires. The walking and bike trails, or suitable detours would continue to be available to the public through the entire construction period. The south end facilities, except the boat ramp would be open to the public; however, the nearby proximity of construction could deter visitors to the area. Construction would affect recreation for a little less than 2 years. This analysis estimates a loss of about 25,690 visits during 2008 and about 13,143 visits during 2009. Because effects would occur longer than one year, this impact to day use recreation would be potentially significant.

After construction, if appropriate, the government would turn over the construction platform and processing area at Beal's Point to DPR. Reclamation would cover the staging area in road base aggregate, or another suitable material. If borrow activity occurs at Beal's Point, the beaches would be re-contoured as appropriate.

During construction, the loss of day use recreation at Beal's Point would be potentially significant. Mitigation Measures RC-1 through RC-8 would reduce the impact to less than significant.

<u>*Construction could result in a substantial loss of use at the Beal's Point Campground.*</u>

The campground facilities would still be open to the public during construction. Construction would occur on the opposite side of the dikes from the campground. A small staging area would be located north of the campground. Construction would not occur anywhere on the campground or result in any closure of camping facilities. Construction activities would generate noise and traffic that could affect use of the campground adjacent to Beal's Point. Noise levels would be mitigated to the extent possible through the mitigation measures in Section 3.10.4. Increased noise levels could result in some decreased recreational use of the campground.

The loss of use at the Beal's Point Campground over the construction period would be potentially significant. Mitigation Measures in Section 3.10.4 and RC-1 through RC-8 would reduce the impact to less than significant.

<u>*Construction could result in a substantial loss of recreational use at Folsom Point.*</u>

Construction is scheduled to start at Folsom Point in Fall of 2007. Construction would likely start after the peak recreation season and ensue through 2012. Folsom Point would be the main staging area along the reservoir's southern edge for construction on the Auxiliary Spillway, the main dam, the Left Wing Dam, and MIAD. Folsom Point would include contractor's offices, parking, staging of material, and processing and stockpiling of borrow materials, as well as other staging area-related activities. During the preparation of the plans and specifications, the lead construction agency would coordinate with DPR on the potential to use temporary construction access, staging areas, haul routes and permanent stockpiles as future recreation areas.

All recreation at Folsom Point would be interrupted during the construction period. Visitors would not be able to access Folsom Point facilities, including the boat launch or the parking lots. Recreation would be affected for about 6 years. Losses in annual recreation visits are estimated to range from about 128,400 in 2008 to 139,600 in 2012.

This would be a significant and unavoidable impact to recreation at Folsom Point. The government would implement Mitigation Measures RC-1 through RC-8, but impacts would still be significant while Folsom Point is closed.

Construction traffic and construction activities could interrupt and interfere with recreation at Beal's Point.

Construction traffic would include the trucking of borrow materials and processed materials. Formal internal haul routes within the reservoir would be established that connect all of the dikes and dams to a primary borrow area and a primary processing area. Public traffic would be restricted on these roads. This would decrease construction traffic on public roads within the Beal's Point area.

Internal haul roads would be constructed above the normal high waterline to ensure that the hauls roads are available except in extreme conditions. Construction vehicles would rarely need to use the main entrance at Beal's Point from Auburn-Folsom Road. Construction traffic would occur during the scheduled hours of the identified construction period. Construction traffic would not occur on weekends with scheduled special functions or on holiday weekends that would interfere with recreation. During off-peak seasons, recreational use within the Beal's Point facility is generally low; construction traffic would not cause major interruptions to recreation. During the peak summer season, recreational use is high on weekdays and weekends. If public access routes are used, construction traffic would slow down visitors to Beal's Point, but visitors would not be excluded.

A small staging area and or a transition would be constructed north of Beal's Point Campground to store and transport materials to Dikes 5 and 6. All construction activities would occur on the water side of the dikes away from the campground. Some construction noise would be audible from the campground. All reasonable mitigation measures would be used to reduce to noise impacts, which would include, but would not be limited to using portable noise barriers, limiting construction work to daytime (7:00 a.m. to 7:00 p.m.) and off-season periods (October through April), and erecting staging areas as far from the campground as possible. A detailed list of mitigation measures to reduce noise levels is presented in Section 3.10.4. Construction traffic would occur from the staging areas to the construction areas. There may be some increased wait times to access the facility; as well as minor construction within the facility.

Impacts to the Beal's Point recreation facilities would be significant during the construction period. Mitigation Measures RC-1 through RC-8 would be taken to reduce interruptions to recreation activities from construction traffic during the peak season. After mitigation, impacts to recreation at Beal's Point would be less than significant.

Construction traffic and construction activities could interrupt and interfere with recreation at Folsom Point.

Because of the full closure of Folsom Point, onsite construction traffic and construction activities would not interfere with recreation at Folsom Point facilities.

Construction could result in lost recreational use on trails at Granite Bay and Beal's Point.

FLSRA has many paved and dirt multi-use trails for biking, walking, hiking, and horse riding. A dirt multi-use trail extends from Granite Bay south to Beal's Point. Construction on Dikes 4, 5, and 6 and potential borrow activity north of Beal's Point could limit access to the trail. The Pioneer Express Trail, an equestrian and pedestrian trail, also extends from Beal's Point to Granite Bay. The American River Bike Trail extends from downtown Sacramento and ends at the Beal's Point recreation area. Use of these trails would be interrupted intermittently during the construction period. Parts of the trails may be closed to the public or may be removed to accommodate construction activities.

This would be a temporary significant impact. Mitigation Measures RC-9 and RC-10 would reduce the impact to less than significant.

Construction could result in lost recreational use on Folsom Point-Browns Ravine trail.

The Folsom Point-Browns Ravine multi-use trail extends northeast from Folsom Point to Browns Ravine. The trail runs across MIAD and along the reservoir's edge to Browns Ravine. Construction activities would restrict public access to the Folsom Point-Browns Ravine trail from Folsom Point the entire time that the Folsom Point staging area is used. Signs would be posted that redirect visitors to trail access at Browns Ravine. Restricted access to Folsom Point-Browns Ravine trail from Folsom Point would be a temporary significant and unavoidable impact.

During construction on MIAD, the portion of the trail that runs over MIAD would be closed to the public. The parking lot to access the trail from MIAD would also be closed. Under Alternative 1, construction on MAID would occur from 2008 to 2010. During this time, the government would allow use of other portions of Folsom Point-Browns Ravine trail subject to public safety considerations.

Loss of recreational use on this trail would be a temporary, significant and unavoidable impact.

Construction could result in cancellation of special events scheduled at FLSRA.

Section 3.13.1.3 describes some special events held annually at the FLSRA sites. Special events attract both participants and spectators. Many special events, including triathlons, other races, and bass fishing tournaments are held at Granite Bay. Under Alternative 1, construction would not occur at Granite Bay; therefore, there would be no impacts to special events.

Construction activities at Beal's Point would not occur during weekends when special events are scheduled to take place. All construction areas would be blocked off from the public. Additional efforts may be necessary to accommodate crowds within a smaller designated area.

Some scheduled events at Folsom Point would need to change venues to a different area of the FLSRA or be cancelled until construction is complete. The FLSRA already is overcrowded during the summer season; therefore, it would be difficult to schedule additional special events during this time at unaffected areas of the FLSRA. If special events occur during the off-peak season, organizers would likely be able to find an alternative FLSRA location to hold the event. Fishing tournaments out of Browns Ravine would be unaffected by construction.

The government would implement Mitigation Measure RC-7. If cancellation of any event occurs because of construction, this impact would be significant and unavoidable.

Construction could displace visitors from Beal's Point and Folsom Point and substantially contribute to overcrowded conditions at other regional recreation sites.

Because of potential interruptions to recreation at Beal's Point and the full closure of Folsom Point, visitors would need to find alternate recreation opportunities. During the off-peak season, other facilities at FLSRA would be able to accommodate displaced users. The FLSRA is typically over crowded during the peak season and would not likely accommodate all displaced visitors. The remaining areas of the 3-county region offer multiple recreation opportunities, including many parks and swimming areas. Boaters could travel to nearby reservoirs in the Sierra foothills or the Sacramento-San Joaquin Delta. The surrounding counties, including Yolo, Yuba, and San Joaquin County also have outdoor recreational and boating opportunities. Displaced visitors would be able to find a comparable substitute for recreation at FLSRA; however, many of these sites are also overcrowded during the peak season, especially boating facilities. Not all displaced visitors from FLSRA would go to the same recreation areas. Some visitors may opt for non-outdoor recreational substitutes.

Visitors would be displaced during the construction season at each facility. This analysis assumes that 10 percent of visitors would be affected annually at Beal's Point. Displaced visitors during the off-peak season would not result in substantial overcrowding at other recreation sites. When construction occurs during the peak season, more visitors could be affected. Most recreational facilities at Beal's Point would continue to be open for public use during construction; therefore, fewer visitors would be displaced than if the facility were completely closed. The majority of visitors at Beal's Point are not boaters; therefore, the multitude of other regional recreation areas would be able to accommodate visitors interested in hiking, swimming, or picnicking.

This impact would be less than significant.

Folsom Point would be closed for about 6 years. Any displaced visitors from Folsom Point that travel to other recreation areas for boating activities would contribute to overcrowding. The magnitude and duration of displaced visitors, especially boaters, from Folsom Point to other facilities would create overcrowding.

This impact would be significant and unavoidable. The government would implement Mitigation Measures RC-1 through RC-8; however, impacts from overcrowding would still be significant.

Installation and operation of security measures could interrupt recreation at FLSRA facilities.

Proposed security measures include appropriate level of access controls, intrusion detection, supplemental lighting and Closed Circuit television (CCTV) components throughout the Folsom Dam facilities. Installation of security cameras would require the construction of 30' steel towers on each end of Dikes 4, 5, 6, and 7, and MIAD. Once installed the cameras would be able to only monitor critical access control devices. Cameras would be installed at Beal's Point to monitor access control points of Folsom Dam and the Right Wing Dam. Construction associated with the security measures would be coordinated with construction activities of the Folsom DS/FDR.

Installation at Beal's Point includes a fixed camera tower at the southern edge of the public parking lot near the RWD. Installation of the tower would restrict part of the parking lot from public use for a short period of time. The staging area at Beal's Point would be set up for construction at the RWD and Dikes 4, 5, and 6. Installation of the security camera would not interfere with additional recreation. The security cameras would video recreation activity around the recreation sites; however, recreation would not be affected. Increased security could improve public safety at the recreation site.

This would be a less than significant impact.

Installation of camera towers and lighting on the dikes could temporarily affect existing bike and pedestrian trails that run atop the dikes. Permanent lighting could improve recreation opportunities on trails.

This impact would be less than significant with Mitigation Measures RC-6, RC-9 and RC 10.

Installation of camera towers on MIAD at the left and right abutments would require some construction work. The Folsom Point-Browns Ravine trail over MIAD would be restricted to the public during construction work on MIAD. Installation of the security measure would occur during the same period.

The impact would be less than significant.

Environmental Consequences/Environmental Impacts of Alternative 2

Table 3.13-7 presents assumptions about the percentage of recreation affected at each facility under Alternative 2 and the proposed construction period. Table 3.13-8 shows estimated losses to Granite Bay, Beal's Point, and Folsom Point during the construction period under Alternative 2, compared to the No Action/No Project Alternative. The following sections identify and evaluate potential recreation impacts of Alternative 2.

Table 3.13-7
Timeframe of Construction at FLSRA Facilities under Alternative 2

FLSRA Site	% of Visitors Affected	Construction Timeframe	# of Peak Recreation Season Affected
Granite Bay	0%	Late summer (August, September) 2013	0.5
Beal's Point	10%	Fall 2007 to early Summer (May, June) 2009	1.5
Folsom Point	100%	Fall 2007 to end 2013	6

Table 3.13-8
Loss of Visitors During Construction Period Under Alternative 2

Facility	2007	2008	2009	2010	2011	2012	2013	2014
Granite Bay	-	-	-	-	-	-	-	-
Beal's Point	742	25,690	13,143	-	-	-	-	-
Folsom Point	3,712	128,449	131,147	133,901	136,713	139,584	142,515	-
Total	4,455	154,139	144,290	133,901	136,713	139,584	142,515	-

Construction could result in a substantial loss of recreational use at Granite Bay

Under Alternative 2, construction at Granite Bay would occur during the late summer, roughly August through October, in 2013. The Granite Bay staging area would be north of Granite Bay on the east side of Dike 1, which is outside of major a recreational activity at Granite Bay. During the preparation of the plans and specifications, the lead construction agency would coordinate with DPR on the potential to use temporary construction access, staging areas, haul routes and permanent stockpiles as future recreation areas. There would be no borrow activity at Granite Bay under this alternative. The Granite Bay staging area would support the construction on Dikes 1, 2, and 3, including contractor's offices, parking, construction, materials storage, as well as other staging area-related activities. All recreation facilities at Granite Bay would be available for public use. Construction on Dikes 1, 2, and 3 would not result in any losses to recreational use at Granite Bay.

This impact would be less than significant.

Construction could result in a substantial loss of recreational use at Beal's Point

Impacts to Beal's Point would be similar to Alternative 1. Because of construction effects and restricted use of the boat launch, it is assumed that about 10 percent of recreation at Beal's Point would be interrupted during the construction period. All facilities, except the boat launch, would remain open to the public.

During construction, the loss of day use recreation at Beal's Point would be significant. Mitigation Measure RC-1 through RC-8 would reduce the impact to less than significant.

Construction could result in a substantial loss of use at the Beal's Point Campground.

Impacts to Beal's Point Campground would be similar to Alternative 1.

The loss of use at the Beal's Point Campground over the construction period would be significant. Mitigation Measures in Section 3.10.4 and RC-1 through RC-8 would reduce the impact to less than significant.

Construction could result in a substantial loss of recreational use at Folsom Point

Construction is scheduled to start at Folsom Point in the Fall of 2007. Construction would likely start after the peak recreation season and ensue through 2013. Folsom Point would be the main staging area along the reservoir's southern edge for construction on the Auxiliary Spillway, the main dam, the Left Wing Dam, Dikes 7 and 8, and MIAD. All recreation at Folsom Point would be interrupted during the construction period. The boat ramp at Folsom Point would be closed for public use. Recreational use of the facility would be lost for over 6 years. Annual losses in visits are estimated to range from about 128,400 in 2008 to 142,500 in 2013. During the preparation of the plans and specifications, the lead construction agency would coordinate with DPR on the potential to use temporary construction access, staging areas, haul routes and permanent stockpiles as future recreation areas.

This impact would be a significant and unavoidable impact to recreation at Folsom Point during the construction period. The government would implement Mitigation Measures RC-1 through RC-8, but impacts would still be significant while Folsom Point is closed.

Construction traffic and activities could interrupt or interfere with recreation at Beal's Point and Granite Bay.

Construction traffic would include the trucking of borrow materials and processed materials. Formal internal haul routes within the reservoir would be established that connect all of the dikes and dams to a primary borrow area and a primary processing area. Public traffic would be restricted on these roads. An internal haul route would be constructed from Beal's Point to Granite Bay. Construction trucks would use this route to the extent possible to haul materials. This would reduce the effects of construction traffic on recreation at these facilities.

Internal haul roads would be constructed above the normal high waterline to ensure that the hauls roads are available except during extreme conditions. When water levels are high and internal roads are inundated, construction vehicles would need to use the main entrances to Beal's Point from Auburn-Folsom Road and to Granite Bay from Douglas Boulevard. Construction traffic would occur during scheduled hours of the identified construction period. Construction traffic would not occur during weekends with scheduled special events or holiday weekends that would interfere with recreation. During off-peak seasons, recreational use within the Beal's Point and Granite Bay facilities are generally low; construction traffic would not cause major interruptions to recreation. During the peak summer season, recreational use is high on weekdays and weekends. If public access routes are used, construction traffic would slow down visitors and increase wait times to access Beal's Point and Granite Bay.

A small staging area would be constructed north of Beal's Point Campground to store and transport materials to Dikes 5 and 6. All construction activities would occur on the water side of the dikes away from the campground. Some construction noise would be audible from the campground. All reasonable mitigation measures would be used to reduce to noise impacts, which would include, but would not be limited to using portable noise barriers, limiting construction work to daytime (7:00 a.m. to 7:00 p.m.) and off-season periods (October through April), and erecting staging areas as far from the campground as possible. A detailed list mitigation measures to reduce noise levels is presented in Section 3.10.4. Construction traffic would occur from the staging area to the construction areas. There may be some increased wait times to access the facility; construction traffic would not interfere with public traffic within the facility.

Impacts to the Beal's Point and Granite Bay recreation facilities would be significant during the construction period. Mitigation Measures RC-1 through RC-8 would be taken to reduce interruptions to recreation activities from construction traffic during the peak season. After mitigation, impacts to recreation at Beal's Point and Granite Bay would be less than significant.

<u>Construction traffic could cause major interruptions to recreation at Folsom Point.</u>

Because of full closure at Folsom Point, onsite construction traffic would not affect recreation at Folsom Point facilities.

<u>Construction could result in lost recreational use on trails at Granite Bay and Beal's Point.</u>

FLSRA has many paved and dirt multi-use trails for biking, walking, hiking, and horse riding. A dirt multi-use trail extends from Granite Bay south to Beal's Point. Construction on Dikes 4, 5, and 6 and potential borrow activity north of Beal's Point could limit access to the trail. The Pioneer Express Trail, an equestrian and pedestrian trail, also extends from Beal's Point to Granite Bay. The American River Bike Trail extends from downtown Sacramento and ends at the Beal's Point recreation area. Use of these trails would be interrupted intermittently from late 2007 to the early summer of 2009 peak season, and the latter half of the 2013 summer season. Parts of the trails may be closed to the public or may be removed to accommodate construction activities.

This would be a significant impact. Mitigation Measures RC-9 and RC-10 would reduce the impact to less than significant.

<u>*Construction could result in lost recreational use on Folsom Point-Browns Ravine trail.*</u>

The Folsom Point-Browns Ravine multi-use trail extends northeast from Folsom Point to Browns Ravine. The trail runs across the MIAD and along the reservoir's edge to Browns Ravine. Construction activities would restrict public access to the Folsom Point-Browns Ravine trail from Folsom Point the entire time that the Folsom Point staging area is used. Signs would be posted that redirect visitors to trail access at Browns Ravine. Restricted access to Folsom Point-Browns Ravine trail from Folsom Point would be a temporary significant and unavoidable impact.

During construction on MIAD, the portion of the trail that runs over MIAD would be closed to the public. The parking lot to access the trail from MIAD would also be closed. Under Alternative 2, construction on MAID would occur from 2008 to 2011. During this time, the government would allow use of other portions of Folsom Point-Browns Ravine trail subject to public safety considerations. However, loss of recreational use on this trail during MIAD construction would be a temporary, significant and unavoidable impact.

Loss of recreational use on this trail would be a temporary, significant and unavoidable impact.

<u>*Construction could result in cancellation of special events scheduled at FLSRA.*</u>

Section 3.13.1.3 describes some special events held annually at the FLSRA sites. Special events attract both participants and spectators. Many special events, including triathlons, other races, and bass fishing tournaments are held at Granite Bay. Alternative 2 would not interrupt recreation at Granite Bay facilities; therefore, these special events could be held during construction periods. Construction activities would not occur during weekends when special events take place. All construction areas would be blocked off from the public. Additional efforts would be necessary to accommodate crowds within a smaller designated area.

Effects to special events at Beal's Point and Folsom Point would be the same as Alternative 1. Events would likely be able to occur as planned at Beal's Point during the construction period. Events scheduled at Folsom Point would need to be relocated, rescheduled, or cancelled.

The government would implement Mitigation Measure RC-7 and RC-9. If any events are cancelled, this would be a significant and unavoidable impact.

Construction could displace visitors and substantially contribute to overcrowded conditions at other regional recreation sites.

Because of potential interruptions to recreation at Beal's Point and full closure of Folsom Point, visitors would need to find alternate recreation opportunities. During the off-peak season, other facilities at FLSRA would be able to accommodate displaced users. The FLSRA is typically over crowded during the peak season and would not likely accommodate all displaced visitors. The remaining areas of the 3-county region offer multiple recreation opportunities, including many parks, swimming areas and boating opportunities. The surrounding counties, including Yolo, Yuba, and San Joaquin County also have outdoor recreational and boating opportunities. Displaced visitors would be able to find a comparable substitute for recreation at FLSRA; however, many of these sites are also overcrowded during the peak season, especially boating facilities. Not all displaced visitors from FLSRA would go to the same recreation areas. Some visitors may opt for non-outdoor recreational substitutes.

Visitors would be displaced during the construction season at each facility. Granite Bay offers boating and non-water related activities. Construction would not affect recreation at Granite Bay. Visitors would still be able to use all facilities, including boat ramps.

This impact to Beal's Point and Granite Bay would be less than significant.

This analysis assumes that 10 percent of visitors would be affected annually at Beal's Point. Displaced visitors during the off-peak season would not result in substantial overcrowding at other recreation sites. When construction occurs during the peak season, more visitors could be affected. Most recreational facilities at Beal's Point would continue to be open for public use during construction. The majority of visitors at Beal's Point are not boaters; therefore, the multitude of other regional recreation areas would be able to accommodate visitors interested in hiking, swimming, or picnicking.

Displaced visitors from Beal's Point would not result in substantial overcrowding at other facilities. This would be a less than significant impact.

Folsom Point would be entirely closed for 6 peak recreation seasons. Any displaced visitors from Folsom Point that travel to other recreation areas for boating activities would contribute to overcrowding. The magnitude and duration of displaced visitors, especially boaters, from Folsom Point to other facilities would create overcrowding.

This impact would be significant and unavoidable. The government would implement mitigation measure RC-1 through RC-8; however, impacts from overcrowding would still be significant.

<u>*Installation and operation of security measures could interrupt recreation at FLSRA facilities.*</u>

Impacts would be the same as described for Alternative 1.

Environmental Consequence/Environmental Impacts of Alternative 3

Table 3.13-9 presents assumptions about the percentage of recreation affected at each facility and the scheduled construction period. Table 3.13-10 shows estimated losses to Granite Bay, Beal's Point, and Folsom Point during the construction period, compared to the No Action/No Project Alternative. The following sections identify and evaluate potential recreation impacts of Alternative 3.

Table 3.13-9
Timeframe of Construction at FLSRA Facilities under Alternative 3

FLSRA Site	% of Visitors Affected	Construction Timeframe	# of Peak Recreation Season Affected
Granite Bay	0%	Late summer 2009	0.5
Beal's Point	10%	Spring through summer 2008	1
Folsom Point	100%	Fall 2007 to end 2013	6

Table 3.13-10
Loss of Visitors During Construction Period Under Alternative 3

Facility	2007	2008	2009	2010	2011	2012	2013	2014
Granite Bay	-	-	-	-	-	-	-	-
Beal's Point	-	21,985	-	-	-	-	-	-
Folsom Point	3,712	128,449	131,147	133,901	136,713	139,584	142,515	-
Total	3,712	150,435	131,147	133,901	136,713	139,584	142,515	-

<u>*Construction could result in a substantial loss of recreational use at Granite Bay.*</u>

Under Alternative 3, impacts to Granite Bay would be the same as Alternative 2, except construction would occur during the latter part of the 2009 peak season as opposed to the latter part of the 2013 peak season under Alternative 2. Construction would not affect any recreation facilities at Granite Bay.

This impact would be less than significant.

<u>*Construction could result in a substantial loss of recreational use at Beal's Point.*</u>

Under this alternative, construction at Beal's Point is scheduled to begin in Spring 2008 and end in Summer 2008. Construction activities at Beal's Point would include contractor's offices, parking, staging of material, and concrete production, as well as other staging area-related activities. A construction platform would be constructed so that no public parking would be occupied by construction staging and activities. The construction platform would be near some picnic facilities and restrooms, but they would still be open to the public. The boat launch facility at Beal's Point would be closed to the public because the staging area would more than likely block access to the boat launch. If excavation is necessary, there could be some borrow development at Beal's Point that could affect recreation. During the preparation of the plans and specifications, the lead construction agency would coordinate with DPR on the potential to use temporary construction access, staging areas, haul routes and permanent stockpiles as future recreation areas.

Because of construction effects and restricted use of the boat launch, it is assumed that about 10 percent of recreation at Beal's Point would be interrupted during the construction period. All facilities, except the boat launch, would remain open to the public. This analysis estimates a loss of about 22,000 visits during the 6-month construction period.

Because it is expected that only 10 percent of recreation would be affected and construction would be less than one year, this impact would be less than significant.

<u>*Construction could result in a substantial loss of use at the Beal's Point Campground.*</u>

Impacts to Beal's Point Campground would be similar to Alternative 1. However, under this Alternative, substantial amounts of visitors would not be affected because the construction period is shorter, as described above.

The loss of use at the Beal's Point Campground over the construction period would be less than significant.

<u>*Construction could result in a substantial loss of recreational use at Folsom Point.*</u>

Impacts to Folsom Point under Alternative 3 would be the same as Alternative 2.

Impacts would be significant and unavoidable. The government would implement Mitigation Measures RC-1 through RC-8 to mitigate the loss of boating facilities, but impacts would still be significant while Folsom Point is closed.

<u>*Construction traffic could result in substantial interruptions to recreation at Beal's Point and Granite Bay.*</u>

Impacts from construction traffic would be the same as Alternative 2.

Impacts to the Beal's Point and Granite Bay recreation facilities would be significant during the construction period. Mitigation Measures RC-1 through RC-8 would be taken to reduce interruptions to recreation activities from construction *traffic. After mitigation, impacts to recreation at Beal's Point and Granite Bay would be less than significant.*

Construction could result in lost recreational use on trails at Granite Bay and Beal's Point.

Impacts from construction traffic would be the same as Alternative 2.

Impacts would be less than significant with Mitigation Measures RC-9 and RC-10.

Construction would result in lost recreational use on Folsom Point-Browns Ravine Trail.

Impacts to Folsom Point-Browns Ravine trail would be the same as Alternative 2.

This would be a temporary, significant and unavoidable impact.

Construction could result in cancellation of special events scheduled at FLSRA.

Effects to special events would be the same as Alternative 2. Events would likely be able to occur as planned at Granite Bay and Beal's Point during the construction period. Events scheduled at Folsom Point would need to be relocated, rescheduled, or cancelled.

Mitigation Measure RC-7 would be implemented. If cancellation of events occurs, this would be a significant and unavoidable impact.

Construction could displace visitors and substantially contribute to overcrowded conditions during more than one peak season at other regional recreation sites.

Impacts of Alternative 3 would be the same as Alternative 2. Displaced visitors from Granite Bay and Beal's Point would not cause substantial overcrowding at other recreation sites.

This impact would be less than significant.

Displaced visitors from Folsom Point would cause substantial overcrowding at other facilities. *This impact would be significant and unavoidable.*

Installation and operation of security measures could interrupt recreation at FLSRA facilities.

Impacts would be the same as described for Alternative 1.

Environmental Consequences/Environmental Impacts Alternative 4

Table 3.13-11 summarizes assumptions about the percentage of recreation affected at each facility and the proposed construction period. Table 3.13-12 shows estimated losses to Granite Bay, Beal's Point, and Folsom Point during the construction period, compared to the No Action/No Project Alternative. The following sections identify and evaluate potential recreation impacts of Alternative 4.

Table 3.13-11
Timeframe of Construction at FLSRA Facilities Under Alternative 4

FLSRA Site	*% of Visitors Affected*	*Construction Timeframe*	*# of Peak Recreation Season Affected*
Granite Bay	25%	Late summer 2013 to end 2014	1.5
Beal's Point	50%	Fall 2007 to end 2009	2
Folsom Point	100%	Fall 2007 to end 2013	6

Table 3.13-12
Loss of Visitors During Construction Period Under Alternative 4

Facility	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
Granite Bay	-	-	-	-	-	-	46,683	163,892
Beal's Point	3,712	128,449	131,147	-	-	-	-	-
Folsom Point	3,712	128,449	131,147	133,901	136,713	139,584	142,515	-
Total	7,425	256,899	262,293	133,901	136,713	139,584	189,198	163,892

Construction could result in a substantial loss of recreational use at Granite Bay.

Under Alternative 4, construction at Granite Bay would occur during the late summer 2013 and continue through 2014. The Granite Bay staging area would be north of Granite Bay on the east side of Dike 1, which is outside of major a recreational activity at Granite Bay. The Granite Bay staging area would support the construction on Dikes 1, 2, and 3, including contractor's offices, parking, construction, materials storage, as well as other staging area-related activities. There would be borrow development in the northern parts of Granite Bay under this alternative, which would affect recreation at Granite Bay. During the preparation of the plans and specifications, the lead construction agency would coordinate with DPR on the potential to use temporary construction access, staging areas, haul routes and permanent stockpiles as future recreation areas. It is assumed that about 25 percent of recreation at Granite Bay would be interrupted during the construction period. Recreation would be affected for almost 2 years. This analysis estimates a loss of about 46,700 visits during the latter half of 2013 and about 167,000 in 2014.

This impact would be a significant and unavoidable impact. Mitigation Measures RC-1 through RC-8 would be implemented, but would not reduce this impact to less than significant.

Construction could result in a substantial loss of recreational use at Beal's Point.

Under Alternative 4, construction at Beal's Point would begin in November 2007 after the peak recreation season and ensue through 2009. There would be an in-reservoir staging area at the southwest end of Beal's Point so that no public parking is used for construction activities. Beal's Point would include contractor's offices, parking, stockpiling of and equipment, as well as other staging area-related activities. Borrow development at the southern end of Beal's Point would occur under this alternative. A processing plant would be constructed in-reservoir at the southern end of the facility. Borrow development would affect recreational use in this area. The picnic facilities and restrooms on the south end of Beal's Point would be open to the public; however, the public would likely avoid these facilities during construction. The boat launch facility at Beal's Point would be closed to the public. The staging area would block access to the boat launch. There could be borrow development at the northern part of Beal's Point depending on materials needed. During the preparation of the plans and specifications, the lead construction agency would coordinate with DPR on the potential to use temporary construction access, staging areas, haul routes and permanent stockpiles as future recreation areas.

It is assumed that about 50 percent of recreation at Beal's Point would be interrupted during the construction period. This analysis estimates a loss of about 128,500 visits during 2008 and about 131,100 visits 2009.

This impact would be a significant and unavoidable impact. Mitigation Measures RC-1 through RC-8 would be implemented, but would not reduce this impact to less than significant.

Construction could result in a substantial loss of use at the Beal's Point Campground.

Impacts to Beal's Point Campground would be similar to Alternative 1; however, construction activities would be greater and would occur over a longer period.

The loss of use at the Beal's Point Campground over the construction period would be potentially significant. Mitigation Measures in Section 3.10.4 and RC-1 through RC-8, would be implemented, but would not reduce this impact to less than significant.

<u>Construction could result in a substantial loss of recreational use at Folsom Point.</u>

Impacts to Folsom Point under Alternative 4 would be the same as Alternative 2.

Impacts would be significant and unavoidable.

The government would implement Mitigation Measures RC-1 through RC-8 but impacts would still be significant while Folsom Point is closed.

<u>Construction traffic could result in substantial interruptions to recreation at Beal's Point and Granite Bay.</u>

Impacts under Alternative 4 would be the same as Alternative 2.

Impacts to the Beal's Point and Granite Bay recreation facilities would be significant during the construction period. Mitigation Measures RC-1 through RC-9 would be taken to reduce interruptions to recreation activities from construction traffic during the peak season. After mitigation, impacts to recreation at Beal's Point and Granite Bay would be less than significant.

<u>Construction could result in lost recreational use on trails at Granite Bay and Beal's Point.</u>

Impacts under Alternative 4 would be the same as Alternative 2.

Impacts would be less than significant with Mitigation Measures RC-9 and RC-10.

<u>Construction could result in lost recreational use on Folsom Point-Browns Ravine Trail.</u>

Impacts to Folsom Point-Browns Ravine trail would be the same as Alternative 2.

This would be a temporary, significant and unavoidable impact.

<u>Construction could result in cancellation of special events scheduled at FLSRA.</u>

Effects to special events would be the same as Alternative 2. Events at Granite Bay and Beal's Point would be able to occur during the construction period. Events scheduled at Folsom Point would need to be relocated, rescheduled, or cancelled.

Mitigation Measure RC-7 would be implemented. If cancellation of events occurs, this would be a significant and unavoidable impact.

<u>Construction could displace visitors and substantially contribute to overcrowded conditions at other regional recreation sites.</u>

Overcrowding would likely occur during the peak summer seasons. Boaters at Granite Bay would be displaced for 1.5 peak summer seasons. This analysis estimates that about 128,000 visitors could be displaced in the 2014 peak summer season. This could result in substantial overcrowding at other recreation sites.

This impact would be significant and unavoidable.

Under this alternative, about 50 percent of visitors at Beal's Point would be displaced for 2 peak seasons. This analysis estimates that about 128,000 visits could be displaced in 2008 and 131,000 visits in 2009. The amount and duration of displaced visitors from Beal's Point would cause substantial overcrowding at other recreation sites.

This impact would be significant and unavoidable. Similar to Alternatives 1 through 3, displaced visitors from Folsom Point for 6 peak seasons would cause substantial overcrowding; this impact would be significant and unavoidable.

Installation and operation of security measures could interrupt recreation at FLSRA facilities.

Impacts would be the same as described for Alternative 1.

Environmental Consequences/Environmental Impacts Alternative 5

Table 3.13-13 presents assumptions about the percentage of recreation affected at each facility and the proposed construction period. Table 3.13-14 shows estimated losses to Granite Bay, Beal's Point, and Folsom Point during the construction period, compared to the No Action/No Project Alternative. The following sections identify and evaluate potential recreation impacts of Alternative 5.

Table 3.13-13
Timeframe of Construction at FLSRA Facilities under Alternative 5

FLSRA Site	***% of Visitors Affected***	***Construction Timeframe***	***# of Peak Recreation Season Affected***
Granite Bay	50%	Late summer 2013 to end 2014	1.5
Beal's Point	50%	Fall 2007 to end 2012	5
Folsom Point	100%	Fall 2007 to end 2013	6

Table 3.13-14
Loss of Visitors During Construction Period Under Alternative 5

Facility	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***
Granite Bay	-	-	-	-	-	-	46,683	163,892
Beal's Point	3,712	128,449	131,147	133,901	136,713	139,584	-	-
Folsom Point	3,712	128,449	131,147	133,901	136,713	139,584	142,515	-
Total	7,425	256,899	262,293	267,802	273,425	279,167	189,198	163,892

<u>Construction could result in a substantial loss of recreational use at Granite Bay.</u>

Under Alternative 5, construction at Granite Bay would occur during the late summer 2013 and continue through 2014. There would be borrow development in the northern parts of Granite Bay under this alternative. It is assumed that about 50 percent of recreation at Granite Bay would be interrupted during the construction period. This analysis estimates a loss of about 46,700 visits during the latter half of 2013 and about 163,900 in 2014.

This impact would be a significant and unavoidable impact. Mitigation Measures RC-1 through RC-8 would be implemented, but would not reduce this impact to less than significant.

<u>Construction could result in a substantial loss of recreational use at Beal's Point.</u>

Under Alternative 5, construction at Beal's Point would begin in Fall 2007 after the peak recreation season and ensue through 2012. Effects would be similar to Alternative 4, but more borrow development would occur. Borrow development on both the southern and northern ends of Beal's Point would occur under this alternative. The length and magnitude of construction would be larger under this alternative relative to Alternative 4.

It is assumed that about 50 percent of recreation at Beal's Point would be interrupted during the construction period. This analysis estimates annual losses in recreation ranging from about 128,500 visits during 2008 to about 139,000 visits during 2012.

This impact would be a significant and unavoidable impact. Mitigation Measures RC-1 through RC-8 would be implemented, but would not reduce this impact to less than significant.

<u>Construction could result in a substantial loss of use at the Beal's Point Campground.</u>

Impacts to Beal's Point Campground would be similar to Alternative 1; however, construction activities would be greater and would occur over a longer period.

The loss of use at the Beal's Point Campground over the construction period would be potentially significant. Mitigation Measures in Section 3.10.4 and RC-1 through RC-8 would be implemented, but would not reduce this impact to less than significant.

<u>Construction could result in a substantial loss of recreational use at Folsom Point.</u>

Impacts to Folsom Point under Alternative 5 would be the same as Alternative 2. *Impacts would be significant and unavoidable. The government would implement Mitigation Measures RC-1 through RC-8, but impacts would still be significant while Folsom Point is closed.*

Construction traffic could result in substantial interruptions to recreation at Beal's Point and Granite Bay.

Alternative 5 involves more construction than all the other alternatives. More borrow material is required to support construction activities; therefore, more trucks would be needed to haul materials. *Impacts to the Beal's Point and Granite Bay recreation facilities would be significant during the construction period. Mitigation Measures RC-1 through RC-8 would be taken to reduce interruptions to recreation activities, but construction traffic would cause a significant and unavoidable impact to recreation.*

Construction could result in lost recreational use on trails at Granite Bay and Beal's Point.

Impacts under Alternative 5 would be the same as Alternative 2.

Impacts would be less than significant with Mitigation Measures RC-9 and RC-10.

Construction could result in lost recreational use on Folsom Point-Browns Ravine Trail.

Impacts to Folsom Point-Browns Ravine trail would be the same as Alternative 2.

This would be a temporary, significant and unavoidable impact.

Construction could result in cancellation of special events scheduled at FLSRA.

Effects to special events would be the same as Alternative 2. Events at Granite Bay and Beal's Point would be able to occur during the construction period. Events scheduled at Folsom Point would need to be relocated, rescheduled, or cancelled.

Mitigation Measure RC-7 would be implemented. If cancellation of events occurs, this would be a significant and unavoidable impact.

Construction could displace visitors and substantially contribute to overcrowded conditions at other regional recreation sites.

Overcrowding would likely occur during the peak summer seasons. Under this alternative, construction would displace about 50 percent of visitors at Beal's Point for 5 peak seasons and 50 percent of visitors at Granite Bay for 1.5 peak seasons.

The amount and duration of displaced visitors from Granite Bay and Beal's Point would cause substantial overcrowding at other recreation sites.

Similar to Alternatives 1 through 4, displaced visitors from Folsom Point would cause substantial overcrowding. Mitigation Measures RC-1 through RC-8 would be implemented, but this impact would be significant and unavoidable.

Installation and operation of security measures could interrupt recreation at FLSRA facilities.

Impacts would be the same as described for Alternative 1.

3.13.3 Comparative Analysis of Alternatives

Table 3.13-15 summarizes effects of the five action alternatives on recreation resources during the construction period. Construction on most alternatives would begin at the end of the 2007 peak season. The potential interruptions to recreation are dependent on the length of the construction period and the facility being affected. If construction takes longer than identified in the schedule, impacts to recreation would increase.

Table 3.13-15
Comparison of Alternatives Recreation Impacts Loss of Visits During Construction Season

	2007	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*Total 2007 to 2014*
Granite Bay									
Alternative 1	-	-	-	-	-	-	-	-	-
Alternative 2	-	-	-	-	-	-	-	-	-
Alternative 3	-	-	-	-	-	-	-	-	-
Alternative 4	-	-	-	-	-	-	46,683	163,892	210,575
Alternative 5	-	-	-	-	-	-	46,683	163,892	210,575
Beal's Point									
Alternative 1	742	25,690	13,143	-	-	-	-	-	39,575
Alternative 2	742	25,690	13,143	-	-	-	-	-	39,575
Alternative 3	-	21,985	-	-	-	-	-	-	21,985
Alternative 4	3,712	128,449	131,147	-	-	-	-	-	263,308
Alternative 5	3,712	128,449	131,147	133,901	136,713	139,584	-	-	673,506
Folsom Point									
Alternative 1	3,712	128,449	131,147	133,901	136,713	139,584	-	-	673,506
Alternative 2	3,712	128,449	131,147	133,901	136,713	139,584	142,515	-	816,021
Alternative 3	3,712	128,449	131,147	133,901	136,713	139,584	142,515	-	816,021
Alternative 4	3,712	128,449	131,147	133,901	136,713	139,584	142,515	-	816,021
Alternative 5	3,712	128,449	131,147	133,901	136,713	139,584	142,515	-	816,021

Granite Bay is the most used facility at FLSRA; therefore, any interruptions to recreation at Granite Bay would affect more visitors relative to less used facilities. Alternative 1 would not have any construction at Granite Bay. Alternatives 2 and 3 would have some construction north of Granite Bay, but would not interrupt recreation at the facilities. Alternative 4 and 5 would have the most impacts to recreation at Granite Bay because borrow activity could occur and construction would ensue over a longer period.

Under Alternatives 1, 2, and 4, recreation at Beal's Point would be interrupted in late 2007 through 2009. Alternative 4 would affect about 50 percent of the recreation because of increased borrow activity. Alternative 3 would have the shortest construction period at Beal's Point; therefore it would have the fewest impacts to recreation at Beal's Point.

Folsom Point would be fully closed under all the alternatives. Alternative 1 has a shorter scheduled construction period; therefore, it would have fewer impacts to recreation than the other alternatives. Impacts would be the same under Alternatives 2 through 5.

3.13.4 Mitigation Measures

This section identifies preliminary mitigation measures for impacts to recreation under the Folsom DS/FDR alternatives. Reclamation and the Corps would continue to coordinate with DPR to identify opportunities to avoid significant recreation impacts at FLSRA. If significant recreation impacts cannot be avoided, the agencies would work within their guidance and authority to provide mitigation for these impacts. Final determination by the federal agencies on actual mitigation measures will be specified in the Record of Decision (ROD). Potential mitigation measures could include but are not limited to the measures listed below.

RC-1: All construction-related damages to recreation facilities would be replaced in kind by the appropriate agency, in accordance with policy and guidance.

RC-2: The lead construction agency, would post signage and public announcements to inform the public of construction activities, facility closures at Folsom Point, and potential increased crowding and waiting times at Beal's Point and Granite Bay.

RC-3: Construction, borrow and staging areas would be sited as far away from recreation areas as practical in order to minimize recreation impacts, as determined by the lead construction agency. When a staging area cannot be moved or relocated, appropriate measures would be taken for noise and safety considerations.

RC-4: Borrow development, staging and construction activities would be re-contoured by the lead constructing agency, as appropriate, to pre construction conditions, or to contours which do not pose a safety hazard.

RC-5: After all construction activities are complete at Beal's Point, Folsom Point, or Granite Bay, all disturbed recreation areas and facilities would be restored as closely as possible to pre-construction conditions.

RC-6: The lead construction agency would include in the plans and specifications, if appropriate, a plan to ensure that the entrance stations at Beal's Point, Folsom Point and Granite Bay would meet public safety and traffic requirements during construction.

RC-7: Construction hours would be scheduled to minimize impacts during peak recreation use periods, holidays, and special events, as practical.

RC-8: The lead construction agency would develop a traffic management plan for all public roads within the recreation areas where both public and construction traffic occur. The plan would include measures such as flagmen and appropriate signage. The traffic plan would be submitted to the appropriate entities, or included in the Plans and Specifications for construction. An appropriate mile per hour speed limit would be imposed in all public areas close to construction. Construction crews and traffic would utilize internal haul routes, to the extent practical.

RC-9: Suitable detours would be established, with appropriate signage, for any bike, equestrian, or pedestrian trails that are interrupted by construction, per agency guidance and policy. Public service announcements would also be distributed and posted to inform the public of route changes.

RC-10: Any damage to existing improved trails from construction would be repaired in kind after construction is completed by the lead construction agency, per agency policy and guidance.

3.13.5 Cumulative Effects

Table 5-1 describes the projects included in the cumulative analysis. Besides, the Folsom DS/FDR, the other projects would not restrict access to or use of major recreation sites at the FLSRA. The Folsom Dam Road Closure will continue to redirect traffic through city streets and may cause further traffic interruptions to those trying to access FLSRA facilities. The New Folsom Bridge should relieve some of the traffic interruptions. Construction of the bridge should not have any direct effect on FLSRA facilities. The DPR, in partnership with Reclamation, recently began work on the integrated FLSRA General Plan and Resource Management Plan Update. This process would update the current general plan, as well as the long-range vision for the area. The General Plan will result in improvements to the FLSRA facilities.

The Folsom DS/FDR impacts to recreation would be cumulatively considerable during the construction period because of the magnitude of potential decreases in visitation at FLSRA facilities.

3.14 Public Services and Utilities

Public services and utilities include electricity, natural gas, water, stormwater, wastewater, solid waste, telecommunications, roads, police, fire, and parks and recreation. The following section discusses the regulatory setting, the existing conditions, and the potential effects of the Folsom DS/FDR alternatives on public services and utilities. A discussion of existing recreational resources in the Folsom Facility area and impacts from the Folsom DS/FDR to such resources are discussed in greater detail in Section 3.13, Recreation Resources, and Chapter 4, Socioeconomics.

3.14.1 Affected Environment/Existing Conditions

3.14.1.1 Area of Analysis

The area of analysis for this section includes the area surrounding the Folsom Facility, but does not include the American River or Lake Natoma, downstream of Folsom Dam. The area of analysis generally follows the 500-foot contour line around the entire Folsom Facility, and also includes all potential borrow, staging, and construction areas.

3.14.1.2 Regulatory Setting

This section describes the federal and state regulatory setting for public services and utilities.

Solid Waste

Federal

At the federal level, the USEPA regulates the management of non-hazardous solid waste according to the Resource Conservation and Recovery Act (RCRA), Subtitle D (USEPA 2005b). Under RCRA, the USEPA is also in charge of regulating the handling and disposal of hazardous wastes.

State

Under the jurisdiction of the California Environmental Protection Agency (California EPA), the California Integrated Waste Management Board (CIWMB) is charged with managing solid waste. Title 14 , Chapter 3, of the CCR, addresses minimum standards for solid waste handling and disposal (CIWMB 2004).

Public Services

Federal

Police and Fire**:** There are no federal regulations specifically associated with the provision of police, or fire services. Local county and city departments establish their own guidelines and rules regarding services.

State
Police: There are no specific state regulations related to police service. Local county and city departments establish their own guidelines and rules regarding services.

Fire: The California Office of the State Fire Marshal (COSFM) indirectly regulates fire services by regulating buildings and controlling substances that could cause fires (COSFM 2003). Local county and city departments establish their own guidelines and rules for fire services.

Parks and Recreation: The California State Park and Recreation Commission approves general plans for State Parks, classifies units of the State Park system, and establishes general policies on the protection and development of State Parks (DPR 2004).

3.14.1.3 Environmental Setting

The following section provides a description of the existing utilities and public services at the Folsom Facility, starting at the northwest end of the reservoir and continuing counter-clockwise around the reservoir. Information was obtained from the 2002 *American River Watershed Investigation Long-Term Study Final Supplemental Plan Formulation Report EIS/EIR* by the Corps, the 2006 *Folsom Bridge SEIS/SEIR by the Corps,* and the DPR 2003 *Folsom Lake State Recreation Area Resource Inventory* by Wallace, Roberts, and Todd et al., consultation with Reclamation, and various site visits.

Rattlesnake Bar
There are no water or sewer pipelines at Rattlesnake Bar. There is a well system but it is no longer in operation. There are porta-potties and pre-cast concrete vault toilets (pre-cast concrete restrooms with lined pits that store waste until it can be pumped out and taken to a treatment plant) available in the parking lot. The entrance kiosk to Rattlesnake Bar has telephone service and electrical service provided by PG&E. Power lines extend to the well and lights in the parking lot.

Horseshoe Bar (Sterling Point, Eden Rock)
There are no public utilities at Horseshoe Bar.

Granite Bay
Granite Bay is generally divided into three main areas, the Granite Bay boat launch area in the south, the Granite Bay Main Beach just north of the boat launch area, and Oak Point, Doton's Point, and Beeks Bight north of the Main Beach. The boat launch area has Stage 1 through 4 boat ramps as well as a 5 percent boat ramp. The Main Beach includes a snack bar, concessions, restrooms, and an activity center. There are no major buildings that require utilities past the Main Beach.

There are three restrooms at the Granite Bay Main Beach, one restroom at the Stage 4 boat ramp, and one restroom at the 5 percent boat ramp that are connected to San Juan Water District (SJWD) water system. Sewer connects to a leach field system.

There are four lift stations in Granite Bay; three serve the three restrooms at the Main Beach and one serves the Stage 4 boat ramp. There is also a lift station for the new restroom at the 5 percent boat ramp.

SJWD provides water services for the residence, shop, and kiosk restrooms at the Main Beach. Sewer is connected to a septic tank and leach fields.

Utilities at the entrance kiosk, the residence, the shop, and concession stand at the Main Beach include telephone and electricity.

Restrooms at the activity center, Main Beach, and Stage 4 boat ramp have electricity as do all boat ramps.

There are no utilities at the Horse Assembly Area, Oak Beach, Beeks Bight, or Doton's Point. The Horse Assembly Area has a porta-pottie and Oaks Beach, Beeks Bight, and Dotons Point have pre-cast concrete vault toilets.

Beal's Point

All restrooms at Beal's Point have flush toilets with sewer and water service. SJWD provides water through a water line that extends from Folsom-Auburn Road to the campgrounds, two restrooms and showers, the food concession, restrooms next to the food concession, and restrooms in the day use parking lot area. Placer County provides the sewer service with three sewer lift stations, one at the food concession and two at the Beal's Point Campground. An existing sewer pipeline runs through the upper right abutment of Dike 4 and extends towards Auburn-Folsom road (Sherer 2006). Telephone lines extend to the kiosk, lifeguard tower, and food concession.

PG&E provides electricity for Beal's Point and underground lines extend to restrooms, food concession, and RV campsites. Electric water heaters are used to heat water for showers and at the food concession and restrooms. Propane gas heaters heat water for the RV sites. Of the 69 campsites at the Beal's Point Campground, 20 are RV campsites with electrical hookups.

DPR Gold Fields Headquarters/Bureau Headquarters

Water and sewer lines are connected to the City of Folsom lines on Auburn Road. Electricity is provided by Sacramento Municipal Utility District (SMUD), Western Area Power Administration (WAPA), and PG&E. Telephone and internet services are provided to the DPR/Reclamation headquarters by SBC fiber-optic cables that use the existing SMUD 12 kV line. Hot water is heated by propane.

Main Dam

The City of Roseville shares an 84-inch raw water pipeline with SJWD that extends from the right abutment of the Main Concrete Dam towards the SJWD Sydney N. Peterson Water Treatment Plant (Peterson water treatment plant) just south of Beal's Point.

A 42-inch raw water pipeline, referred to as the Natomas Pipeline extends from the left abutment of the main concrete dam and provides water to the City of Folsom and Folsom State Prison.

Below the right abutment of the main concrete dam is the Folsom Powerplant. The Folsom Powerplant has three generating units with an average generating capacity of 198,720 kW**.**

Corps Resident Office

The Corps Resident office receives power from a SMUD 12 kV line that was a formerly abandoned 112 kV PG&E power line. An 8-inch fire protection pipeline is connected to the existing 42-inch Natomas Pipeline to provide fire protection to the Corps Residence Office.

Observation Point

There are no public utilities at Observation Point. The parking lot and kiosk are currently closed to the public.

Folsom Point

Folsom Point has two pre-cast concrete vault toilets in the day use area and a restroom at the boat launch area.

A 3-inch water main and a sewer line extend to the kiosk and restrooms at the boat launch. Sewer lift stations transport sewage back to East Natoma Road.

The Folsom Point kiosk has electricity that is connected to the City of Folsom utility lines on East Natoma Road.

MIAD area

A power line extends to a shed at the east end of MIAD.

Browns Ravine

Browns Ravine is the only marina at the Folsom Facility. It has flush toilets and a store. Water and sewer lines extend from El Dorado Irrigation District utilities off Green Valley Road to restrooms in the parking lot. Two El Dorado Irrigation District lift stations serve the restrooms. Electricity and telephone service is available for the shop and restrooms.

Storm drains and a culvert are installed in the Browns Ravine parking lot.

Old Salmon Falls (Falcon Crest, Jack Shack, Monte Vista)

The Old Salmon Falls parking lot has a porta-pottie and the Falcon Crest area has drinking fountains. The Monta Vista campground is not in operation and does not have a septic system but does have drinking fountains.

Sweetwater Creek

There are no public utilities or restrooms at Sweetwater Creek.

Salmon Falls (Lower half of South Fork American River, west of Skunk Hollow)

Salmon Falls has a parking lot, four pre-cast concrete vault toilets, and drinking water. There is no public water or sewer service. Telephone service is available but is not in use.

Skunk Hollow (Lower Half of South Fork American River)

Skunk Hollow has no public utilities. There are two pre-cast concrete vault toilets at the end of the parking lot.

Peninsula

The Peninsula has a campground with 104 camp sites, five restrooms, two boat ramps, and small amphitheatre. The restrooms at the Peninsula are flush toilets. The sewer system consists of a collection system and leach field, where waste is gravity fed to a lift station and then to a leach field. There are also pre-cast vault toilets in the parking lot. The Peninsula campground has a potable water system that pumps well water into a 50,000 gallon tank and delivers water to the five restrooms and various drinking fountains.

Mormon Island Wetlands Preserve

Currently there are no utilities at Mormon Island Wetlands Preserve. An unpaved road and parking lot provide access to the area.

Easements and Parcel Leases

Several agencies and companies have easements or parcel leases in the vicinity of the Folsom Facility. The easements provide the utility owners with permanent and guaranteed access to pipelines or transmission lines for maintenance and repair purposes (Wallace, Roberts, and Todd et al. 2003). Table 3.14-1 below provides a list of the easements and parcel leases and a general description of their location.

Table 3.14-1 ***Easements and Parcel Leases at the Folsom Facility***		
Company/Agency	***Easement/Parcel Lease***	***Location***
City of Folsom	42-inch raw water pipeline (Natomas Pipeline) (transitions to a 60-inch raw water pipeline).	Left abutment of Main Concrete Dam.
City of Roseville	84-inch raw water pipeline (shared with SJWD).	Extends from right abutment of Main Concrete Dam to Peterson water treatment plant.
	60-inch pipeline that connects to the 84-inch pipeline.	Runs south of Peterson Water Treatment Plant towards Folsom Auburn Road.
WAPA	Two overhead power lines.	Both originate from the Folsom Powerhouse. One extends west through the unit to Folsom Auburn Road, the other follows the American River south.
SMUD	230 kilovolt transmission line.	Along the northern boundary of Folsom Prison; carries electricity from WAPA facilities to the City of Folsom.
	12 kV power line.	Uses a 115 kV PG&E abandoned line and provides power to Corps Resident Office.
PG&E	115 kV electric tower line.	Passes through the Folsom Facility in the areas of Rattlesnake Bar and Granite Bay.
	Small distribution line - less than 50 kV .	Extends from the 115 kV line to Peninsula Campground.
	Newcastle Powerhouse.	End of Newcastle Road off Rattlesnake Road, east of Rattlesnake Bar.
El Dorado Irrigation District	Raw water intake facility that includes intake pipelines, a surge tank, and pump station.	South Fork of American River near Planeta Way.
	30-inch raw water pipeline.	From the intake facility.
SJWD	84-inch raw water pipeline (shared with City of Roseville).	Extends from right abutment of Main Concrete Dam to Peterson water treatment plant.
	51,200 gallon potable water hydropneumatic tank.	Mooney Ridge off the end of Skyway Lane, south of Granite Bay.
	Leases a parcel of land called Parcel C.	North end of Peterson water treatment plant.

Source: (Wallace, Roberts, and Todd et al. 2003, Corps 2002, Corps 2006).

Landfills

The Sacramento County (Kiefer) Landfill currently serves the City of Folsom.

Roads

Roads surrounding the Reclamation Central California Area Office provide operation and maintenance access to the main dam, powerplant, and pumping plant and generally remain closed to the public. The remaining roads at the Folsom Facility are managed by DPR as part of the Folsom Lake State Recreation Area and are open to the public. There are several access roads and trails that run along the top of dams and dikes or over them.

Public Services

Police: The Folsom Police Department provides police services for the City of Folsom and has a total staff of 103 (City of Folsom 2002b).

Fire: Four fire stations in the City of Folsom, with a total staff of approximately 74, provide fire/rescue and emergency medical services (City of Folsom 2002a).

Parks and Recreation: The majority of the land around Lake Natoma and Folsom Reservoir is owned by Reclamation. In 1956, DPR entered into agreement with Reclamation to manage the recreation facilities at the Folsom Lake State Recreation Area and Lake Natoma (Wallace, Roberts, and Todd et al. 2003). DPR is generally responsible for maintenance of the recreation facilities, trails, roads, and parking lots within the Folsom Facility.

Existing Potential Inundation of Utilities

Under existing conditions, Folsom Reservoir's high water elevation is approximately 466 feet and it rarely rises above this elevation; however, a severe storm event could cause levels to rise above this elevation. Beal's Point, Granite Bay, and Browns Ravine range in elevation from 465 to 475 feet (Reclamation et al. 2006). If the reservoir were to reach an elevation of 470 feet, portions of Beal's Point, Granite Bay, and Browns Ravine could be inundated, including several utilities, roads, and parking lots. Salmon Falls Road, which crosses the South Fork American River, would have all restroom facilities, trails, and parking lots completely inundated at an elevation of 482 feet (Reclamation et al. 2006). Under existing conditions, the potential for the reservoir to reach an elevation above 466 feet is low.

3.14.2 Environmental Consequences/Environmental Impacts

3.14.2.1 Assessment Methods

This impacts analysis takes into consideration the potential effects on public services and utilities from the five action alternatives and the No Action/No Project Alternative. The analysis takes into account the potential for borrow activities to require the relocation of utilities. Alternatives 1, 2 and 3 would require the least amount of borrow and would likely be able to avoid most utility relocations.

In addition to site visits and consultation with Reclamation, the following documents were used to describe the potential effects of the alternatives on public services and utilities:

- American River Watershed Long-Term Study Final Supplemental Plan Formulation Report EIS/EIR by the Corps, 2002

- Folsom Lake State Recreation Area Resource Inventory by CDPR, 2003
- PASS II, by Reclamation, Corps, SAFCA, DWR, State Reclamation Board, 2006
- Folsom Bridge SEIS/SEIR, by the Corps, 2006.

3.14.2.2 Significance Criteria

Impacts to public services and utilities would be considered potentially significant if Folsom DS/FDR actions would:

- Require the construction, expansion, or re-location of infrastructure or facilities for electricity, natural gas, water, wastewater, stormwater, and telecommunications, which could result in interruptions in service or adverse environmental effects;
- Exceed landfill capacity with waste generated by the project;
- Damage existing parking lots, roads, or trails at the Folsom Facility;
- Create a demand for public services that substantially exceeds the capacity of public service agencies (by increasing response times or requiring large increases in staff); or
- Impair or interfere with emergency or evacuation plans.

3.14.2.3 Environmental Consequences/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

The environmental consequences/impacts of the No Action/No Project Alternative would remain similar to existing conditions. Without the Folsom DS/FDR, there would be no impacts to existing utilities as no relocations would be required. There would be no changes in public services.

The No Action/No Project Alternative would have no effect on utilities or public services.

Environmental Consequences/Environmental Impacts of Alternative 1

Electricity

Construction activities could require the relocation of electricity infrastructure.

Several power lines and utility poles may require relocation during construction, including:

- A power line that connects to a shed at the east end of MIAD;

- Approximately five wood poles and 1,500 feet of conductor of the existing SMUD 12-kilivolt (kV) service to the Corps Resident Office;
- A 4,160 – volt power line that serves Reclamation's yard on the right abutment of the Main Concrete Dam could require relocation of seven poles and approximately 2,000 feet of conductor; and
- Power lines that serve the Folsom Point entrance kiosk.

The relocation of electrical infrastructure above could result in interruptions in service.

This impact would be potentially significant. Mitigation Measures PSU-1 and PSU-2 would reduce the impact to a less than significant level.

<u>*Electricity would be required to power processing and concrete batch plants.*</u>

In order to sort and crush borrow material and to create concrete, processing plants and concrete batch plants would be established in several areas around Folsom Reservoir. The processing plants and concrete batch plants would have the option of either using diesel powered generators or extending existing electricity infrastructure. If existing electricity infrastructure is used, this could require the extension of existing infrastructure such as towers, power lines, or poles. The construction/relocation of electrical infrastructure could result in interruptions in service.

This impact would be potentially significant. Mitigation Measures PSU-1 and PSU-2 would reduce the impact to a less than significant level.

<u>*Electricity may be required for various types of construction equipment.*</u>

Various types of construction equipment could require power to operate. Construction crews would likely use onsite generators or existing electricity infrastructure. This could require the extension of existing power lines. This would be unlikely to result in interruptions in service and would not affect any other existing utilities.

This impact would be less than significant.

<u>*Construction activities may require the temporary raising of power lines.*</u>

Several overhead power lines cross the entrance of Granite Bay. During construction, large vehicles may need to have these power lines raised in order to safely pass under them. In any instances where overhead lines could create obstacles for construction vehicles, agencies would likely temporarily raise the power lines with large poles in order to avoid utility relocations and interruptions in service.

This impact would be less than significant.

<u>During construction, a new substation would be constructed.</u>

To provide a source of power for various aspects of the Main Concrete Dam and Auxiliary Spillway, a new substation would need to be constructed. This substation would tie into existing SMUD power. Construction of this substation could result in interruptions in service.

This impact would be potentially significant. Mitigation Measures PSU-1 and PSU-2 would reduce the impact to a less than significant level.

<u>Installation and operation of security measures would have impacts to utilities.</u>

The installation of stoplights, lights, cameras, and intercoms around the Main Concrete Dam, MIAD, Dikes 4,5, 6, and 7, Left Wing Dam, Right Wing Dam, Beal's Point, and Folsom Pumping Plant, would require electricity. In order to provide power to these security features, power lines would be installed in trenches. A temporary power source such as a generator, or an upgrade of the solar power source currently in use, could be utilized until a permanent power source could be constructed. Construction actions including digging trenches and the placement of concrete poles for cameras could damage existing utilities. The conversion to a permanent power source could result in interruptions in service.

This impact would be potentially significant. Mitigation Measures PSU-1 and PSU-2 would reduce the impact to a less than significant level.

Natural Gas
No known existing natural gas infrastructure or facilities exist in the study area, therefore there would be no impacts to natural gas.

Water
<u>Construction of the Auxiliary Spillway would require the relocation of water infrastructure.</u>

The chute alignment for the new Auxiliary Spillway would cross a portion of the aboveground 42-inch diameter raw water pipeline (Natomas Pipeline), which provides water to the City of Folsom and the California Department of Corrections water treatment facilities. Approximately 300 feet of the existing pipeline may need to be relocated. The City of Folsom has stated that it will not accept interruptions in service for more than several hours. In addition, an 8-inch diameter fire protection pipeline and metering station that serve the Corps Resident Office would also have to be relocated. Mitigation Measure WS-1 in Section 3.2, Water Supply, would reduce this impact to a less than significant level.

This impact would be less than significant with implementation of Mitigation Measure WS-1.

Construction activities could require the relocation of existing water infrastructure.

Construction and borrow activities could require the relocation of existing water infrastructure including:

- An existing 3-inch water main that serves the entrance kiosk and restroom facilities at the boat launch at Folsom Point; and

The relocation of water infrastructure listed above could result in interruptions in service.

This impact would be potentially significant. Mitigation Measure PSU-1 would reduce this impact to a less than significant level.

Wastewater

Construction activities could require the relocation of existing wastewater facilities.

Construction activities around the Folsom Facility may lead to the damage or removal of existing restroom facilities. Mitigation Measure RC-1 in Section 3.13 states that any damaged or removed recreation facilities would be replaced in kind; therefore this impact would be less than significant.

This impact would be less than significant with implementation of Mitigation Measure RC-1.

Construction activities would require the relocation of existing wastewater infrastructure.

A mounded leach field of approximately 7,500 square feet at the Corps Resident Office would need to be relocated to a site adjacent to the existing septic tank before construction of the Auxiliary Spillway.

This impact would be potentially significant. Mitigation Measure PSU-1 would reduce this impact to a less than significant level.

Construction activities would likely result in the need for additional restroom facilities.

Construction workers onsite would likely require additional restrooms in various construction areas. Contractors would likely rent porta-potties for the duration of the construction.

This impact would be less than significant.

Construction activities could require relocation of wastewater infrastructure at Dike 4.

Construction activities at Dike 4 could require the relocation of an existing sewer pipeline that runs through the upper right abutment of Dike 4 and out towards Auburn-Folsom Road. This could result in interruptions in service.

This impact would be potentially significant. Mitigation Measure PSU-1 would reduce the impact to a less than significant level.

Construction activities could require the relocation of existing wastewater infrastructure at Folsom Point.

Borrow activities in the vicinity of Folsom Point could require the relocation of an existing sewer line that serves the restroom facilities at the boat launch.

This impact would be potentially significant. Mitigation Measure PSU-1 would reduce this impact to a less than significant level.

Stormwater

Construction activities would not require the relocation of existing infrastructure or the installation of new stormwater infrastructure; therefore, there would be no impact to stormwater infrastructure.

Solid Waste

Construction activities would generate solid waste.

Construction activities would generate various types of solid waste, such as litter, and miscellaneous construction waste such as concrete or steel, that would require disposal in a landfill. Construction activities could also generate hazardous wastes that would require proper disposal. All non-hazardous waste would be trucked to a local landfill for disposal. Because construction is expected to continue through the end of 2014, a large quantity of waste could be sent to the local landfill.

This impact would be potentially significant but Mitigation Measures PSU-3 through PSU-5 would reduce the impact to a less than significant level.

Construction activities would generate borrow material waste.

Excavation at certain borrow areas may result in quantities of material that are not suitable for use as shell or filter material for dikes or dams. Any excess borrow material would be applied to MIAD or placed in the reservoir and would not affect existing landfills.

This impact would be less than significant.

Telecommunications
Construction activities could require the relocation of telecommunications infrastructure.

Telephone and internet is provided to the Corps Resident Office by SBC, which uses SMUD's 12 kV poles. The fiber-optic cables for telephone and internet could need to be relocated and would follow the new 12 kV alignment. Telephone service to a Reclamation station uses several existing 4,160 volt power poles that provide power to the Reclamation Office. If the 4,160 volt power line and poles require relocation, two telephone poles and approximately 500 feet of wire would also need to be relocated. The relocation of telecommunication infrastructure could result in interruptions in service.

This impact would be potentially significant. Mitigation Measures PSU-1 and PSU-2 would reduce this impact to a less than significant level.

Roads
Construction activities could damage existing roads.

Construction activities such as the use of heavy equipment, could damage existing roads throughout the Folsom Facility. Mitigation Measure RC-1 in Section 3.13 would reduce this impact to less than significant by replacing all damaged facilities in kind.

This impact would be potentially significant. Mitigation Measure RC-1 in Section 3.13 would reduce this impact to less than significant.

Construction activities could require alterations to Folsom Dam Road on top of the Right Wing Dam and Left Wing Dam.

The Right Wing Dam may require a retaining wall near the intersection of the road and the crest of the upstream side of the road. A transition section could be required between Right Wing Dam and the Main Concrete Dam if the construction activities result in a difference in crest elevation.

In addition, the road on top of Left Wing Dam could have to be removed during construction. A new road would be installed with a metal beam guardrail on the downstream side and a concrete parapet wall on the upstream side. The road may also require a transition section if there is a difference in the crest elevation of Left Wing Dam and the Main Concrete Dam. Construction of these features would not affect any other existing roads or trails. This road is not open to the public and would therefore be considered less than significant. During construction, alternate routes would be made available to Reclamation for operation and maintenance access.

This impact would be less than significant.

A new Auxiliary Spillway would require construction of a maintenance access road and access ramp.

The new Auxiliary Spillway would require construction of a new access road to allow Reclamation access for operation and maintenance. This new access road would likely run across the new spillway and would connect to the new bridge access road that would be constructed by the Corps as part of the Folsom Bridge project. This road could be bench-cut into the slope of the spillway inlet channel. The new access road would be built to withstand semi-trucks with oversized loads.

In addition to an access road, a vehicle ramp would be constructed to allow vehicle access into the Auxiliary Spillway channel. The new ramp would be constructed of concrete and would enter on the northern face near the start of the spillway channel, would angle toward the river channel, and then exit through the training walls onto the floor of the spillway channel. The new access road and access ramp would be unlikely to affect existing roads or utilities.

This impact would be less than significant.

Construction of a new Auxiliary Spillway could require armoring of the existing Folsom Powerplant access road.

The existing access road to the Folsom Powerplant may require armoring to prevent erosion damage from releases by the new Auxiliary Spillway. This would not affect any other existing roads or utilities. During construction, alternate routes would be made available to Reclamation for operation and maintenance access.

This impact would be less than significant.

Relocation of the Natomas Pipeline would require construction of a new access turnout.

The Natomas Pipeline, which would be relocated because of the new Auxiliary Spillway, would likely be placed between the new Auxiliary Spillway channel and the new Folsom Bridge Road. City of Folsom employees would require access to this pipeline for operation and maintenance. Access could be difficult because the new Folsom Bridge Road would be on an embankment in this area. One option would be to construct a turnout and shoulder turn lane on the north side of Folsom Bridge Road, which would be accessible to westbound traffic. Construction of a turnout and shoulder turn lane would not affect existing roads or utilities.

This impact would be less than significant.

Construction of the Auxiliary Spillway could require the re-alignment of the access road to Left Wing Dam toe and the existing stilling basin.

A portion of the existing access road from Folsom Dam Road to the Corps Resident Office, the toe of Left Wing Dam, and the stilling basin would need to be realigned because of the new Auxiliary Spillway control structure and chute, and the new Folsom Bridge Road embankment. The new sections of the road would be paved and would still allow access from the Left Wing Dam toe to the Corps Resident Office and the toe of the Main Concrete Dam and stilling basin. This would not affect any other existing roads or utilities. During construction, alternate routes would be made available to Reclamation for operation and maintenance access.

This impact would be less than significant.

Construction activities would require the development of new internal haul roads.

In order to provide access to all areas around the reservoir, a series of in-reservoir roads would be constructed. These roads would likely consist of soil and gravel and would be constructed when the reservoir is low. When the reservoir fills, these roads would become inundated and could require reconstruction each year. The construction of in-reservoir roads would not affect any existing roads or utilities because it would occur in the reservoir.

This impact would be less than significant.

Public Services

Construction activities could increase emergency response times to the Folsom Facility.

Construction activities such as the stockpiling of materials or equipment may block sections of existing roadways or parking lots within the Folsom Facility. Several existing paved or unpaved roads could be removed during construction of the dikes and dams. This could reduce the number of access routes available to emergency vehicles or increase the response times if emergency vehicles are forced to take longer routes.

This impact would be potentially significant. Mitigation Measure PSU-6 would reduce the impact to a less than significant level.

<u>Construction activities could create the need for additional police staff.</u>

Construction activities would not create the need for additional police staff. Contractors would be responsible for hiring 24-hour security for the construction site.

This impact would be less than significant.

<u>Construction activities could create the need for additional fire protection staff.</u>

Construction workers could be working in potential fire risk areas to excavate borrow materials and to perform other construction activities. Although the potential for fires would exist, it is unlikely that additional fire staff would be needed to address the fire risk. No new buildings or facilities would be constructed that would require additional fire protection staff. Construction crews would take precautions to reduce the chances of fire (see Section 3.17, Public Health and Safety).

This impact would be less than significant.

<u>Construction activities could create the need for additional parks and recreation staff.</u>

Construction activities would not require additional parks and recreation staff. All security would be the responsibility of the contractor.

This impact would be less than significant.

<u>Construction activities could increase the emergency staff to population ratio.</u>

A large number of construction workers would be onsite at all times during the seven years of construction, and certain recreation areas would also remain open to the public during construction. The Folsom Facility has over 2,000 parking spots and can accommodate well over 2,000 people per day. Because construction workers at the Folsom Facility are not expected to exceed 300 people per shift on any given day, workers would be unlikely to exceed the Folsom Facility's visitor capacity and would therefore have little impact on the emergency staff to population ratio.

This impact would be less than significant.

Environmental Consequences/Environmental Impacts of Alternative 2
Electricity
Because Alternative 2 would involve construction on Dikes 1 through 3, several utilities, in addition to those described under Alternative 1, could require relocation.

The impacts to electricity would be similar to Alternative 1 with the following additional impact:

- Several power lines running beneath the boat launch area in front of Dike 3 could require relocation.

Mitigation Measures PSU-1 and PSU-2 would reduce any potentially significant impacts to a less than significant level.

Natural Gas
No existing natural gas infrastructure or facilities exist in the study area; therefore, there would be no impacts to natural gas.

Water

Construction activities could require the relocation of existing water infrastructure.

Construction and borrow activities could require the relocation of existing water infrastructure including:

- Water pipelines running beneath the boat launch area in front of Dike 3 that provide water service to the restrooms at the boat launch.
- An existing 3-inch water main that serves the entrance kiosk and restroom facilities at the boat launch at Folsom Point; and

The relocation of water infrastructure listed above could result in interruptions in service.

This impact would be potentially significant. Mitigation Measure PSU-1 would reduce this impact to a less than significant level.

The remaining impacts to water would be the same as those discussed for Alternative 1. Mitigation Measures PSU-1 would reduce any potentially significant impacts to a less than significant level.

Wastewater
The impacts to wastewater would be the same as Alternative 1. Mitigation Measures PSU-1 (Section 3.13) would reduce any potentially significant impacts to a less than significant level.

Stormwater
Construction activities would not require the relocation of existing infrastructure or the installation of new stormwater infrastructure; therefore, there would be no impact to stormwater infrastructure.

Solid Waste
The impacts to solid waste would be the same as Alternative 1. Mitigation Measures PSU-3 through PSU-5 would reduce any potentially significant impacts to a less than significant level.

Telecommunications
The impacts to telecommunications would the same as Alternative 1. Mitigation Measures PSU-1 and PSU-2 would reduce any potentially significant impacts to a less than significant level.

Roads
The remaining impacts to roads would be the same as Alternative 1. Mitigation Measure RC-1 in Section 3.13 would reduce any potentially significant impacts to a less than significant level.

Public Services
The impacts on public services would be the same as Alternative 1. Mitigation Measure PSU-6 would reduce any potentially significant impacts to a less than significant level.

New Embankments/Flood Easements
A series of new embankments/flood easements could be constructed around the Folsom Facility to raise areas of low elevation. The number of new embankments/flood easements and their locations have not yet been determined.

Construction of new embankments/flood easements could require the relocation of utilities.

Construction of new embankments/flood easements could require the relocation of utilities.

This impact would be potentially significant. Mitigation Measures PSU-1 and PSU-2 would reduce these impacts to a less than significant level.

Construction of the new embankments/flood easements could require new roads.

Construction of new embankments/flood easements could require the construction of new roads to allow construction and maintenance vehicles access. This would not affect existing roads.

This impact would be less than significant.

Construction of the new embankments/flood easements would be unlikely to affect public services.

Construction of the new embankments/flood easements would be unlikely to have any effects on police, fire, or parks and recreation services.

There would be no impact to public services.

Inundation
An increase in flood storage could inundate utilities during a severe storm event.

Because this alternative includes a potential raise of the dams and dikes, this would potentially increase the flood storage capacity at Folsom Reservoir. During a severe storm event, utilities around the Folsom Facility could become inundated. The potential for such a severe storm is very low and the inundation period would only last a few days until the water could be released.

This impact would be potentially significant but could be reduced to a less than significant level with Mitigation Measure PSU-7.

Environmental Consequences/Environmental Impacts of Alternative 3
The environmental effects of Alternative 3 would be the same as those discussed under Alternative 2. Mitigation Measures PSU-1 through PSU-7, RC-1, and WS-1 would reduce any impacts to a less than significant level.

Environmental Consequence/Environmental Impacts of Alternative 4
The environmental effects of Alternative 4 would be the same as those discussed under Alternative 2. Mitigation Measures PSU-1 through PSU-7, RC-1, and WS-1 would reduce any impacts to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 5
The impacts under Alternative 5 would be similar to Alternative 2, but would not involve any impacts associated with construction of the new Auxiliary Spillway. The impacts under Alternative 5 would also be similar to Alternative 1, but would involve construction on Dikes 1 through 3, and would involve a raise and the potential for new embankments.

Electricity
Construction activities would require the relocation of electricity infrastructure.

Several power lines may require relocation during construction, including:

- Power lines running beneath the boat launch area in front of Dike 3;
- An existing power line that connects to a shed on the east end of MIAD; and
- The power lines that serve the Folsom Point entrance kiosk.

The relocation of electrical infrastructure could result in interruptions in service.

This impact would be potentially significant but Mitigation Measures PSU-1 through PSU-2 could reduce this impact to a less than significant level.

The remaining impacts to electricity from Alternative 5 would the same as Alternative 1. Mitigation Measures PSU-1 through PSU-2 would reduce any impacts to less than significant.

Natural Gas
No existing natural gas infrastructure or facilities exist in the study area; therefore there would be no impacts to natural gas.

Water
Construction activities could require the relocation of existing water infrastructure.

Construction and borrow activities could require the relocation of existing water infrastructure including:

- An existing 3-inch water main that serves the entrance kiosk and restroom facilities at the boat launch at Folsom Point; and
- Water pipelines beneath the Dike 3 boat launch that serve the restrooms at the boat launch.

These relocations could result in interruptions in service.

This impact would be potentially significant but Mitigation Measure PSU-1 would reduce this impact to a less than significant level.

Wastewater
These impacts would be the same as Alternative 1, except the leach field at the Corps Resident Office would not require relocation because the Auxiliary Spillway would not be constructed. Mitigation Measures PSU-1 and RC-1 in Section 3.13 would reduce any impacts to less than significant.

Stormwater
Construction activities would not require the relocation of existing stormwater infrastructure or the installation of new stormwater infrastructure; therefore, there would be no impact to stormwater infrastructure.

Solid Waste
These impacts would be the same as Alternative 1. Mitigation Measures PSU-3 through PSU-5 would reduce any potentially significant impacts to a less than significant level.

Telecommunications
The Auxiliary Spillway would not be constructed under Alternative 5; therefore there would be no impacts to telecommunications.

Roads
<u>*Construction activities could damage existing roads.*</u>

Construction activities such as the use of heavy equipment, could damage existing roads throughout the Folsom Facility. Mitigation Measure RC-1 in Section 3.13 would reduce this impact to less than significant by replacing all damaged facilities in kind.

This impact would be potentially significant. Mitigation Measure RC-1 in Section 3.13 would reduce this impact to less than significant.

<u>*Construction activities could require alterations to Folsom Dam Road on top of the Right Wing Dam and Left Wing Dam*</u>*.*

The Right Wing Dam may require a retaining wall near the intersection of the road and the crest of the upstream side of the road. A transition section could be required between Right Wing Dam and the Main Concrete Dam if the construction activities result in a difference in crest elevation.

In addition, the road on top of Left Wing Dam could have to be removed during construction. A new road would be installed with a metal beam guardrail on the downstream side and a concrete parapet wall on the upstream side. The road may also require a transition section if there is a difference in the crest elevation of Left Wing Dam and the Main Concrete Dam. This road is not open to the public and would be considered a less than significant impact. Construction of these features would not affect any other existing roads or trails. During construction, alternate routes would be made available to Reclamation for operation and maintenance access.

This impact would be less than significant.

Construction activities would require the development of new internal haul roads.

In order to provide vehicle access to all areas around the dam, a series of in-reservoir roads would be constructed. These roads would likely consist of soil and gravel and would be constructed when the reservoir is low. When the reservoir fills, these roads could become inundated and could require reconstruction each year. The construction of in-reservoir roads would not affect any existing roads or utilities because it would occur in the reservoir.

This impact would be less than significant.

Public Services

The impacts to public services would be the same as Alternative 1. Mitigation Measure PSU-6 would reduce any potentially significant impacts to a less than significant level.

New Embankments/Flood Easements

A series of new embankments/flood easements could be constructed around the Folsom Facility to raise areas of low elevation. The numbers of new embankments/flood easements and their locations have not yet been determined.

The impacts to utilities and public services would be the same as Alternative 2. Mitigation Measures PSU-1 to PSU-2 would reduce any potentially significant impacts to a less than significant level.

Inundation

These impacts would be the same as Alternative 2. These impacts would be potentially significant but could be reduced to less than significant with Mitigation Measure PSU-7.

3.14.3 Comparative Analysis of Alternatives

The impacts analysis discussed above considers the potential impacts of obtaining borrow material from all of the potential borrow areas, however, for the smaller potential raises, it is unlikely that 100 percent of all the borrow areas would need to be used. Although the impacts to utilities are generally similar for Alternatives 2 through 5, Alternatives 1 and 3 would require less borrow material and, therefore, would be able to avoid the relocation of most of the existing utilities. Alternatives 1 through 3 would still require the relocation of utilities for the Auxiliary Spillway and the relocation of the Natomas Pipeline.

Alternative 4, the 7-foot raise, would require more borrow material than alternatives 1 and 3, and could require utility relocations in order to obtain borrow from the borrow areas. This alternative would also require utility relocations associated with the new Auxiliary Spillway. The Natomas Pipeline would have to be relocated. A potential 7-foot raise would likely require the construction of more new embankments/flood easements than Alternatives 2 and 3.

Alternative 5 would require the most amount of borrow material from the actual borrow sites and, therefore, could require the most utility relocations associated with borrow areas. It would also have the greatest flood storage capacity and could potentially inundate a larger area then the other alternatives. This would increase the potential for several utilities to become submerged under water. Alternative 5 would also require the largest quantity of new embankments/flood easements to raise up low elevation areas surrounding the reservoir. This could cause additional utility relocations. One important difference between Alternative 5 and the remaining alternatives would be the lack of a new Auxiliary Spillway. Alternative 5 would not require all of the utility relocations that would be needed during construction of an Auxiliary Spillway, nor would it require the relocation of the Natomas Pipeline.

Alternative 1 would require the least amount of borrow material from the actual borrow sites and would therefore likely be able to avoid utility relocations associated with borrow areas. This alternative would not create any additional flood storage capacity. Construction of the Auxiliary Spillway would likely require relocation of existing utility poles and utility lines and would also require the relocation of the Natomas Pipeline. New embankments/flood easements would not be constructed under this alternative as there would be no raise.

3.14.4 Mitigation Measures

The following mitigation measures, in addition to compliance with all federal and state rules and regulations, would reduce all potentially significant impacts to a less than significant level:

PSU-1: Coordinate with utility companies and other relevant agencies before construction to locate existing utilities and avoid damage. Avoid the relocation of utilities whenever possible. Provide notification of any potential interruptions in services to the appropriate agencies.

PSU-2: Stage utility relocations to minimize interruptions in service.

PSU-3: Consult with local landfills to select licensed landfills with adequate capacity to receive the wastes.

PSU-4: Recycle construction wastes whenever possible.

PSU-5: Dispose of hazardous wastes at licensed hazardous waste facilities.

PSU-6: Prior to construction, consult with local police, fire, and CDPR staff to develop and implement emergency response plans and establish emergency vehicle routes.

PSU-7: Notification will be provided to the appropriate agencies if any additional utilities could be inundated as a result of the implementation of the Folsom DS/FDR.

Mitigation Measures WS-1 (see Section 3.2.4) and RC-1 (See Section 3.13.4) would also serve to reduce potential public services and utilities impacts during construction to a less than significant level.

3.14.5 Cumulative Effects

This section contains analysis of potential cumulative effects, that is, the effects of each of the five Folsom DS/FDR alternatives in addition to those past, present, and reasonably foreseeable projects that would have similar impacts. The projects in consideration for this cumulative analysis are listed in Table 5-1 in Chapter 5, Cumulative Effects.

Electricity
There could be cumulative impacts associated with electricity.

The Corps' New Folsom Bridge Project and the Folsom DS/FDR would both require electricity during construction to operate equipment. This could exceed the capacity of existing energy infrastructure and could require new energy infrastructure. The Folsom DS/FDR's contribution to the cumulative condition would be less than significant. Electricity demands for equipment throughout the construction period are not expected to exceed capacity of existing electricity infrastructure and would not require additional infrastructure beyond the extension of existing power lines and the construction of a substation. In addition, generators would likely be used onsite to provide power for equipment. Besides the security measures and the alterations to the main dam and Auxiliary Spillway, the majority of the Folsom DS/FDR actions would only require electricity for the duration of the construction period.

This impact would be less than significant.

Natural Gas/Stormwater
The Folsom DS/FDR actions would not have any impacts on natural gas or stormwater; therefore, there would be no cumulative impact.

Water
There would be no cumulative effects on water infrastructure or facilities.

The Folsom DS/FDR and the projects in Table 5-1 would not increase the demand for water and would not require new water infrastructure or facilities other than a temporary water supply for the City of Folsom.

This impact would be less than significant.

Wastewater
There would be no cumulative effects on wastewater infrastructure or facilities.

The Folsom DS/FDR and the projects in Table 5-1 would not increase the amount of wastewater generated and would not require new wastewater infrastructure or facilities.

This impact would be less than significant.

Solid Waste
There could be potentially cumulative effects on existing landfills.

Many of the construction projects, including this Folsom DS/FDR, would create waste that would be sent to landfills. These projects could contribute to a reduction in the capacity and life of the local landfills. The Folsom DS/FDR would not contribute significantly to the cumulative condition. As describe in the mitigation measures, the Folsom DS/FDR would select only licensed landfills with adequate capacity to accept the waste. In addition, waste from the Folsom DS/FDR would be temporary and would only last through the duration of the construction period.

This impact would be less than significant.

Telecommunications
There would be no cumulative effects on telecommunications infrastructure or facilities.

The Folsom DS/FDR and the projects in Table 5-1 would not increase the demand for telecommunications and, therefore, would not require new telecommunications infrastructure or facilities.

This impact would be less than significant.

Roads
There would be no cumulative effects associated with existing roads in the Folsom Facility.

The Folsom DS/FDR and the projects in Table 5-1 would not increase the demand for roads and would not require any additional roads beyond the temporary internal haul routes or other temporary roads needed during construction. Mitigation measures will require all roads, parking lots, or trails removed during construction to be replaced.

This impact would be less than significant.

Public Services
<u>There would be no cumulative effects on public services.</u>

The Folsom DS/FDR and the projects in Table 5-1 would not increase the demand for public services and would not require any additional public services staff.

This impact would be less than significant.

3.15 Hydropower Resources

This section presents potential impacts to hydropower resources from construction of the Folsom DS/FDR alternatives.

3.15.1 Affected Environment/Existing Conditions

The following description of the hydropower resources associated with the Folsom DS/FDR was primarily obtained from the following sources unless otherwise noted:

- *American River Watershed Long-Term Study Final Supplemental Plan Formulation Report/Environmental Impact Statement/Environmental Impact Report* dated February 2002 prepared jointly by the United States Army Corps of Engineers, Sacramento Area Flood Control Agency, and the State of California Reclamation Board.

- *Folsom Dam Road Access Restriction Final Environmental Impact Statement*, dated April 2005 prepared by the U.S. Bureau of Reclamation.

3.15.1.1 Area of Analysis

The study area assessed as part of the evaluation of hydropower resources included Folsom Dam and Nimbus Dam, and associated hydropower generation facilities.

3.15.1.2 Regulatory Setting

Hydropower operations are regulated by the Federal Energy Regulatory Commission (FERC) pursuant to the Federal Power Act and the Electric Consumers Protection Act. Both laws require balancing of power generation with conservation of natural resources.

3.15.1.3 Environmental Setting

Central Valley Project Hydropower System

Folsom Dam is part of the Central Valley Project (CVP) hydropower system that extends from the Cascade Range in the north to the plains along the Kern River approximately 500 miles to the south. The CVP was built primarily to provide the Central Valley with water supply, flood control, and hydropower generation. Although the CVP emphasizes irrigation and flood control, features of the project such as Folsom Dam also provide domestic and industrial water supply, water quality enhancement, environmental CVP Improvement Act benefits, recreation, and hydropower generation (Reclamation 2005a).

The CVP hydropower system consists of eight powerplants and two pumping-generating plants. This system is fully integrated into the Northern California Power System and provides a substantial 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 (Reclamation 2005a, Corps 2002).

Folsom Dam and Reservoir

Reclamation constructed Folsom Powerplant at the foot of Folsom Dam on the north side of the river. Water from the dam is released through three 15-foot-diameter penstocks (i.e., pipelines) to three generating units. Each generating unit has a capacity of 66,240 kW, with a combined average generating capacity of 198,720 kW (CDPR 2004a, Reclamation 2005a). Based on a 10-year average, Folsom Dam generates (net) between approximately 35 gigawatt hours (GWh) (September through December) and 70 GWh (February through June) (http://www.usbr.gov/power/data/sites/folsom/ folsomgr.pdf). Water is supplied to the three 74,000 horsepower turbines that drive the generators through three 560-foot-long, 15-foot-diameter penstocks that run through the right abutment of the Main Concrete Dam. The capacity of the three power penstocks is approximately 8,000 cfs (Corps 2002, CDPR 2002).

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 generation) from the plant. The facility is dedicated first to meeting the requirements of the CVP facilities and preferred customers. The remaining electricity from the plant is marketed to various customers in Northern California. On average, the powerplant produces about 10 percent of the power used in Sacramento each year, and about 0.3 percent of the total projected power generation in the State. It also supplies power to the local pumping plant to provide domestic water supply to the cities of Folsom and Roseville, Folsom State Prison, and San Juan Water District. The powerplant has been increasingly relied upon to support local electrical loads during system disturbances (Reclamation 2005a).

To avoid sudden water surface elevation fluctuations in the lower American River, Nimbus Dam and Lake Natoma, downstream of Folsom Dam, are operated as regulating facilities for releases from Folsom Reservoir. Nimbus Powerplant, also constructed and operated by Reclamation, is located on the right abutment of Nimbus Dam, on the north side of the river. The Nimbus Powerplant consists of two generating units, with a generating capacity of approximately 17,000 kW and release capacity of approximately 5,100 cfs. Water is supplied to two 9,400 horsepower turbines that drive the generators through six 46.5-foot-long by 13.75-foot by 15.95-foot penstocks. Electricity is generated from this facility continuously throughout the day (Corps 2002).

3.15.2 Environmental Consequences/Environmental Impacts

3.15.2.1 Assessment Methods

The methods used to assess impacts to hydropower resources consisted of the evaluation of any changes to hydropower generation during construction of an alternative compared to that which would be generated under the No Action/No Project Alternative. In addition, changes in hydropower generation output over the course of a daily or weekly cycle resulting from construction of an alternative when compared to the No Action/No Project Alternative were also evaluated.

3.15.2.2 Significance Criteria

Impacts to hydropower resources would be potentially significant if construction of the Folsom DS/FDR would:

- Result in a reduction of total hydropower output; or
- Change the ability of the Folsom Powerplant to operate as a peaking facility (i.e., if construction under an alternative would alter the Powerplant's ability to generate hydropower at appropriate times of the day).

3.15.2.3 Environmental Consequences/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

The No Action/No Project Alternative would not change reservoir operations; therefore, it would not reduce hydropower or change the system's ability to operate.

Under the No Action/No Project Alternative, there would be no impact to hydropower and the Folsom Powerplant would continue to operate in a manner consistent with current and past operations.

The No Action/No Project Alternative would have no effect on hydropower resources.

Environmental Consequences/Environmental Impacts of Alternative 1

Alternative 1 construction activities would not change reservoir operations; therefore, it would not reduce hydropower or change the system's ability to operate.

Under Alternative 1, there would be no impact to hydropower during construction because Folsom Dam would be operated in a manner consistent with current and past operations.

Alternative 1 construction activities would have no effect on hydropower resources.

Environmental Consequences/Environmental Impacts of Alternative 2
Alternative 2 construction activities would not change reservoir operations; therefore, it would not reduce hydropower or change the system's ability to operate.

Under Alternative 2, there would be no impact to hydropower during construction because Folsom Dam would be operated in a manner consistent with current and past operations.

Alternative 2 construction activities would have no effect on hydropower resources.

Environmental Consequence/Environmental Impacts of Alternative 3
Alternative 3 construction activities would not change reservoir operations; therefore, it would not reduce hydropower or change the system's ability to operate.

Under Alternative 3, there would be no impact to hydropower during construction because Folsom Dam would be operated in a manner consistent with current and past operations.

Alternative 3 construction activities would have no effect on hydropower resources.

Environmental Consequences/Environmental Impacts of Alternative 4
Alternative 4 construction activities would not change reservoir operations; therefore, it would not reduce hydropower or change the system's ability to operate.

Under Alternative 4, there would be no impact to hydropower during construction because Folsom Dam would be operated in a manner consistent with current and past operations.

Alternative 4 construction activities would have no effect on hydropower resources.

Environmental Consequences/Environmental Impacts of Alternative 5
Alternative 5 construction activities would not change reservoir operations; therefore, it would not reduce hydropower or change the system's ability to operate.

Under Alternative 5, there would be no impact to hydropower during construction because Folsom Dam would be operated in a manner consistent with current and past operations.

Alternative 5 construction activities would have no effect on hydropower resources.

3.15.3 Comparative Analysis of Alternatives

None of the Folsom DS/FDR alternatives would have impacts to hydropower generation.

3.15.4 Mitigation Measures

No mitigation measures are required.

3.15.5 Cumulative Effects

The Folsom DS/FDR actions would have no impacts to hydropower generation; therefore, there would be no cumulative impacts.

3.16 Population and Housing

This section presents demographic data from the 2000 U.S. Census and analyzes the effects of the Folsom DS/FDR alternatives on population and housing.

3.16.1 Affected Environment/Existing Conditions

3.16.1.1 Area of Analysis

The Folsom DS/FDR area encompasses the areas surrounding Folsom Reservoir, including the construction footprint and adjacent properties. The area of analysis for the population and housing analysis is defined as the potential construction, staging, and borrow areas and local transportation routes for hauling construction materials plus properties and neighborhoods adjacent to these areas and routes, all located within the designated 2000 Census Tracts and Block Groups listed below. The Folsom DS/FDR area is within unincorporated portions of Placer County and El Dorado County and within the City of Folsom in Sacramento County. These areas are growing in population with new housing developing rapidly. The two counties and the City of Folsom have General Plan documents and Zoning Ordinances that include measures to plan for the housing and services needed to accommodate the increased population. As indicated above, the affected environment is broken down into State and local jurisdictions including: Folsom State Prison, Placer County, El Dorado County, Sacramento County, and the City of Folsom. There are no housing units or residents within the Folsom Lake State Recreation Area. The 2000 Census Tracts and Block Groups used for this analysis include the following:

- Folsom State Prison/California State Prison, Sacramento (Sacramento County) – Block Group 1, Census Tract 83
- Placer County – Block Groups 1, 2 and 3, Census Tract 206.01 and Block Group 2, Census Tract 206.05
- El Dorado County – Block Group 1, Census Tract 307.01 and Block Group 1, Census Tract 307.02
- City of Folsom (Sacramento County) – Block Groups 1, 2 and 4, Census Tract 82.10; Block Group 1, Census Tract 84.02 and Block Group 2, Census Tract 85.01

Figure 3.16-1 shows the Census geographic area used for determining Block Groups and Census Tracts to include within the Folsom DS/FDR area.

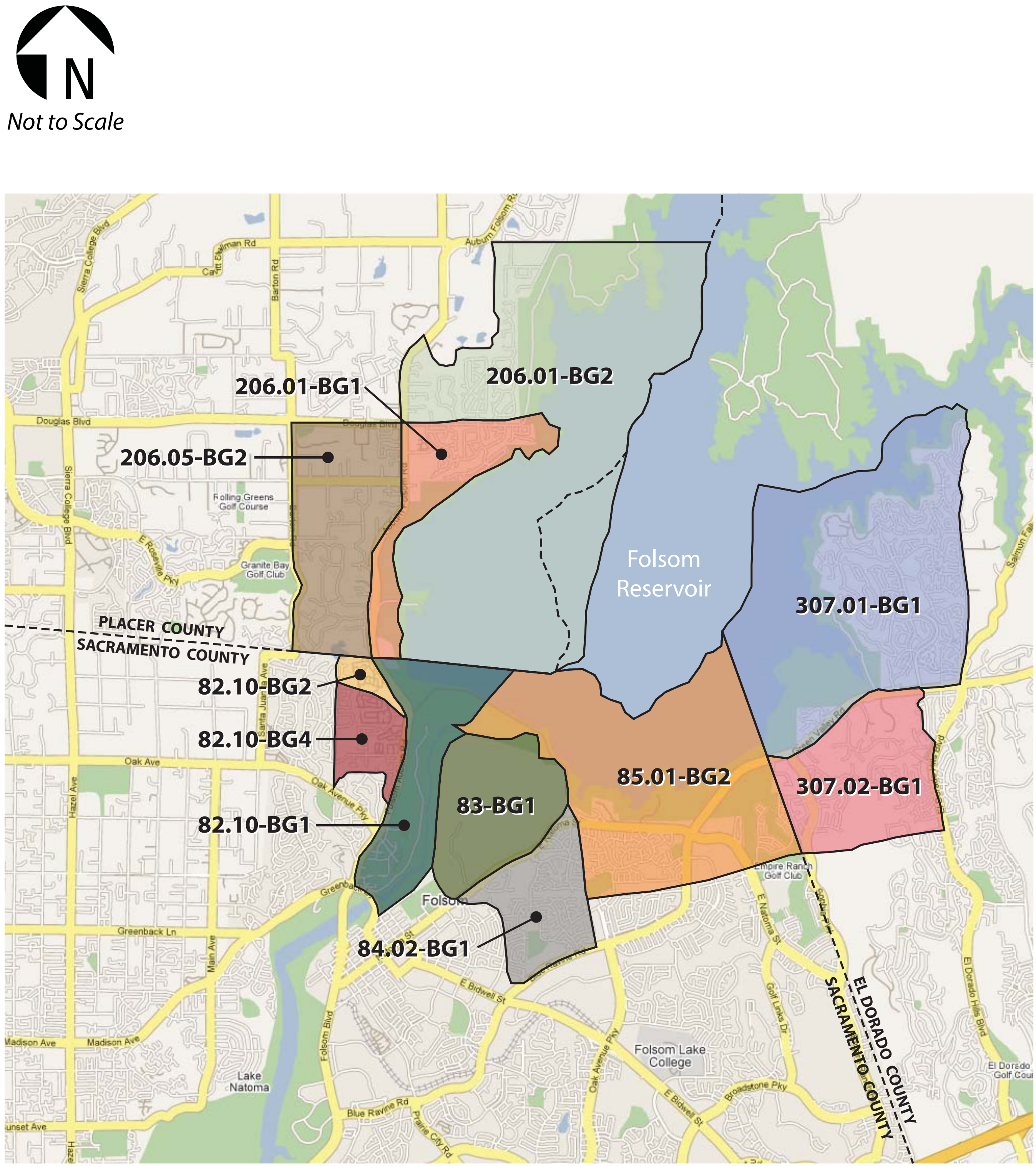

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Figure 3.16-1
Population and Housing - Census Geographic Area

CDM

3.16.1.2 Regulatory Setting

Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Uniform Act)

The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646), commonly referred to as the Uniform Act, is the Federal law that provides the minimum standards for relocation assistance requirements for persons affected by Federally funded projects or programs. Under this Act, any person who is displaced or whose property is acquired because of a Federally funded project or program must receive fair and equitable treatment and is eligible for assistance during the relocation process.

3.16.1.3 Environmental Setting

Most of the data were obtained from the 2000 U.S. Census. Additional information sources are noted. Table 3.16-1 is the consolidated Demographic Characteristics of the entire Folsom DS/FDR area by Census Tract and Block Group. This information is also included separately for Folsom State Prison/California State Prison as well as Placer County, El Dorado County, and the City of Folsom.

Table 3.16-1
Demographic Characteristics of the Folsom DS/FDR Area

Parameter	Block Group 1, Census Tract 307.01, El Dorado County	Block Group 1, Census Tract 307.02, El Dorado County	Block Group 1, Census Tract 206.01, Placer County	Block Group 2, Census Tract 206.01, Placer County	Block Group 3, Census Tract 206.01, Placer County	Block Group 2, Census Tract 206.05, Placer County	Block Group 1, Census Tract 82.10, Sacramento County	Block Group 2, Census Tract 82.10, Sacramento County	Block Group 4, Census Tract 82.10, Sacramento County	Block Group 1, Census Tract 83, Sacramento County	Block Group 1, Census Tract 84.02, Sacramento County	Block Group 2, Census Tract 85.01, Sacramento County
Population												
2000 Census	5,108	746	1,435	4,719	271	2,295	459	711	1,733	6,842	4,280	2,815
Percentage under 18	34.4%	29.4%	25.6%	25.9%	24.4%	26.8%	17.2%	8.7%	13.8%	0.23%	31.17%	37.09%
Percentage 65 or over	6.4%	10.9%	12.5%	11.7%	21.8%	10.0%	11.1%	45.7%	42.6%	1.20%	6.80%	3.37%
Racial Composition												
White	89.0%	92.0%	93.4%	92.8%	91.5%	92.3%	88.0%	91.0%	94.8%	35.63%	89.42%	87.71%
African American	1.1%	0.3%	0.1%	0.8%	0.0%	0.5%	0.0%	1.4%	0.4%	35.52%	0.61%	0.96%
Native American	0.4%	0.9%	0.5%	0.6%	0.7%	0.5%	0.0%	0.1%	0.2%	0.95%	0.72%	0.46%
Asian	4.7%	2.0%	2.4%	2.3%	0.7%	2.0%	5.9%	4.8%	1.7%	1.29%	3.60%	4.37%
Other or mixed	4.8%	4.8%	3.6%	3.4%	7.0%	4.6%	6.1%	2.7%	2.9%	26.62%	5.65%	6.50%
Hispanic or Latino	5.5%	2.8%	4.7%	4.4%	8.5%	5.0%	4.6%	3.0%	2.5%	27.19%	7.76%	8.13%
Median household income	$99,728	$109,025	$79,912	$101,851	$74,821	$101,617	$87,417	$29,500	$35,543	$56,042	$75,698	$100,250
Per-capita income	$42,695	$45,197	$33,670	$50,118	$36,209	$44,201	$42,830	$24,064	$30,396	$12,245	$25,269	$30,370
Below poverty level	2%	0.0%	3.2%	2.9%	0.0%	5.1%	3.9%	5.9%	3.8%	53.34%	3.78%	1.94%

Source: 2000 U.S. Census, US Census Bureau 2004a

Folsom State Prison/California State Prison - Sacramento

Folsom State Prison and California State Prison, Sacramento (CSPS) are within the same Census Tract and Block Group and within the City limits of Folsom. Folsom State Prison is a medium security prison for men, housing Level II and Level III inmates. A minimum security unit is also at Folsom State Prison (California Department of Corrections and Rehabilitations 2006a). CSPS is adjacent to Folsom State Prison and houses maximum security inmates with long sentences as well as inmates perceived as management problems from other institutions and is a Department of Corrections Medical hub for Northern California.

Folsom State Prison and CSPS are within Census Tract 83, Block Group 1, Sacramento County, California. The majority of individuals are listed as living within group quarters. Table 3.16-2 displays the racial and ethnic breakdown of the Folsom State Prison and the CSPS populations.

Table 3.16-2
Race and Ethnic Demographics within Folsom State Prison and CSPS

Race/Ethnicity	***Population***	***Percent of Total Prison and CSPS Population***
White	2,438	35.63%
Black or African American	2,430	35.52%
American Indian and Alaska Native	65	0.95%
Asian	88	1.29%
Other or Mixed	1,821	26.61%
		100.00%
Hispanic or Latino[1]	1,860	27.19%

(1) Hispanics or Latinos are also included in the population totals for the five racial groups listed above because Hispanic and Latinos are considered an ethnic group and not a racial group according to the U.S. Census. Therefore the percentages total over 100%. Hispanics or Latinos are separated out because some are included in the white racial group; however, according to Federal guidelines for Environmental Justice, Hispanics and Latinos are considered a minority group.

Source: U.S. Census Data 2000 (U.S. Census Bureau 2004a)

The population of both facilities is currently over maximum capacity and there are no imminent plans to expand the capacity of either facility. The population of both facilities as of March 2006 is 7,374 which is an increase of approximately 8.4 percent since 2000.

Table 3.16-3 shows the age and gender breakdown of residents within Folsom State Prison and CSPS.

Table 3.16-3 ***Age Demographics by Gender within Folsom State Prison and CSPS***			
Age	***Male***	***Female***	***Total***
Under 5 Years*	2	2	4
5 to 17 Years*	7	5	12
18 to 21 Years	319	2	321
22 to 29 Years	1,809	3	1,812
30 to 39 Years	2,536	5	2,541
40 to 54 Years	1,784	19	1,803
55 to 64 Years	263	4	267
Over 65 Years	81	1	82
Total	6,801	41	6,842
Median Age	35.1	43.3	35.1

*The 2000 Census Data includes employees and their families who live on site.
Source: U.S. Census Data 2000 (U.S. Census Bureau 2004a)

Placer County

Placer County is one of the fastest growing counties in California with a population increase of 44 percent between 1990 and 2000, and an increase of 24 percent between 2000 and 2004 (U.S. Census Bureau 2004a). The population of Placer County was 307,004 in 2004, 248,399 in 2000, and 172,796 in 1990. Census 2000 data for the area surrounding the Folsom DS/FDR footprint were analyzed for statistical information. Census Tracts 206.01 (Block Groups 1 and 2) and 206.05 (Block Group 2) are within the Folsom DS/FDR area. This information was used to determine the existing housing and population demographics of the area. The total 2000 population within these two Census Tracts was 8,720, 3.5 percent of the entire Placer County population. The race and ethnic demographics of the Placer County population as compared to the population that occurs within Folsom DS/FDR portion of Placer County are listed in Table 3.16-4.

Table 3.16-4 ***Race and Ethnic Demographics within Placer County Folsom DS/FDR Area***			
Race/Ethnicity	***Placer County***	***Placer County Study Area Block Groups***	***Percent of Placer County Study Area Population***
White	220,053	8,089	92.8%
Black or African American	2,031	54	0.6%
American Indian and Alaska Native	2,199	49	0.6%
Asian	7,317	193	2.2%
Other or Mixed	16,799	335	3.8%
		8,720	100%
Hispanic or Latino[(1)]	14,566	415	

(1) Hispanics or Latinos are also included in the population totals for the five racial groups listed above because Hispanic and Latinos are considered an ethnic group and not a racial group according to the U.S. Census. Therefore the percentages total over 100%. Hispanics or Latinos are separated out because some are included in the white racial group; however, according to Federal guidelines for Environmental Justice, Hispanics and Latinos are considered a minority group.

Source: U.S. Census Data 2000 (U.S. Census Bureau 2004a)

Placer County's population is projected to exceed 456,000 by 2020 (EDD 2004), an increase of approximately 83 percent from year 2000 Census figures.

Table 3.16-5 shows the age and gender breakdown of residents within all of Placer County compared to the Folsom DS/FDR area residents that occur within Placer County.

Table 3.16-5
Age Demographics by Gender within Placer County Folsom DS/FDR Area

Age	***Placer County***		***Placer County Study Area Block Groups***		***Percentage of Total County Population***	
	Male	***Female***	***Male***	***Female***	***Male***	***Female***
Under 5 Years	8,027	7,897	216	182	2.7%	2.3%
5 to 17 Years	25,430	24,404	969	902	3.8%	3.7%
18 to 21 Years	5,742	5,012	145	150	2.5%	3.0%
22 to 29 Years	9,697	9,439	143	138	1.5%	1.5%
30 to 39 Years	18,286	19,193	438	521	2.4%	2.7%
40 to 54 Years	29,295	30,370	1,282	1,354	4.4%	4.5%
55 to 64 Years	11,238	11,809	656	604	5.8%	5.1%
Over 65 Years	14,177	18,383	517	503	3.6%	2.7%
Totals	121,892	126,507	4,366	4,354	3.6%	3.4%
Median Age	37.1	38.8	42.8	43.4		

Source: U.S. Census Data 2000 (U.S. Census Bureau 2004a)

A total of 3,195 housing units were listed in the 2000 Census statistics for the Placer County Block Groups within the Folsom DS/FDR area. Occupied units totaled 3,115 and 80 units were listed as vacant. The occupied units were listed as 2,905 or 93.3 percent owner occupied and 210 or 6.7 percent renter occupied units. The average household size was 2.74 people.

Table 3.16-6 presents the economic statistics for the Folsom DS/FDR area population within Placer County. The income levels within the Folsom DS/FDR area of Placer County were higher than the overall county median household income and the per-capita income. The percentages of people living below the poverty level for each block group are less than the overall Placer County percentage.[1] The median value for owner occupied homes for each block group is higher than the overall Placer County median value for owner occupied homes. The median contract rent prices for Census Tract 206.05 Block Group 2 was significantly less than the overall

[1] In 1999, the poverty threshold for a two-person household was annual income of $10,869 (U.S. Census Bureau 2004a)

Placer County median contract rent price.[2] Based on the above statistics the Folsom DS/FDR area appears to be a more affluent area within Placer County.

Table 3.16-6
Economic Statistics in Placer County Folsom DS/FDR Area

	Census Tract 206.01 Block Group 1	Census Tract 206.01 Block Group 2	Census Tract 206.05 Block Group 2	Census Tract 206.01, Block Group 3	Placer County
Median Household Income 1999	$79,912	$101,851	$101,617	$74,821	$57,535
Per-capita income	$33,670	$50,118	$44,201	$36,209	$27,963
Percentage Below Poverty Level	3.2%	2.9%	5.1%	0.0%	12%
Median Value for Owner Occupied Homes	$283,900	$388,100	$385,000	$339,700	$213,900
Median Contract Rent	$1,179	$1,138	$383	Not reported	$687

Source: U.S. Census Bureau 2004a

El Dorado County

El Dorado County is also growing at a steady rate with a total population of 172,889 in 2004,156,299 in 2000, and 125,995 in 1990. This represents a 10.6 percent increase between 2000 and 2004 and a 24 percent increase between 1990 and 2000 Census figures.

Census data for the area surrounding the Folsom DS/FDR footprint was analyzed for statistical information. Census Tracts 307.01 Block Group 1 and 307.02 Block Group 1 are within the Folsom DS/FDR area. This information was used to determine the existing housing and population demographics of the area. The total 2000 population within these two Census Tracts was 5,854, 3.7 percent of the entire El Dorado County population.

[2] A representative from the Placer County Redevelopment Agency was contacted for an explanation as to why the median rent prices within the block group was so low compared to the other block groups within the project area and all of Placer County. The contact explained that no formal analysis has been done to justify this difference and that these areas include large estate-type homes and owners may be renting rooms and/or cottages and secondary units to family and friends or employees who work on their property. (Auerbach 2006)

The race and ethnic demographics of the El Dorado County population as compared to the Folsom DS/FDR area population that occurs within El Dorado County are listed below in Table 3.16-7.

Table 3.16-7
Race and Ethnic Demographics within El Dorado County Folsom DS/FDR Area

Race/Ethnicity	*El Dorado County*	*El Dorado County Study Area Block Groups*	*Percent of El Dorado County Study Area Population*
White	140,209	5,231	89.4%
Black or African American	813	60	1.0%
American Indian and Alaska Native	1,566	26	0.4%
Asian	3,328	257	4.4%
Other or Mixed	10,383	280	4.8%
Total		5,854	100.0%
Hispanic or Latino(1)	14,566	302	

(1) Hispanics or Latinos are also included in the population totals for the five racial groups listed above because Hispanic and Latinos are considered an ethnic group and not a racial group according to the U.S. Census. Therefore the percentages total over 100%. Hispanics or Latinos are separated out because some are included in the white racial group; however, according to Federal guidelines for Environmental Justice, Hispanics and Latinos are considered a minority group.

Source: U.S. Census Data 2000 (U.S. Census Bureau 2004a)

El Dorado County's population is projected to exceed 221,000 by 2020 (EDD 2004), an increase of approximately 41 percent from year 2000 Census figures. Table 3.16-8 shows the age and gender breakdown of residents within all of El Dorado County compared to the Folsom DS/FDR area residents that occur within El Dorado County.

Table 3.16-8
Age Demographics by Gender within El Dorado County Folsom DS/FDR Area

Age	*El Dorado County*		*El Dorado County Study Area Block Groups*		*Percentage of Total County Population*	
	Male	*Female*	*Male*	*Female*	*Male*	*Female*
Under 5 Years	4,688	4,258	213	198	4.5%	4.7%
5 to 17 Years	16,323	15,523	801	765	4.9%	4.9%
18 to 21 Years	3,636	3,127	110	81	3.0%	2.6%
22 to 29 Years	5,600	5,171	96	103	1.7%	2.0%
30 to 39 Years	10,367	11,161	389	478	3.8%	4.3%
40 to 54 Years	20,786	20,968	883	880	4.2%	4.2%
55 to 64 Years	7,647	7,710	235	215	3.1%	2.8%
Over 65 Years	8,916	10,418	212	195	2.4%	1.9%
Totals	77,963	78,336	2939	2915	3.8%	3.7%
Median Age	38.8	40	38.5	39		

Source: U.S. Census Data 2000 (U.S. Census Bureau 2004a)

A total of 1,990 housing units were listed in the 2000 Census statistics for the two El Dorado County Block Groups within the Folsom DS/FDR area. Occupied units totaled 1,924 and 66 units are listed as vacant. The occupied units were listed as

1,648 or over 85 percent owner occupied and 276 or almost 15 percent renter occupied units. The average household size was 2.94 people. The types of residences existing within the Folsom DS/FDR area include: custom homes on 1, 2 and 5-acre parcels, new and older single family homes on small lots and a limited amount of multi-family planned unit development (El Dorado 2006). Most of the residences are within the Northwest El Dorado Hills Specific Plan area.

Table 3.16-9 presents the economic statistics for the Folsom DS/FDR area population within El Dorado County.

Table 3.16-9
Economic Statistics El Dorado County Folsom DS/FDR

	Census Tract 307.01 Block Group 1	*Census Tract 307.02 Block Group 1*	*El Dorado County*
Median Household Income 1999	$99,728	$109,025	$51,484
Per-capita income	$42,695	$45,197	$25,560
Percentage Below Poverty Level	1.8%	0%	15%
Median Value for Owner Occupied Homes	$335,700	$203,900	$194,400
Median Contract Rent	$1,153	$1,625	$617

Source: U.S. Census Data 2000 (U.S. Census Bureau 2004a)

Based on the above statistics the Folsom DS/FDR area appears to be a more affluent area within El Dorado County.

Sacramento County
A portion of the Folsom DS/FDR area is within Sacramento County, however, this portion falls entirely within the City of Folsom. Therefore, Sacramento County statistics related to population and housing were not analyzed.

City of Folsom
The City of Folsom is located within Sacramento County and, like the neighboring counties, Sacramento County and the City of Folsom are growing at a steady rate with a total population of 63,960 in 2004, 51,884 in 2000, and 29,802 in 1990. This represents a 23.3 percent increase between 2000 and 2004 and a 74.1 percent increase between 1990 and 2000.

Census data for the area surrounding the Folsom DS/FDR footprint was analyzed for statistical information. Census Tracts 82.10 (Block Groups 1, 2 and 4), 84.02 (Block

Group 1) and 85.01 (Block Group 2) are within the Folsom DS/FDR area. Census Tract 83 is also within the City of Folsom; however, this is the Folsom State Prison and CSPS. Folsom State Prison's and CSPS's population and housing information is explained above in a separate subsection and is not included in this section. The City of Folsom Block Groups were used to determine the existing housing and population demographics of the area. The total 2000 population within these Block Groups was 9,998, or 19.2 percent of the entire City of Folsom population.

The race and ethnic demographics of the City of Folsom population as compared to the Folsom DS/FDR area population that occurs within the City of Folsom are listed below in Table 3.16-10. Folsom State Prison is not included in this table.

Table 3.16-10
Race and Ethnic Demographics within City of Folsom Non-Prison Folsom DS/FDR Area

Race/Ethnicity	***City of Folsom***	***Folsom Non-Prison Study Area Block Groups***	***Percent of Folsom Non-prison Study Area Population***
White	40,415	8,990	89.9%
Black or African American	3,109	70	0.7%
American Indian and Alaska Native	302	48	0.5%
Asian	3,731	367	3.7%
Other or Mixed	4,327	523	5.2%
		9,998	100.0%
Hispanic or Latino[1]	4,914	646	

(1) Hispanics or Latinos are also included in the population totals for the five racial groups listed above because Hispanic and Latinos are considered an ethnic group and not a racial group according to the U.S. Census. Therefore the percentages total over 100%. Hispanics or Latinos are separated out because some are included in the white racial group; however, according to Federal guidelines for Environmental Justice, Hispanics and Latinos are considered a minority group.

Source: U.S. Census Data 2000 (U.S. Census Bureau 2004a)

The City of Folsom's population is projected to exceed 76,333 by 2020 (SACOG 1990), an increase of approximately 47.1 percent from year 2000 Census figures.

Table 3.16-11 shows the age and gender breakdown of residents within all of the City of Folsom compared to the Folsom DS/FDR area residents that occur within the City of Folsom except Folsom State Prison and CSPS.

Table 3.16-11
Age Demographics by Gender within City of Folsom Non-Prison Folsom DS/FDR Area

Age	***City of Folsom***		***City of Folsom Non-prison Study Area***		***Percentage of Total County Population***	
	Male	***Female***	***Male***	***Female***	***Male***	***Female***
Under 5 Years	1,788	1,803	305	321	17.1%	17.8%
5 to 17 Years	4,571	4,395	1,092	1,041	23.9%	23.7%
18 to 21 Years	1,094	736	172	187	15.7%	25.4%
22 to 29 Years	3,533	1,864	279	283	7.9%	15.2%
30 to 39 Years	6,583	4,431	685	802	10.4%	18.1%
40 to 54 Years	5,671	5,671	1,295	1,273	22.8%	22.4%
55 to 64 Years	1,666	1,666	372	390	22.3%	23.4%
Over 65 Years	2,660	2,660	598	903	22.5%	33.9%
Totals	27,566	23,226	4,798	5,200	17.4%	22.4%
Median Age	35.4	36.6	45	46.9		

Source: U.S. Census Data 2000 (U.S. Census Bureau 2004a)

A total of 3,938 housing units were listed in the 2000 Census statistics for the Folsom Block Groups within the Folsom DS/FDR area. Occupied units total 3,811 and 127 units were listed as vacant. The occupied units were listed as 3,198 or 84% owner occupied and 613 or 16% renter occupied units. The average household size was 2.45 people. The types of residences surveyed within the Folsom DS/FDR area include: custom estate homes overlooking Folsom Reservoir, single family small lot planned unit developments, and multi-family planned developments.

Table 3.16-12 presents the economic statistics for the Folsom DS/FDR area population within the City of Folsom, not including Folsom State Prison and CSPS. Based on the statistics in Table 3.16-12, the Folsom DS/FDR area had a wide range of income levels. Census Tract 82.10, Block Groups 2 and 4 listed lower median household incomes than other areas within the City and study area; however, the median value for owner occupied homes was over the City median. Census Tract 82.10, Block Group 1 had a high median household income level and a low median value for owner occupied home. Only Census Tract 85.01, Block Group 2 had consistently higher economic values than other blocks within the City of Folsom and appears to be a more affluent area within the City of Folsom.

Table 3.16-12 Economic Statistics for City of Folsom Non-Prison Folsom DS/FDR Area						
	Census Tract 82.10 Block Group 1	Census Tract 82.10 Block Group 2	Census Tract 82.10 Block Group 4	Census Tract 84.02 Block Group 1	Census Tract 85.01 Block Group 2	City of Folsom
Median Household Income 1999	$87,417	$29,500	$35,543	$75,698	$100,250	$73,175
Per-capita income	$42,830	$24,064	$30,396	$25,269	$30,370	$30,210
Percentage Below Poverty Level	3.9%	5.9%	3.8%	3.8%	1.9%	6.8%
Median Value for Owner Occupied Homes	$203,300	$276,400	$260,600	$206,300	$257,300	$228,700
Median Contract Rent	$1,100	$838	$821	$904	$1,470	$867

Source: U.S. Census Data 2000 (U.S. Census Bureau 2004a)

3.16.2 Environmental Consequences/Environmental Impacts

3.16.2.1 Assessment Methods

This environmental effects analysis uses both qualitative and quantitative methods to determine potential impacts to population and housing from construction of the Folsom DS/FDR action alternatives. The significance criteria listed below were used to qualitatively assess the impacts of each alternative. Preliminary planning-level analyses from the PASS II Study Real Estate Plan provide estimates of the numbers and extent of parcels potentially affected by the various alternatives (Reclamation 2005g). However, as the preliminary parcel impacts from the various raise alternatives may be overestimated, a site-specific analysis would be conducted to accurately assess impacts to any potentially affected parcel, if a raise feature is selected. It is anticipated that the site-specific analysis would conclude that the numbers and extent of parcels potentially affected would actually be less than estimated through the PASS II Study Real Estate Plan; hence, the impacts analysis presented herein is considered to be conservative.

3.16.2.2 Significance Criteria

Implementation of the Folsom DS/FDR action would result in a significant population or housing impact if it would:

- Induce substantial population growth in an area, either directly or indirectly.

- Displace substantial numbers of existing housing units, necessitating construction of replacement housing elsewhere.
- Displace substantial numbers of residents, necessitating construction of replacement housing elsewhere.

3.16.2.3 Environmental Consequences/Environmental Impacts

Environmental Consequences/Environmental Impacts of the No Action/No Project Alternative

The No Action/No Project Alternative would result in no improvements to the Folsom Facility. The conditions at Folsom Reservoir would remain similar to existing conditions and no additional dam safety and flood damage reduction measures would be implemented.

The No Action/No Project Alternative would have no effect on population growth in the area since the Folsom DS/FDR purpose is to modify existing structures for dam safety/security and flood damage reduction.

No displacement of housing or residents would occur as a direct result of the No Action/No Project Alternative. The risk of displacement to population and housing in the Folsom DS/FDR area from a severe storm event and potential inundation would remain similar to existing conditions, but would increase over time with the projected future population growth and development.

Environmental Consequences/Environmental Impacts of Alternative 1

Actions under the Folsom DS/FDR are construction-related actions only and would not cause, either directly or indirectly, a population increase or decrease. The Folsom DS/FDR would have no long-term effect on population and housing within the area. Alternative 1 would not have any effect on housing or displacement of people.

Environmental Consequences/Environmental Impacts of Alternative 2

Alternative 2 could require one possible residential relocation as a result of property acquisition in order to address temporary flooding during extreme storm events.

Under Alternative 2, a 4-foot raise could result in an increase in the reservoir pool elevation during extreme storm events, and this could flood lower elevation areas beyond the boundaries of the Folsom Facility. The lower elevation areas are primarily located in Mooney Ridge, north of Granite Bay, and certain areas along the eastern shoreline.

To address the potential for flooding related to a 4-foot raise, Reclamation, the Corps, or SAFCA, as the Corps non-Federal sponsor, and any one of these referred to in the discussion below as the responsible agency, would pursue structural or real estate remedies, or a combination of both, in cooperation with affected non-federal property owners. Probable remedies in lower elevation areas would include construction of new flood damage reduction berms (and associated access and flood damage reduction structure easements if berms are located on non-federal property) and/or acquisition of flood easements on impacted non-federal parcels.

Where flood easements are acquired and/or where flood damage reduction berms are constructed (and associated flood damage reduction structure and access easements acquired if necessary) in order to address the potential for flooding, the responsible agency would acquire such easements according to State and Federal guidelines.

According to Corps guidelines (Corps 2006), properties encumbered by flood easement would be restricted as follows:

- No structure for human habitation shall be constructed or maintained on the easement premises.
- No other structure shall be constructed or maintained on the land except those that have been approved in writing by the responsible agency.
- No excavation shall be conducted or fill placed on the land without approval of the responsible agency.

With a 4-foot raise, Reclamation's preliminary planning-level analyses indicate that property title of up to four non-federal parcels could potentially be acquired in fee, including one residential property. Impacted property owner(s) would be entitled to fair market value, assistance with replacement housing, and relocation benefits and services in accordance with Public Law 91-646. However, efforts would be made to develop a structural solution that would eliminate the need for acquisition of real estate rights (easements or fee title) or relocation.

Because the non-federal parcels potentially impacted by this alternative are identified through the use of coarse planning-level analyses, the number and extent of parcels potentially affected may be overestimated. Detailed site-specific analyses would be conducted should this raise feature be selected. The need for, location, number, and impacts of flood damage reduction berms and/or acquisition of real estate rights (easements or fee title) would be further analyzed and disclosed in more detail in a supplemental environmental compliance document, if this raise feature is selected and further designed.

In the event that a flood damage reduction berm would be constructed (and associated easements acquired if the berm is located on non-federal property), and/or a flood easement would be acquired on an impacted non-federal parcel, these actions would not require the relocation of residents or displacement of houses.

The potential acquisition of one residential property under Alternative 2 would not result in the displacement of a substantial number of residents or existing housing units that would necessitate construction of replacement housing elsewhere. As discussed above, in the event that acquisition of property fee title would be required, relocation assistance to the impacted residential property owner(s) would be implemented. The impacted property owner(s) would be entitled to fair market value, assistance with replacement housing, and relocation benefits and services in accordance with Public Law 91-646. As indicated above, Placer County is one of the fastest growing counties in California and El Dorado County is also growing at a steady rate. It is anticipated that replacement housing for the one residential property that could potentially be acquired in fee would be available within the existing housing inventory or within new housing from continued growth in the area. Further, as indicated above, efforts would be made to design and construct flood damage reduction structures that would reduce or eliminate the need for acquisition of fee title of impacted properties that would result in residential relocations. The determination regarding structural solutions and/or acquisition of real estate rights (easements or fee title) for any impacted non-federal parcel would be made on a case-by-case basis and would depend upon feasibility, cost, and acceptability to the landowner(s).

Population and housing impacts under Alternative 2 would be less than significant.

Environmental Consequences/Environmental Impacts of Alternative 3

Alternative 3 could require one possible residential relocation as a result of property acquisition in order to address temporary flooding during extreme storm events.

Under Alternative 3, a 3.5-foot parapet wall raise could result in an increase in the reservoir pool elevation during extreme storm events, and this could flood lower elevation areas beyond the boundaries of the Folsom Facility. The lower elevation areas are primarily located in Mooney Ridge, north of Granite Bay, and certain areas along the eastern shoreline.

The environmental consequences/environmental impacts from construction of Alternative 3 would be essentially the same for population and housing as those described for Alternative 2.

Environmental Consequences/Environmental Impacts of Alternative 4

Alternative 4 could require six possible residential relocations as a result of property acquisition in order to address temporary flooding during extreme storm events.

A 7-foot raise could result in an increase in the reservoir pool elevation during extreme storm events, and this could flood lower elevation areas beyond the boundaries of the Folsom Facility. The lower elevation areas are primarily located in Mooney Ridge, north of Granite Bay, and certain areas along the eastern shoreline.

The environmental consequences/environmental impacts from construction of Alternative 4 would be the same for population and housing as those described for Alternative 2, with the following exceptions:

- More potentially impacted parcels due to the 7-foot raise height. Additional acquisition of flood easements and/or construction of larger flood damage reduction berms (and acquisition of associated flood damage reduction structure and access easements if necessary).
- With a 7-foot raise, Reclamation's preliminary planning-level analysis also indicates the acquisition in fee title of approximately nine non-federal properties, including approximately six residential properties, for which the property owners would be entitled to fair market value, assistance with replacement housing and relocation benefits and services in accordance with Public Law 91-646. However, efforts would be made to develop a structural solution that would eliminate the need for acquisition of real estate rights (easements or fee title) or relocation.

Because the non-federal parcels potentially impacted by this alternative are identified through the use of coarse planning-level analyses, the number and extent of parcels potentially affected may be overestimated. Detailed site-specific analyses would be conducted should this raise feature be selected. The need for, location, number, and impacts of flood damage reduction berms and/or acquisition of real estate rights (easements or fee title) would be further analyzed and disclosed in more detail in a supplemental environmental compliance document, if this raise feature is selected and further designed.

Flood damage reduction berms and/or occasional flowage easements would not require the relocation of residents or displacement of houses.

The potential acquisition of six residential properties under Alternative 4 would not result in the displacement of a substantial number of residents or existing housing units that would necessitate construction of replacement housing elsewhere. As discussed above, in the event that acquisition of property fee title would be required, relocation assistance to the impacted residential property owner(s) would be implemented. The impacted property owner(s) would be entitled to fair market value, assistance with replacement housing, and relocation benefits and services in accordance with Public Law 91-646. As indicated above, Placer County is one of the fastest growing counties in California and El Dorado County is also growing at a steady rate. It is anticipated that replacement housing for the six residential properties that could potentially be acquired in fee would be available within the existing housing inventory or within new housing from continued growth in the area. Further, as indicated above, efforts would be made to design and construct flood damage reduction structures that would reduce or eliminate the need for acquisition of fee title of impacted properties that would result in residential relocations. The determination regarding structural solutions and/or acquisition of real estate rights (easements or fee title) for any impacted non-federal parcel would be made on a case-by-case basis and would depend upon feasibility, cost, and acceptability to the landowner(s).

Population and housing impacts under Alternative 4 would be less than significant.

Environmental Consequences/Environmental Impacts of Alternative 5
Alternative 5 could require 37 possible residential relocations as a result of property acquisition in order to address temporary flooding during extreme storm events.

The 17-foot earthen raise could result in a substantial increase in the reservoir pool elevation during extreme storm events, and this could be expected to flood lower elevation areas beyond the boundaries of the Folsom Facility. The lower elevation areas are primarily located in Mooney Ridge, north of Granite Bay, and certain areas along the eastern shoreline.

The environmental consequences/environmental impacts from construction of Alternative 5 would be the same for population and housing as those described for Alternative 2, with the following exceptions:

- More potentially impacted parcels due to the 17-foot raise height. Additional acquisition of flood easements and/or construction of larger flood damage reduction berms (and acquisition of associated flood damage reduction structure and access easements if necessary).

- With a 17-foot raise, Reclamation's preliminary planning-level analysis also indicates the acquisition in fee title of approximately 45 non-federal properties, including as many as 37 residential properties, for which the property owners would be entitled to fair market value, assistance with replacement housing, and relocation benefits and services in accordance with Public Law 91-646. However, efforts would be made to develop structural solutions wherever possible that would eliminate the need for acquisition of real estate rights (easements or fee title) or relocation.

Because the non-federal parcels potentially impacted by this alternative are identified through the use of coarse planning-level analyses, the number and extent of parcels potentially affected may be overestimated. Detailed site-specific analyses would be conducted should this raise feature be selected. The need for, location, number, and impacts of flood damage reduction berms and/or acquisition of real estate rights (easements or fee title) would be further analyzed and disclosed in more detail in a supplemental environmental compliance document, if this raise feature is selected and further designed.

Flood damage reduction berms and/or occasional flowage easements would not require the relocation of residents or displacement of houses.

The potential acquisition of 37 residential properties under Alternative 5 would not result in the displacement of a substantial number of residents or existing housing units that would necessitate construction of replacement housing elsewhere. As discussed above, in the event that acquisition of property fee title would be required, relocation assistance to the impacted residential property owner(s) would be implemented. The impacted property owner(s) would be entitled to fair market value, assistance with replacement housing, and relocation benefits and services in accordance with Public Law 91-646. As indicated above, Placer County is one of the fastest growing counties in California and El Dorado County is also growing at a steady rate. It is anticipated that replacement housing for the 37 residential properties that could potentially be acquired in fee would be available within the existing housing inventory or within new housing from continued growth in the area. Furthermore, as indicated above, efforts would be made to design and construct flood damage reduction structures that would reduce or eliminate the need for acquisition of fee title of impacted properties that would result in residential relocations. The determination regarding structural solutions and/or acquisition of real estate rights (easements or fee title) for any impacted non-federal parcel would be made on a case-by-case basis and would depend upon feasibility, cost, and acceptability to the landowner(s).

Population and housing impacts under Alternative 5 would be less than significant.

3.16.3 Comparative Analysis of Alternatives

The No Action/No Project Alternative would have no effect on population growth in the Folsom DS/FDR area and no displacement of housing or residents would occur as a direct result of the No Action/No Project Alternative.

Alternative 1 would not result in effects on population and housing since no new flood damage reduction berms would be constructed, and real estate rights (easements or fee title) would not be acquired. Alternatives 2 through 5 could result in impacts to population and housing. Raise heights of these action alternatives could result in property acquisition that could require relocation of a small number of residents, except perhaps Alternative 5. From preliminary planning-level analyses, the population and housing impacts of Alternatives 2 and 3 would be the same with one residential property possibly affected. Alternative 4 would possibly affect 6 residential properties. Alternative 5 would possibly affect 37 residential properties. If a raise feature is selected, efforts would be made to avoid or mitigate population and housing impacts. Additionally, the need for, location, number, and impacts of flood damage reduction berms and/or acquisition of real estate rights (easements or fee title) would be further analyzed and disclosed in more detail in a supplemental environmental compliance document if a raise feature is selected.

3.16.4 Mitigation Measures

There would be no significant impacts on population and housing; therefore, no mitigation measures are required.

3.16.5 Cumulative Effects

Table 5-1 provides a list of past, present and probable future projects in the general vicinity of the Folsom DS/FDR area that are included in the cumulative effects analysis. No significant impact on population and housing would occur as a result of the Folsom DS/FDR action. It is unlikely that the projects identified in Table 5-1 would have any impact on population and housing in a negative way. Therefore, the cumulative effect of the Folsom DS/FDR action would be less than significant.

3.17 Public Health and Safety

This section describes potential public health and safety concerns, including risks posed by hazardous, toxic, and radiological wastes (HTRW) within the study area that are relevant to the alternatives.

3.17.1 Affected Environment/Existing Conditions

3.17.1.1 Area of Analysis

The area of analysis includes Folsom Reservoir as well as areas identified as construction areas, staging areas, and borrow areas for the alternatives. No effect on public safety in other areas is expected because no construction activities would occur outside of these identified areas. Potential effects on the lower American River due to floods or releases from the reservoir are discussed in Section 3.1, Hydrology, Water Quality, and Groundwater.

3.17.1.2 Regulatory Setting

Public Safety

Federal Regulations

The Federal Guidelines for Dam Safety require that dams be designed, inspected, and maintained to protect the structural integrity of the dam and appurtenant structures and ensure protection of human life and property. The following documents contain the requirements for design floods for dams that are the responsibility of federal agencies:

- Federal Guidelines for Dam Safety, Federal Emergency Management Agency (FEMA) Publication FEMA 93, June 1979, reprinted April 2004.

- Federal Guidelines for Dam Safety: Selecting and Accommodating Inflow Design Floods for Dams, FEMA Publication FEMA 94, October 1998, reprinted April 2004.

The Corps and Reclamation both have obligations and interests in the Folsom Facility (which includes the Folsom Dam and appurtenant facilities) but differ in respect to congressional objectives, mandates, authorities, funding and timelines. Reclamation is responsible for operation and maintenance of the Folsom Facility as part of the Central Valley Project (CVP). The Corps' interest in the Folsom Facility is primarily as flood protection and wetlands and waterways regulation and permitting.

Hazardous, Toxic, and Radiological Wastes

Federal Regulations

Hazardous materials, hazardous substances, and hazardous wastes are regulated under various federal laws including:

- Resource Conservation and Recovery Act (RCRA, 42 United States Code 692);
- Hazardous Material Transportation Act (HMTA);
- Clean Water Act (CWA);
- Comprehensive Environmental Response Compensation and Liability Act (CERCLA, 43 United States Code 9601);
- Superfund Amendment Reauthorization Act (SARA) Title 3;
- 40 CFR 260-279 Federal Regulations on hazardous waste management;
- 40 CFR, Section 301 et seq. Emergency Planning and Community Right to Know Act; and
- Toxic Substances Control Act (15 United States Code 2601).

Under RCRA, the U.S. Environmental Protection Agency (USEPA) regulates the generation, transportation, and disposal of hazardous wastes (USEPA 2005c). The USEPA requires permits for the treatment, storage, and/or disposal of hazardous wastes and tracks the wastes from generation through to disposal (USEPA 2005c). The USEPA delegates some of this authority, such as permitting, to individual states.

The Department of Transportation through the HMTA regulates transportation of hazardous materials. Transporting hazardous materials requires special handling, packaging, placarding, and manifesting of cargoes. Various laws, including the SARA and HMTA, govern day-to-day management of hazardous materials. These laws define the requirements for storage of hazardous materials, safe handling practices, and employee training.

State Regulations
California state laws that regulate activities involving hazardous materials, hazardous substances, or hazardous waste include:

- Hazardous Waste Control Law (California Health and Safety Code section 25100);
- Title 17, Public Health (California Code of Regulations);
- Title 19, Public Safety (California Code of Regulations);
- Title 22, Division 4.5 - Environmental Health Standards for the Management of Hazardous Waste (California Code of Regulations);

- Title 26, Toxics (California Code of Regulations); and
- California Department of Motor Vehicles, Hazardous Waste and Materials Transportation Requirements (Vehicle Code Section 31303).

The California Department of Toxic Substances Control (DTSC) administers the Federal RCRA for the state, and enforces the California Health and Safety Code. According to the California Government Code (Section 65962.5), DTSC is required to compile and update lists of hazardous materials sites, including land designated as hazardous waste sites and hazardous waste disposals on public lands. The California Government Code (Section 65962.5) also requires the State Water Resources Control Board to compile and update hazardous materials site lists, including underground storage tanks for which an unauthorized release report is filed, and solid waste disposal facilities from which there is a migration of hazardous wastes.

Other agencies that enforce hazards or hazardous materials regulations include the California Highway Patrol, the Regional Water Quality Control Boards, and local fire departments.

3.17.1.3 Environmental Setting

Seismology/Earthquakes

The study area is in the Foothills Fault system which 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 and crosses the South Fork arm of Folsom Reservoir. The last major movement of this system occurred 140 million years ago and the United States Geological Survey has not designated the Bear Mountains Fault as an active fault (Corps 2006b). Additional details on seismic activity are provided in Section 3.6.1.

Landslides

As discussed in Section 3.6, Soils, Minerals, and Geological Resources, factors that influence slope stability include slope inclination, bedrock geology, geologic structure, geomorphology, weathering, vegetation, and granitic rocks. Studies along the Highway 50 corridor have shown slides to occur where metamorphic and granitic rocks are in contact as well as where metamorphic and Tertiary sedimentary rocks are in contact. These geologic conditions are present within the study area where the sedimentary Laguna Formation overlies the metamorphic bedrock and along the north side of Folsom Reservoir where the Mehrten Formation tops the granite hills. Despite these geologic formations, landslides are not a major hazard in the study area because soils are thin and the slopes are not particularly steep (Wallace, Roberts, and Todd et al. 2003).

Fire Risk

During the dry season, the area surrounding the reservoir is at risk for fires, particularly at the interface between residential development and open space. From Granite Bay to the middle of MIAD (Placer and Sacramento Counties), the fire threat is moderate to high. From the middle of MIAD north towards Browns Ravine (Sacramento and El Dorado Counties), the fire threat is very high according to the California Fire Alliance Fire Planning and Mapping website (California Fire Alliance 2004).

Floods/Leakage

Folsom Reservoir is in close proximity to an urban area and serves as flood management for the entire Sacramento metropolitan area. A comprehensive Facility Review conducted by Reclamation in 2000 identified deficiencies in the Folsom Facility. A flood with a more frequent return period than originally anticipated could overtop the Main Concrete Dam, MIAD, and dikes. In addition, several of the dikes and the Right and Left Wing Dams surrounding Folsom Reservoir do not meet current standards for filters. This creates the potential for seepage and piping and increases the static instability of the dikes.

Reservoir Levels

The retention structures at the Folsom Facility have a crest elevation of 480.5 feet above mean sea level (483.1 feet in NAVD 88). Between 1985 and 2006, water elevation in Folsom Reservoir fluctuated between 347.14 feet (November 3, 1998) and 465.51 feet (June 21, 1993).[1]

Recreation Areas

The area surrounding the Folsom Facility is operated as a state recreational park. The reservoir and recreation area are used by visitors for hiking, biking, running, camping, picnicking, horseback riding, water-skiing, swimming, and boating.

Hazardous Waste

Hazardous materials are defined by the State of California as:

> *…any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. "Hazardous materials" include, but are not limited to, hazardous substances, hazardous waste, and any material which a handler or the administering agency has a reasonable basis for believing that it would*

[1] Source: http://cdec.water.ca.gov/cgiprogs/selectQuery?station_id=FOL&dur_code =D&sensor_num=6&start_date=1985&end_date=now

> *be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.*[2]

Hazardous, toxic, or radioactive materials include, but are not limited to, the following:

- Asbestos
- Construction and demolition debris
- Drums
- Landfills or solid waste disposal sites
- Pits, ponds, or lagoons
- Wastewater
- Fill, dirt, depressions, and mounds
- Underground storage tanks
- Wastewater treatment plants
- Stormwater runoff structures
- Transformers that may contain polychlorinated biphenyls (PCBs)

In May 2005, the Corps conducted an environmental site assessment (ENSA) for the Folsom Dam Modification Project. The ENSA included records research, interviews, and field surveys within a 1.5-mile radius of the Folsom Dam. A one-mile buffer was added for the records research to account for potential groundwater migration and contaminant transport. In addition to identifying about 70 HTRW sites within the study area, the report identified two potential hazardous sites within the area of analysis. The first site, located near the Left Wing Dam, had total petroleum hydrocarbons (TPH) at 1,900 mg/kg detected in a single soil sample at 7 to 9 feet below ground surface when it was sampled during a geotechnical exploration in 2004. The second potential hazardous site is the foundation of MIAD. The gravel used for the MIAD foundation may have been mined from an area where naturally occurring asbestos rock exists. It is unknown whether the asbestos is friable.[3]

To include the construction areas being evaluated as part of the Folsom DS/FDR EIS/EIR, another database records search was performed for a corridor extending along the west and south borders of the reservoir. A one-mile buffer was included to account for potential groundwater migration and contaminant transport. A map showing the area searched and an overview of the identified HTRW sites is shown in

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[2] California Health and Safety Code, Division 20, Chapter 6.95, Section 25501(k)

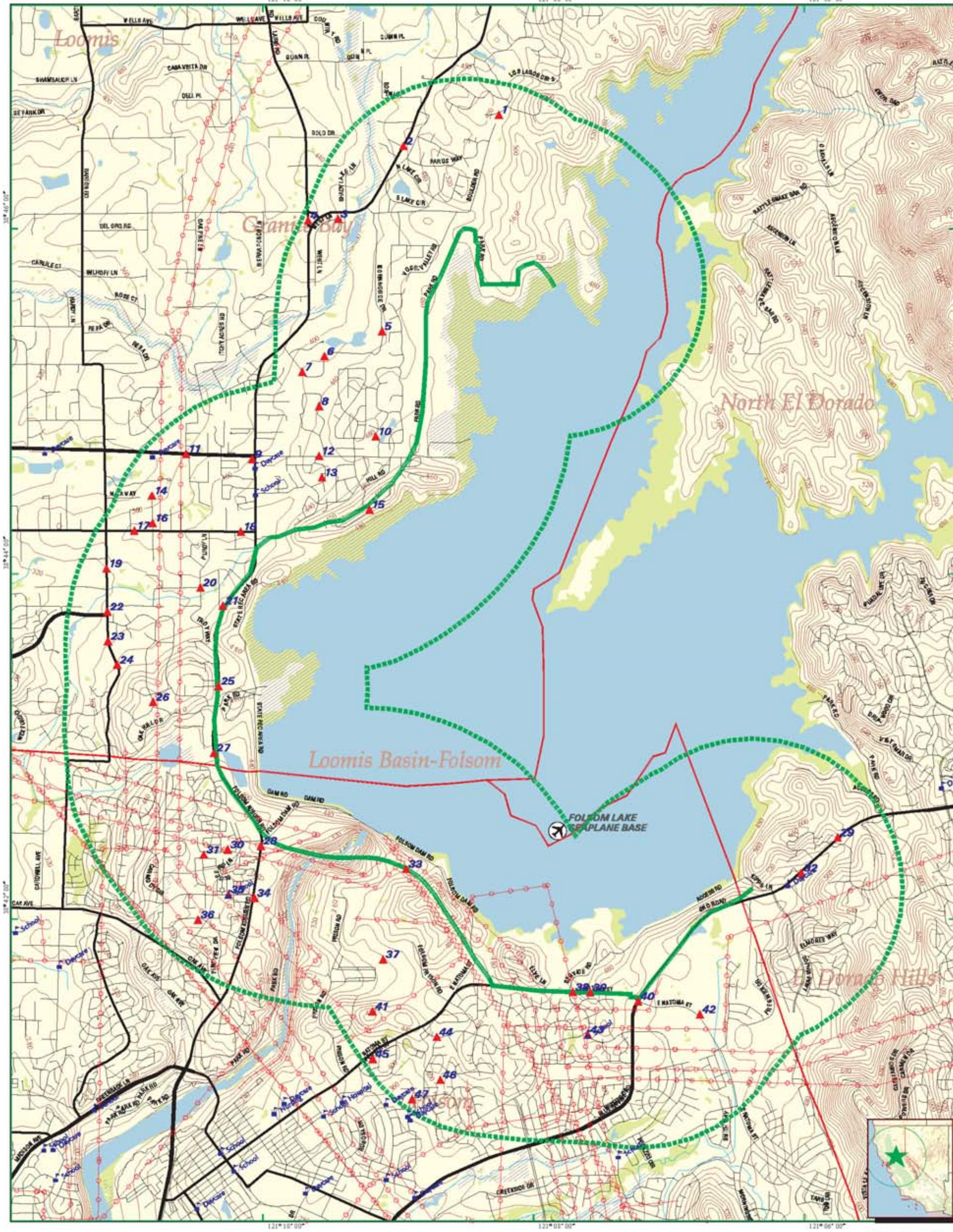
[3] USACE 2005. *Environmental Site Assessment Folsom Dam Modification, Sacramento County California Draft*. May.

Figure 3.17-1. The databases for which sites were identified are summarized in Table 3.17-1.[4]

Table 3.17-1 Map Findings Summary		
Federal Records Databases	***Date EDR Contacted Agency***	***Number of Sites***
Emergency Response Notification System (ERNS)	1/12/2006	5
Hazardous Materials Information Reporting System (HMIRS)	1/16/2006	10
FIFRA/TSCA Tracking System (FTTS)	3/20/2006	1
Section Seven Tracking System (SSTS)	3/6/2006	1
Facility Index System (FINDS)	1/3/2006	14
State and Local Records Databases	***Date EDR Contacted Agency***	***Number of Sites***
No Further Action (NFA)	3/15/2006	1
State Landfill	3/15/2006	1
California Water Resources Control Board – Waste Discharge System (CA WDS)	3/21/2006	1
Cortese Hazardous Waste and Substances Sites List	2/6/2006	9
Recycling Facilities (SWRCY)	1/9/2006	1
Leaking Underground Storage Tanks (LUST)	1/16/2006	7
California Facility Inventory Database (CA FID UST)	12/28/1998	9
Spills, Leaks, Investigation & Cleanup Cost Recovery Listing (SLIC)	1/16/2006	1
Sacramento Co. Contaminated Sites (CS)	1/30/2006	7
Underground Storage Tank Facilities (UST)	1/9/2006	2
Hazardous Substance Storage Container Database (HIST UST)	7/26/2001	15
Aboveground Storage Tank Facilities (AST)	1/30/2006	4
Placer Co. Master List (MS)	3/20/2006	23
Statewide Environmental Evaluation and Planning System (SWEEPS UST)	6/3/2005	16
California Hazardous Material Incident Reporting System (CHMIRS)	2/20/2006	9
Deed Restriction Listing (DEED)	1/3/2006	1
Voluntary Cleanup Program Properties (VCP)	3/15/2006	1
Clandestine Drug Labs (CDL)	2/8/2006	2
Sacramento Co. Master List (ML)	1/30/2006	22
Facility and Manifest Data (HAZNET)	2/24/2006	42

FIFRA – Federal Insecticide, Fungicide, & Rodenticide Act
TSCA – Toxic Substances Control Act
EDR – Environmental Data Resources

[4] EDR 2006. *EDR DataMap Corridor Study for Folsom Dam (Inquiry Number 01637093.lr).* March 23.



Folsom, CA

EDR® Environmental Data Resources Inc

Listed Sites
Earthquake Epicenters (Richter 5 or greater)
Search Boundary
Roads
Major Roads
Waterways
Railroads
Contour Lines
Pipelines
Powerlines
Fault Lines
Water
Superfund Sites
Federal DOD Sites
Indian Reservations BIA
100-Yr Flood Zones
Wetlands

N

0 1
Miles

Figure 3.17-1
EDR DataMap™ - Corridor Study - Folsom Dam

CDM

Based on the database research results, 205 sites with potential to affect public health and safety during construction were identified within a 1-mile radius of the corridor. However, many of the sites reported by the database search identify generators of hazardous waste or owners of storage tanks that hold potentially hazardous materials. The existence of these generators and storage facilities does not necessarily indicate that the contents have been released to the environment in such a way that would affect construction of the dam improvements. In addition, some sites reported by the database search have received closure from the governing agency indicating that the contamination was found to be sufficiently contained. No record reviews or site inspections were performed on the sites identified from the database searches. However, based on the database information, the following sites were identified as potentially contaminated sites warranting further evaluation:

- ARCO #2140 (Map Location #9 – 8555 Auburn-Folsom Road, Granite Bay). Gasoline was discharged at the site in 1993 and methyl-tert-butyl-ether (MTBE) was found affecting the drinking water aquifer. The site is currently under post remedial action monitoring.

- Beacon #3642-Former (Map Location #9 – 6990 Douglas Boulevard, Granite Bay). Diesel was discharged at the site in 2000 and MTBE was found affecting the drinking water aquifer. The site is currently under remedial action.

- Haag Property (Map Location #13 – 9232 Barton Road, Granite Bay). In 2000, this residential property had fill material contaminated with a nitrogen-based residual explosive from a blasting operation at another site. The DTSC determined that the soil poses no risk of chemical contamination but does present a potential risk due to physical contamination of the soil. The owners applied for the Voluntary Cleanup Program to address the site. Although the DTSC issued no further action for DTSC, no additional information was provided as to the outcome of the site.

- Green Valley Gas and Food (Map Location #32 - 381 Green Valley Road, El Dorado Hills). A leaking gasoline underground storage tank (UST) was reported on this site in 2000. A work plan and preliminary assessment were conducted in 2004. The site is currently conducting pollution characterization.

- WAPA-Folsom Substation (Map Location #33 - Folsom Dam Road, Folsom). This site was reported in the Sacramento contaminated sites list as having waste oil. However, no closure date was provided for this site.

- Folsom Prison (Map Location #37 – north of Folsom City, Represa). Folsom Prison operates a license plate manufacturing plant onsite that uses caustic stripping bath liquids and paint sludges. In addition, the prison has an evaporation pond for cannery wastewater, a scrap metal disposal area, light industrial areas, and a firing range. The prison is part of the Voluntary Cleanup Program to address the contamination. Several remedial actions were completed at the site. Groundwater monitoring is on-going.

- California State Prison Garage (Map Location #38 – 560 East Natoma Street, Folsom). This site was reported in the Sacramento contaminated sites list as having an unknown substance released that affects groundwater. However, no closure date was provided for this site.
- Folsom State Prison (Map Location #38 – 560 East Natoma Street, Represa). This site was reported in the Sacramento contaminated sites list as having diesel released to the soil in 1989. However, no closure date was provided for this site.
- Folsom Prison – Green Valley (Map Location #38 – 560 East Natoma Street, Represa). This site was reported in the Sacramento contaminated sites list as having gasoline released to the soil in 1998. However, no closure date was provided for this site.
- California Department of Food and Agriculture (CDFA) Folsom Facility (Map Location #39 – 600 East Natoma Street, Folsom). This site was reported in the California State Spills, Leaks, Investigation & Cleanup (SLIC) database as having an open case. However, no further information was provided for this site.

Appendix H of this Draft EIS/EIR presents a complete list of the databases searched and information concerning the governing agencies, the 205 sites identified in the Folsom DS/FDR corridor vicinity, and a map locating all sites. Although the agency lists are updated regularly, there may be contaminated sites that have not yet been identified and therefore are absent from the databases. A complete Phase I ENSA was not performed for the Folsom DS/FDR corridor because such investigations tend to remain valid for only six months and, as a result, are typically done after selection of the preferred alternative and closer to construction.

3.17.2 Environmental Consequences/Environmental Impacts

3.17.2.1 Assessment Methods

Impacts on public safety at Folsom Reservoir were evaluated based on the potential for human exposure to hazardous conditions during construction.

3.17.2.2 Significance Criteria

Using the environmental checklist form in Appendix G of the State CEQA Guidelines as a base, effects on public safety would be significant if an alternative would:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials; or through reasonable foreseeable upset and accident conditions resulting in the release of hazardous materials into the environment;

- Emit hazardous emissions or handle hazardous materials, substances, or waste within a one-quarter mile of an existing or proposed school;
- Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment;
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or
- Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including areas where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

3.17.2.3 Natural Disasters

Natural disasters occur when natural phenomenon (e.g., earthquake, landslides) result in fatalities or property damages. Common natural phenomena that could potentially result in natural disasters at the Folsom Reservoir include earthquakes, landslides, fires, and floods.

3.17.2.3.1 Environmental Consequences/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

Under the No Action/No Project Alternative, no new construction would occur. Thus, no change to risk of public safety as a result of a wildland fire or landslide would occur under the No Action/No Project Alternative. Although this alternative would result in no change in public safety because persons would not be exposed to additional hazards associated with construction of flood management facilities, the existing risks to the public from current dam deficiencies, such as failure due to seismic (earthquake), static (seepage), and hydrologic concerns (probable maximum flood events), would remain. Failure of the Folsom Facility would result in flood impacts on downstream populations. Folsom Reservoir is in an urban setting and flood flows could flow through the Sacramento metropolitan area.[5] Due to the current deficiencies in the dam, the No Action/No Project Alternative would have the potential to result in serious property damage and loss of human life in the event of a seismic or maximum flood event. This would be a significant and unavoidable impact.

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[5] Reclamation 2005c. *Folsom Dam - Safety of Dams – Corrective Action Study Scoping Report, Folsom Dam Central Valley Project, California.*

The No Action/No Project Alternative would have significant impacts related to public safety. Based on the analysis presented above, it is anticipated that the environmental impacts of the No Action/No Project Alternative (i.e., future environmental conditions if no action is taken relative to the Folsom DS/FDR) would exceed the significance criteria defined herein. However, unlike a significant impact associated with an action alternative, no mitigation can be required for significant impacts associated with the No Action/No Project (i.e., within the regulatory framework of NEPA and CEQA, a project applicant cannot be required to mitigate the impacts that would result from taking no action). As such, the impacts identified above for the No Action/No Project Alternative are considered to be significant, adverse, and unmitigable.

Environmental Consequences/Environmental Impacts of Alternative 1
<u>Excavation of borrow material would not result in landslides.</u>

Alternative 1 would not result in significant adverse effects associated with landslides. As described in Section 3.6.1.3, landslides are not a major hazard in the study area because soils are thin and the slopes are not particularly steep. Excavation would be conducted in a manner to further minimize the potential for landslides (e.g., excavation may be terraced to stabilize slopes).

Impacts associated with landslides would be less than significant.

<u>During construction of Alternative 1, an impact to public safety would occur if construction activities reduced the integrity of the existing Folsom Facility such that leakage occurs or the structures can no longer retain flood flows.</u>

Construction activities would be designed, staged, and scheduled in such a manner to prevent compromising existing structures, particularly during the wet weather season. Many of the improvements, such as jet grouting and installation of drains, shear key elements, and tendons, involve intrusive activities to existing flood management structures and could diminish structural integrity of the structure either temporarily or permanently if not designed or installed correctly. Placement of fill on top of existing dams and dikes, such as for the overlay of the MIAD and the raising of the elevations of the dams and dikes, could also have a detrimental effect on existing structures if not designed or constructed properly. In addition, conducting blasting near existing structures or near a fault could cause structural damage or damage to foundations thereby reducing the integrity of the existing Folsom Facility such that leakage occurs or the structures can no longer retain flood flows. This impact would be mitigated by having the Folsom Facility improvements designed and the construction schedule phased by California-licensed professional civil and structural engineers and the construction work performed by licensed professional contractors. Designs and plans would also require reviews and permits per local, state and federal laws.

These requirements are already established as part of the Folsom DS/FDR, and would reduce this impact to a less than significant level.

Construction activities could increase hazards by the placement of construction equipment in waterways, roadways, or other areas potentially accessible by park visitors.
For example, popular recreation areas, such as Beal's Point, are in the immediate vicinity of construction borrow areas. Although these areas would be closed off to the public while they are under construction to reduce hazards to the public, blockage of existing roadways could also interfere with existing emergency evacuation plans. Adequate signage and notification would be required per Section 659 of the Harbors and Navigation Code (California Administrative Code, Title 14, Section 7000) to reduce the potential for these potential hazardous conditions.

The placement of construction equipment in areas potentially accessible by park visitors would be a potentially significant impact. Mitigation Measure PHS-1 would reduce this impact to a less than significant level.

Construction would increase the risk of fire.

During the dry season, the area surrounding the reservoir is at risk for fires, particularly at the interface between residential development and open space. Construction activities, particularly those that may result in accidental spills of flammable liquids, could further aggravate the risk of fire. Mitigation measures would be implemented to reduce these risks, such as proper housekeeping procedures at construction sites.

The risk of fire would be a potentially significant impact. Mitigation Measure PHS-2 would reduce this impact to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 2
There would be no appreciable difference between the impacts of Alternative 1 and Alternative 2 regarding construction design and scheduling, blockage or closure of roads for construction, construction activities in waterways or other areas accessible by park visitors, potential landslides, and fire risks. Implementation of Mitigation Measures PHS-1 and PHS-2 would mitigate these impacts to a less than significant level.

Similarly, new embankments and/or flood easements that could be constructed around the reservoir under Alternative 2 to prevent flooding in areas of low elevation also could result in additional impacts to public health and safety. The number of new embankments/flood easements required and their exact locations have not been determined. However, typical construction of the new embankments would involve the use of scrapers, loaders, and other equipment to create earthen berms and the creation of access roads for construction and maintenance. The nature of the impacts from these activities would not be substantially different from the impacts addressed under Alternative 1 and would be mitigated to a less than significant level by implementation of Mitigation Measures PHS-1 and PHS-2.

Environmental Consequence/Environmental Impacts of Alternative 3

Impacts of Alternative 3 would not be substantially different from the impacts addressed under Alternative 2 and would be mitigated to a less than significant level by implementation of Mitigation Measures PHS-1 and PHS-2. There would be no other appreciable difference between the impacts of Alternative 2 and Alternative 3 for the impacts regarding construction design and scheduling, lowering of reservoir levels, blockage or closure of roads for construction, construction activities in waterways or other areas accessible by park visitors, potential landslides, fire risks, construction of new embankments/flood easements, and inundation from dam/embankment raises. Implementation of Mitigation Measures PHS-1 and PHS-2 would mitigate these impacts to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 4

There would be no appreciable difference between the impacts of Alternative 3 and Alternative 4 for the impacts regarding construction design and scheduling, lowering of reservoir levels, blockage or closure of roads for construction, construction activities in waterways or other areas accessible by park visitors, potential landslides, fire risks, construction of new embankments/flood easements, and inundation from dam/embankment raises. Implementation of Mitigation Measures PHS-1 and PHS-2 would mitigate these impacts to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 5

There would be no appreciable difference between the impacts of Alternative 3 and Alternative 5 for the impacts regarding construction design and scheduling, lowering of reservoir levels, blockage or closure of roads for construction, construction activities in waterways or other areas accessible by park visitors, potential landslides, fire risks, construction of new embankments/flood easements, and inundation from dam/embankment raises. Implementation of Mitigation Measures PHS-1 and PHS-2 would mitigate these impacts to a less than significant level.

3.17.2.4 Hazardous, Toxic, and Radiological Waste

Exposure to hazardous materials and contaminated soil and groundwater along urbanized portions of the Folsom DS/FDR corridor could occur during construction of the preferred alternative. This section describes the potential impact of exposure to hazardous substances from construction of the Folsom DS/FDR.

3.17.2.4.1 Environmental Consequences/Environmental Impacts

Environmental Consequence/Environmental Impacts of the No Action/No Project Alternative

Under the No Action/No Project Alternative, no new construction would occur. No change in public safety with respect to hazardous, toxic, and radiological wastes is expected because no persons would be exposed to hazardous, toxic, and radiological wastes associated with the construction of flood management facilities. Existing conditions of the Folsom Facility also do not currently expose people to hazardous, toxic, and radiological wastes.

The No Action/No Project Alternative would have no effect on health and safety related to hazardous, toxic, or radiological waste.

Environmental Consequences/Environmental Impacts of Alternative 1

Development of soil borrow in the vicinity of Dike 8 may expose workers to health and safety effects.

As discussed in Section 3.6.2.3, soil in the area of Dike 8 is derived from schist containing minute amounts of asbestos-like fibers. During borrow removal, processing, and placement at MIAD, friable, asbestos fibers may be released during construction. Engineering controls would be required during disturbance of the concrete foundation to protect construction crews and the general public.

This impact would be potentially significant. Mitigation Measures GR-1 (See Section 3.6.4), PHS-3, PHS-4, and PHS-5 would reduce impacts to a less than significant level.

Construction activities could result in exposure to hazardous materials.

Some construction activities would require the use of hazardous materials and their use could result in accidental spills at construction sites. In addition, all earthwork has the potential to uncover hazardous materials in the soil, groundwater, or sediment. Excavation or borrow development could expose hazards left in the area from previous construction activities. Spillway modifications could result in resuspension of sediments that may contain contaminants such as mercury. Depending on the concentrations, the introduction of these contaminants in the reservoir could require closures or warnings for swimming and fishing. (Refer to Section 3.1, Hydrology, Water Quality, and Groundwater and Section 3.5, Terrestrial Vegetation and Wildlife, for additional information regarding mercury contamination.). The contractor needs to be prepared to implement appropriate protocols for proper handling and disposal of hazardous materials should they be encountered during construction to protect construction crews and the general public; and to provide proper notification to the general public, as needed.

This impact would be potentially significant. Mitigation Measures HWQ-1 and HWQ-2 (See Section 3.1.4), PHS-1, PHS-3, PHS-4, and PHS- 5 would reduce impacts to a less than significant level.

Environmental Consequences/Environmental Impacts of Alternative 2

As with Alternative 1, Alternative 2 could involve the development of borrow material containing asbestos-like fibers, the use of hazardous materials that could result in accidental spills at construction sites, and earthwork that has the potential to uncover hazardous materials in the soil, groundwater, or sediment. One difference between Alternatives 1 and 2 would be that new embankments/flood easements could be constructed around the reservoir under Alternative 2 to prevent flooding in areas of low elevation. The number of embankments required and their exact locations have not been determined; however, typical construction of the new embankments/flood easements would involve the use of scrapers, loaders, and other equipment to create earthen berms, and the creation of access roads for construction and maintenance. The nature of the impacts from these activities would not be substantially different from the impacts addressed under Alternative 1 and would be mitigated to a less than significant level by implementation of Mitigation Measures GR-1, HWQ-1, HWQ-2, PHS-1, PHS-3, PHS-4, and PHS- 5.

Other than the new embankments/flood easements, there would be no appreciable difference between the impacts of Alternative 1 and Alternative 2 for these elements. Mitigation Measures identified for Alternative 1 are applicable to Alternative 2.

Environmental Consequence/Environmental Impacts of Alternative 3

As with Alternative 2, Alternative 3 could involve the development of borrow material containing asbestos-like fibers, the use of hazardous materials that could result in accidental spills at construction sites, and earthwork that has the potential to uncover hazardous materials in the soil, groundwater, or sediment. There would be no appreciable difference between the impacts of Alternative 2 and Alternative 3 for these elements. Mitigation Measures identified for Alternative 2 are applicable to Alternative 3.

Environmental Consequence/Environmental Impacts of Alternative 4

As with Alternative 2, Alternative 4 could involve the development of borrow material containing asbestos-like fibers, the use of hazardous materials that could result in accidental spills at construction sites, and earthwork that has the potential to uncover hazardous materials in the soil, groundwater, or sediment. There would be no appreciable difference between the impacts of Alternative 2 and Alternative 4 for these elements. Mitigation Measures identified for Alternative 2 are applicable to Alternative 4.

Environmental Consequences/Environmental Impacts of Alternative 5

As with Alternative 2, Alternative 5 could involve the development of borrow material containing asbestos-like fibers, the use of hazardous materials that could result in accidental spills at construction sites, and earthwork that has the potential to uncover hazardous materials in the soil, groundwater, or sediment. There would be no appreciable difference between the impacts of Alternative 2 and Alternative 5 for these elements. Mitigation Measures identified for Alternative 2 are applicable to Alternative 5.

3.17.3 Comparative Analysis of Alternatives

There would generally be no difference between the alternatives for impacts to public health and safety due to natural disasters or hazardous, toxic, and radiological waste. However, Alternatives 4 and 5 would require the largest quantities of borrow material and would therefore have a greater chance of encountering hazards in the soils. Alternatives 1 through 4 would require excavation in the reservoir for a new Auxiliary Spillway and could therefore encounter mercury in the sediments. Although there would be no excavation in the reservoir for a new Auxiliary Spillway, construction activities at MIAD under Alternative 5 could encounter mercury in the sediment.

3.17.4 Mitigation Measures

Adherence to the following mitigation measures would satisfy the regulatory requirements regarding hazard identification and would mitigate potentially significant impacts to a less than significant level.

PHS-1: A public safety management plan will be prepared and implemented to maintain public safety during all phases of construction. Components of the plan will address:

- Public notification of the location and duration of construction activities, pedestrian/bicycle path/trail closures, and restrictions on reservoir use (i.e., boating, water skiing, fishing, swimming);

- Verification with local jurisdictions that construction blockage of existing roadways will not interfere with existing emergency evacuation plans;

- Adequate signage regarding the location of construction sites and warning of the presence of construction equipment;

- Fencing of construction staging areas and of construction areas if dangerous conditions exist when construction is not occurring; and

- Temporary walkways (with appropriate markings, barriers, and signs to safely separate pedestrians from vehicular traffic) and detour signage where an existing sidewalk or pedestrian/bicycle path/trail will be closed during construction.

PHS-2: Prior to initiating construction activities, the responsible Federal agency in consultation with the appropriate city, county, and State fire suppression agencies will prepare and implement a Fire Management Plan. The plan will include fire prevention and response methods including fire precaution, presuppression, and suppression measures consistent with the policies and standards in the affected jurisdictions.

PHS-3: Conduct a Phase I ENSA at all construction sites before beginning construction. Reclamation and the Corps will require that site-specific environmental site assessments be performed for all sites where construction will be conducted. As necessary, a soil and groundwater characterization program will be developed and implemented at all excavation locations in proximity to listed hazardous waste sites identified in the Phase I ENSA. The soil and groundwater characterization program will identify those excavation areas that will require development and implementation of appropriate remediation measures. Mitigation Measure PHS-5 described below applies only to areas where contact with contaminated soil or groundwater is suspected.

PHS-4: Prepare and implement a Worker Health and Safety Plan prior to the start of construction activities. The Contractor will prepare a Health and Safety Plan that should, at a minimum, identify:

- All contaminants that could be encountered during excavation activities (e.g., potential asbestos in the gravel used for the foundation of the Folsom Dam, TPH in soil);

- All appropriate worker, public health, and environmental protection equipment and procedures;

- Emergency response procedures;

- Most direct route to a hospital; and

- Site Safety Officer.

The plan will require documentation that all workers have reviewed and signed the plan.

PHS-5: Prior to initiation of construction activities, the Contractor will be required to prepare a Hazardous Material Management Plan for review by the responsible Federal agency. The purpose of this plan is to have an established plan of action if hazardous materials are encountered during construction and to establish best management practices (BMPs) to reduce the potential for exposure to hazardous wastes. The plan will:

- Define a protocol for proper handling and disposal of hazardous materials if they are encountered during construction;
- Define a protocol for proper emergency procedures and handling and disposal of hazardous materials if an accidental spill occurs during construction; and
- Establish BMPs to reduce the potential for spills of HTRW.

Typical BMPs to reduce the potential for spills may include, but are not limited to:

- Having a spill prevention and control plan with a designated supervisor to oversee and enforce proper spill prevention measures;
- Providing spill response and prevention education for employees and subcontractors;
- Stocking appropriate clean-up materials onsite near material storage, unloading and use areas;
- Designating hazardous waste storage areas away from storm drains or watercourses;
- Minimizing production or generation of hazardous materials onsite or substituting chemicals used onsite with less hazardous chemicals;
- Designating areas for construction vehicle and equipment maintenance and fueling with appropriate control measures for runon and runoff; and
- Arranging for regular hazardous waste removal to minimize onsite storage.

HWQ-1 and HWQ-2 (see Section 3.1.4) and GR-1 (see Section 3.6.4) would also serve to reduce potential public health and safety impacts during construction to a less than significant level.

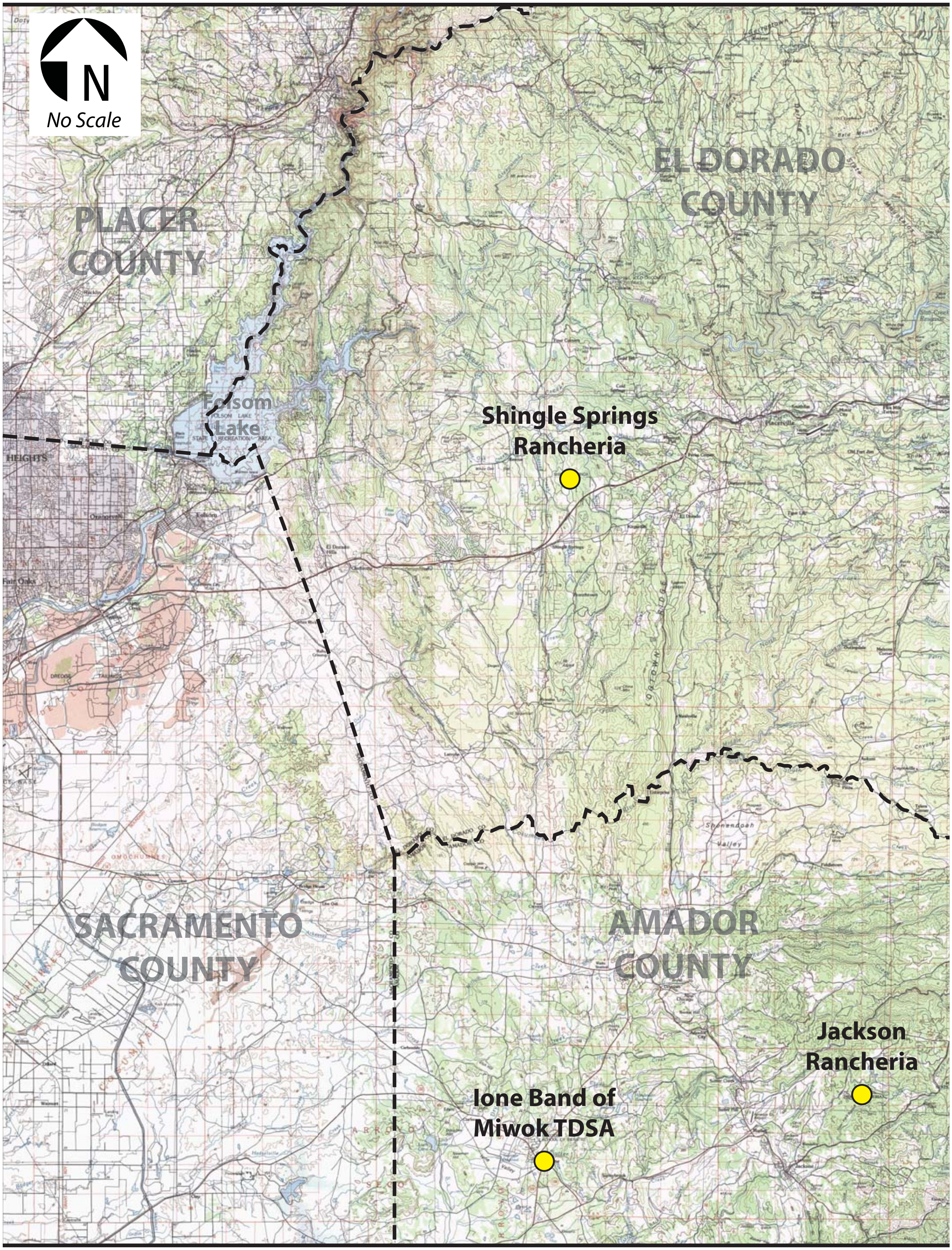
3.17.5 Cumulative Effects

Cumulatively, the Folsom DS/FDR actions would have a beneficial effect on public health and safety with respect to natural disasters. The Folsom DS/FDR actions would reduce current dam deficiencies, such as potential failure due to seismic (earthquake), static (seepage), and hydrologic concerns (probable maximum flood events), and provide greater protection to downstream populations in the Sacramento metropolitan area from potential flood impacts. Effects on public health and safety with respect to hazardous, toxic, and radiological waste were found not to have the potential to contribute to cumulative effects because the effects are either temporary or have no potential to be additive to other projects. Therefore, the Folsom DS/FDR actions would not have an adverse cumulative effect on public health and safety.

3.18 Indian Trust Assets

Indian Trust Assets (ITAs) are defined as legal interests in property held in trust by the United States government for Indian tribes or individuals, or property protected under United States law for Indian tribes and individuals. Federal agencies are required to take responsibility for protection and maintenance of ITAs. EISs should consider impacts to ITAs when the potential for impacts exist.

As shown in Figure 3.18-1, ITAs are not present within the area or adjacent to the Folsom Facility. Therefore, there would be no impacts to ITAs from the Folsom DS/FDR actions (U.S. Census Bureau 2001).



W:\REPORTS\Folsom EIR\Graphics\ITAs Near Project Area_Fig3.18-1.ai 11/01/06 JJT

Figure 3.18-1
ITAs Near the Folsom Facility

CDM

3.19 Environmental Justice

This section addresses the degree to which the Folsom DS/FDR alternatives would comply with federal and state regulations and guidelines pertaining to environmental justice by identifying potentially disproportionately high and adverse human health or environmental effects on minority and/or low-income populations. The applicable federal and state environmental justice regulations and guidelines are described below in Subsection 3.19.1.2.

3.19.1 Affected Environment/Existing Conditions

3.19.1.1 Area of Analysis

The study area is broken down into State and local jurisdictions including: Folsom State Prison/California State Prison - Sacramento (CSPS), Placer County, El Dorado County, Sacramento County, and City of Folsom. The 2000 Census Tract Block Groups used for this analysis include the following:

- Folsom State Prison/California State Prison, Sacramento (Sacramento County) – Block Group 1, Census Tract 83
- Placer County – Block Groups 1, 2 and 3, Census Tract 206.01 and Block Group 2, Census Tract 206.05
- El Dorado County – Block Group 1, Census Tract 307.01 and Block Group 1, Census Tract 307.02
- City of Folsom (Sacramento County) – Block Groups 1, 2 and 4, Census Tract 82.10; Block Group 1, Census Tract 84.02 and Block Group 2, Census Tract 85.01

The study area for the environmental justice analysis is the area in which the collective environmental effects resulting from the Folsom DS/FDR alternatives would be likely to occur. Figure 3.16-1, in Section 3.16, Population and Housing, shows the census tracts and block groups included in the Folsom DS/FDR study area.

3.19.1.2 Regulatory Setting

Federal Environmental Justice Regulations and Guidelines

Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority and Low-Income Populations,” established the priority of analyzing environmental justice for any action that could cause disproportionately high and adverse impacts to a minority and/or or low-income population. All federal agencies are required to include analysis of environmental justice within EISs. Minority population is defined as including all non-white racial groups and Hispanics of any racial group; low-income population is defined based on federal poverty thresholds (Council of Environmental Quality 1997).

Two principles are central to the analysis of environmental justice under Executive Order 12898:

- Fair treatment of all people regardless of race, color, nation of origin or income; and

- Promotion of public participation by minority and/or low-income populations.

Reclamation and the Corps have guidelines for analysis of environmental justice in EAs and EISs. Potential disproportionately high and adverse impacts to minority and/or low-income populations should be discussed and reasonable mitigation measures established as necessary. Active engagement of minority and low-income communities within the public scoping and involvement processes should be promoted. Consideration of minority cultural and language needs should be addressed when developing public involvement programs.

State Environmental Justice Regulations and Guidelines
California State Government Code Section 65040.12(e) defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations and policies. The Office of Planning and Research (OPR) is the coordinating agency in State government for environmental justice programs. OPR is responsible for developing guidelines for incorporating environmental justice into general plans.

Enacted at the same time as Government Code Section 65040.12, Public Resources Code Sections 71110-71116 designate the California Environmental Protection Agency (CalEPA) as the public agency to implement the state's environmental justice programs. Specifically, CalEPA is required to "promote enforcement of all health and environmental statutes within its jurisdiction in a manner that ensures the fair treatment of people of all races, cultures, and income levels, including minority populations and low income populations of the state." See Public Resources Code § 71110. CalEPA's other broad responsibilities include the implementation of environmental justice in the design and implementation of programs, policies and activities, the implementation of enforcement efforts, the design of public participation activities, and conducting health and environmental research and data collection. Pursuant to this law, CalEPA has developed a model environmental justice mission statement and convened a Working Group and an Advisory Group to develop an agency-wide strategy for identifying and addressing any gaps in existing programs, policies, or activities that could impede the achievement of environmental justice. On October 7, 2003, the Advisory Group finalized and published their

Environmental Justice Recommendations to the Working Group, which provide a set of comprehensive recommendations to establish and implement an effective environmental justice program at CalEPA.

Beyond these general environmental justice laws, there is currently no state requirement or specific guidance for addressing environmental justice under CEQA. However, it is in recognition of the environmental justice principles and policies under Government Code Section 65040.12 and Public Resources Code Sections 71110-71116 and the still-developing statewide approach to environmental justice, the subject issue is addressed in this section.

Placer and El Dorado Counties' General Plans and the City of Folsom's General Plan do not include guidelines related to environmental justice.

3.19.1.3 Environmental Setting

Table 3.19-1 shows the demographic and income breakdown for each block group in the study area. Based on this information, there is one block group with a population consisting primarily of minority and low-income individuals. Block Group 1, Census Tract 83 consists of the Folsom State Prison and the CSPS, and is located adjacent to the Folsom DS/FDR area, within the City of Folsom. As indicated in Table 3.19-1, year 2000 U.S. Census data indicates that Block Group 1, Census Tract 83 consists of over 50 percent minority individuals and 53.3 percent of low-income individuals, defined as living below the federal poverty level.

Section 3.18, Population and Housing, defines the race and ethnic demographic breakdown within the area of analysis. Household income is also discussed in the Section 3.18 for the area of analysis.

Folsom State Prison/California State Prison - Sacramento

Folsom State Prison and CSPS are within the same census tract and block group, and within the city limits of Folsom. Folsom State Prison is a medium security prison for men, housing Level II and Level III inmates. A minimum security unit is also at Folsom State Prison (California Department of Corrections and Rehabilitations [CDCR] 2006a). Adjacent to Folsom State Prison, CSPS houses maximum security inmates with long sentences and inmates perceived as management problems from other institutions.

CSPS is also a medical hub for Northern California. This facility provides a Psychiatric Services Unit, enhanced outpatient (EOP) and EOP Administrative Segregation levels of healthcare. An Outpatient Housing Unit and Correction Treatment Center are also located at the facility (CDCR 2006b). A total of 7,367 inmates were housed at the two prisons as of March 31, 2006 (CDCR 2006b).

Table 3.19-1
Demographic and Income Data of Environmental Justice Study Area

Parameter	***Applicable Environmental Justice Threshold[1]***	***Block Group 1, Census Tract 307.01, El Dorado County, CA***	***Block Group 1, Census Tract 307.02, El Dorado County, CA***	***Block Group 1, Census Tract 206.01, Placer County, CA***	***Block Group 2, Census Tract 206.01, Placer County, CA***	***Block Group 3, Census Tract 206.01, Placer County, CA***	***Block Group 2, Census Tract 206.05, Placer County, CA***	***Block Group 1, Census Tract 82.10, Sacramento County, CA***	***Block Group 2, Census Tract 82.10, Sacramento County, CA***	***Block Group 4, Census Tract 82.10, Sacramento County, CA***	***Block Group 1, Census Tract 83, Sacramento County, CA***	***Block Group 1, Census Tract 84.02, Sacramento County, CA***	***Block Group 2, Census Tract 85.01, Sacramento County, CA***
Total Population		5,108	746	1,435	4,719	271	2,295	459	711	1,733	6,842	4,280	2,815
Total Minority Population[2]		737	69	139	467	40	247	71	76	124	4,493	643	465
Minority Percentage	50% or more	14.4%	9.2%	9.7%	9.9%	14.8%	10.8%	15.5%	10.7%	7.2%	65.7%	15.0%	16.5%
Median Household Income		$99,728	$109,025	$79,912	$101,851	$74,821	$101,617	$87,417	$29,500	$35,543	$56,042	$75,698	$100,250
Percentage Below Federal Poverty Threshold		1.8%	0.0%	3.2%	2.9%	0.0%	5.1%	3.9%	5.9%	3.8%	53.3%	3.8%	1.9%

Source: 2000 U.S. Census unless noted otherwise, U.S. Census Bureau 2004a
[1]Based on Environmental Justice – Guidance Under the National Environmental Policy Review Act, Council on Environmental Quality (CEQ), 1997, page 25.
[2]Total population minus “white alone” plus Hispanics/Latinos who are white alone.

Folsom State Prison and CSPS are located in Census Tract 83, Block Group 1, Sacramento County. Table 3.19-2 shows the majority of the prison population to be minorities at 65.7 percent of the population in 2000.

Table 3.19-2 ***Race and Ethnic Demographics within Block 1, Census Tract 83*** ***(Folsom State Prison and CSPS)***		
Race/Ethnicity	***Number***	***Percentage of Study Area Population***
White alone	2,438	35.6%
Black or African American	2,430	35.5%
American Indian and Alaska Native	65	1.0%
Asian	88	1.3%
Other or Mixed	1,821	26.6%
Total	6,842	100.0%
Hispanic or Latino	1,860	27.2%
Total minority	4,493	65.7%

Source: US Census Data 2000 (U.S. Census Bureau 2004a)

The majority of the prison population was reported as having incomes below the poverty level. U.S. Census 2000 reports 77 people living in 36 households with a median household income of $56,042. Because these households are in the same census block group as the prisons, separate racial and income data are not available for them. The 2000 Census reported no families living below poverty level in the block group. Discussions with prison public information officers indicate that individuals living within these households are prison employees and their families and are not institutionalized individuals (Cocke 2006; Lucchi 2006).

3.19.2 Environmental Consequences/Environmental Impacts

3.19.2.1 Assessment Methods

The U.S. Environmental Protection Agency's (USEPA) guidance for determining whether there is a minority community where environmental justice effects could occur gives both quantitative and qualitative measures: if the affected area's minority population is over 50 percent, and if the minority population in the affected area is "meaningfully greater" than that in the general population.

U.S. 2000 Census data was used to identify the percentage of minority and low income populations within the study area to determine if environmental justice impacts would occur. Data indicated the percentage of individuals who are listed as minorities in census block groups in the study area. The demographic analysis also identified percentages of study area residents living below the poverty level.

3.19.2.2 Significance Criteria

Implementation of the proposed actions of the Folsom DS/FDR would result in a significant environmental justice impact if they would:

- Expose a minority or low-income population to disproportionately high and adverse impacts or hazards; or
- Not take efforts to encourage public participation within predominately minority or low-income population segments.

3.19.2.3 Environmental Consequences/Environmental Impacts

Environmental Consequences/Environmental Impacts of the No Action/No Project Alternative

Under the No Action/No Project Alternative, construction of the Folsom DS/FDR improvements at the Folsom Facility would not occur. All income levels and populations would be at the same risk if seismic, hydrologic, or static problems or a major flood occurred at the Folsom Facility. Appropriate measures would be taken to protect the prison population from any hazardous effects. Because there would be no disproportionate effect to minorities or low income populations, the No Action/No Project Alternative would have no impact relative to Environmental Justice.

The No Action/No Project Alternative would have no impact to Environmental Justice.

Environmental Consequences/Environmental Impacts of Alternative 1

Actions under Alternative 1 would not result in environmental justice impacts.

The majority of the population in the study area is not a minority and is living above the Federal poverty threshold. Therefore, based on demographics identified in Table 3.19-1, there would not be a disproportionate impact to minority or low-income populations or property in the majority of the study area. Folsom State Prison/CSPS and prison employee households (Block Group 1, Census Tract 83) indicated low income and minority groups above 50 percent. Therefore, environmental justice could be an issue if implementation of the Folsom DS/FDR disproportionately affects the prison population, including inmates and workers and families living on the prison grounds.

Construction activities could temporarily increase noise, traffic, and air emissions in the vicinity of the site. Several phases of construction planned for the Alternative 1 would occur around the Main Concrete Dam and Left Wing Dam, which could increase noise levels near the prison. Construction activities would also occur in multiple areas surrounding the Folsom Facility, which would increase noise for other communities. The effects of increased noise would be experienced by all people within the surrounding areas of the Folsom Facility. Therefore, there would be no disproportionate effect of increased noise on Block Group 1, Census Tract 83, including the prison population.

Increased traffic from construction activities would also affect a wide range of income levels and races in the study area. Traffic could increase along the Highway 50 and Interstate 80 corridors and in the City of Folsom. These increases would affect all drivers and would not have any disproportionately high and adverse effects to minority and/or low-income populations. In general, because construction is planned throughout the study area, any effects would fall on all residents within the study area. Disproportionately high and adverse effects to minority and/or low-income populations would not occur from construction of Alternative 1.

Alternative 1 would also close recreation sites in the Folsom Lake State Recreation Area. The Folsom Lake State Recreation Area is used by people of all income levels and race. Closure of the recreation areas would not affect prisoners or disproportionately affect workers or families living on the prison grounds.

As described in Section 2, the formulation, screening, and selection of alternatives to be considered for the Folsom DS/FDR included public outreach and community input, including attendance at local scoping meetings (see Appendix A, Public Scoping Report). Additional focused efforts to solicit public participation within predominately minority or low-income population segments were not conducted relative to the Folsom DS/FDR, given the unique circumstances of the subject population (i.e., inmates within Folsom State Prison and CSPS).

This impact would be less than significant.

Environmental Consequences/Environmental Impacts of Alternative 2
Impacts of Alternative 2 related to environmental justice would be the same as Alternative 1.

Environmental Consequences/Environmental Impacts of Alternative 3
Impacts of Alternative 3 related to environmental justice would be the same as Alternative 1.

Environmental Consequences/Environmental Impacts of Alternative 4
Impacts of Alternative 4 related to environmental justice would be the same as Alternative 1.

Environmental Consequences/Environmental Impacts of Alternative 5
Impacts of Alternative 5 related to environmental justice would be the same as Alternative 1.

3.19.3 Comparative Analysis of Alternatives

There would be no significant impacts under any of the Folsom DS/FDR action alternatives with regard to environmental justice.

3.19.4 Mitigation Measures

There would be no significant environmental justice impacts; therefore, no mitigation measures are required.

3.19.5 Cumulative Effects

The Folsom DS/FDR would have no significant environmental justice impacts and would not contribute to any cumulative environmental justice impacts.

Chapter 4
Socioeconomics

This chapter presents potential economic effects of implementing the Folsom DS/FDR alternatives. This chapter is separate from other resources in Chapter 3 because economic effects are treated differently under CEQA and NEPA. See Section 4.2.1 below. Therefore, this chapter is also organized differently than the resource analyses contained in Chapter 3 of this EIS/EIR.

4.1 Regional Socioeconomic Setting

The study area includes Sacramento, Placer, and El Dorado Counties where potential economic effects could occur from implementation of the alternatives. These counties are included because they border Folsom Reservoir and the Folsom Lake State Recreation Area (FLSRA) where the action alternatives would be implemented. This section includes a description of the local economy in the three-county region, as well as for the City of Folsom, which is adjacent to Folsom Reservoir and Dam. This section also includes a description of recreational activity in three recreation use areas; Folsom Point, Beal's Point, and Granite Bay within the FLSRA.

4.1.1 Sacramento County

4.1.1.1 Population and Income[1]

In 2005, Sacramento County had a population of about 1.37 million, an increase of 25,000 people from 2004. From 1990 to 2000, the compound annual growth rate was 1.6 percent; and, from 2000 to 2005, the compound annual growth rate increased to 2.3 percent. The county's population is projected to reach 2 million by 2020 (EDD 2004). According to the 2000 U.S. Census, Sacramento County's population was 64 percent white, 10 percent black or African American, 1 percent Native American, 11 percent Asian, 1 percent Pacific Islander, and the remaining classified as other or more than one race.

In 2003, total personal income in Sacramento County was about $40.1 million and per capita personal income was $30,129 (Bureau of Economic Analysis [BEA] 2005). From 1993-2003, average annual growth rate of per capita personal income in Sacramento County was 3.8 percent. Sacramento County ranked 10th among counties in the state in total personal income and 22nd in per capita personal income. In 1999, median family income was $50,717; 10 percent of families lived below the poverty level (U.S. Census Bureau 2004a). In 2004, the poverty level for a family of two was an annual income of $12,490 and $18,550 for a family of four.

[1] Population data presented in this chapter may differ from data in Section 3.16 Population and Housing. The population and housing analysis relies on specific Census Tract Data; and data in this chapter is presented at the county-level for background purposes.

4.1.1.2 Industry

Table 4-1 shows 2001 to 2003 industry earnings in Sacramento County. Top earning industries include government and government enterprises, health care and social assistance, finance and insurance, construction and retail trade. From 2001 to 2003, total industry earnings grew the most in absolute terms in the government and government enterprises sector, about $899.1 million. Finance and insurance industry earnings grew about $514.5 million from 2001 to 2003. In terms of percentage, the fastest growing industries from 2001 to 2003 were real estate and rental and leasing (29 percent increase), finance and insurance (24 percent increase), educational services (23 percent increase), health care and social assistance (19 percent increase), and arts, entertainment, and recreation (19 percent increase).

Table 4-1
Industry and Industry Earnings, Sacramento County, 2001 to 2003
(in thousands)

Industry	***2001***	***2002***	***2003***
Forestry, fishing, related activities, and other	$37,602	$36,292	$37,365
Mining	$50,309	$43,427	$45,755
Construction	$2,255,393	$2,435,238	$2,623,129
Manufacturing	$2,138,755	$2,122,699	$2,132,785
Wholesale trade	$1,023,739	$1,070,828	$1,199,264
Retail trade	$2,205,556	$2,291,242	$2,404,667
Transportation and warehousing	$557,641	$528,025	$542,263
Information	$1,157,718	$1,310,808	$1,306,141
Finance and insurance	$2,160,665	$2,351,648	$2,675,182
Real estate and rental and leasing	$606,564	$614,260	$779,951
Management of companies and enterprises	$508,441	$486,469	$499,216
Administrative and waste services	$1,183,837	$1,157,217	$1,172,318
Educational services	$231,920	$264,631	$286,381
Health care and social assistance	$2,546,460	$2,744,616	$3,039,722
Arts, entertainment, and recreation	$227,949	$248,086	$271,704
Accommodation and food services	$664,808	$721,401	$742,131
Other services, except public administration	$993,337	$1,075,193	$1,156,802
Government and government enterprises	$10,249,518	$10,833,501	$11,148,663

Source: BEA 2005, Regional Economic Information System

4.1.1.3 Employment

Table 4-2 shows industry employment and compensation in Sacramento County from 2001 to 2003. In 2003, government and government enterprises employed the most people, followed by retail trade, health care and social assistance, and construction. Finance and insurance had the largest increase in employment from 2001 to 2003. Average compensation per job in Sacramento County was $46,036 in 2001, $48,597 in 2002, and $50,939 in 2003.

Major employers in Sacramento County in 2005 include: Aerojet Fine Chemicals, LLC, Gen Corp Inc, Wild Zone, American River College, California State University, Sacramento City College, Kaiser Foundation Hospital, Mercy General

Hospital, Mercy San Juan Medical Center, Sutter Memorial Hospital, UC Davis Medical Center, University of California Surgery Clinic, Sacramento Municipal Utility District (SMUD), and the Sacramento Bee Newspaper. State government departments with high employment include Corrections, Health Services, Employment Development, Social Services, Water Resources, and Education. In 2003, Sacramento County unemployment rate was 5.5 percent.

Table 4-2
Industry Employment and Compensation, Sacramento County, 2001 to 2003

Industry	***2001***		***2002***		***2003***	
	Employment # Jobs	***Compensation $***	***Employment # Jobs***	***Compensation $***	***Employment # Jobs***	***Compensation $***
Forestry, fishing, related activities, and other	1,724	23,453	1,527	22,622	1,498	23,578
Mining	643	18,326	550	17,809	488	18,095
Utilities	739	74,077	859	93,984	869	98,277
Construction	47,200	1,803,191	48,337	1,995,348	50,469	2,117,798
Manufacturing	34,048	2,082,225	33,260	2,068,202	31,851	2,075,531
Wholesale trade	20,870	964,751	20,754	999,424	21,312	1,099,592
Retail trade	77,170	1,931,694	77,822	2,036,071	80,478	2,140,781
Transportation and warehousing	15,627	477,039	14,999	465,475	14,667	477,840
Information	19,344	1,029,149	20,218	1,184,907	18,942	1,161,309
Finance and insurance	42,904	2,035,798	43,504	2,246,739	46,214	2,568,520
Real estate and rental and leasing	25,211	338,694	25,326	346,458	26,680	463,150
Professional and technical services	49,326	2,109,845	49,217	2,141,205	49,881	2,123,984
Management of companies and enterprises	8,372	507,911	7,520	484,377	7,160	497,148
Administrative and waste services	49,328	1,074,527	47,035	1,024,723	46,071	1,036,693
Educational services	9,955	214,249	11,112	249,267	11,976	272,202
Health care and social assistance	62,595	2,231,775	61,950	2,404,170	64,324	2,676,206
Arts, entertainment, and recreation	12,307	188,189	12,627	206,335	12,932	227,694
Accommodation and food services	43,886	625,053	44,937	685,460	45,167	704,571
Other services, except public administration	39,764	836,751	41,563	918,529	42,698	995,143
Government and government enterprises	183,042	10,249,518	184,768	10,967,368	181,926	11,437,807

4.1.2 Placer County

4.1.2.1 Population and Income

In 2005, Placer County had a population of about 305,675, an increase of close to 9,000 people from 2004. From 1990 to 2000, the compound annual growth rate was 3.6 percent; and, from 2000 to 2005, the compound annual growth rate increased to 4.2 percent. The county's population is projected to exceed 456,000 by 2020 (EDD 2004). In 2000, Placer County's population was 89 percent white, 1 percent black or African American, 1 percent Native American, 3 percent Asian, 0.2 percent Pacific Islander, and the remaining classified as other or more than one race.

In 2003, total personal income in Placer County was about $10.8 million and per capita personal income was $36,613 (BEA 2005). From 1993-2003, average annual growth rate of per capita personal income in Placer County was 4.2 percent. Placer County ranked 22nd among counties in the state in total personal income and 10th in per capita personal income. In 1999, median family income was $65,858; 3.9 percent of families lived below the poverty level (U.S. Census Bureau 2004a).

4.1.2.2 Industry

Table 4-3 shows 2001 to 2003 industry earnings in Placer County. Top earning industries included manufacturing, wholesale trade, transportation and warehousing, accommodation and food services, and real estate, rental, and leasing. The manufacturing industry grew the most from 2001 to 2003 in earnings, about $2.56 million. Real estate grew about $2.12 million from 2001 to 2003.

Table 4-3
Industry and Industry Earnings, Placer County, 2001 to 2003 (in thousands)

Industry	*2001*	*2002*	*2003*
Forestry, fishing, related activities, and other	$4,922	$4,591	$7,518
Mining	$10,975	$9,248	$11,031
Construction	$37,241	$41,887	$49,058
Manufacturing	$901,263	$980,166	$1,157,539
Wholesale trade	$852,240	$822,349	$787,771
Retail trade	$174,041	$188,765	$174,608
Transportation and warehousing	$666,449	$718,250	$771,645
Information	$195,687	$190,890	$182,186
Finance and insurance	$189,955	$172,335	$169,998
Real estate and rental and leasing	$361,093	$445,806	$573,687
Management of companies and enterprises	$218,644	$244,938	$285,636
Administrative and waste services	$358,287	$388,465	$447,897
Educational services	$142,512	$112,365	$123,698
Health care and social assistance	$246,249	$235,763	$250,393
Arts, entertainment, and recreation	$46,533	$57,189	$62,300
Accommodation and food services	$489,273	$587,032	$639,535
Other services, except public administration	$65,846	$67,793	$75,291
Government and government enterprises	$216,313	$227,633	$251,391

Source: BEA 2005, Regional Economic Information System

4.1.2.3 Employment

Table 4-4 shows industry employment and compensation in Placer County from 2001 to 2003. In 2003, retail trade employed the most people, followed by construction, government and government enterprises, accommodation and food service, and health care and social assistance. Construction had the largest increase in employment from 2001 to 2003, about 2,600 people or 14 percent. Average compensation per job in Placer County was $41,602 in 2001, $43,505 in 2002, and $45,262 in 2003.

Table 4-4
Industry Employment and Compensation[1], Placer County, 2001 to 2003

Industry	2001		2002		2003	
	Employment # Jobs	Compensation $	Employment # Jobs	Compensation $	Employment # Jobs	Compensation $
Forestry, fishing, related activities, and other	311	1,136	337	540	547	3,464
Mining	243	5,959	209	5,291	211	6,776
Utilities	494	36,963	502	42,251	494	49,573
Construction	18,888	671,474	19,439	751,680	21,470	896,463
Manufacturing	12,458	852,202	10,996	821,051	10,400	786,859
Wholesale trade	3,768	161,484	3,914	174,296	3,349	183,801
Retail trade	21,446	575,794	22,600	627,940	24,019	678,612
Transportation and warehousing	3,757	178,623	3,542	177,249	3,245	168,450
Information	3,215	181,129	3,223	163,766	3,106	159,696
Finance and insurance	7,469	302,149	8,417	392,317	9,488	520,444
Real estate and rental and leasing	8,841	89,738	9,134	109,630	9,606	125,808
Professional and technical services	9,069	241,728	9,528	275,615	10,661	330,717
Management of companies and enterprises	2,388	142,480	1,831	111,988	1,905	123,343
Administrative and waste services	9,782	221,824	9,497	206,516	9,942	220,560
Educational services	2,517	44,665	2,724	56,983	2,850	63,065
Health care and social assistance	11,698	377,342	13,106	458,065	13,420	501,602
Arts, entertainment, and recreation	4,108	58,299	4,430	60,331	4,693	67,906
Accommodation and food services	13,121	204,020	13,277	209,781	14,122	233,237
Other services, except public administration	9,067	173,656	8,837	169,603	8,274	147,196
Government and government enterprises	15,791	683,309	16,014	734,297	16,998	813,132

(1) Employment includes full- and part-time workers. Compensation is the sum of wage and salary disbursements and supplements, such a bonuses

Source: BEA 2005, Regional Economic Information System

Major employers in Placer County in 2005 include: Adventist Health, Formica Corp, Future Ford, Hewlett Packard Co, Home Depot, JR Pierce Plumbing Co Inc, NEC Electronic USA, Oracle Corp, Sierra Community College District, Sierra West Drywall Inc, Sutter Roseville Medical Center, Thunder Valley Casino, and Underground Construction Co. In 2003, Placer County unemployment rate was 4.6 percent.

4.1.3 El Dorado County

4.1.3.1 Population and Income

In 2005, El Dorado County had a population of about 173,407, an increase of approximately 3,000 people from 2004. From 1990 to 2000, the compound annual growth rate was 2.2 percent; and, from 2000 to 2005, the compound annual growth rate remained relatively constant at 2.1 percent. The county's population is projected to exceed 221,000 by 2020 (EDD 2004). In 2000, El Dorado County's population was 90 percent white, 0.5 percent black or African American, 1 percent Native American, 2 percent Asian, 0.1 percent Pacific Islander, and the remaining classified as other or more than one race.

In 2003, total personal income in El Dorado County was about $6.2 million and per capita personal income was $36,373 (BEA 2005). From 1993-2003, average annual growth rate of per capita personal income in El Dorado County was 4.9 percent. El Dorado County ranked 26th among counties in the state in total personal income and 12th in per capita personal income. In 1999, median family income was $60,250; 5 percent of families lived below the poverty level (U.S. Census Bureau 2004a).

4.1.3.2 Industry

Table 4-5 shows 2001 to 2003 industry earnings in El Dorado County. Top earning industries in 2003 include manufacturing, administrative and waste services, accommodation and food services, and transportation and warehousing. The real estate, rental and leasing industry grew the most in earnings from 2001 to 2003, about $7.1 million. Accommodations and food services grew about $6.1 million and manufacturing grew about $5.9 million in earnings from 2001 to 2003.

Table 4-5 ***Industry and Industry Earnings, El Dorado County, 2001 to 2003 (in thousands)***			
Industry	***2001***	***2002***	***2003***
Forestry, fishing, related activities, and other	$23,451	$24,497	$23,965
Mining	$6,490	$5,010	$5,247
Construction	$10,168	$10,763	$11,761
Manufacturing	$400,330	$409,813	$459,193
Wholesale trade	$120,151	$104,080	$114,913
Retail trade	$52,586	$60,261	$57,736
Transportation and warehousing	$233,876	$237,560	$236,466
Information	$25,085	$29,064	$26,404
Finance and insurance	$30,563	$31,053	$33,764
Real estate and rental and leasing	$103,020	$146,883	$173,045
Management of companies and enterprises	$101,760	$108,077	$117,124
Administrative and waste services	$402,939	$398,346	$401,838
Educational services	$9,797	$9,557	$11,221
Health care and social assistance	$75,359	$84,369	$82,421
Arts, entertainment, and recreation	$8,628	$10,880	$8,841
Accommodation and food services	$225,799	$256,717	$287,072
Other services, except public administration	$54,888	$62,945	$62,033
Government and government enterprises	$85,523	$91,697	$102,310

Source: BEA 2005, Regional Economic Information System

4.1.3.3 Employment

Table 4-6 shows industry employment and compensation in El Dorado County from 2001 to 2003. In 2003, retail trade employed the most people, followed by government and government enterprises, professional and technical services, and construction. Finance and insurance had the largest increase in employment from 2001 to 2003, about 1,700 people or 47 percent. Average compensation per job in El Dorado County was $36,901 in 2001, $38,154 in 2002, and $39,456 in 2003.

Major employers in western El Dorado County in 2005 include: AmDocs Ltd, DST Output, Fortune 800, McClone Construction Co, and Sierra Pacific Industries. In 2003, El Dorado County unemployment rate was 5.1 percent.

4.1.4 City of Folsom

The City of Folsom is within Sacramento County, approximately 25 miles east of downtown Sacramento on Highway 50. Because of availability of data on a city level, data presented below differs from county economic discussions.

Table 4-6
Industry Employment and Compensation(1), Placer County, 2001 to 2003

Industry	2001		2002		2003	
	Employment # Jobs	Compensation $	Employment # Jobs	Compensation $	Employment # Jobs	Compensation $
Forestry, fishing, related activities, and other	614	8,581	696	8,965	675	8,332
Mining	166	2,455	135	2,106	125	2,124
Utilities	168	9,873	142	10,645	133	11,661
Construction	8,579	215,792	8,260	215,955	8,396	235,356
Manufacturing	2,385	120,122	2,140	104,681	2,250	111,518
Wholesale trade	1,387	44,351	1,551	52,088	1,552	49,109
Retail trade	9,645	183,716	9,725	191,682	9,706	188,452
Transportation and warehousing	951	14,766	1,027	20,781	910	17,620
Information	1,058	21,582	966	21,072	889	23,490
Finance and insurance	3,529	64,710	4,551	112,691	5,199	138,982
Real estate and rental and leasing	6,030	25,391	6,179	30,378	6,254	25,610
Professional and technical services	8,766	284,858	8,953	280,927	9,241	280,018
Management of companies and enterprises	230	9,749	207	9,492	304	11,143
Administrative and waste services	3,770	55,450	3,848	60,326	3,672	57,415
Educational services	855	5,987	958	8,461	978	6,140
Health care and social assistance	6,243	157,789	6,518	182,583	6,944	207,262
Arts, entertainment, and recreation	3,455	36,439	3,500	38,303	3,443	36,787
Accommodation and food services	6,054	77,448	6,278	84,514	6,673	94,810
Other services, except public administration	5,090	54,093	5,407	64,198	5,724	74,145
Government and government enterprises	9,201	401,678	9,429	436,073	9,278	455,347

(1) Employment includes full- and part-time workers. Compensation is the sum of wage and salary disbursement and supplements

Source: BEA 2005, Regional Economic Information System

4.1.4.1 Population and Income

In 2005, the City of Folsom (Folsom) had a population of about 68,033, an increase of 2,000 people from 2004. In 1990, Folsom had a population of 29,802. From 1990 to 2000, the compound annual growth rate was 5.5 percent; and, from 2000 to 2005, the compound annual growth rate remained relatively constant at 5.6 percent. In 2000, Folsom's population was 78 percent white, 6 percent black or African

American, 0.6 percent Native American, 7 percent Asian, 0.2 percent Pacific Islander, and the remaining classified as other or more than one race.

In 1999, median family income was $82,448; 3 percent of families lived below the poverty level (U.S. Census Bureau 2004a).

4.1.4.2 Industry

Table 4-7 shows the number of establishments and sales of major industries in Folsom. Retail trade has the most establishments and generates the highest sales for the city. Folsom has an outlet mall with 80 stores and the relatively new Folsom Gateway mall includes major retailers, such as Best Buy, Sam’s Club, Staples, and REI.

Table 4-7
Major Industries in Folsom

Industry	*Number of Establishments*	*Sales (1000 $)*
Wholesale trade	38	$741,726
Retail trade	207	$1,364,104
Information	38	N/A
Real estate, rental, and leasing	58	$41,509
Professional, scientific, technical services	172	N/A
Administrative, support, waste management and remediation service	54	$55,204
Educational service	10	$4,719
Healthcare and social assistance	138	$157,960
Arts, entertainment, and recreation	15	$10,884
Accommodation and food services	137	$100,746
Other services (except public administration)	804	$39,428

N/A – Not available

Source: 2002 Economic Census, U.S. Census Bureau 2006

4.1.4.3 Employment

Table 4-8 shows industry employment in Folsom. Education, health, and social services and manufacturing industries employ the most people, 16.3 and 13.5 percent of total employment, respectively.

Major employers in Folsom include: Intel Corporation, Folsom-Cordova Unified School District, Mercy Hospital, Kaiser Permanente, Maximus, Verizon, Costco, Walmart, Folsom State Prison, Home Depot, Mervyn's, Target, Lowe's, Trader Joe's, Kohl's, Best Buy, Winco, REI, Sam's Club, Video Products Distributors, and Cal-ISO.

Table 4-8 Folsom Employment, 2000		
Industry	***Employment***	***Percent***
Agriculture, forestry, fishing and hunting, and mining	271	1.2
Construction	1,335	5.7
Manufacturing	3,157	13.5
Wholesale trade	896	3.8
Retail trade	2,477	10.6
Transportation and warehousing, and utilities	814	3.5
Information	727	3.1
Finance, insurance, real estate, and rental and leasing	2,487	10.6
Professional, scientific, management, administrative, and waste management services	2,805	12.0
Educational, health and social services	3,833	16.3
Arts, entertainment, recreation, accommodation and food services	1,192	5.1
Other services (except public administration)	907	3.9
Public administration	2,564	10.9

Source: Census 2000 (U.S. Census Bureau 2004b)

4.1.5 Recreation at Folsom Lake State Recreation Area

This analysis is focused on the existing conditions for three recreation use areas; Folsom Point, Beal's Point, and Granite Bay within the FLSRA that would be used for staging, borrow material excavation and processing, and materials stockpiling under all of the action alternatives. FLSRA is part of the California Department of Parks and Recreation (DPR) park system.

FLSRA is an important local, regional, and state recreation resource. With more than 1.5 million visitors in 2000, the FSLRA is one of the most popular areas in the DPR system. Recreational uses include both water-based activities and land-based activities. Water-based activities account for approximately 85 percent of all visits to the FLSRA. Approximately 75 percent of users visit the FSLRA during the warmer spring and summer months. DPR obtains revenue from use fees paid by the public and rental fees associated with concession operations in the FLSRA.

Use fees are directly related to the number of visitors and overnight users. Fees collected for both day use and overnight use vary between peak-season and off-season as illustrated in Table 4-9. Numerous other fees collected in the FLSRA are collected dependent upon the amenities offered in particular recreational areas including pay showers, special events, and boat launches. Total fees collected for the three focus areas in Fiscal Year (FY) 2004/2005 are listed in Table 4-10.

Table 4-9 *FLSRA Use Fees*		
	Peak Season[(1)]	***Off-Peak Season***
Day Use Fees[(2)]		
Developed Parking	$7	$5
Undeveloped Parking	$3	$3
Boat Launch	$8	$5
Camping Fees per night[(3)]	$20	$15

(1) Camping peak season May 15 – September 15; all other activities April 1 – September 30
(2) Effective July 1, 2004
(3) Effective January 1, 2005

Source: CDPR 2006c, CDPR 2006d

Table 4-10 *Use Fees Collected (Fiscal Year 2004/2005)*									
Location	***Regular Day Use***	***Boat Launch***	***Annual Pass***	***Special Events***	***Camping***	***Reserve America***	***Pay Showers***	***Rafting***	***Total***
Folsom Point	$80,281	$46,397	$0	$0	$0	$0	$0	$0	$126,678
Beal's Point	$219,434	$6,740	$2,750	$467	$103,337	$109,701	$4,471	$480	$447,380
Granite Bay	$888,572	$283,028	$447,340	$0	$0	$0	$0	$0	$1,618,940
Total	$1,188,287	$336,165	$450,090	$467	$103,337	$109,701	$4,471	$480	$2,192,998

Source: CDPR 2006b

Twelve concessionaires operated in the FLSRA in calendar year 2005. Services provided include aquatic recreation equipment rentals, land equipment rentals, and food services. Total concession gross sales for the entire FLSRA in calendar year 2005 were $1,938,065 (see Table 4-11). Total rental revenues received by DPR as a result of concession operations were $342,101.

Table 4-11 *Concession Gross Sales and Rental Payments (2005)*		
Location	***Concession Gross Sales***	***Rental Payment***
Granite Bay	**$164,391**	**$21,722**
Brown's Ravine	**$1,425,047**	**$296,722**
Beal's Point	**$152,934**	**$11,737**
Lake Natoma	**$195,693**	**$11,920**
Total for FLSRA	$1,938,065	$342,101

Sources: CDPR 2006b.

4.1.5.1 Folsom Point

Folsom Point is the most popular day use area on the Folsom Lake eastern shore. In 2000, 112,200 visitors utilized this area. 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 129 vehicles. Aquatic and day use facilities quickly reach capacity during peak season weekends as it is a popular site for staging special aquatic events.

Use fees collected for this area include day use fees and boat launch fees. In FY 2004/2005 total day use fees collected were $80,281 or approximately seven percent of the total day use fees collected for the three focus areas (see Table 4-10). Total boat launch fees collected were $46,397 or approximately 14 percent of the total boat launch fees collected for the three focus areas. When compared to the other two focus areas, Folsom Point had the lowest total day use fees collected and was in the middle with regards to the total boat launch fees collected. Overall, total use fees collected at Folsom Point in FY 2004/2005 were the lowest of all three sites at $126,678 or approximately 6 percent of all uses fees collected between the three sites. Folsom Point does not have any concessionaires that pay monthly rental fees to DPR.

4.1.5.2 Beal's Point

Beal's Point includes day use facilities and a campground. Annual attendance in 2000 was 219,986 visitors. Facilities include a guarded swim beach for summer use, parking for approximately 400 vehicles, one boat launch ramp, hiking trails, picnic areas, 49 single camp sites, and 20 RV sites. Concessions include a snack bar and beach equipment rentals.

Fees collected for this area include day use, boat launch, annual passes, camping, special events, Reserve America fees, pay showers, and rafting (see Table 4-10). In FY 2004/2005 total day use fees collected were $219,434 or approximately 18 percent of the total day use fees collected for the three focus areas. Total boat launch fees collected were $6,740 or approximately 2 percent of the total boat launch fees collected for the three focus areas. Out of the three focus areas, Beal's Point had the lowest total boat launch fees collected and was in the middle with regards to the total regular day use fees collected. Beal's Point is the only focus area that collected fees for uses other than regular day use, boat launch, and annual passes. Overall, total use fees collected at Beal's Point in FY 2004/2005 were the second highest of the three sites at $447,380 or approximately 20 percent of all uses fees collected between the three sites.

In calendar year 2005, Beal's Point concessions had gross sales of about $153,000 (see Table 4-11). Total rental fees paid to DPR for concessions operating at Beal's Point in 2005 were about $11,700.

4.1.5.3 Granite Bay

Granite Bay is the most popular day use facility within the FLSRA. Annual attendance in 2000 was 507,712 visitors. Facilities include picnic areas, a guarded swim beach for summer use, informal unguarded swim areas, tot lot, equestrian staging area, hiking trails including an Americans with Disabilities Act (ADA) only trail, parking, reservable group picnic area, fishing, and boating. Dependent upon water levels, a maximum of 14 boat launch ramps are available. Concessions in the area include a snack bar and beach equipment rentals.

Fees collected for this area include day use, boat launch, and annual pass (see Table 4-10). In FY 2004/2005, total day use fees collected were $888,572 or approximately 75 percent of the total day use fees collected for the three focus areas. Total boat launch fees collected were $283,028 or approximately 84 percent of the total boat launch fees collected for the three focus areas. Out of the three focus areas, Granite Bay had the highest fees collected for each category for which fees are collected at Granite Bay. Overall, total use fees collected at Granite Bay in FY 2004/2005 were $1,618,940 or approximately 74 percent of all uses fees collected between the three sites.

In calendar year 2005, Granite Bay concessions had gross sales of about $164,400 (see Table 4-11). Total rental fees paid to DPR for concessions operating at Granite Bay in 2005 were about $21,700.

4.2 Methods of Economic Analysis

4.2.1 CEQA/NEPA Analysis

This economic analysis is part of the CEQA and NEPA environmental documentation for the Folsom DS/FDR action. For CEQA and NEPA analyses, social and economic changes resulting from a project are addressed differently than physical environmental effects, and furthermore, somewhat differently under CEQA than under NEPA. CEQA does not consider economic or social changes resulting from a project as adverse effects on the environment. If a physical change in the environment is caused by economic or social effects, the physical change may be regarded as an adverse effect. Because the economic effects of project components do not change the physical environment, a CEQA analysis is not necessary.

Under NEPA, economic or social effects must be discussed if they are inter-related to the natural or physical environmental effects of a project. Since economic effects of the upgrades to the Folsom Facility are related to physical environmental effects, a NEPA analysis is required. However, NEPA does not require that economic impacts be judged for significance.

The following sections describe the economic analysis tools and related assumptions for estimating economic impacts from the upgrades at the Folsom Facility.

4.2.2 Assessment Tool

This economic analysis focuses on economic impacts caused by 1) reductions in recreational spending from the temporary closure of recreation facilities and 2) increased labor demands associated with construction-related activities. The analysis uses IMPLAN (Impact Planning and Analysis), an input-output (I-O) database and modeling software, to estimate economic impacts of the project alternatives[2]. An I-O analysis describes and analyzes the relationship among industries.

Any given industry typically purchases goods and services from -- and sells goods and services to -- another industry within a given geographic area, which in turn, sells to or buys from other industries or supplies final consumers. IMPLAN uses these inter-industry linkages and provides a tool to estimate the total economic effects within a region from a change in final demand to one economic sector. Total economic effects include:

- Direct effects – changes in final demand
- Indirect effects – changes in expenditures within the region in industries supplying goods and services
- Induced effects – changes in expenditures of household income

IMPLAN is a widely used regional economic modeling and forecasting software that uses the most recent available individual industry data from a variety of government economic censuses to build a computer model of a specified regional economy. The regional economy could be defined at state, county, and zip code levels. IMPLAN estimates regional economic effects by constructing social accounting matrices[3] and converting them to input-output accounts and multipliers for each industry.

A chain of supplies and services, including labor and government, links base and service industries; these relationships are sometimes referred to as backward linkages. Forward linkages, on the other hand, usually referred to as "downstream processing," consist of support industries that take products produced by the base industry and enhance product value through further processing and packaging. Consumers, both other industries and households, form the final link in the chain. Figure 4-1 shows the general flows of money between industries and consumers that is captured by IMPLAN.

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2 Minnesota IMPLAN Group (MIG) 2003 http://www.implan.com/index.html

3 Social accounts represent the flow of commodities to industries from producers and consumers and the consumption of production factors from outside the region.

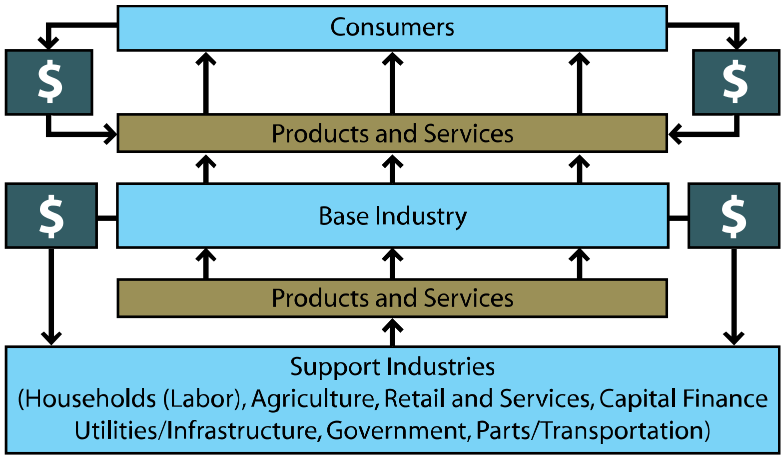

Figure 4-1
Economic Linkages in a Hypothetical Industry

Input-output modeling is built around quantifying interactions between basic and service sectors/industries of an economy. Each industrial or service activity within an economy is assigned to an economic sector within a so-called "transactions" table that reflects the value of goods and services exchanged between sectors of the economy. In any transaction table, the level of detail and method of identifying industries is arbitrary. But, in general, sectors are classified according to government standards such as the North American Industry Code Standards (i.e., NAICS codes), and the level of aggregation is fairly high.

The regional economic model for this analysis includes 2002 IMPLAN data for Sacramento, Placer, and El Dorado Counties. IMPLAN estimates impacts on an annual basis. If the project effects occurred over a shorter period of time, economic effects would be less. This analysis presents estimates of impacts to value of output, value added, and employment. Value of output is the total value of an industry's production. Value added includes wages and salaries, proprietor's income, dividends and interest, and indirect business taxes. Employment is the number of jobs in each industry.

4.2.3 Assessment Methods

The following sections describe the methods to analyze economic effects of the Folsom DS/FDR alternatives to recreational spending and construction activities. It is important to note that these estimated impacts are temporary and would only occur during the period of construction.

4.2.3.1 Recreation Economic Impact Assessment

FLSRA is an important local, regional, and state recreation resource. Recreation generates sales, profits, jobs, tax revenues, and income in the study area. Any change to recreation opportunities as a result of the Folsom DS/FDR alternatives would affect the study area's economy. This recreation economic impact analysis focuses on reductions in direct visitor spending for recreation activities, such as user fees, boat rentals, and retail sales as a result of site closures due to storing borrow materials or processing construction materials on recreation facilities. The analysis calculates indirect and induced economic impacts through the use of IMPLAN. The economic analysis makes some key assumptions to estimate direct impacts from reduced recreational spending. IMPLAN also has some built in coefficients and assumptions to determine secondary impacts.

Calculating Direct Economic Effects

To estimate direct effects, it is important to understand the amount of local visitors to the FLSRA versus the amount of visitors that come from outside the region. This analysis assumes that the majority of users of FLSRA are residents of the study area. Specifically, this analysis assumes that all day users are from within the study area and campers and other overnight users arrive from outside the region. A California State Parks survey indicated that 87 percent of users of major state recreation areas live within 60 minutes of the site and the average travel time for all visitors is 45 minutes (DPR 2003). An on-site survey of recreation users for FLSRA indicated that 70 percent of visitors to FLSRA originated from the 3-county region (Fletcher 2004). Because of the majority of local visitors, it is more likely that recreational spending intended for FLSRA would be spent elsewhere in the regional economy and the direct effects to the economy would be less than if most visitors were from outside the region.

In general, for a recreation activity, visitors typically spend money on food, hotels, restaurants, gasoline, boat rentals and/or other supplies required for outdoor activities. These expenditures would occur in various sectors. This analysis assumes that local visitors would find a substitute recreation activity within the study area and continue to spend money within these sectors. Therefore, local spending for food, restaurants, and gasoline would continue in the study area. In some instances, money may not be spent on the exact goods, such as picnic supplies, but it would likely be spent elsewhere in the local economy (for example, on movie tickets). Campers and other overnight users would generally be from outside the region; therefore, reductions in spending would be expected in services, retail, and food and accommodation sectors. FLSRA entrance fees for all users (day and overnight) would be counted as a loss to the state treasury, particularly if users do not visit a state sponsored site as a substitute for FLSRA. This analysis includes an estimate of funds lost to the state treasury from temporary interruptions to identified FLSRA facilities and assumes that these revenues are not recollected via visits to other state recreational areas in the study region.

The following sections further describe how the analysis calculated direct effects for input into the IMPLAN model. In short, direct effects are based on number of visitors affected and the average daily spending by each visitor. This economic analysis makes a number of assumptions regarding visitor use and spending in the 3-county region for each alternative. A sensitivity analysis of economic effects could be conducted by varying some of these assumptions. For example, if number of visitors is allowed to increase in the future, regional economic effects from reduced recreational spending would increase.

Number of Visits Affected

The number of visits affected represents the loss of visitors at the FLSRA from temporarily interrupting recreation at Beal’s Point, Folsom Point, and Granite Bay facilities. Section 3.13, Recreation Resources, identifies the number of visitors that would be affected by each alternative for each facility. It is important to distinguish the type of user to determine a more detailed representation of the total recreational spending contribution lost to the economy.

For purposes of this economic analysis, existing visitation assumptions were used to determine the type of user, for example, day use vs. overnight use or water activity vs. non-water activity. Wallace, Roberts, and Todd, et al. (2003) states that 85 percent of visitors use the recreation area for water-related activities, including boating, wind surfing, jet skis, water skiing, rafting, swimming, and fishing. Of the 85 percent, boating is the most popular water-related activity, accounting for approximately 30 percent of water-related activities. The remaining 15 percent of recreation visits are for non-water activities, such as picnicking, camping, and trail use (Wallace, Roberts, and Todd, et al 2003). According to FLSRA visitation data from 2001 to 2005, about 95 percent of users are day users and 5 percent are overnight users at camping facilities. Some overnight users may choose to stay at nearby hotels or other accommodations and use the FLSRA for day use. About 85 percent of the day users pay entrance fees. All others use free facilities, such as biking and walking trails. This analysis divides the visitors into types of use based on the above percentages.

The construction period for the Folsom DS/FDR spans from 2007 to 2013 or 2014 depending on the alternative. This analysis estimates the economic effects during the year when maximum interruptions to recreation are estimated to occur for each alternative. Table 4-12 summarizes the maximum annual number of visitors affected at Granite Bay, Beal’s Point, and Folsom Point. Maximum interruptions to recreation would occur during 2008 under Alternatives 1, 2, and 3; during 2009 under Alternative 4; and during 2012 under Alternative 5. Section 3.13 further discusses effects to recreation.

Table 4-12 Breakdown of Visitors Affected by FLSRA Closures					
	Maximum Annual Number of Visitors Affected				
Type of Use	***Alternative 1***	***Alternative 2***	***Alternative 3***	***Alternative 4***	***Alternative 5***
Campers who boat	347	347	297	1,770	1,884
Campers who do not boat	809	809	693	4,131	4,397
Day users who boat	43,930	43,930	42,874	74,754	79,563
Day users who do not boat	102,503	102,503	100,039	174,425	185,646
Other overnight visitors who boat	1,965	1,965	1,960	2,164	2,303
Other overnight visitors who do not boat	4,586	4,586	4,573	5,049	5,374
Total	154,139	154,139	150,435	262,293	279,167

Based on Recreation analysis Section 3.13, assumptions include:
- 95% are day users, 5% are overnight users
- 85% are day users who do not pay boat fees
- 85% of total users participate in water-related activities, 30% is boating

Source: Wallace, Robert and Todd, LLC 2003; CDPR 2006b

Average Spending per Visit

The average spending per visitor depends on the types of recreational activity in which visitors participate. Table 4-9 shows the user fees for each use. It is assumed that all visitors would have to pay either a day use fee or an overnight fee. Additional recreational spending within the FLSRA includes boat rental fees, other equipment fees, and concessions. Visitors also spend money outside of the FLSRA for food, drinks, gasoline and other recreational needs. This analysis uses local fee data and the Corps national spending profiles to estimate average visitor spending. Table 4-13 shows the assumed average daily visitor spending at FLSRA for each type of visitor. Boat rentals and user fees are based on local rates at Folsom Reservoir for a full day boat use and on FLSRA standards. Spending for “other expenses” (food, gas, and other goods) are based on average spending profiles by the Corps (2003) study.

Table 4-13 Average Daily Visitor Spending at FLSRA, 2002 Dollars			
Type of Visitor	***Boat Rentals, User Fees(1)***	***Other Expenses (e.g., food, gas)***	***Total Average Daily Spending***
Campers who boat	$53.03	$53.02	$106.05
Campers who do not boat	$3.64	$41.11	$44.75
Day users who boat	$52.12	$20.39	$72.51
Day users who do not boat	$1.27	$12.25	$13.52
Other overnight visitors who boat	$52.12	$85.76	$137.88
Other overnight visitors who do not boat	$1.27	$51.11	$52.38

(1) User fees and boat rentals are based on a 5-person party
(2) All day users are from the local area, all overnight users and campers are from outside the region

Source: CDPR 2003, Corps 2003, Folsom Lake Boat Rentals 2005

Direct Effects

The values in Table 4-12 and 4-13 were used to estimate direct effects to the local economy for input into the IMPLAN model. The effects are assumed to represent changes in final demand. IMPLAN requires distribution of direct effects to specific sectors of the economy. For purposes of this analysis, direct effects are distributed to the retail trade, services, camping, entertainment and recreation, and accommodation and food services sectors. It is assumed that these sectors best represent the reduction in recreational spending for boat rentals, hotel costs, camping supplies, gasoline, food, restaurants, and other expenses associated with recreation at FLSRA. As stated above, all the day users would be from the local region; therefore, all spending on "other expenses" would continue to be spent within the region.[4] For campers and other overnight users, spending on "other expenses" would be lost to the region. These losses are represented by effects to retail trade, services, and accommodation and food service sectors. Table 4-14 identifies the estimated annual direct effects in the region for Alternatives 1and 5. Alternatives 2 and 3 would have similar overall economic effects to Alternative 1 because losses in recreation would be similar. Alternative 4 would have similar effects to Alternative 5 because total losses in recreation would be similar.

Table 4-14
Annual Direct Effects from Reduced Recreational Activity at FLSRA (2002 dollars)

Sector	*Alternative 1*	*Alternative 5*
Retail trade	-$174,500	-$356,200
Services	-$33,600	-$51,400
Camping, entertainment and recreation	-$1,682,900	-$3,053,300
Accommodation and food services	-$163,100	-$229,300
Institutions	-$950,300	-$1,688,800
Total	-$3,004,400	-$5,379,000

The institutions sector captures the transfer of money between institutions in various regions and is estimated by IMPLAN. In this instance, it represents lost non-market monetary transfers from the study area to other regions. Such transfers typically occur when goods and services sold in the local market are partially or wholly produced outside the region. As a result some of the local spending dollars are exported to other regions. For example, a final product such as gasoline is produced in multiple regions; therefore, only a portion of the lost dollars from gasoline sales within the study area would have remained in the region. A recreational visitor who chooses to no longer travel to the region may not purchase $50 worth of gasoline at a local gas station. If the local gas station purchases $30 worth of gasoline from a wholesaler outside the region then only $20 would be lost to the local region and the

4 "Other expenses" include food, gas, restaurants, hotels, and anything associated with recreational activity at FLSRA besides entry fees and boat rentals.

remaining $30 would be lost to another region. The institutions sector represents those dollars that would have been transferred to outside regions.

Using IMPLAN to Estimate Secondary Economic Effects
As discussed in Section 4.2.2, IMPLAN identifies economic linkages between industries by estimating multiple economic parameters. Direct impacts are an input into the regional model. IMPLAN default models are generated based on national and state level data and some parameters may be modified for studies that focus on areas smaller than a state. Figure 4-2 presents a flowchart of the regional analysis and its components. The following sections discuss important parameters and any modifications to the default IMPLAN model performed during the model development phase.

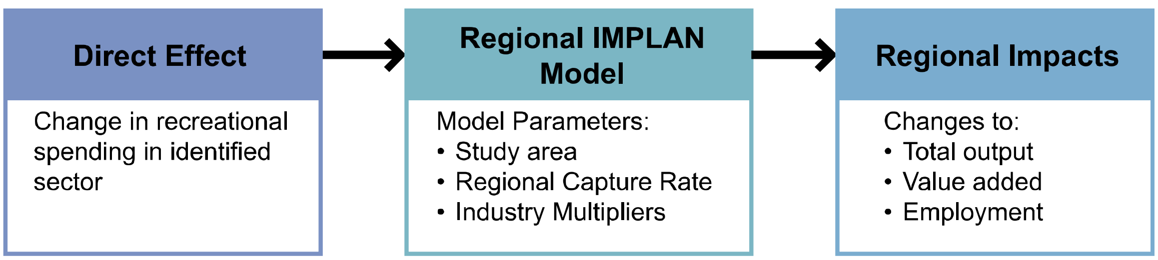

Figure 4-2
Regional Economic Analysis Flowchart

Regional Capture Rate
The capture rate represents the percentage of spending that accrues to the region's economy as direct sales or final demand. In many cases, visitors purchase goods that are produced outside of the region. Any loss in demand of these goods would not affect the region's economy; therefore, loss of these purchases should not be used to determine any change in final demand from within the region. A low capture rate would indicate that many goods or supply inputs are purchased from outside the region. IMPLAN sets default capture rates based on national and state level data. Generally, for tourism activities, 60 to 70 percent of visitor spending appears as final demand in the identified region (Stynes undated). The Corps (2003) study defines an average capture rate at 66 percent for multiple Corps projects (Corps 2003). Based on the high level of local use at the FLSRA and the existing studies, the IMPLAN default capture rate was adjusted from 40 percent to 66 percent for the parks sector.

Industry Multipliers
IMPLAN provides the regional economic multipliers for this analysis. Multipliers capture the indirect and induced effects of recreation activity. For example, a multiplier of 2.0 indicates that each dollar of direct sale generates another dollar of secondary sales in the regional economy; a multiplier of 3.0 indicates that each dollar

of direct sale generates an additional $2 of secondary sales in the regional economy, and so on. For the 3-county study area, the default IMPLAN multiplier for camping, entertainment, and recreation is 2.02. Therefore, for every dollar lost to this sector, $1.02 would be lost to the total regional economy in indirect and induced effects. In addition to output multipliers, IMPLAN generates multipliers for value added and employment effects.

Deflators

Deflators convert expenditures over time to a specified base year. The regional IMPLAN model is based on year 2002 economic activity and results are expressed in 2002 dollars.[5] The economic effects from reduced recreation would occur during the length of the construction period. Table 4-15 shows the construction schedule for each alternative. Annual visitation would be affected in time period construction occurs. If construction does not occur throughout an entire year or if visitors are allowed to use the facilities for a portion of the year, economic impacts would be less.

Table 4-15
Construction Activity Timeframe

Granite Bay	
Alternative 1	None
Alternative 2	Late summer (August, September, October) 2013
Alternative 3	Late summer 2009
Alternative 4	Late summer 2013 to end 2014
Alternative 5	Late summer 2013 to end 2014
Beal's Point	
Alternative 1	Fall 2007 to early summer (May, June) 2009
Alternative 2	Fall 2007 to early summer 2009
Alternative 3	Spring 2008 through summer 2008
Alternative 4	Fall 2007 to end 2009
Alternative 5	Fall 2007 to end 2012
Folsom Point	
Alternative 1	Fall 2007 to end 2012
Alternative 2	Fall 2007 to end 2013
Alternative 3	Fall 2007 to end 2013
Alternative 4	Fall 2007 to end 2013
Alternative 5	Fall 2007 to end 2013

4.2.3.2 Construction-related Economic Impact Assessment

Construction associated with the Folsom DS/FDR alternatives would create jobs and generate additional economic activity within the local region during the period of

[5] Economic impacts can be adjusted to price levels for other years using economic price indices, such as the Consumer Price Index. Despite the price adjustment, the region's economy is still based on 2002 conditions.

construction.[6] Table 4-16 summarizes the total number of workers required for each year of project construction (2007 through 2014). The number of workers remains constant for each alternative, but construction periods vary. IMPLAN estimates effects on an annual basis. If construction is shorter than a year, economic benefits would be less.

Table 4-16
Total Number of Construction Workers Required per Year for All Alternatives

Year	*All Alternatives*
2007	34
2008	181
2009	287
2010	207
2011	169
2012	133
2013	188
2014	127

The analysis assumes that the 3-county region labor pool would supply the construction workers necessary for the Folsom DS/FDR. Using the data in Table 4-16, the economic analysis can estimate direct effects to labor associated with construction activities on the region's economy. IMPLAN converts jobs created into a value of output for the economy based on an estimated amount that each worker can contribute in terms of output. No changes were made to the IMPLAN economic parameters for the construction economic impacts analysis.

4.3 Estimated Economic Effects

This section describes the economic effects of implementation of the Folsom DS/FDR alternatives. The analysis assumes constant 2000 visitation levels. Chapter 2 describes the alternatives in detail.

4.3.1 No Action/No Project Alternative Economic Effects

The No Action/No Project Alternative would maintain the current recreation activities and operations at FLSRA without construction or operations of any of the infrastructure alterations proposed under the five action alternatives. No changes to economic conditions and trends are expected to occur under the No Action/No

[6] Because the Folsom DS/FDR would be a government funded project, economic impacts of increased construction activity at the State level may be offset because funding could be unavailable for another project. Therefore, the benefits of construction-related economic effects are focused on the local region.

Project Alternative. Under the No Action/No Project Alternative, current recreational activities at the FLSRA would continue with no reduction in recreational spending or revenues.

The analysis recognizes that development would increase under the No Action/No Project Alternative relative to existing conditions. The cumulative analysis addresses economic growth as a result of increased development. For purposes of the economic analysis of recreational spending and construction impacts of the proposed alternatives, this section assumes that the No Action/No Project Alternative is the same as the existing conditions.

4.3.2 Action Alternatives Economic Effects

Table 4-17 describes the baseline economy in terms of value of output, employment, and value added of the Sacramento, Placer, and El Dorado 3-county region. These values differ slightly from those presented in Section 4.1, Regional Socioeconomic Setting, because IMPLAN has some varying accounting measures.

Table 4-17
Economic Baseline in 3-County Region, 2002 Values

	Value of Output, 1000 $	*Value Added, 1000 $*	*Employment, Jobs*
3-County Region	$100,104,188	$63,913,630	1,067,438

Source: MIG 2003

4.3.2.1 Alternative 1 Economic Effects

<u>*Economic Impacts from Reduced Recreational Spending Relative to the Baseline Condition*</u>
Construction of Alternative 1 would affect recreation opportunities at Beal’s Point and Folsom Point facilities in the FLSRA. Reductions in recreation would decrease visitor spending in the regional economy. Visitors would not pay entry fees, rent boats or other equipment, and may reduce purchases of food, gas, and other recreation supplies. These reductions in spending would ripple through other sectors of the economy. Under this alternative, Granite Bay facilities would not be affected.

The Beal’s Point facilities would remain open during the entire construction period for the Right Wing Dam, and Dikes 4, 5, and 6. It is anticipated that there would only be minor use of the Beal’s Point area for construction activities, such as the movement of construction vehicles. One or two staging areas would be created using fill material to ensure that the level of impacts to the recreation area are minimized. Construction is estimated to begin in November 2007 extending through early summer 2009. About 10 percent of users would be affected by this alternative. Beal's Point has both day users and overnight users.

Folsom Point facilities would be fully closed during borrow development and construction on MIAD, the Auxiliary Spillway, the Left Wing Dam, and Dikes 7 and

8. Construction is estimated to occur from 2007 to 2013. Folsom Point only offers day use activities, including a boat launch.

Table 4-18 presents the estimates of total economic impacts to value of output, value added, and employment from reduced recreational area spending for Beal's Point and Folsom Point facilities associated with construction of Alternative 1. The total output effects are direct inputs into the IMPLAN model; IMPLAN estimates direct effects to value added and employment based on total output. As discussed in Section 4.2.3.1, the direct impacts are a result of reduced day use and overnight entry fees into the FLSRA and spending on additional food, accommodations, and supplies by overnight users. For day users, all additional recreational spending is assumed to continue in the study area because of the many recreation substitutes that the study area offers.

Table 4-18
Annual Economic Impacts to Total Value of Output, Value Added, and Employment of Reduced Recreational Spending under Alternative 1, 2008 Visits, 2002 Dollars

Alternative 1 (2008 Visits)	*Total Output, $*	*Total Value Added, $*	*Employment, Jobs*
Direct Impacts	-$3,004,400	-$1,115,800	-25
Indirect Impacts	-$741,000	-$470,600	-8
Induced Impacts	-$1,185,800	-$760,000	-13
Total Impacts	-$4,931,200	-$2,346,400	-46

For each year Beal's Point and Folsom Point facilities are closed, this analysis estimates that value of output in the region would decrease by about $4.9 million (0.005 percent of 2002 baseline output), total value added would decrease about $2.3 million (0.002 percent of 2002 baseline value added), and employment would decrease by about 46 jobs (0.004 percent of 2002 baseline employment). These estimates are based on estimated losses of visitation described in Section 3.13 and average visitor spending identified in Section 4.2.3.1. These are the maximum expected impacts that would occur annually during the construction periods identified in Table 4-15.

Table 4-19 presents Alternative 1 average daily total economic impacts to the 3-county region to value of output, value added, and employment based on annual impacts. If construction does not occur throughout the year, these daily impacts would be less. The daily level of impact would change based on weather, time of year, construction schedule, and other factors; however, these values provide general impact estimates that can be used if construction schedules or project implementation changes, causing FLSRA facilities to be closed longer than anticipated or for periods that do not correspond to one or more annual periods. In general, these estimates should be adjusted to the time of year when additional construction would occur.

Loss of recreational spending would be larger during peak use seasons, generally May through September.

Table 4-19 ***Average Daily Impacts of Reduced Recreational Spending under Alternative 1, 2008 Visits, 2002 Values***			
	Value of Output, $/Day	***Value Added, $/Day***	***Employment, Jobs/Day***
3-County Region	-$13,400	-$6,400	-0.12

A decline in FLSRA entry fees would reduce funds into the State treasury. Multiple concessionaires also pay rental fees to the State. If FLSRA facilities are closed, concessionaires would move out of the area and rental payments would stop. This analysis evaluates decreases to the State funds by estimating total loss in revenues from decreased entry fees based on estimated visitation losses and rental payments. Tables 4-9 and 4-12 present daily and overnight entry fees and estimated visitation losses for each alternative, respectively. Based on these values, funds to the State would decrease by about $927,000 from construction of Alternative 1. Table 4-20 shows the breakdown per visitor category of reduced entry fees assuming peak season rates. Under Alternative 1, concessionaires at Beal’s Point would not be affected by construction activities; therefore, rental payments to DPR would not reduce.

Table 4-20 ***Estimated Annual Reductions in State Revenues Due to Reductions in FLSRA Entry and Boat Launch Fees under Alternative 1, 2008 Visits***	
Campers who boat	$ 18,500
Campers who do not boat	$ 5,400
Day users who boat	$ 820,000
Day users who do not boat	$ 35,900
Other overnight visitors who boat	$ 36,700
Other overnight visitors who do not boat	$ 10,700
Total visitors affected	$ 927,200

Day use fees are $7 per party, camping fees are $20 per party per night, $8 boat launch fees per party

Economic Impacts from Construction at the Folsom Facility

Construction required by Alternative 1 would generate economic activity within the region by increasing employment, wages and salaries, and total output. Approximately 1,330 workers would be needed to complete construction during the 2007 to 2013 Folsom DS/FDR timeframe. Total construction is estimated to occur from 2007 to 2013 or 2014 depending on alternative. Table 4-16 details the workers required per year. Construction labor would likely be supplied from laborers within the 3-county region. The region’s labor pool is assumed to be sufficient to supply the construction’s annual labor needs.

IMPLAN was used to determine indirect and induced effects to the regional economy. Table 4-21 shows the direct, indirect, induced and total economic effect of employing 100 construction workers, as calculated by IMPLAN. This value is used to estimate potential employment benefits for all the alternatives. The total economic effect would be an increase of about $15.7 million in total value of output, $9.3 million in value added, and 168 jobs.

Table 4-21
Total Annual Economic Effects of Employing 100 Construction Workers, 2002 Values

	Value of Output, $	*Value Added, $*	*Employment, Jobs*
Direct Impacts	$9,409,900	$5,323,400	100
Indirect Impacts	$2,503,800	$1,520,200	27
Induced Impacts	$3,856,400	$2,471,700	41
Total Impacts	$15,770,200	$9,315,300	168

Table 4-22 presents economic impacts based on the existing construction worker schedule. These economic impacts would benefit the local region and would only occur during the construction period. The impacts would be larger during years when more construction labor is required. Under Alternative 1, construction would be complete by 2013.

Table 4-22
Annual Total Economic Impacts During Construction of Alternative 1, 2002 Values

Year	*Number of Workers*	*Value of Output, $*	*Value Added, $*	*Employment, Jobs*
2007	34	$5,361,900	$3,167,200	57
2008	181	$28,543,900	$16,860,600	304
2009	287	$45,260,500	$26,734,700	482
2010	207	$32,644,300	$19,282,600	348
2011	169	$26,651,600	$15,742,800	284
2012	133	$20,974,400	$12,389,300	223
2013	188	$29,648,000	$17,512,700	316
2014	127	$20,028,200	$11,830,400	213

IMPLAN generates direct employment numbers estimates based on the expected value of output that a full time worker could produce. Induced effects are then estimated with average wage data, which IMPLAN bases on state levels. IMPLAN data shows that average annual salary for full-time construction laborer ranges from $46,000 to $50,000, or about $22.10 to $24.04 per hour. These values are slightly higher than local data. According to California Labor Market Data Library wage and salary data for employment in California industries, construction laborers in the Sacramento MSA earned an average hourly wage of $15.38 per hour in 2002. Skilled laborers received $17.95 per hour (California Labor Market Information Data Library 2006). The IMPLAN wage averages include regions of California, such as

Los Angeles and the San Francisco Bay Area, where wages area typically higher. Considering this data, the level of total economic effects may be less than those identified in Table 4-22.

4.3.2.2 Alternative 2 Economic Effects

The recreation-related economic impacts under Alternative 2 would be similar to those described for Alternative 1. Recreation impacts are determined on an annual visitor basis. Under this alternative, construction activities would occur near the Granite Bay recreation facilities; however, it is not expected that recreation activity would be affected. Construction is anticipated to occur during late summer 2013. Effects to Beal's Point and Folsom Point facilities would be similar to Alternative 1, except Folsom Point facilities would be closed for an additional year.

Under Alternative 2, state revenues would decrease similar to Alternative 1. Because construction at Folsom Point would be longer under Alternative 2, total reduction to state revenues would be more than Alternative 1. Funds to the State are estimated to decrease by approximately $927,000 in 2008, which is the year with the most expected interruptions to recreation. In total, reductions in state revenues would be slightly larger under this alternative relative to Alternative 1 because of an additional year of closure at Folsom Point.

The number of construction workers required under this alternative would be the same as under Alternative 1. This alternative is scheduled over a longer construction period; however, the economic benefits from additional construction time would be minimal.

4.3.2.3 Alternative 3 Economic Effects

This alternative would require less construction relative to Alternatives 1 and 2; therefore, FLSRA recreational facilities may be closed for a shorter period of time. Under this alternative, construction north of Granite Bay is anticipated to occur during late summer 2009; however, interruptions to recreation are not expected to occur because of the distance of the staging area to the recreational facilities. Recreation at Beal's Point would be interrupted during construction on the Right Wing Dam and Dikes 4, 5, and 6. Construction at Beal's Point is estimated to begin in April 2008 and continue through summer. The construction timeframe at Beal's Point is shorter than the other alternatives. Similar to Alternative 2, Folsom Point facilities are expected to be completely closed during the 2007 to 2013 construction period. The difference in economic effects of this alternative compared to Alternatives 1 and 2 would be minimal.

Under Alternative 3, reductions to state funds would be slightly less than under Alternatives 1 and 2 because of the shorter construction period. Funds to the State are estimated to decrease by about $900,000 during the year with maximum estimated impacts (2008).

The number of construction workers required would be the same under Alternative 3 as under Alternatives 1 and 2; however, the construction period would be shorter. The economic effects of fewer construction days would likely be small.

4.3.2.4 Alternative 4 Economic Effects

This alternative would require more construction relative to Alternatives 1, 2, and 3; therefore, the FLSRA facilities would be interrupted for a longer period of time. Construction at Granite Bay is expected to occur from late summer 2013 through 2014. Approximately 25 percent of users of Granite Bay facilities would be affected by this alternative. Beal’s Point facilities would be interrupted during borrow development and construction on the RWD and Dikes 4, 5, and 6. Construction at Beal's Point is expected to begin in November 2007 and continue through 2009. Approximately 50 percent or less of users of Beal’s Point facilities would be affected by this alternative. Effects would be greater if borrow excavation at the north end of Beal’s Point is needed. Facility closures at Folsom Point would be similar to Alternatives 2 and 3. Maximum visitation losses under this alternative are expected to occur in 2009.

Under Alternative 4, reductions to State funds would be greater than under Alternatives 1 through 3 because of the longer construction period. Funds to the State are estimated to decrease by about $1.6 million during the year with maximum estimated recreation losses (2009).

The number of construction workers required would be the same under Alternative 4 as under Alternatives 1, 2, and 3; however, the economic benefits of construction to the local economy would last longer under this alternative because of the a longer construction period. The economic effects of additional construction days would likely be small.

4.3.2.5 Alternative 5 Economic Effects

This alternative would require additional construction relative to the other action alternatives; therefore; FLSRA recreational facilities would be affected for a longer time period. Construction at Granite Bay is estimated to begin in late summer 2013 and continue through 2014. Approximately 50 percent of facility users would be affected by this alternative. Beal’s Point facilities would be partially closed during borrow development and construction of the RWD and Dikes 4, 5, and 6. Construction is estimated to occur from November 2007 through 2012, affecting approximately 75 percent of its users. Under this alternative, it is likely that borrow activity would occur at the south and north end of Beal’s Point. Folsom Point facility closures would be similar to Alternatives 2 through 4. Table 4-23 presents total economic impacts to value of output, value added, and employment from reduced recreational spending for Granite Bay, Beal’s Point, and Folsom Point facilities during the year when maximum visitation losses are expected to occur (2014) under this alternative.

Table 4-23
Annual Economic Impacts to Total Value of Output, Value Added, and Employment of Reduced Recreational Spending under Alternative 5, 2014 Visits, 2002 Dollars

Alternative 5 (2014 Visits)	Total Output, $	Total Value Added, $	Employment, Jobs
Direct Impacts	-$5,379,001	-$2,002,879	-$44
Indirect Impacts	-$1,336,472	-$849,239	-$15
Induced Impacts	-$2,142,285	-$1,373,019	-$23
Total Impacts	-$8,857,758	-$4,225,137	-$82

Under Alternative 5, reductions to state funds would be greater than under Alternatives 1 through 4 because of the longer construction period. Funds to the State are estimated to decrease by about $1.7 million during the year with maximum estimated impacts (2014).

The economic benefits of construction to the local economy would last longer under this alternative because of more worker days. The economic effects of additional construction days would likely be small.

4.3.3 Comparative Analysis of Alternatives

The economic impacts of the action alternatives depend on the amount of time that the recreational facilities at FLSRA would be closed and the amount and time of construction labor required for project components. The impacts under each alternative would vary as these factors change. Table 4-24 qualitatively compares the effects of all alternative.

Table 4-24 Alternatives Comparison of Economic Effects					
Economic Impact Description	***Alternative 1 Economic Effects***	***Alternative 2 Economic Effects***	***Alternative 3 Economic Effects***	***Alternative 4 Economic Effects***	***Alternative 5 Economic Effects***
Reduced recreational spending	Value of Output: -$4.9 million Value Added: -$2.3 million Employment: -45 jobs	Slightly greater than Alternative 1	Less impacts than Alts 1 and 2 because fewer construction days and FLSRA could be closed for a shorter time	Slightly less than Alternative 5, Greater impacts than Alts 1-3	Value of Output: -$8.4 million Value Added: -$4 million Employment: -77 jobs
Reduced State revenues	-$940,000	Slightly greater than Alternative 1 because of longer construction at Folsom Point	Less impacts than Alts 1 and 2 because FLSRA could be closed for a shorter time	Greater impacts than Alts 1-3 because FLSRA closed for a longer time	-$1.7 million Greater impacts than Alts 1-4 because FLSRA closed for a longer time
Increase economic activity from construction per 100 jobs (impact vary per year based on number of workers)	Value of Output: $15.7 million Value Added: $9.3 million Employment: 168 jobs	Same as Alternative 1	Slightly less beneficial impacts than Alts 1 and 2 because shorter construction period	More beneficial impacts than Alts 1-3 because longer construction period	More beneficial impacts than Alts 1-4 because longer construction period

4.3.4 Cumulative Effects

Chapter 5 presents projects considered in the cumulative effects analysis. Implementation of these projects would produce economic benefits to the region by providing employment and increasing output. Projects planned to alleviate traffic congestion in the Folsom area would ease access within and out of the region. Local residents may be more willing to drive to shopping centers, restaurants, and recreation areas with less traffic. Also, outside visitors may drive into the region for recreation, shopping, and other activities. Increased spending at the retail and recreation levels would ripple through other sectors the economy.

Under the cumulative condition, population growth is expected to continue at forecasted rates for the 3-county region. In Sacramento County, the total population is expected to increase from 1.37 million in 2005 to approximately 2 million in 2020; in Placer County, the population is expected to increase 305,675 in 2005 to approximately 456,000 in 2020. El Dorado County’s population is expected to increase 173,407 in 2005 to approximately 221,000 in 2020 (EDD 2004). Urban development necessary to accommodate growth would provide construction jobs for housing and commercial building. Increased economic opportunities would attract businesses to the region, providing more economic activity. Increased population growth would also increase demand for recreation in the region, including FLSRA facilities.

The Folsom DS/FDR alternatives would temporarily close Folsom Point, Granite Bay, and Beal’s Point facilities at FLSRA. This would decrease economic activity in the region as discussed above. This analysis assumes that users would likely find a substitute recreation activity in the region and continue to spend money within the economy. Therefore, economic activity would not decrease as much as if local residents left the region for recreation opportunities. Under the cumulative condition, the region’s economy would continue to grow. FLSRA facilities would be open when construction of the Folsom DS/FDR is complete and recreation activity would be restored and likely improved. No other identified cumulative project would result in permanent or temporary closure of recreational facilities and a reduction of recreational spending in the region.

Chapter 5
Cumulative Effects

5.1 Introduction

Cumulative effects analyses are an important element of the environmental documentation and approval process and are required by both NEPA and CEQA. Cumulative effects are two or more effects that may be considered insignificant when analyzed separately, but become significant when considered together. Cumulative effects must take into consideration related past, present, and reasonably foreseeable future projects. The cumulative effect is the change in the environment that occurs from the incremental effects of a project when considered with the effects of other past, present, and probable future projects.

The cumulative effects analyses in this EIS/EIR evaluate the combined effects of the Folsom DS/FDR action and other projects that could have effects similar to the Folsom DS/FDR action. The subsequent sections describe the regulatory basis for cumulative effects, the methodology used to analyze cumulative effects in this document, the related projects considered in the analyses, and finally, the cumulative effects by environmental resource.

5.2 Regulatory Basis

5.2.1 National Environmental Policy Act

NEPA regulations (40 CFR Section 1508.25) require an Environmental Impact Statement to discuss impacts which may be cumulative. NEPA defines a cumulative impact as:

> "...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR Section 1508.7).

5.2.2 California Environmental Quality Act

According to Section 15130(a) of the CEQA Guidelines, a lead agency must discuss the cumulative impacts of a project when the project's incremental effect is "cumulatively considerable", that is, when impacts of a project, combined with impacts from other projects, are considered significant. Cumulative impacts are defined in the CEQA Guidelines as:

> "…two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts.
>
> (a) The individual effects may be changes resulting from a single project or a number of separate projects.
>
> (b) The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time" (CEQA Guidelines Section 15355).

5.3 Methodology

This cumulative effects analysis uses the "list" approach as defined in CEQA (CEQA Guidelines Section 15130(b)(1)(A)). Section 5.4 presents a comprehensive list of past, present, and probable future projects that could have effects similar to those of the Folsom DS/FDR action.

5.3.1 Study Area

The study area for the cumulative effects analysis includes the entire area surrounding the Folsom Reservoir and the area of the lower American River to Lake Natoma. Several resource areas may expand the study area to include additional areas (local roads, etc.) in order to fully analyze the cumulative effects.

5.3.2 Timeframe

The timeframe for this cumulative analysis extends from 2007 through 2014, which is the length of the Folsom DS/FDR construction period. Because one possible outcome of the Folsom DS/FDR action could be the requirement to amend the current reservoir flood control operations plan (scheduled for 2018), reoperation of the reservoir is mentioned as a cumulative effect project. Reoperation will have its own separate environmental analysis and EIS/EIR, and thus is not addressed in detail within this section.

5.4 Related Projects

Table 5-1 provides a list of past, present and probable future projects in the general vicinity of the study area that are included in the cumulative effects analysis.

Table 5-1
Cumulative Projects

No.	Project Name	Description	Date of Completion
1.	New Folsom Bridge	New bridge downstream of Main Concrete Dam	Late 2008
2.	Future Redundant Water Supply Intake and Pipeline for Roseville, Folsom, and San Juan Water District	A new 84-inch-diameter inlet water pipe connected to the proposed Auxiliary Spillway side approach channel.	When new Flood Control Diagram is implemented, not to exceed 2018.
3.	Folsom Dam Road Closure	Closure of Dam Road for public safety and security reasons.	2003
4.	L.L. Anderson Dam Improvements	Widen the spillway of French Meadows Reservoir.	Unknown
5.	Lower American River Common Features Project	Levee stabilization and raising in Lower American River, Natomas Cross Canal, and elsewhere in Sacramento region.	Ongoing
6.	Long-Term Reoperation of Folsom Dam and Reservoir	Interim operation agreement with SAFCA expires.	2018
7.	Sacramento Municipal Utility District (SMUD) 230kV Transmission Line Relocation	Relocation of transmission lines and towers because of construction of New Folsom Bridge.	Late 2006 or early 2007

5.4.1 Folsom Bridge Project

The Corps is proposing to construct a new bridge downstream of Folsom Dam Road. This new bridge would be part of the American River Watershed Project and is proposed to alleviate traffic congestion in downtown Folsom as a result of the closure of Folsom Dam Road. That road once accommodated 18,000 vehicles per day. Construction of the new bridge is scheduled to begin in 2007 and traffic is expected to be on the bridge by December 2008.

5.4.2 Future Redundant Pipeline

Several water agencies are proposing to construct a parallel pipeline within an existing pipeline right-of-way to improve water transport capability and reliability. The project would also include a new water supply intake. The new intake and pipeline may be completed together or as separate projects.

5.4.3 Folsom Dam Road Closure

In February of 2003, Folsom Dam Road was closed to public use due to dam safety concerns. Following a Record of Decision issued May 2005, Reclamation allowed the road to be opened to commuter traffic for 3-hour periods during the morning and evening peak periods subject to the City of Folsom providing safety and infrastructure improvements. The City of Folsom is currently unable to open the roads subject to Reclamation's conditions; therefore, the road remains temporarily closed. Relative to the impacts analysis conducted for this EIS/EIR, it was assumed that the Dam Road remains closed for the foreseeable future (i.e., through the construction period); hence, the transportation impacts analysis is considered to be conservative (i.e., potential impacts on nearby streets resulting from Folsom DS/FDR construction would, for the most part, be greater than would otherwise occur if the Dam Road is opened pursuant to the ROD)."

5.4.4 L.L. Anderson Dam Improvements

As part of the American River Watershed Project, the Corps plans modifications to L.L. Anderson dam at French Meadows Reservoir thereby reducing the PMF levels that would otherwise reach Folsom Reservoir.

5.4.5 Lower American River Common Features Project

The Corps, SAFCA, and the Reclamation Board are implementing ongoing programs for levee stability in the lower American River region, and elsewhere along the Sacramento River. Substantial levee improvement has been completed and the vast majority of the project will be constructed prior to implementation of the Folsom DS/FDR.

5.4.6 Long-Term Reoperation of Folsom Dam and Reservoir

The current approved flood control diagram for Folsom Reservoir requires 400,000 acre-ft of flood storage capacity during the flood season. However, the reservoir is currently operated for additional flood storage capacity through an agreement between Reclamation and SAFCA. This "interim reoperation" requires a variable flood storage capacity of 400,000 to 670,000 acre-ft, depending on upstream storage conditions. A long-term reoperation plan is currently in the planning phase to update the approved flood control diagram to a variable 400,000 to 600,000 acre-ft of required flood storage capacity. An EIS/EIR would be developed by the Corps to address reoperation of the Folsom Facility based on the constructed features and reoperation potential of the Proposed Action.

5.4.7 SMUD 230kV Transmission Line Relocation

SMUD owns and operates a 230kV transmission line that extends along the northern boundary of Folsom Prison and provides electricity from the Upper American River Project hydropower facilities to Sacramento County and a portion of Placer County. This transmission line and nine existing lattice steel towers are currently in the corridor proposed for the New Folsom Bridge Project and will be relocated north of the proposed New Folsom Bridge and road, to avoid construction conflicts. A Draft Environmental Assessment/Finding of No Significant Impact is currently being prepared for this utility relocation. The relocation of the transmission line and towers would also allow for a possible future connection into the Western Area Power Association (WAPA) Folsom substation (Reclamation 2006e).

5.5 Summary of Cumulative Effects for Individual Resource Areas

The following section presents a summary of the cumulative effects analysis by environmental resource area. A complete cumulative analysis is included in each resource section. These brief descriptions explain the Folsom DS/FDR action's contribution to cumulative effects on each resource.

5.5.1 Hydrology, Water Quality, and Groundwater

Flood protection would improve as a result of the Folsom DS/FDR and the other cumulative projects. This would result in positive cumulative benefits. Folsom DS/FDR-related construction activities could potentially influence water quality, change the viability of wetlands, and alter groundwater and surface water levels. When combined with construction of the New Folsom Bridge; Future Redundant Water Pipeline for Roseville, Folsom, and San Juan Water Districts; and the Lower American River Common Features Project, there is a possibility that water resources would be affected. However, each project's associated Storm Water Pollution Prevention Plans (SWPPPs), Best Management Practices (BMPs), pertinent permits, and appropriate monitoring and testing would ensure that measures are implemented to avoid hydrologic resource impairment including water quality degradation, changing water levels, and detrimental effects to wetlands. This would result in effective mitigation of significant cumulative impacts.

5.5.2 Water Supply

Of the projects identified in Table 5-1 only the Long-term Reoperation of Folsom Dam and Reservoir would potentially affect water supply. Impacts of reoperation are unknown and would be addressed in separate environmental compliance documentation; however, for this cumulative analysis, the impact is assumed to be less than significant after mitigation. Other projects in Table 5-1 would not have any effects on water supplies. The Folsom DS/FDR could potentially reduce reservoir storage by approximately 0 to 1,243 acre-feet which would be considered less than significant. No other known projects would reduce reservoir storage; therefore, the Folsom DS/FDR's incremental contribution to the cumulative condition would be less than significant.

5.5.3 Air Quality

Many of the projects in Table 5-1, including the New Folsom Bridge, include construction within the study region. Construction of these projects would increase emissions of criteria pollutants, including VOC, NO_x, CO, SO_2, and PM emissions, from onsite construction and transport of materials. If these construction projects are implemented concurrently, the combined cumulative effects would be above CEQA thresholds for air quality emissions and the General Conformity de minimus thresholds. Each project would need to mitigate individual air quality effects, which could decrease overall cumulative effects. However, without consideration of scheduling and sequence of activities, concurrent construction projects within and adjacent to Folsom Reservoir would have significant cumulative air quality impacts.

The effects of the Folsom DS/FDR to air quality would be cumulatively considerable. Additionally, mitigated NO_x, PM_{10} and CO emissions associated with the Folsom DS/FDR would be greater than the General Conformity *de minimis* threshold. Therefore, these incremental effects would be significant under the cumulative condition.

5.5.4 Aquatic Resources

The Folsom Bridge Project is expected to result in limited impacts to fishery resources, in part in areas also potentially affected by the Folsom DS/FDR actions. Therefore, the cumulative effects of the Folsom Bridge Project and the Folsom DS/FDR actions would not be cumulatively considerable for fishery resources in general.

5.5.5 Terrestrial Resources

Vegetation

The Folsom Bridge Project is expected to result in limited impacts to native vegetation, in part in areas also potentially affected by the Folsom DS/FDR Action. These impacts include impacts to jurisdictional wetlands. The project provides mitigation to reduce these impacts to a less-than-significant level. The Sacramento Municipal Utility District Transmission Line Project will result in limited impacts to native vegetation, primarily in areas also potentially affected either by the Folsom Bridge Project or the Folsom DS/FDR Action. Additional impacts to native vegetation in the Folsom DS/FDR Action area are not expected from this project. Potential alterations to stream flow due to modification of the spillway at French Meadows Reservoir would be attenuated in the long distance between L.L. Anderson Dam and the Folsom DS/FDR Action area and are not likely to affect vegetation in the Folsom DS/FDR Action area. Although work related to the Lower American River Common Features Project is on-going, it is close to completion and consists primarily of levee work outside the floodway.

Therefore, the effects of these projects in combination with the Folsom DS/FDR Action would not be cumulatively considerable for vegetation in general, for riparian vegetation, or for wetland vegetation.

Special-status Plant Species

The Folsom Bridge Project is not expected to result in impacts to special-status plant species. The SMUD Transmission Line Project is not expected to result in impacts to special-status plant species. Potential alterations to stream flow due to modification of the spillway at French Meadows Reservoir would be attenuated in the long distance between L.L. Anderson Dam and the Folsom DS/FDR Action area and are not likely to affect vegetation in the Folsom DS/FDR Action area. Although work related to the Lower American River Common Features Project is on-going, it is close to completion and consists primarily of levee work outside the floodway.

Cumulative impacts to federally or state-listed plant species from the Folsom DS/FDR Action are not expected to occur because species in those categories are unlikely to occur in the project area. In addition, other special-status plant species are unlikely to be affected by the Folsom DS/FDR Action. While complete avoidance of such species may not be possible, should they be found in the interim, the proposed mitigation measures would reduce the impact to a less-than-significant level. The implementation of the Folsom DS/FDR Action, its implementation along with the Folsom Bridge Project would not result in cumulatively considerable impacts.

Therefore, the effects of these projects in combination with the Folsom DS/FDR Action would not be cumulatively considerable for special-status plant species.

Special-status Wildlife Species

Construction-related disturbances for all alternatives of the Folsom DS/FDR Action have the potential to affect elderberry shrubs, the host plant for the valley elderberry longhorn beetle. Mitigation measures specified in Section 3.5.2 would reduce this impact to a less-than-significant level. Mitigation for these impacts may be compensated in a joint area with elderberry compensation for the Folsom Bridge Project to provide better quality habitat and greater cost efficiency.

Construction-related disturbances for all alternatives of the Folsom DS/FDR Action have the potential to affect only small amounts of existing amphibian aquatic habitat, most of which is unsuitable to marginally suitable for amphibian species, including special-status species. Terrestrial habitat potentially utilized by western spadefoot toad may be altered temporarily or permanently, but since the distribution of this species appears to be limited by the lack of aquatic breeding habitat rather than terrestrial habitat, none of the proposed alternatives are likely to affect the overall habitat value for this species. Mitigation measures, such as performing pre-construction surveys and implementation of a Mitigation, Monitoring and Reporting Plan for wetlands affected by the project, would reduce both direct and indirect impacts to a less-than-significant level. Therefore, these impacts would result in only a very minor contribution to ongoing cumulative effects caused by other projects within the region.

Construction-related disturbances for all alternatives of the Folsom DS/FDR Action have the potential to affect special-status reptiles, birds, and bats and their habitat, and other breeding migratory birds. However, other habitat is available adjacent to the project area. With the mitigation measures described in Section 3.5.2, these potential impacts would be reduced to a less-than-significant level.

The DEIS/EIR for the Folsom Bridge project (Corps 2006b) found there would be no adverse effects to the California red-legged frog or the giant garter snake from any of the alternatives evaluated for that project because "…no suitable habitat for special-status reptiles, amphibians, or invertebrates was noted during the wetland delineation for the proposed project" (Corps 2006b). The DEIS/EIR for the Folsom Bridge project did identify potential impacts to the white-tailed kite and for the bald eagle if these species were to be present during construction. This document also provided mitigation measures to reduce any potential impacts to a less-than-significant level.

Construction activities for three other projects would be implemented concurrently with, and generally within the footprint of, construction activities implemented for the Folsom DS/FDR Action. Therefore, they would not contribute to additional direct or indirect impacts. These projects include the Reliable Water Supply Project for the City of Roseville, City of Folsom, the San Juan Water District project and the Sacramento Municipal Utility District Transmission Line Project.

Because environmental documents to fulfill NEPA/CEQA requirements have not yet been completed for the redundant water pipeline for the City of Roseville, City of Folsom, the San Juan Water District project, or the Sacramento Municipal Utility District Transmission Line Project impacts to wildlife and wildlife habitat, including special-status species, have not been identified. However, any alternative that would install a new intake and redundant delivery pipeline would affect habitat already disturbed by the existing infrastructure. Furthermore, a substantial portion of the construction-related impacts would occur concurrently with, and within the footprint of, construction activities for the Folsom DS/FDR Action. Likewise, a substantial portion (possibly all) of the construction-related impacts for Sacramento Municipal Utility District Transmission Line Project would occur within the footprint of, construction activities for the Folsom DS/FDR Action or the Folsom Bridge project.

Potential alterations to stream flow due to modification of the spillway at French Meadows Reservoir would be attenuated in the long distance between L.L. Anderson Dam and the Folsom DS/FDR Action area. Although work related to the Lower American River Common Features Project is on-going, it is close to completion. Impacts to wildlife and their habitat due to the Folsom DS/FDR Action are less-than-significant with mitigation and, therefore, would not contribute to cumulative impacts with the remaining levee work.

Therefore, the effects of these projects in combination with the Folsom DS/FDR Action would not be cumulatively considerable for wildlife in general or for special-status wildlife.

5.5.6 Soils, Minerals, and Geological Resources

Blasting could potentially be required for the Folsom DS/FDR and the New Folsom Bridge. However, blasting would be of sufficient distance from the Bear Mountains Fault system and would not trigger seismic activity. Cumulative adverse effects associated with seismic activity would be less than significant.

Although the construction of the New Folsom Bridge and the Folsom DS/FDR actions would involve a substantial amount of soil and material displacement, the potential for landslides within the study area is low and construction techniques would be implemented to minimize the potential for landslides. Cumulative adverse effects associated with landslides would be less than significant.

Although the construction of the New Folsom Bridge and the Folsom DS/FDR actions would involve a substantial amount of soil and material displacement, impacts associated with this loss would be less than significant. Any minerals that would be excavated would not be used for commercial purposes and therefore would not be considered an economic loss. Similarly, excavated topsoil is not of a high ecological or agricultural value. Cumulative adverse effects associated with soil losses would be less than significant.

Combined construction activities would result in significant impacts associated with soil erosion. However, both actions would be mitigated through the implementation of BMPs set forth in the SWPPP. The development and implementation of an SWPPP for each project would effectively mitigate impacts to a less than significant level.

5.5.7 Visual Resources

Cumulative effects on visual resources were evaluated considering the effects of past, present, and reasonably foreseeable projects. Table 5-1 summarizes projects in the cumulative analysis. Under the cumulative condition, only the New Folsom Bridge Project and Folsom DS/FDR would affect visual resources within the local visual setting. However, because the New Folsom Bridge Project would not be visible from the same FLSRA view points, it would not create a noticeable change in the characteristic visual landscape. The Folsom DS/FDR would not contribute to any cumulative effects.

5.5.8 Agricultural Resources

Because none of the alternatives, including the No Action/No Project Alternative, would affect agricultural resources, there would be no cumulative effects.

5.5.9 Transportation and Circulation

Most of the projects include construction within the study region that will require transport of materials to and from the site. In addition, population is increasing in the region, which will further increase traffic congestion in the study area. Under the cumulative condition, all Folsom Facility construction projects would have the potential for significant transportation and circulation effects should construction activities occur concurrently. Cumulative effects of traffic near the Main Concrete Dam would be limited by restricted access, staging, and closed construction areas. Also, cumulative effects of construction projects could be controlled through the scheduling and sequencing of haul truck traffic. Once completed, the new Folsom Bridge will greatly alleviate traffic congestion within the vicinity of the Folsom construction areas.

Alternatives of the Folsom DS/FDR would have significant impacts to transportation and circulation at select roads, including East Natoma Street and Scott Road, from increased trip generation. The Folsom DS/FDR would further increase traffic in a highly congested area along East Natoma Street. This would be considered a significant cumulative effect.

5.5.10 Noise

The potential for cumulative noise impacts from other nearby projects occurring concurrently with the Folsom DS/FDR include the New Folsom Bridge Project. Construction activities associated with Folsom DS/FDR would be similar to those anticipated for the Folsom DS/FDR. Similar construction activities include: earthwork, concrete work, blasting operations and truck hauling operations. Cumulative noise impacts would occur for residential areas along Folsom-Auburn Road south of Folsom Reservoir and along East Natoma Street in particular when the Auxiliary Spillway work and the New Folsom Bridge Project would be under construction during the same period beginning 2008. Both the Folsom Bridge Project and the Folsom DS/FDR include mitigation measures to minimize noise impacts and are anticipated to reduce the impacts to a less than significant level.

5.5.11 Cultural Resources

The Folsom DS/FDR, in conjunction with the cumulative projects listed above, and the growth potential of the region, could lead to cumulative impacts to cultural resources. However, provided that proper mitigation consistent with Section 106 of the NHPA for federal actions and CEQA for state, county and municipal actions, is implemented for all projects, cumulative impacts would likely be avoided. The Folsom DS/FDR would implement appropriate mitigation measures and would therefore not contribute to a significant cumulative impact to cultural resources.

5.5.12 Land Use, Planning, and Zoning

Any land use action taken, such as building a flood damage reduction berm and/or acquisition of real estate rights (easements or fee title), that could change the existing land use operation or function of an impacted parcel would be a potentially significant impact to land use. It is unlikely that the projects identified in Table 5-1 would have any notable adverse impact on local land use designations or zoning designations. Therefore, the cumulative effect of the Folsom DS/FDR action would be less than significant.

5.5.13 Recreation Resources

Table 5-1 describes the projects included in the cumulative analysis. Besides, the Folsom DS/FDR, the other projects would not restrict access to or use of major recreation sites at the Folsom Lake State Recreation Area (FLSRA). The Folsom Dam Road Closure will continue to redirect traffic through city streets and may cause further traffic interruptions to those trying to access FLSRA facilities. The New Folsom Bridge should relieve some of the traffic interruptions. Construction of the bridge should not have any direct effect on FLSRA facilities. The DPR, in partnership with Reclamation, recently began work on the integrated FLSRA General Plan and Resource Management Plan Update. This process would update the current general plan, as well as the long-range vision for the area. The General Plan will result in improvements to the FLSRA facilities.

The Folsom DS/FDR impacts to recreation would be cumulatively considerable during the construction period because of the magnitude of potential decreases in visitation at FLSRA facilities.

5.5.14 Public Services and Utilities

The Folsom DS/FDR would not have cumulatively considerable impacts to utilities and public services, including electricity, natural gas, stormwater, solid waste, water and wastewater infrastructure, telecommunication infrastructure, and existing roads.

5.5.15 Hydropower Resources

The Folsom DS/FDR actions would have no impacts to hydropower generation; therefore, there would be no cumulative impacts.

5.5.16 Population and Housing

No significant impact on population and housing would occur as a result of the Folsom DS/FDR action. It is unlikely that the projects identified in Table 5-1 would have any impact on population and housing in a negative way. Therefore, the cumulative effect of the Folsom DS/FDR action would be less than significant.

5.5.17 Public Health and Safety

Cumulatively, the Folsom DS/FDR action would have a beneficial effect on public health and safety with respect to natural disasters. The Folsom DS/FDR action would reduce current dam deficiencies, such as potential failure due to seismic (earthquake), static (seepage), and hydrologic concerns (probable maximum flood events), and provide greater protection to downstream populations in the Sacramento metropolitan area from potential flood impacts. Effects on public health and safety with respect to hazardous, toxic, and radiological waste were found not to have the potential to contribute to cumulative effects because the effects are either temporary or have no potential to be additive to other projects. Therefore, the Folsom DS/FDR action would not have an adverse cumulative effect on public health and safety.

5.5.18 Indian Trust Assets

The Folsom DS/FDR would not affect any Indian Trust Assets; therefore, it would not have any cumulative considerable impacts.

5.5.19 Environmental Justice

The Folsom DS/FDR would have no significant environmental justice impacts and would not contribute to any cumulative environmental justice impacts.

5.5.20 Socioeconomics

Population and economic development in the Folsom DS/FDR study area is increasing. The Folsom DS/FDR would not have a cumulative considerable impact to the region's economy.

5.6 Unavoidable Adverse Impacts

The CEQA Guidelines state that any significant environmental impacts that cannot be avoided if the project is implemented must be described. This description extends to those significant impacts that can be mitigated, but not reduced to a level of insignificance. The following section discusses significant and unavoidable impacts related solely to the project, as well as cumulative impacts of the project in combination with existing and reasonably foreseeable future projects.

5.6.1 Project-Related Significant and Unavoidable Impacts

The Folsom DS/FDR would have a significant unavoidable impact on the following resources:

5.6.1.1 Recreation

Folsom DS/FDR construction would result in a temporary loss of recreational use at major recreation sites and trails. Folsom Point would be closed to the public during 5 to 6 peak seasons, depending on the alternative. This would result in a significant and unavoidable impact to the region's recreation and potential overcrowding of other regional facilities. Partial closure and reduced access to the Folsom Point-Browns Ravine Trail would be a significant and unavoidable impact. Construction would also cause the cancellation of some special events scheduled at FLSRA because of the shutting down of Folsom Point. Under Alternatives 4 and 5, there would be significant and unavoidable impacts to recreation at Granite Bay and Beal's Point. All significant and unavoidable impacts would be temporary and last only during the construction period.

5.6.1.2 Visual

Borrow areas and processing facilities at Beal's Point would be within the foreground views from most all vantage points at Beal's Point for Alternatives 1 through 5. These activities would significantly impact Class A and B visual resources. Impacts from borrow areas and processing facilities at Granite Bay for Alternatives 4 and 5 would be within the foreground views from the beach area and could affect Class A and Class B visual resources. The borrow area and processing plant at MIAD Left would be within the foreground views from most all vantage points at Browns Ravine/Folsom Reservoir Marina under Alternatives 4 and 5. These impacts would be significant and unavoidable until completion of construction.

Several residential developments contain homes with lake views. These residents would potentially view construction activities throughout the day and evening throughout the duration of the Folsom DS/FDR under all the alternatives. Construction-related impacts to visual resources as perceived scenic views from residential developments would be significant and unavoidable for the duration of the construction period. Alternatives 2 through 4 would involve raises to Folsom Facility that could permanently impair views of the reservoir from several private residential developments; these impacts would be considered significant and unavoidable.

Under Alternatives 2 and 3, construction of parapet walls would impair views of hikers along trails that circumnavigate the western and southern part of the reservoir. This view impact would be further impaired by placement of a safety rail at the top of each wall to prevent walking on top of and falling off of the walls. This permanent visual impact would be significant and unavoidable.

This construction would also cause a significant and unavoidable permanent impact on the visual character of the Folsom Facility. Under Alternatives 2 through 5 the raising of existing embankments and the construction of new embankments could impair view of the reservoir from the shoreline. These impacts would be permanent, and considered significant and unavoidable.

5.6.1.3 Terrestrial Resources

Inundation caused by emergency flood retention could adversely affect other special-status wildlife. Inundation above the OHWM could adversely affect special status wildlife such as western burrowing owls, northwestern pond turtles, California horned lizards, giant garter snakes, long billed curlew, white faced ibis, mountain plovers, and various bat species.

Because such inundation would be a rare event and even for a 151-year flood would last for less than two days, with the water being progressively lowered, little or no impacts to reptiles and to ground-foraging birds that do not breed in the project area would occur.

The nests of ground nesting birds may be inundated if emergency retention occurs after eggs have been laid. Any western burrowing owls that occupy areas that lie between the current OHWM and the maximum reservoir elevation that would result from implementation of the project could be subject to drowning, loss of burrows and loss of eggs. These impacts would be significant and unavoidable.

5.6.1.4 Land Use

Under Alternatives 2 through 5, if substantial inundation of non-federal property surrounding Folsom Reservoir could not be avoided through other flood damage reduction measures (such as a flood damage reduction berm) under an extreme flood or Probable Maximum Flood (PMF) event, fee title would be acquired for the impacted non-federal parcel. The effect of acquiring fee title for an impacted non-federal parcel and associated discontinuation of the existing land use function or operation would be a significant and unavoidable impact to land use.

5.6.2 Cumulative Significant and Unavoidable Impacts

Without proper scheduling and sequencing, the Folsom DS/FDR would have significant and unavoidable adverse cumulative impacts to recreation, traffic and air quality.

5.7 Relationship Between Short-Term Uses and Long-Term Productivity

NEPA guidance (NEPA Section 102(2)(c)(iv) and 40 CFR 1502.16) requires a discussion of long-term versus short-term effects. At issue is whether short-term effects are counterbalanced by long-term effects. The discussion of effects should include effects that narrow the range of beneficial uses of the environment or pose long-term risks to health and safety.

All action alternatives implement dam safety measures that involve construction of new features, raising dam and/or dike elevations, constructing seismic and static retrofits, and construction of staging and borrow sites. These would include short-term uses of capital, labor, fuels, and construction materials, habitats, and recreation areas. General construction material resource commitments are largely irreversible, since most of the construction materials are unsalvageable. The labor and fuel used in the construction and operation of the Folsom DS/FDR are irretrievable. Habitat and recreation area losses would only be temporary during construction activities and would be recommitted as habitat and recreation areas or mitigated elsewhere.

Benefits include reduction of potential flooding-related loss of resources, property, and human life. The environmental uses of these areas would not change, and habitat for a variety of species would still exist in the creek, levees, and streambanks. There are no adverse effects that would pose a long-term risk to health and safety.

5.8 Irreversible and Irretrievable Commitment of Resources/Significant Irreversible Changes

In accordance with the NEPA and CEQA Guidelines (NEPA Section 102(2)(c)(v) and 40 CFR 1502.16 and Public Resources Code 21100(b)(2)(B) and CEQA Guidelines 15126(c), 15126.2(c), and 15127), this EIS/EIR discusses any irreversible and irretrievable commitment of resources that would be consumed with the implementation of the Folsom DS/FDR. Significant irreversible environmental changes are defined as uses of nonrenewable resources during the initial and continued phases of the project which may be irreversible, since a large commitment of these resources makes future removal of nonuse unlikely.

Construction activities would involve the consumption of nonrenewable natural resources such as the earthen borrow material, concrete and slurry mixture, and petroleum for fuel. The resources used in site preparation, construction material transportation, borrow material transportation, excavation, and disposal of excess excavated materials would be permanently committed to the Folsom DS/FDR alternatives. In addition, continued operation and maintenance of the completed Folsom DS/FRD would use petroleum for fuel and potentially soil and concrete.

Additionally, Alternatives 2, 3, 4, and 5 could require dam raises and construction of new embankments. Views of the reservoir from nearby residences could be impaired by the raised and new embankments. The visual character of the Folsom Facility would also be permanently altered with any raise. This loss in scenic quality would be considered a significant irreversible change since there is no feasible mitigation to reduce the visual impacts of new embankments or a raise to the Folsom Facility.

5.9 Growth Inducement

Section 15126.2 of the CEQA Guidelines requires an environmental document to:

> *"Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth…"*

In general, an action would be considered growth inducing if it caused or contributed to economic or population growth. Growth-inducing actions would result in more economic or population growth than would have occurred otherwise from other factors. Thus, a growth-inducing action would promote or encourage growth beyond that which could be attributed to other factors known to have a significant relationship to economic or population growth.

The various alternatives currently being considered for the Folsom DS/FDR action would not contribute directly to population or economic growth by constructing additional housing or by building new businesses. However, the Folsom DS/FDR would generate additional economic benefits during construction and would contribute to greater flood damage reduction protection for the Sacramento area once complete. Therefore, the Folsom DS/FDR may have some limited growth inducing potential.

Although the Folsom DS/FDR has limited growth inducing potential, it would not necessarily result in growth. Each municipality or county controls growth at the local level through land use policies in each jurisdiction. Decision-makers alone are able to transform growth-inducing potential or pressure, created by economic or social conditions, into actual growth.

Within the study area, growth and development are controlled by the local governments of the City of Sacramento, City of Folsom, County of Sacramento, County of El Dorado, and County of Placer. 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.

Additionally, although the Folsom DS/FDR would provide for greater flood damage reduction protection, there are many other components to the flood protection system along the American River. For instance, the Corps is responsible for the levee system along the lower American River, and FEMA is responsible for flood hazard mapping and the Flood Insurance Program. Recent improvements by the Corps to the lower American River levees resulted in FEMA issuing a Letter of Map Revision (LOMR) on February 18, 2005 removing a number of properties from the Special Flood Hazard Area and from flood insurance requirements. Any additional flood damage reduction benefits offered by the Folsom DS/FDR would not result in new LOMRs. Moreover, development has already occurred in significant portions of the American River floodplain and is currently expanding despite floodplain designation and costs associated with providing flood insurance. Thus, eliminating the flood risk designations or reducing the area within the floodplain would not increase growth or development in the American River floodplain.

Therefore, the Folsom DS/FDR would not promote or encourage growth beyond that which could be attributed to the other factors noted above that are known to have a significant relationship to economic or population growth.

Chapter 6
Consultation and Coordination

6.1 Related Laws, Rules, Regulations, and Executive Orders

Implementation of the Folsom DS/FDR is subject to multiple Federal and State statutes and local planning regulations. Chapters 1 and 3 describe the regulations related to each environmental resource. This section identifies compliance efforts for applicable regulations. Table 6-1 lists the statute, the section it is described in, any relevant permits or processes required, and the status of compliance.

Table 6-1
Related Laws, Rules, Regulations, and Executive Orders

Statute	***Section with Description***	***Relevant Permits/Processes***	***Status of Compliance***
Federal Statute			
National Environmental Policy Act of 1969 (NEPA)	Section 1.8	EIS, Record of Decision	Ongoing
National Historic Preservation Act of 1966 (NHPA)	Section 1.8, Section 3.11.1.2	Section 106 Consultation	Ongoing
Clean Air Act	Section 1.8, Section 3.2.2.1	Conformity provisions, mitigation measures	Ongoing
River and Harbors Act	Section 1.8	Analyzed in EIS/EIR(1)	In Compliance
Clean Water Act (CWA)	Section 1.8, Section 3.1.1.2	Section 401 and 404 requirements, NPDES permit	Ongoing
Endangered Species Act (ESA)	Section 1.8, Section 3.4.1.3, Section 3.5.1	Section 7 Consultation, Biological Assessment,	Ongoing
Fish and Wildlife Coordination Act (FWCA)	Section 1.8	FWCAR	Ongoing
Migratory Bird Treaty Act	Section 1.8, Section 3.5.1	Analyzed in EIS/EIR	In Compliance
Executive Order 11990, Protection of Wetlands	Section 3.5.1	Analyzed in EIS/EIR	In Compliance
Executive Order 12898, Environmental Justice	Section 1.8, Section 3.22	Analyzed in EIS/EIR	In Compliance
Farmland Protection Policy Act	Section 1.8, Section 3.8.1	Analyzed in EIS/EIR	In Compliance
Indian Trust Assets	Section 3.18	Analyzed in EIS/EIR	In Compliance

Table 6-1
Related Laws, Rules, Regulations, and Executive Orders

Statute	***Section with Description***	***Relevant Permits/Processes***	***Status of Compliance***
State Statute			
Porter-Cologne Water Quality Control Act	Section 1.8, Section 3.1.1.2	NPDES, Waste Discharge Requirements	Ongoing
California Environmental Quality Act (CEQA)	Section 1.8	EIR	Ongoing
California ESA	Section 1.8	DFG consultation	Ongoing
Natural Community Conservation Planning Act	Section 1.8	DFG consultation	Ongoing
Government Code Section 65040.12(e) Environmental Justice	Section 1.8	Analyzed in EIS/EIR	In Compliance
California Land Conservation Act (Williamson Act)	Section 3.8.1	Analyzed in EIS/EIR	In Compliance
California Clean Air Act	Section 3.2.2.1	Ambient air quality standards, mitigation measures	Ongoing
Local Statute			
Sacramento County General Plan	Section 3.10.1	Zoning requirements	In Compliance
El Dorado County General Plan	Section 3.10.1	Zoning requirements	In Compliance
Placer County General Plan	Section 3.10.1	Zoning requirements	In Compliance

(1) regulation addressed through EIS/EIR process

Note: Ongoing – Some requirements of the regulation remain to be met by subsequent installation actions before implementation of some of the actions associated with this project. Once the statutory requirement for each action has been met, compliance will be labeled "in compliance".

6.2 Public Scoping Meetings

On October 6, 2005, the U.S. Department of Interior, Bureau of Reclamation (Reclamation) published the Notice of Intent to prepare an EIS to correct seismic, static, and hydrologic issues associated with the structures that make up Folsom Dam. The Folsom DS/FDR EIS/EIR, which in addition to Reclamation, includes the Corps, SAFCA, DWR, and the State Reclamation Board. These agencies held public scoping meetings at the following locations to receive comments:

- Granite Bay, December 12, 2005.
- Folsom, December 14, 2005.
- Sacramento, December 15, 2005.

Approximately 90 people attended the three meetings, including members of the public, elected officials, and representatives from public agencies, water resources, waterways, and electric power and flood control. All three public meetings were held in an open house forum. Displays were set up to provide information on issues, impacts, agency roles, and opportunities for public involvement. The displays included the following information:

Display 1. Project Overview

- Background information about the Folsom Dam, its role in the Central Valley Project, its role as a flood control facility for the Sacramento area, the critical need for improvements, and the proposed alternatives.

Display 2. Issues

- The three main issues (hydrologic, seismic and static) that need to be addressed in order to maintain the long term safety of Folsom Dam.

- Associated structures explained in detail with graphics.

Display 3. Impacts

- Potential impacts to both the reservoir and the Folsom area during construction and after modifications are complete.

Display 4. Roles & Responsibilities

- The collaborative relationship of Reclamation with the Corps to improve the structural integrity of Folsom Dam and protect the region from floods.

Display 5. EIR/EIS Process

- A timeline and explanation of the complete environmental review process from developing the purpose and need, to adopting the Record of Decision, with information describing continued public involvement.

At the scoping meetings, the public had the opportunity to comment, either verbally or written, on the Folsom Dam project. The following bullets provide a summary of major issues from public comments received including verbal comments made during the public scoping meetings, and all written comments submitted during the comment period where possible. These comments were addressed during development of the EIS/EIR.

- What is the role of each of the agencies and how will the two Federal agencies interact in completing the project?

- What are the major impacts from this project and how will they be mitigated?

- How will traffic be affected?

- What level of safety will the new dam features provide?
- What downstream affects will the new facilities have?
- How will agencies keep the public informed about future meetings and other project updates?
- What will the impacts be on local homeowners during construction?
- What are the recreational, cultural, and natural resource impacts and how will they be mitigated?

6.3 Agency Coordination

Table 6-2 presents the agencies involved in development of the Folsom DS/FDR EIS/EIR. The following sections further describe these agencies' roles in the process and the involvement of other Federal, State, and local agencies. These efforts are ongoing and agencies in addition to those listed below could be consulted throughout the project implementation.

Table 6-2
Agencies involved in Developing the Folsom DS/FDR

Agency	***Role in Folsom DS/FDR***
Reclamation	NEPA Lead Agency
Corps	Cooperating Agency under NEPA
Reclamation Board/DWR	CEQA Lead Agency
SAFCA	Responsible Agency under CEQA

6.3.1 U.S. Department of Interior, Bureau of Reclamation

Reclamation is participating in the Folsom DS/FDR pursuant to the Safety of Dams Program and the Energy and Water Development Act of 2006. Reclamation's main objective under the Dam Safety Program is to ensure the Folsom Facility can safely pass the Probable Maximum Flood (PMF)[1]. The Energy and Water Development Appropriations Act of 2006 directed Reclamation and the Corps to collaborate on authorized activities to maximize flood damage reduction improvements and address dam safety needs at the Folsom Facility. As the Federal lead agency, Reclamation is responsible for complying with NEPA, Section 106 of the NHPA, FWCA, ESA, and CWA.

[1] The PMF is defined as "the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular drainage area" (Corps 2002).

6.3.2 U.S. Army Corp of Engineers

The Corps is participating in the Folsom DS/FDR pursuant to the flood damage reduction objectives and the Energy and Water Development Act of 2006. The Corp's flood damage reduction objective is to provide the region downstream of the Folsom Facility with a level of flood protection that the community has interpreted as a minimum of a 1-in-100-year flood protection.

6.3.3 California Department of Water Resources and State Reclamation Board

With increased development in flood prone areas and recent legal decisions, the State is at financial risk for flood damages. DWR and the State Reclamation Board are participating in the Folsom DS/FDR to improve flood protection and management in the region. The State Reclamation Board is the State lead agency responsible for CEQA compliance of the Folsom DS/FDR. The Reclamation Board's mission includes controlling flooding along the Sacramento River and its tributaries in cooperation with the Corps.

6.3.4 Sacramento Area Flood Control Agency

SAFCA is the local agency involved in the Folsom DS/FDR. In 1989, the City of Sacramento, the County of Sacramento, the County of Sutter, the American River Flood Control District and Reclamation District 1000 created SAFCA through a Joint Exercise of Powers Agreement (SAFCA Undated, Corps 1996). The purpose of SAFCA was to represent local interests during the flood protection planning process (SAFCA Undated, Corps 1996).

6.3.5 U.S. Fish and Wildlife Service

USFWS is participating in the Folsom DS/FDR pursuant to the ESA and FWCA. The project agencies are consulting with USFWS for preparation of a Biological Opinion (BO) and Fish and Wildlife Coordination Action Report (FWCAR).

6.3.6 California Department of Fish and Game

CDFG participation is based on its responsibilities for protecting California's fish and wildlife resources and native plants and habitat. CDFG also protects special status species through implementing the California ESA. The project agencies and sponsors are consulting with CDFG for effects to sensitive species and plant communities.

6.3.7 State Water Resources Control Board

SWRCB has authority over California water quality and appropriative surface water rights. The SWRCB and nine Regional Water Quality Control Boards (RWQCB) carry out the NPDES permitting process for point source discharges and the CWA Section 303 water quality standards program. The Folsom DS/FDR agencies and sponsors are consulting with the CVRWQCB for potential effects to water quality from construction activities.

6.3.8 CVP Water and Power Users

Reclamation has been actively coordinating with approximately 240 CVP water and power users who will be responsible for 15 percent of the cost of the Dam Safety portion of the Folsom DS/FDR.

6.4 Project Management and Technical Teams

Many management and technical teams studied and reviewed the construction and environmental impacts of the Folsom DS/FDR. These teams included representatives from multiple agencies.

- PASS Team - Project Alternative Solutions Study Team
- PASS II Team - Project Alternative Solutions Study II Team
- OMG - Oversight Management Group
- PDT - Project Development Team
- PMT - Project Management Team
- Mitigation and Monitoring Team
- PMG - Project Management Group

Chapter 7
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Chapter 8
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Chapter 9
Document Recipients

This Chapter lists Federal, State, regional, and local public and private agencies and organizations that have either received a copy of this Draft EIS/EIR or a notification of document availability. In addition to the regulatory agencies, agencies with special expertise or interest in evaluating environmental issues related to the project are included. Private agencies, organizations, and individuals who may be affected by the project or who have expressed an interest in the project through the public involvement process are also included.

The Folsom DS/FDR Draft EIS/EIR is available on the web at:
http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=1808

Copies of the Draft EIS/EIR are available for public review at the following locations:

- Bureau of Reclamation, Denver Office Library, Building 67, Room 167, Denver Federal Center, 6th and Kipling, Denver, CO 80225
- Bureau of Reclamation, Mid-Pacific Regional Office Library, 2800 Cottage Way, W-1825, Sacramento, CA 95825-1898
- El Dorado County Library, 345 Fair Lane, Placerville, CA 95667-5699
- Folsom Public Library, 300 Persifer Street, Folsom, CA 95630
- Natural Resources Library, U.S. Department of the Interior, 1849 C Street NW, Main Interior Building, Washington, DC 20240-0001
- Roseville Public Library, 311 Vernon Street, Roseville, CA 95678
- Sacramento Central Library, 828 I Street, Sacramento, CA 95814-2589

9.1 Elected Officials and Representatives

Governor of California
- Honorable Arnold Schwarzenegger

United States Senate
- Honorable Barbara Boxer
- Honorable Dianne Feinstein

House of Representatives
- Honorable John Doolittle
- Honorable Doris Matsui
- Honorable Daniel Lungren

California Senate
- Honorable Dave Cox

California Assembly
- Honorable Roger Niello

9.2 Government Departments and Agencies

9.2.1 U.S. Government

Advisory Council on Historic Preservation
Agricultural Stabilization and Conservation Service
Army Corps of Engineers
Bureau of Land Management
Bureau of Reclamation
Council on Environmental Quality
Environmental Protection Agency
Federal Emergency Management Agency
Federal Highway Commission
Fish and Wildlife Service
Geological Survey
National Marine Fisheries Service
National Park Service
Natural Resources Conservation Service
Office of Environmental Project Review
Western Area Power Administration

9.2.2 State of California

Senate Committee on Natural Resources
Assembly Committee on Water, Parks, and Wildlife
Air Resources Board
California Water Commission
Central Valley Regional Water Quality Control Board

Department of Conservation
Department of Corrections
Department of Fish and Game
Department of Parks and Recreation
Department of Recreation
Department of Transportation
Department of Water Resources
Native American Heritage Preservation
Office of Transportation Planning
Reclamation Board
State Clearinghouse
State Lands Commission
Water Resources Control Board

9.2.3 Regional, County, and City

City of Folsom
El Dorado County
Granite Bay Advisory Council
Placer County
Sacramento Area Flood Control Agency
Sacramento County
Sacramento Metropolitan Air Quality Management District

9.3 Private Organizations and Businesses

SARA – Save The American River Association
El Dorado Irrigation District
Friends of the River
LARTF – Lower American River Task Force

Chapter 10
Glossary

Term	Definition
abatement	Reduction or decrease in amount, degree, intensity or worth.
abutment	The part of a dam that contacts the riverbank.
access easement	Grants the right of access.
acquisition of in fee title	Acquisition of ownership. Parcel would be acquired in its entirety, probably in fee at appraised value.
acre-foot (AF)	The volume of water that would cover 1 acre to a depth of 1 foot, or 325,851 gallons of water. On average, 1 acre-foot could supply one to two households with water for a year. A flow of 1 cubic foot per second for a day is approximately 2 acre-feet.
adjudicate	To decide or settle something in a legal setting.
aesthetic	A term that denotes those properties of an entity that appeal to the senses.
air district	A political body responsible for managing air quality on a regional or county basis. California is divided into 35 air districts.
alkalinity	Alkalinity is a measure of the capacity of water to neutralize acids and is also known as the buffering capacity.
alluvial soils	Soils deposited through the action of moving water. These soils lack horizons and are usually highly fertile.
alternative	A collection of actions or action categories assembled to provide a comprehensive solution to problems.

Term	Definition
ambient	1) The existing or background air, soil, water, or plant quality in a given community. 2) The allowable amount of materials, as a concentration of pollutants, in air, soil, water, or plants.
Amphibolite schist bedrock	Strongly foliated crystalline metamorphic bedrock containing amphibolite minerals that may include magnesium, iron, calcium, sodium, aluminum, and iron.
anadromous fish	Fish that spend a part of their life cycle in the sea and return to freshwater streams to spawn.
annual grassland	Annual grassland is a heterogeneous mix of non-native grasses, annual forbs and wildflowers.
appurtenant structures	Refers to ancillary features of a dam, such as outlets, spillways, bridges, drain systems, tunnels, towers, etc.
aquifer	Underground layer of porous rock, sand, etc. that contains water.
archaeology	The study of human cultures through the recovery, documentation and analysis of material remains and environmental data, including architecture, artifacts, human remains, and landscapes.
armored	A facing layer or protective cover of concrete structural features placed to prevent erosion or the sloughing off of an embankment. Also, a layer of large stones, broken rocks or boulders, or precast blocks placed in specific random fashion on a river to protect against flowing water.
arterial	A signalized street that primarily serves through-traffic and that secondarily provides access to abutting properties, with signal spacings of 2.0 miles or less.
artifact	Any object manufactured, used or modified by humans. Common examples include tools, utensils, art, food remains, and other products of human activity.

Term	Definition
asbestos	A naturally occurring fibrous silicate mineral popular in manufacturing and industry due to its strength, chemical and thermal stability. USEPA has banned or severely restricted its use in manufacturing and construction because it has been found to be a health hazard.
attainment area	Areas that do meet the ambient air quality standards.
auxiliary spillway	A spillway, usually located in a saddle or depression in the reservoir rim which leads to a natural or excavated waterway, located away from the dam which permits the planned release of excess flood flow beyond the capacity of the service spillway. A control structure is seldom furnished. The crest is set at the maximum water surface elevation for a 100-year flood or some other specific frequency flood. The auxiliary spillway thus has only infrequent use. Any secondary spillway that is designed to be operated very infrequently and possibly in anticipation of some degree of structural damage or erosion to the spillway during operation.
avian species	Of, relating to, or derived from birds.
background view	The part of a scene or view that lies behind objects in the foreground.
barge	A vessel, either motorized or towed, used to carry products in navigable waterways.
bathymetry	The measurement of the depth of the waterbody floor from the water surface; the equivalent of topography, or an underwater elevation model.
bedrock	The solid rock that underlies all soil, sand, clay, gravel, and other loose materials on the earth's surface.

Term	Definition
beneficial use	Uses of the waters of the state that may be protected against quality degradation include domestic, municipal, agricultural and industrial supply; recreation and navigation; and the preservation of fish and wildlife.
benthic	Pertaining to the bottom of a body of water.
best management practices	Best Management Practices (BMPs) are effective, practical, structural or nonstructural methods which prevent or reduce the movement of sediment, nutrients, pesticides and other pollutants from the land to surface or ground water, or which otherwise protect water quality from potential adverse effects of activities.
biological assessment	Information prepared by, or under the direction of, a Federal agency to determine whether a proposed action is likely to: (1) adversely affect listed species or designated critical habitat; (2) jeopardize the continued existence of species that are proposed for listing; or (3) adversely modify proposed critical habitat. Biological assessments must be prepared for "major construction activities." See 50 CFR §402.02. The outcome of this biological assessment determines whether formal consultation or a conference is necessary. [50 CFR §402.02, 50 CFR §402.12]
biological opinion	A written statement setting forth the opinion of the USFWS or the NMFS as to whether or not a federal action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat.
blasting	Using explosives to loosen rock for excavation.
borrow	Material excavated from one area to be used as fill material in another area.
brome	An opportunistic and imported annual grass, usually considered inferior forage, which has replaced native grasses throughout the West.

Term	Definition
California Endangered Species Act (CESA)	California legislation that prohibits the "take" of plant and animal species designated by the CDFG as either endangered or threatened. Take includes hunting, pursuing, catching, capturing, killing, or attempting such activity. CESA provides the CDFG with administrative responsibilities over the plant and wildlife species listed under the State act as threatened or endangered. CESA also provides CDFG with the authority to permit the take of State-listed species under certain circumstances.
California Environmental Quality Act (CEQA)	California legislation that requires State, regional, and local agencies to prepare environmental impact assessments for proposed projects that will have significant environmental effects and to circulate these documents to other agencies and the public for comment before making decisions. CEQA requires that the lead agency make findings for all significant impacts identified in the environmental impact report. The lead agency must propose mitigation to reduce environmental impacts to a less-than-significant level unless the mitigation is infeasible or unavailable and there are overriding considerations that require the project to be approved. See Public Res. Code Sections 21001.1, 21002, 21080; Guidelines 15002(c).
candidate species	Plant and animal taxa considered for possible addition to the List of Endangered and Threatened Species. These are taxa for which the Fish and Wildlife Service has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposal to list, but issuance of a proposed rule is currently precluded by higher priority listing actions. [61 FR 7596-7613 (February 28, 1996)]

Term	Definition
carbon monoxide (CO)	A colorless, odorless, poisonous gas, produced by incomplete burning of carbon-based fuels, including gasoline, oil, and wood. Carbon monoxide is also produced from incomplete combustion of many natural and synthetic products.
census tract	A small, relatively permanent statistical subdivision of a county established by the US Census and designed to be homogenous with respect to population characteristics, economic status, and living conditions. Tracts usually have between 2,500 and 8,000 residents.
Central Valley Project (CVP)	A federally operated water management and conveyance system that provides water to agricultural, urban, and industrial users in California. The CVP was originally authorized by legislation in 1937.
chaparral	Habitat that consists of a dense cover of perennial, mostly evergreen shrubs, generally 1 to 3 meters in height.
cofferdam	A watertight enclosure, open at the top, that is pumped dry to expose the bottom of a body of water so that construction may be undertaken in the dry.
cold water ecosystem	Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
coliform bacteria	Organisms common to the intestinal tract of humans and animals; the organisms' presence in waste water is an indicator of pollution. Generally reported as colonies per 100 milliliters of sample.

Term	Definition
conjunctive use	The operation of a groundwater basin in combination with a surface water storage and conveyance system. Water is stored in the ground water basin for later use in place of or to supplement surface supplies. Water is stored by intentionally recharging the basin during years of above-average surface water supply.
conservation measures	Actions to benefit or promote the recovery of listed species that are included by the Federal agency as an integral part of the proposed action. These actions will be taken by the Federal agency or applicant, and serve to minimize or compensate for, project effects on the species under review. These may include actions taken prior to the initiation of consultation, or actions which the Federal agency or applicant have committed to complete in a biological assessment or similar document.
contractor use area	Designated area to be used by construction contractor(s) for materials stockpiling, staging, parking, portable toilets, etc.
control delay	The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.
conveyance	A pipeline, canal, natural channel, or other similar facility that transports water from one location to another.
crest	The top surface of the dam. A roadway may be constructed across the crest to permit vehicular traffic or facilitate operation, maintenance, and examination of the dam. Also, the high point of the spillway control section.
criteria pollutant	Any pollutant for which USEPA has established a National Ambient Air Quality Standard (NAAQS), specifically carbon monoxide, lead, nitrogen oxides, ozone, particulate matter, and sulfur oxides.

Term	Definition
critical habitat	Designation for federally listed species. Consists of: (1) the specific areas within the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the Federal ESA (16 USCA 1533), on which are found those physical or biological features (constituent elements) that are: (a) essential to the conservation of the species and (b) may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of ESA (16 USCA 1533), upon a determination by the Secretary that such areas are essential for the conservation of the species. (16 USCA 1532(5)(A).) Designated critical habitats are described in 50 CFR 17 and 50 CFR 226.
cubic feet per second (cfs)	Rate of water release representing a volume of 1 cubic foot passing a given point during 1 second, equivalent to approximately 7.48 gallons per second or 448.8 gallons per minute. In a stream channel, a release of 1 cubic foot per second is equal to the release at a rectangular cross section, 1 foot wide and 1 foot deep, flowing at an average velocity of 1 foot per second.
cultural resource	A wide-ranging category that describes an extensive variety of resources, regardless of significance. These resources may include archaeological sites, isolated artifacts, features, records, manuscripts, historical sites, traditional cultural properties, historical resources, and historic properties.
cumulative impact	The incremental impact or effect of the action together with impacts of past, present, and reasonable foreseeable future actions (regardless of the source of these other actions).

Term	Definition
dam	Dams are usually constructed by making a large embankment that blocks an existing watercourse. This embankment is used to control the release of flood waters downstream of the Dam. Dams usually contain a small outlet pipe that limits the amount of water that can exit the dam. Any flows in excess of the capacity of the dam outlet are stored behind the dam. The Folsom Facility is operated and maintained by Reclamation as part of the CVP.
day-night noise level	The day-night noise level (L_{dn}) is the energy average sound level for a 24-hour day determined after the addition of a 10-dBA penalty to all noise events occurring at night between 10:00 p.m. and 7:00 a.m. The L_{dn} is used by local jurisdictions to rate community noise impacts from transportation noise sources.
dBA	A unit of measurement/sound level for A-weighted sounds. Environmental sounds are measured with the A-weighted scale of the sound level meter. The A scale simulates the frequency response of the human ear, by giving more weight to the middle frequency sounds, and less to the low and high frequency sounds.
decibel (dB)	A unit used to express the intensity of a sound wave. In sound, decibels generally measure a scale from 0 (the threshold of hearing) to 120-140 dB (the threshold of pain).
de mimimis amount	A legal term for an amount that is small enough to be ignored, too small to be taken seriously.
detention dam	A dam built to store streamflow or surface runoff, and to control the release of such stored water.
detritus	Dead or decaying organic matter.
dewatering	Removing water by pumping, drainage, or evaporation.

Term	Definition
dike	An embankment that blocks an area on a reservoir or lake rim that is lower than the top of the dam.
direct (economic) effect	Change in final demand in an industry.
dissolved oxygen	Amount of free oxygen found in water; perhaps the most commonly employed measurement of water quality. Low DO levels adversely affect fish and other aquatic life. The ideal dissolved oxygen for fish life is between 7 and 9 mg/L; most fish cannot survive when the DO level falls below 3 mg/L.
diversion	The action of taking water out of a river system or changing the flow of water in a system for use in another location.
dredge	To dig under water. A machine that digs under water.
earthfill dam	An embankment dam in which more than 50 percent of the total volume is formed of compacted earth material generally smaller than 3-inch size. Seepage through the dam is controlled by the designed use of upstream blankets and/or internal cores constructed using compacted soil of very low permeability.
easement	The right to use land owned by another for some specific purpose.
ecosystem	A recognizable, relatively homogeneous unit that includes organisms, their environment, and all the interactions among them.
electric conductivity	The measure of a solution's ability to conduct electricity. Electric conductivity units are used to express salinity levels in soil and water. When salt is dissolved in water the conductivity increases, so the more salt, the higher the value.

Term	Definition
embankment	An earth structure the top of which is higher than the adjoining surface. A shaped earth or rockfill dam. Fill material, usually earth or rock, placed with sloping sides and with a length greater than its height. An embankment is generally higher than a dike.
emergency gate	A standby or auxiliary gate used when the normal means of water control is not available. The first gate in a series of flow controls, remaining open while downstream gates or valves are operating.
emergency spillway	A spillway which provides for additional safety should emergencies not contemplated by normal design assumptions be encountered, i.e., inoperable outlet works, spillway gates, or spillway structure problems. The crest is usually set at maximum water surface. A spillway that is designed to provide additional protection against overtopping of a dam and is intended for use under extreme conditions such as misoperation or malfunction of the service spillway or other emergency conditions.
emergent	A plant rooted in shallow water that has most of its vegetative growth above water.
endangered species (CESA)	Any species listed as endangered under the California Endangered Species Act. Endangered species are native California species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that has been determined by the CDFG to be in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, exploitation, predation, competition, or disease. See California Fish and Game Code Section 2062.

Term	Definition
endangered species (ESA)	Any species listed as endangered under the Federal ESA. Endangered species are any species (including subspecies or a qualifying distinct population segment) that is in danger of extinction throughout all or a significant portion of its range. See 16 USCA 1532(6).
endemic	Endemic in biology and ecology means exclusively native to a place or biota. A species that is endemic is unique to that place or region, found naturally nowhere else.
environmental impact report (EIR)	A detailed written report, required by the CEQA, analyzing the environmental impacts of a proposed action, adverse effects that cannot be avoided, alternative courses of action, and cumulative impacts.
environmental impact statement (EIS)	A detailed written statement, required by Section 102(2)(c) of the National Environmental Policy Act (NEPA), analyzing the environmental impacts of a proposed action, adverse effects that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance of long-term productivity, and any irreversible and irretrievable commitment of resources.
environmental justice	Refers to the concept that people of all races, cultures, and incomes deserve fair treatment with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.
ephemeral stream	An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream.
epilimnion	Warm, upper waters of a thermally-stratified water body that is directly affected by seasonal air temperature and wind.

Term	Definition
equivalent noise level	The equivalent noise level (L_{eq}) is the constant sound level that in a given period has the same sound energy level as the actual time-varying sound pressure level. L_{eq} provides a methodology for combining noise from individual events and steady state sources into a measure of cumulative noise exposure. It is used by local jurisdictions and the Federal Highway Administration (FHWA) to evaluate noise impacts.
erosion	A gradual wearing away of soil or rock by running water, waves, or wind. Surface displacement of soil caused by weathering, dissolution, abrasion, or other transporting.
essential fish habitat	Waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.
estuarine	Pertaining to an estuary; a water passage where ocean water mixes with river water.
exceedence noise level	Exceedance levels are values from the cumulative amplitude distribution of all the noise levels observed during a measurement period. They are designated L_n, where n represents a value from 0 to 100 percent. For example, L_{50} is the median noise level, or the noise level in dBA exceeded 50 percent of the time during the measurement period.
exhaust gas recirculation (EGR)	An emission control method that involves recirculating exhaust gases from an engine back into the intake and combustion chambers. This lowers combustion temperatures and reduces NO_x.
exotic species	A species that did not originally occur in the areas in which it is now found, but that arrived as a direct or indirect result of human activity.
fallow farmland	Cultivated land that is not seeded for one or more growing seasons.

Term	Definition
fault creep	Gradual movement along a fault that occurs in the absence of an earthquake.
fault zone	In geology, faults are discontinuities (cracks) in the Earth's crust that are the result of differential motion within the crust. Faults are the source of many earthquakes that are caused by slippage vertically or laterally along the fault.
Federal Endangered Species Act (ESA)	Federal legislation that requires Federal agencies, in consultation with the USFWS and NOAA Fisheries, to ensure that their actions do not jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of these species. The ESA recognizes the value to the nation of species in danger of, or threatened with, extinction. The act requires Federal agencies to conserve these species and their habitats and ranges to the extent practicable. Section 4 of the ESA (16 USCA 1533) provides a listing process for species considered “endangered” (in danger of becoming extinct) or “threatened” (threatened to become endangered). The Secretary of Commerce, acting through NOAA Fisheries, is involved for projects that may affect marine or anadromous fish species listed under the ESA. All other species listed in the ESA are under USFWS jurisdiction. Section 7 of the ESA (16 USCA 1536(a)(2)) requires that all Federal agencies, in consultation with the Secretaries of the Interior and Commerce (acting through USFWS and NOAA Fisheries, respectively), ensure that their actions do not jeopardize the continued existence of species listed as endangered or threatened and protected or result in the destruction or adverse modification of the critical habitat of these species. Section 9 of the ESA (16 USCA 1538) prohibits take of a listed

Term	Definition
	species. Section 9 (16 USCA 1538) compliance is applicable if the proposed action would result in the take of any listed threatened (if not subject to special rule) or endangered fish or wildlife species and such take is not authorized in a biological opinion issued by USFWS or NOAA Fisheries. Section 10 of the ESA (16 USCA 1539) authorizes the conditions for the USFWS or NOAA Fisheries to issue a permit for incidental take of a listed species when there is no other Federal agency involved. See 16 USC 153 1 et seq. federally covered species.
fill	Manmade deposits of natural soils or rock products and waste materials designed and installed in such a manner as to provide drainage, yet prevent the movement of soil particles due to flowing water.
filter	One or more layers of granular material which is incorporated in an embankment dam and is graded (either naturally or by selection) to allow seepage through or within the layers while preventing the migration of material from adjacent zones.
fine particulate matter	Particulate matter less than 2.5 microns in diameter (PM2.5).
flip bucket	An energy dissipator located at the downstream end of a spillway and shaped so that water flowing at a high velocity is deflected upwards in a trajectory away from the foundation of the spillway.
flood easement	See Occasional flowage easement below.

Term	Definition
flood damage reduction berm	Also referred to as a new embankment, and in earlier administrative drafts of this document as an auxiliary dike, or a mini-dike. Flood damage reduction berms are structures to reduce or eliminate the flooding of non-federal property. These flood damage reduction features would be simple berms constructed of earthen material excavated at a specific site or imported from within the boundaries of the hauled in-reservoir, from the closest area with stockpiled material. These flood damage reduction features could also be constructed as, a parapet wall of unknown height, or another type of suitable structure.
flood damage reduction berm easement	Grants the right to build, maintain, repair, operate, and replace a flood damage reduction berm.
Folsom Facility	The physical features that surround Folsom Reservoir, including LWD, RWD, Main Concrete Dam, Dikes 1 through 8, and MIAD.
Folsom Joint Federal Project (Folsom FJP)	A cooperative effort by Reclamation and the Corps, along with SAFCA, California DWR, and the Reclamation Board, to address hydrologic, static, and seismic issues with Folsom Dam and Appurtenant Structures.
forage fish	Small fish which breed prolifically and serve as food for predatory fish.
forb	A broadleaf plant that has little or no woody material in it.
foreground view	The part of an image or view that appears to be closest to the viewer.
freeboard	Generally defined as the difference in elevation from the top edge of a flood control facility (channel, dam, basin) to the design WSE. Freeboard provides a factor of safety and protects against unknown factors such as wave action. Freeboard varies based on the type of project and velocities of flows, but is generally between 1-3 feet.

Term	Definition
freshwater marsh	Freshwater marsh communities within the Project area are wetland communities fed by seeps or springs and are permanently to semi-permanently flooded.
friable asbestos	A form of asbestos found to be the most dangerous because of its ability to become airborne. Friable asbestos can be crushed or reduced to powder form with hand pressure.
fry	Small adult fish, especially when in large groups.
fugitive dust	Particles lifted into the ambient air caused by man-made and natural activities such as the movement of soil, vehicles, equipment, blasting, and wind. This excludes particulate matter emitted directly from the exhaust of motor vehicles and other internal combustion engines, from portable brazing, soldering, or welding equipment, and from piledrivers.
fuseplug	A form of auxiliary spillway consisting of a low embankment designed to be overtopped and washed away during an exceptionally large flood.
gigawatt hour (GWh)	One gigawatt hour (GWh) equals one million kilowatt hours. A kilowatt hour (KWh) is equivalent to the energy consumed by a 100-watt light bulb burning for 10 hours.
gravity dam	A dam constructed of concrete and/or masonry that relies on its weight and internal strength for stability. Gravity dams are generally used where the foundation is rock and earthfill in proper quality and quantity is not available.
habitat enhancement	To improve degraded habitat. Management actions that enhance habitat do not result in increasing the extent of habitat area.
habitat protection, protect habitat	To maintain the existing extent and quality of habitat.

Term	Definition
habitat restoration, restore habitat	To create habitat. Management actions that restore habitat.
hazardous waste	Any solid, liquid, or gaseous substance which, because of its source or measurable characteristics, is classified under state or federal law as hazardous and is subject to special handling, shipping, storage, and disposal requirements.
historic property	Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places. This includes artifacts, records, and remains that are related to and located within such properties. As a general guideline, a cultural resource should be at least 50 years old to be considered as a historic property.
historical resource	Per CEQA guidelines, a resource listed or eligible for listing on the California Register of Historical Resources. It must be significant based on one or more of four criteria to be considered a historical resource on a local, state, or national level.
hydraulic jump	The sudden and usually turbulent passage of water in an open channel from low stage, below critical depth, to high stage, above critical depth. During this passage, the velocity changes from supercritical to subcritical. There is considerable loss of energy during the jump.
hydropower	Energy or power produced by moving water.
hypolimnion	Cold, deep waters of a thermally stratified water body. It is typically the coldest layer in the summer and warmest in the winter. It is isolated from wind mixing and typically too dark for much plant photosynthesis to occur.
igneous rock	Igneous rocks are formed from magma (melted rock) that has cooled and solidified, either within the Earth's crust or on the Earth's surface.

Term	Definition
impervious	Surface that prevents or significantly reduces the entry of water into the underlying soil, resulting in runoff from the surface in greater quantities and/or at an increased rate when compared to natural conditions prior to development.
impoundment	Body of water created by a dam.
incursion	The act of a species entering some territory or domain that is not their native habitat.
indian trust assets (ITAs)	Legal interests in property held in trust by the United States government for Indian tribes or individuals, or property protected under United States law for Indian tribes and individuals. Federal agencies are required to take responsibility for protection and maintenance of ITAs. There are no ITAs present in the project area; therefore, they were not evaluated.
indirect (economic) effect	Changes in industry sectors within the region that supply goods and services to industries directly affected by the changes in final demand.
induced (economic) effect	Changes in economic activity resulting from household spending of the income earned from changes in final demand.
inhalable particulate matter	Particulate matter less than 10 microns in diameter (PM10).
input-output (I-O) analysis	Describes commodity flow from producers to intermediate and final consumers.
instream flows	Year-round flows in rivers and streams.
intermittent stream	A stream that flows part of the time because of a connection with groundwater or because of season snow melt and, therefore, is dry most of the year.
invasive species	Non-native species of plants or animals that out-compete native species in a specific habitat.
inversion layer	A layer of warm air in the atmosphere that prevents the rise of cooling air and traps pollutants beneath it.

Term	Definition
invertebrate	An animal that lacks a backbone or spinal column.
jet grouting	A method of compacting soil using a hose or other device by injecting a grout slurry at high pressures into the liquefiable soils.
jurisdiction	The territory or geographic area within which power can be exercised, or the power or authority of a court to hear and try a case.
kilowatt (kW)	The basic unit of electric demand, equal to 1,000 watts. Average household demand is 10 to 20 kilowatts.
landslide	An abrupt movement of soil and bedrock downhill in response to gravity. Landslides can be triggered by an earthquake or other natural causes.
leach field	Porous soiled area, through which septic tank leach lines run, emptying out the treated liquid waste, forced from the tank, which then percolates down through the soil.
levee	An elevated berm that is used to protect adjacent low lying ground from floodwaters. The levee is usually lined with a structural material such as concrete or rip-rap to ensure that it does not fail from erosion. This lining usually extends many feet below ground to ensure that scour caused by high water velocities cannot undermine the levee.
level of service (LOS)	A qualitative measure describing operational conditions within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience.
lift line	Horizontal construction joint created when new concrete is placed on previously placed concrete.

Term	Definition
liquefaction	Process where water-saturated sediment (sandy material) temporarily looses strength, usually because of an earthquake, and behaves like a fluid. Soil or sand changes from solid ground and behaves like a liquid, which can cause the ground above the liquefied sediment to break into small blocks.
listed species (CESA)	Species or subspecies declared as threatened or endangered by the CDFG in 14 CCR Section 670.5.
listed species (ESA)	Species, including subspecies, of fish, wildlife, or plants federally listed at 50 CFR 17.11 and 50 CFR 17.12 as either endangered or threatened, or listed at 14 CCR Section 670.2 and 14 CCR Section 670.5 as threatened or endangered.
littoral zone	Area on or near the shore of a body of water.
low-income population	That portion of the population that falls within the low-income bracket as defined based on federal poverty thresholds. The low-income index is determined annually by the US Department of Health and Human Services.
maximum contaminant level (MCL)	The highest level of a contaminant that is allowed in drinking water. MCL's are set as close to the Maximum Contaminant Level Goal as feasible using the best available treatment technology.
mesic site	Characterized by having a medium moisture supply e.g., a type of habitat or soil.
metamorphic rock	A rock changed from its original form and/or composition by heat, pressure, or chemically active fluids, or some combination of them.
middleground view	The part of an image or view that lies between the foreground and background.
minority population	Any individual or racial/ethnic group that is not categorized as White, not Hispanic or Latino.

Term	Definition
mitigation	To moderate, reduce, or alleviate the impacts of a proposed activity; including: (a) avoiding the impact by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) compensating for the impact by replacing or providing substitute resources or environments.
monolith	A concrete section or block of the dam.
most probable number (MPN)	Most Probable Number of coliform-group organisms per unit volume of sample water. Expressed as the number of organisms per 100 mL of sample water.
multiplier	A ratio of total economic effects to direct economic effects that captures the size of indirect and induced effects to the region's economy.
National Environmental Policy Act (NEPA)	Federal legislation establishing the national policy that environmental impacts will be evaluated as an integral part of any major federal action. Requires the preparation of an environmental impact statement (EIS) for all major federal actions significantly affecting the quality of the human environment.
National Pollutant Discharge Elimination System (NPDES)	A permitting program under section 402 of the Clean Water Act required for all point sources discharging pollutants into waters of the United States. The purpose of the NPDES program is to protect human health and the environment.

Term	Definition
native vegetation	Stands of blocks of naturally occurring plant communities. These include a range of vegetation associations such as woodlands, grasslands, forests, wetlands, mangroves etc. Scattered native trees and shrubs in cleared paddocks or urban areas are more usually considered separately as scattered or isolated plants.
navigable waters	Waters of the United States including: (a) All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerence, including all waters that are subject to the ebb and flow of the tide. (b) Interstate waters, including interstate wetlands. (c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats and wetlands, the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce, including waters used or which could be used for industries in interstate commerce. (d) All impoundments of waters otherwise defined as navigable waters. (e) Tributaries of waters identified in (a) through (d). (f) Wetlands adjacent to waters identified in (a) through (d).
nephelometric turbidity unit (NTU)	NTU is an indication of the clarity of water, or the amount of suspended particles in water. Low NTU values indicate high quality water. NTU is obtained by measuring the amount of scattering of light in water.
new embankment	See flood damage reduction berm above.

Term	Definition
nitrogen dioxide	A pollutant that causes smog and acid rain, as well as eye, throat, and lung irritation. Nitrogen dioxide is mainly produced by burning fossil fuels (e.g., emissions from burning gasoline in a car).
nitrogen oxide (NO_x)	The chemical transformation caused by sunlight. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.
non-attainment area	Areas that do not meet the ambient air quality standards.
non-criteria pollutant	Any recognized and otherwise regulated air pollutants that are not listed as criteria pollutants.
non-native species	Also called introduced species or exotic species; refers to plants and animals that originate elsewhere and are brought into a new area, where they may dominate the local species or in some way negatively impact the native species environment.
nonpoint source	A contributing factor to water pollution that cannot be traced to a specific spot. Man-made or man-induced alteration of the chemical, physical, biological, or radiological integrity of water, originating from any source other than a point source.
North American Vertical Datum (NAVD)	The vertical control datum established in 1991 by the minimum-constraint adjustment of the Canadian-Mexican-U.S. leveling observations. It held fixed the height of the primary tidal bench mark, referenced to the new International Great Lakes Datum of 1985 local mean sea level height value, at Father Point/Rimouski, Quebec, Canada.
objective release	Releases resulting in a flow that may be sustained without risk of levee failure.
obligate species	A species limited to a restricted environment, such as a wetland.

Term	Definition
occasional flowage easement	Flood easement; grants the right to occasionally flood, as determined necessary and appropriate during extreme storm events. Property owner retains fee ownership; however, such an easement may restrict the construction of new structures and/or uses for human habitation within the easement area premises.
OHWM	Ordinary high water mark of the reservoir.
one-hundred year (100-year) flood	A flooding event that has a one percent chance of occurring in any given year. The term "100-year" is a measure of the size of the flood, not how often it occurs. Several 100-year floods can occur within the same year or within a few short years. The 100-year event for any given area is based on a statistical frequency analysis of local rainfall data. The analysis determines the amount of rainfall that would only have a one percent chance of occurring in a given year. Hydrologic analysis is then applied to the watershed, based on the 100-year rainfall magnitude. The result provides the expected release of the watershed during a 100-year event.
opportunistic species	Species that take advantage of the situation. An opportunistic feeder is one that will eat whenever food is available.
overland flow	Flow of water across the land surface in a down-gradient direction.
overtop	Flow of water over the top of a dam or embankment.
ozone	Ozone gas is a molecule that consists of three oxygen molecules. It is naturally occurring in the earth's atmosphere at all levels and is responsible for filtering out much of the sun's ultraviolet radiation.

Term	Definition
palliative	Describes a material that may be used to reduce or mitigate adverse effects. For instance, a binding palliative material may be applied to an exposed surface for dust and erosion control.
panorama	A panorama is a wide, all-encompassing view; hence also a panoramic format.
parapet wall	A solid wall built along the top of a dam (upstream and/or downstream edge) used for ornamentation, for safety of vehicles and pedestrians, or to prevent overtopping caused by wave runup.
peak particle velocity (PPV)	Pertaining to vibration measurements, peak particle velocity is the maximum rate of ground movement measured by any of the 3 mutually perpendicular components of ground motion. Units are expressed in inches per second. PPV is often used in determining potential damage to buildings from stress associated with blasting and other construction activities.
peaking facility	A powerplant that is scheduled to operate during peak energy demand.
penstock	A sluice or gate for restricting flow of water; a conduit or pipe for conducting water.
perennial plant	A plant that grows for more than one season; it over-winters in a dormant condition and resumes growth the following season.
petrographic	The description and classification of rocks
pH	A relative scale, from 0 to 14, of how acidic or basic (alkaline) a material is, where a pH of 7 is neutral, smaller readings are increasingly acid.
photochemical reaction	The chemical transformation caused by sunlight. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.

Term	Definition
piezometer	An instrument which measures pressure head or hydraulic pressures in a conduit or hydraulic pressures within the fill of an earth dam or the abutment; at the foundation because of seepage or soil compression; or on a flow surface of a spillway, gate, or valve.
Pineapple Express	The Pineapple Express is a Pacific Ocean subtropical jet stream that brings warm moist air from Hawaii (where pineapples are grown) to the U.S. West Coast states of California, Oregon, and Washington, as well as the Canadian province of British Columbia.
piping	Erosion of embankment or foundation material (soil) due to leakage.
piscivorous fish	Fish that eat other fish.
plankton	A diverse group of minute animals (zooplankton) and plants (phytoplankton) that freely drift in the water.
point source	Any discernible, confined, or discrete conveyance from which pollutants are or may be discharged, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft.
probable maximum flood (PMF)	The largest flood that may reasonably be expected to occur at a given point on a stream from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible on a particular watershed.
promulgated	Documents that are formally made public.
radial gate	A pivoted crest gate, the face of which is usually a circular arc, with the center of curvature at the pivot about which the gate swings. A gate with a curved upstream plate and radial arms hinged to piers or other supporting structure.

Term	Definition
radiological waste	Radioactive waste is produced from activities that use radioactive materials such as mining, nuclear power generation, and various processes in industry, defense, medicine, and scientific research. Radioactive waste can be in gas, liquid or solid form, and the waste can remain radioactive for a few hours or several months or even hundreds of thousands of years. There are varying degrees of radioactivity.
re-entrained road dust	Particulate emissions that are kicked-up from movement of vehicles on paved roadway surfaces.
regional capture rate	Percentage of spending that accrues to the region’s economy as direct sales or final demand.
release rate (ramping criteria)	The rate of change in instantaneous output. The ramp rate is established to prevent undesirable effects due to rapid changes in loading or discharge.
relocation	The impacted property owner is paid fair market value for their property, is provided assistance to locate comparable housing and is entitled to relocation benefits and services in accordance with Public Law 91-646.
retaining wall	A wall separating two levels.
return period	The average length of time separating flood events of a similar magnitude: a 100-year flood will occur on average once in every 100 years.
riffle	A section of stream that has shallow, fast-flowing water followed by deep, slow-flowing water.
riparian	The strip of land adjacent to a natural watercourse such as a river or stream. Often supports vegetation that provides important wildlife habitat values when a complex forest structure is present and important fish habitat values when vegetation grows large enough to overhang the bank.

Term	Definition
riprap	A layer of large uncoursed stones, broken rock, or precast blocks placed in random fashion on the upstream slope of an embankment dam, on a reservoir shore, or on the sides of a channel as protection against wave and ice action.
ruderal fields	Growing along roadsides or in disturbed or abandoned farmland.
Safety of Dams Program	Reclamation’s program to identify potential issues with existing dams and develop corrective actions to protect public safety, property, and the environment. Reclamation’s main objective under the Dam Safety Program is to ensure the Folsom Facility can safely pass the Probable Maximum Flood (PMF).
savanna	An ecological community that is dominated by scattered trees and large areas of grasses and other forbs.
sedimentary rock	Rocks formed from material, including debris of organic origin, deposited as sediment by water, wind, or ice and then compressed and cemented together by pressure.
seepage	Percolation of water through the soil from unlined canals, ditches, laterals, watercourses, or water storage facilities.
seismic	Of or related to movement in the earth's crust caused by natural relief of rock stresses.
sensitive species	Listed species, species that are candidates for listing, and other species that have been designated as species of special concern by Federal or State agencies or scientific organizations (see “special-status species”).
shear key	Prevent sliding of a dam along its foundation by excavating a large tunnel or hole through a concrete section into the dam foundation then backfilling with concrete.

Term	Definition
shell	Shell material includes impervious soil and miscellaneous shell soil placed on the outside of a dam or dike to create a shell.
siltation/sedimentation	Deposition of waterborne sediments due to a decrease in velocity and corresponding reduction in the size and amount of sediment which can be carried.
slough	A swamp, marsh, or muddy backwater.
slurry	Watery mixture of insoluble matter which is pumped beneath a dam to form an impervious barrier. Cement grout.
spawn	Laying of eggs, especially by fish.
special status species	Species in any of the following categories: plants listed, proposed for listing, or candidates for possible future for listing under the federal Endangered Species Act, plants listed or proposed for listing under the California Endangered Species Act, plants listed as rare or endangered under the California Native Plant Protection Act, plants that meet the definitions of rare or endangered under the State CEQA Guidelines, plants considered by the CNPS to be “rare, threatened, or endangered in California” (Lists 1B and 2), plants considered by CNPS as plants about which more information is needed to determine their status, and plants of limited distribution (Lists 3 and 4), which may be included as special-status species on the basis of local significance.
species	Species of fish, wildlife, or plants, any subspecies of fish, wildlife, or plants, and any distinct population segment of vertebrate fish or wildlife that interbreeds when mature.

Term	Definition
species of concern	Species that could be affected by actions and are not listed as threatened or endangered under the Federal ESA; proposed for listing under ESA; candidates under ESA; listed as threatened or endangered under the CESA; candidates under CESA; plants listed as rare under the California Native Plant Protection Act; California fully protected species or specified birds under various sections of the California Fish and Game Codes; California species of special concern; or California Native Plant Society List lA, lB, 2, or 3 species.
spillway	The channel or passageway around or over a dam through which excess water is released or "spilled" past the dam without going through the turbines. A spillway is a safety valve for a dam and, as such, must be capable of discharging major floods without damaging the dam, while maintaining the reservoir level below some predetermined maximum level.
spillway gate	A gate on the crest of a spillway to control the discharge or reservoir water level.
staging area	See contractor use area.
static	Issues that occur during normal daily operations, include potential seepage and piping of the wing dams and dikes.
stilling basin	Concrete portion downstream from conduit, tunnel, or control structure. A pool, usually lined with reinforced concrete, located below a spillway, gate, or valve into which the discharge dissipates energy to avoid downstream channel degradation. A basin constructed to dissipate the energy of rapidly flowing water (e.g., from a spillway or outlet) and to protect the riverbed from erosion.

Term	Definition
storage capacity	The total amount of reservoir capacity normally available for release from a reservoir below the maximum storage level. It is total or reservoir capacity minus inactive storage capacity. More specifically, it is the volume of water between the outlet works and the spillway crest.
subsidence	Sinking of the land surface due to compaction of soil caused by loading, removal of underground fluids, or other mechanisms.
subsidence inversion	An inversion at elevations of 1,000 to 2,000 feet enhanced by vertical mixing in the air layer below the inversion. A condition that produces an increase in temperature with height.
sulfur dioxide (SO_2)	Sulfur dioxide is a gas produced by burning coal, most notably in power plants. Some industrial processes, such as production of paper and smelting of metals, produce sulfur dioxide. Sulfur dioxide is closely related to sulfuric acid, a strong acid. Sulfur dioxide plays an important role in the production of acid rain.
surcharge pool/space	The reservoir capacity provided for use in passing the inflow design flood through the reservoir. It is the reservoir capacity between the maximum water surface elevation and the highest of the following elevations: top of exclusive flood control capacity, top of joint use capacity, or top of active conservation capacity. Temporary storage.
surface inversion	A temperature inversion based at the earth's surface (from 1 to 500 feet); that is, an increase of temperature with height beginning at the ground level. This condition is due primarily to greater radiative loss of heat at and near the surface than at levels above.

Term	Definition
suspended particulate matter (SPM)	Particles suspended in the air of less than 10 micrometer in size which can accumulate in the lungs and bronchi bringing about breathing problems for those affected. SPM is caused by human activities (cars and industry) but also by natural phenomena.
swale	A low place in a tract of land. A wide, shallow ditch, usually grassed or paved. A wide open drain with a low center line.
tainter gate	A term used by the Corps of Engineers to describe radial gates (see radial gate).
take	Under the ESA, “To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” in regard to federally listed, endangered species of wildlife (16 USCA 1532[19]). “Harm” is further defined as an act “which actually kills or take threatened species injures”. Harm 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). Under the California Fish and Game Code, take is defined as “to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill” (California Fish and Game Code Section 86).
tendon anchor	Holes drill through all sections of a main concrete dam to the foundation then replaced with steel bar anchored in cement at the foundation to prevent sliding during seismic activity.
terrestrial species	Types of species of animals and plants that live on or grow from the land.

Term	Definition
threatened species (ESA)	Any species listed as threatened under the CESA. Threatened species are native California species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that have been determined by the CDFG, although not presently threatened with extinction, to be likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts. See California Fish and Game Code Section 2067.
toe	The junction of the face of a dam with the ground surface.
toe drain	Open-jointed tile or perforated pipe located at the toe of the dam used in conjunction with horizontal drainage blankets to collect seepage from the embankment and foundation and conveys the seepage to a location downstream from the dam.
total dissolved solids (TDS)	A water quality parameter defining the concentration of dissolved organic and inorganic chemicals in water, usually expressed in milligrams per liter (mg/L).
total maximum daily load (TMDL)	The maximum amount of a pollutant that can be discharged into a water body from all sources (point and non-point) and still maintain water quality standards. Under Clean Water Act Section 303(d), TMDLs must be developed for all water bodies that do not meet water quality standards after application of technology-based controls.
total organic carbon (TOC)	A measure of the concentration of organic carbon in water, determined by oxidation of the organic matter into carbon dioxide.

Term	Definition
toxic air contaminant (TAC)	As defined by California Health and Safety Code, Section 39655 (a): an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health. Substances which have been identified by the USEPA as hazardous air pollutants (e.g. benzene, asbestos) shall be identified by the Board as toxic air contaminants.
toxic waste	A waste that can produce injury if inhaled, swallowed, or absorbed through the skin.
tributary	River or stream flowing into a larger river or stream.
turbidity	A cloudy appearance that results when excessive silt or other substances are in the water.
underground storage tank (UST)	A tank located at least partially underground and designed to hold gasoline or other petroleum products or chemicals.
understory	The layer formed by the leaves and branches of the smaller trees under the forest canopy.
unincorporated land	A region of land is unincorporated if it is not a part of any municipality. To "incorporate" in this context means to form a municipal corporation, i.e., a city or similar. Unincorporated, in turn, implies no city and hence no city, town, village, or other municipal government.
urban blight	A condition of property or the uses of property in parts of a city, town, or neighborhood that are detrimental to the physical, social, and/or economic well-being of a community. It can include abandoned buildings or those severely neglected by their owners, vacant lots full of rubble and garbage, or dangerous and/or illegal uses such as crack houses.

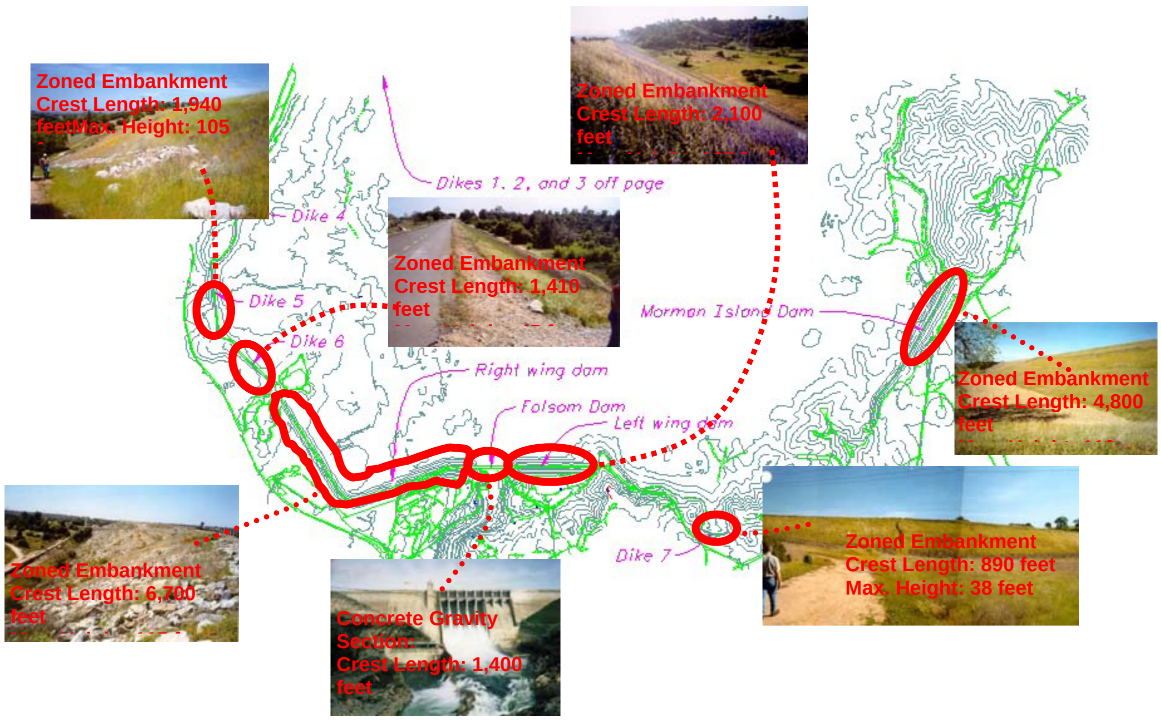
Term	Definition
value added	Economic measurement of wages and salaries, proprietor's income, dividends and interest, and indirect business taxes.
value of output	Total value of an industry's production.
vault toilet	The vault toilet is a brick or otherwise semi-modern enclosure (for your privacy) surrounding a hole in the ground, which has a seat and standoff going into what amounts to a cesspool. Not a septic tank, but directly into a cesspool.
vernal pool	Seasonally ponded landscape depressions in which water accumulates because of limitations to subsurface drainage and that support a distinct association of plants and animals.
vista	A view or the visual percept of a region.
volatile organic compound (VOC)	Reactive gases released during combustion or evaporation of fuel and regulated by USEPA. VOCs react with NO_x in the presence of sunlight and form ozone.
warm water ecosystem	Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
watershed	An area that drains to a particular channel or river, usually bounded peripherally by a natural divide of some kind such as a hill, ridge, or mountain.
water table	The surface of underground, gravity-controlled water, or the level of ground water.
weir	An overflow structure built across an open channel to raise the upstream water level and/or to measure the flow of water.

Term	Definition
wetlands	Lands including swamps, marshes, bogs, and similar areas such as wet meadows, river overflows, mudflats, and natural ponds. An area characterized by periodic inundation or saturation, hydric soils, and vegetation adapted for life in saturated soil conditions. Any number of tidal and nontidal areas characterized by saturated or nearly saturated soils most of the year that form an interface between terrestrial and aquatic environments; including freshwater marshes around ponds and channels, and brackish and salt marshes. A jurisdictional wetland is subject to regulation under the Clean Water Act. A nonjurisdictional is subject to consideration under the Fish and Wildlife Coordination Act.
wing dam	A dam that only partially blocks a river and extends from only one riverbank.
zoning	Land use regulations are enacted to manage use of land and are used to control the character of an area.

Volume II Appendices

Appendix A
Public Scoping Report

Folsom Dam
Combined Federal Effort EIS/EIR
Scoping Meeting Summary Report



Prepared For:

U.S. Department of the Interior
Bureau of Reclamation

Prepared By:

CDM

CirclePoint
The *whole* view.

DRAFT
March, 2006

Contents

Folsom Dam Combined Federal Effort EIS/EIR Scoping Meeting Summary Report

1.0 Introduction

The purpose of scoping is to obtain information on significant issues associated with a project to guide an agency's environmental review. As part of scoping, agencies hold public meetings to provide the public with information and encourage participation and input in the environmental review process.

The Folsom Dam Combined Federal Effort is a cooperative project to correct seismic, static, and hydrologic issues associated with the structures that make up Folsom Dam. The Folsom Dam Combined Federal Effort agencies, including the United States Department of the Interior, Bureau of Reclamation (Reclamation), the United States Army Corps of Engineers (the Corps), Sacramento Area Flood Control Agency (SAFCA), State of California Department of Water Resources (DWR), and the State of California Reclamation Board (State Reclamation Board), are preparing an EIS/EIR for the Combined Federal Effort. Accordingly, these agencies held public scoping meetings at the following locations to receive comments:

- Granite Bay, December 12, 2005.
- Folsom, December 14, 2005.
- Sacramento, December 15, 2005.

This scoping report documents these meetings and the comments captured. Section 4 includes meeting summaries and verbal comments received, Section 5 presents written comments received during the comment period, and Section 6 provides a summary of the recurring issues from the meetings and comments.

1.1 Scoping Purpose and Process

Agencies conduct public scoping meetings to involve the public in the preparation of environmental documents. Scoping is not limited to public meetings; however, public meetings allow interested persons, tribes, organizations, and agencies to listen to information about a proposed project or action and express their concerns and viewpoints to the implementing agencies. The agencies can provide information regarding how additional information or status reports on the process can be obtained.

During scoping meetings, the lead agency generally will outline the proposed project, identify alternatives to the project, define the area of analysis, propose issues to be addressed in the document, and solicit public comments. The agencies then consider those comments during development of the Draft EIS/EIR.

1.1.1 National Environmental Policy Act

National Environmental Policy Act regulations (40 CFR 1501.7) require scoping to determine the scope of the issues to be addressed in the environmental review and to identify significant issues. Scoping should occur early on in the environmental review process and should involve the participation of affected parties.

The lead agency of the proposed action is required to:

1. "Invite the participation of affected Federal, State, and local agencies, any affected Indian tribe, the proponent of the action, and other interested persons (including those who might not be in accord with the action on environmental grounds);

2. Determine the scope and the significant issues to be analyzed in depth in the environmental impact statement;

3. Identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review narrowing the discussion of these issues in the statement to a brief presentation of why they will not have a significant effect on the human environment or providing a reference to their coverage elsewhere;

4. Allocate assignments for preparation of the environmental impact statement among the lead and cooperating agencies, with the lead agency retaining responsibility for the statement;

5. Indicate any public environmental assessments and other environmental impact statements which are being or will be prepared that are related to but are not part of the scope of the impact statement under consideration;

6. Identify other environmental review and consultation requirements so the lead and cooperating agencies may prepare other required analyses and studies concurrently with, and integrated with, the environmental impact statement; and

7. Indicate the relationship between the timing of the preparation of environmental analyses and the agency's tentative planning and decision making schedule" (40 CFR 1501.7).

Public involvement activities are required by Council on Environmental Quality (CEQ) regulations (40 CFR 1506.6(a)), which state: "Agencies shall: Make diligent efforts to involve the public in preparing and implementing their NEPA procedures." Public scoping meetings help to satisfy this requirement.

CEQ regulations (40 CFR 1508.22, 516 DM 2.3D) require the implementing agency to notify the public that it is preparing an EIS for a project under consideration. Reclamation issued an NOI in the Federal Register on October 6, 2005. Appendix A of this scoping report includes a copy of the NOI.

1.1.2 California Environmental Quality Act

Although California Environmental Quality Act (CEQA) does not require public meetings, it encourages early consultation (or scoping) with affected parties. This early consultation often solves potential problems before they turn into more serious problems further on in the process. CEQA describes two other benefits for early consultation:

a) "Scoping has been helpful to agencies in identifying the range of actions, alternatives, mitigation measures, and significant impacts to be analyzed in depth in an EIR and in eliminating from detailed study issues found not to be important.

b) Scoping has been found to be an effective way to bring together and resolve the concerns of affected federal, state, and local agencies, the proponent of the action, and other interested persons including those who might not be in accord with the action on environmental grounds" (CEQA Section 15083).

Parallel to the process of the NOI for NEPA, CEQA requires public notification of the initiation of an EIR through a Notice of Preparation (NOP) (CEQA 15082). A copy of the NOP can be found in Appendix A of this scoping report.

2.0 Background

Folsom Dam (Dam) and its associated structures were constructed in 1955 as a multi-purpose facility providing water supply, power, recreation, as well as flood control for the greater Sacramento metropolitan area. The Dam and its facilities are the joint responsibility of two federal agencies, Reclamation and the Corps. One of the principal reservoirs of California's Central Valley Project, Reclamation operates Folsom Dam to provide water, power, and recreational opportunities. The Corps supports operations for the purpose of flood control protecting people, residences, and businesses along the lower American River.

Congress has assigned to both Reclamation and the Corps the responsibility of ensuring the safety of federal dams. As a part of this responsibility, Reclamation has determined that there is a risk (albeit small) to public safety from dam failure due to seismic, static, and hydrologic concerns. These risks relate to the potential of an earthquake damaging the Dam and Mormon Island Auxiliary Dam, the ability of the earthen structures to control seepage, and the risk of the maximum predicted floodwaters from the upper American River watershed overtopping and threatening the structural integrity of the concrete portion of the dam, and all of the earthen structures.

The Corps operates the Dam for flood control purposes. Essentially this involves releasing the reservoir pool to its lowest elevation just prior to the winter rainy season and then storing stormwater/snowmelt runoff surge flows within the reservoir. The Corps in partnership with the State Reclamation Board and SAFCA, have determined that the reservoir does not have the capacity to contain the maximum predicted floodwaters from the upper American River watershed, thereby diminishing flood protection for the Sacramento area.

The Combined Federal Effort will address Reclamation's Dam Safety Program objectives of improving public safety and Folsom Dam and all associated structures, and the Corps, SAFCA, and the State Reclamation Board's flood damage reduction projects that are designed to provide increased flood protection for the Sacramento area. Both Reclamation and the Corps have conducted engineering studies to identify potential corrective measures for the Dam and its associated facilities to alleviate seismic, static, hydrologic, and flood control concerns. These four agencies have combined their efforts resulting in common solutions for the structural and functional concerns of the Folsom Dam and its associated facilities.

There is a need to implement corrective action measures for Folsom Dam and its associated facilities related to the potential of their failure due to existing seismic, static, and hydrologic conditions. There is also a need to increase flood control protection to a 200-year recurrence level due to inadequate flood storage capacity and reservoir pool release mechanisms. The purpose of the corrective action measures will be to (1) improve the structural integrity of Folsom Dam and appurtenant structures, and (2) improve the flood control capacity of the facility, thereby increasing the public safety. These measures will also ensure the reliability of local power and water supply, as well as maintain an important recreational resource.

3.0 Project Alternatives

Note: The alternatives summarized below were under consideration during public scoping. The alternatives have been refined but still include the basic elements discussed during scoping.

A range of alternatives have been carried forward in the Combined Federal Effort to meet both Reclamation's objective of mitigating hydrologic overtopping risks due to the probable maximum flood (PMF) and the Corp's objective of providing 200-year flood protection to the Sacramento metropolitan area. Additionally, these alternatives meet Reclamation's objectives of mitigating seismic and static issues. The following alternatives, along with the No-Action Alternative will be evaluated in an EIS/EIR.

Alternatives 1 & 2 – no or minimal raise (i.e. earthen raise less than 2 ft.).

1. No raise (+/- 2 ft. earthen) + large fuseplug spillway + MIAD jet grouting u/s & d/s foundation + Concrete dam upper & lower tendons and shear key elements with gate and pier reinforcements + MIAD, Wing Dams, and Dikes ½ ht filters and drains on d/s slopes.

2. No raise (+/- 2 ft. earthen) + large fuseplug spillway + MIAD D/S overlay for u/s foundation and filters, excavate and replace d/s foundation + Concrete dam

upper & lower tendons and shear key elements with gate and pier reinforcements + Only MIAD, Wing Dams and Dike 5 ½ ht filters and drains on d/s slopes.

Alternatives 3 & 4 - low to medium required rise height (i.e. raise greater than 2 ft. but less than 8 ft.).

3. 4.0 ft raise (+/- 1 ft.) (0.5 ft. earth & 3.5 concrete parapet wall) + smaller fuseplug spillway + MIAD jet grouting u/s & d/s foundation + Concrete dam upper & lower tendons and shear key elements with gate and pier reinforcements + MIAD Wing Dams and Dikes ½ ht filters and drains included in raise component.

4. 7.0 ft raise (+/- 1 ft.) (3.5 ft. earth & 3.5 concrete parapet wall) + gated spillway + MIAD D/S overlay for u/s foundation and filters, excavate and replace d/s foundation + Concrete dam upper & lower tendons and shear key elements with gate and pier reinforcements + MIAD Wing Dams and Dikes 1/2 ht filters and drains included in raise component.

Alternatives 5 & 6 -medium to high required rise height (i.e. raise greater than 8 ft. but less than 17 ft.).

5. 10.0 ft raise (+/- 1ft.) (10.0 reinforced earth wall) + small gated spillway + MIAD D/S overlay for u/s foundation and filters, excavate and replace d/s foundation + Concrete dam upper & lower tendons and shear key elements with gate and pier reinforcements + MIAD Wing Dams and Dikes ½ ht filters and drains included in raise component.

6. 12.0 – 17.0 ft. raise (8.5 – 13.5 ft. earth & 3.5 concrete parapet wall) + small gated spillway + MIAD D/S overlay for u/s foundation and filters, excavate and replace d/s foundation + Concrete dam upper & lower tendons and shear key elements with gate and pier reinforcements + MIAD Wing Dams and Dikes ½ ht filters and drains included in raise component.

4.0 Scoping Meetings

Reclamation, the Corps, SAFCA, DWR, and the State Reclamation Board held three public scoping meetings in December of 2005, regarding the Combined Federal Effort Project. Two meetings were held in the vicinity of Folsom Dam, on Monday, December 12 in Granite Bay, and on Wednesday, December 14 in the City of Folsom. The third meeting took place in Sacramento on Thursday, December 15.

Approximately 90 people attended the three meetings, including members of the public, elected officials, and representatives from public agencies, water resources, waterways, and electric power and flood control.

4.1 Publicity

To publicize the meetings, Reclamation distributed notices to approximately 3,000 interested parties, including state and local agencies, elected officials, and area residents. News releases were published in local newspapers including the Sacramento Bee, Roseville Press Tribune, Folsom Telegraph, El Dorado Hills Telegraph, and the Granite Bay Press Tribune. Appendix A of this scoping report contains a copy of the news release and the notice distributed by Reclamation.

4.2 Staff

The following is a list of agency staff in attendance during the public scoping meetings.

John Wondolleck, CDM
John Clerici, CirclePoint
Janice Kelley, CirclePoint
Sonja Wadman, CirclePoint

Becky Victorine, Corps
Jennifer Gonzales, Corps

Liz Ayres, Reclamation
Mike Finnegan, Reclamation
Dave Gore, Reclamation
Larry Hobbs, Reclamation
Rick Johnson, Reclamation
David Jones, Reclamation
Drew Lessard, Reclamation
Jeff McCracken, Reclamation
Shawn Oliver, Reclamation
Rosemary Stefani, Reclamation

4.3 Meeting Agenda and Content

All three public meetings were held in an open house forum. Attendees were asked to sign in and all names were entered into a database for the exclusive purpose of keeping participants up-to-date on future activities, meetings, and project information. Meeting materials included handouts outlining the information displays, information displays, and comment cards.

Five information displays were set up to walk the public through the issues, impacts, agency roles, and opportunities for public involvement. A staff person was assigned to each display and invited the public to ask questions and voice concerns regarding each respective topic. Appendix B contains a copy of the displays and the handout provided to all meeting participants. The displays included the following information:

Display 1. Project Overview

- Background information about the Folsom Dam, its role in the Central Valley Project, its role as a flood control facility for the Sacramento area, the critical need for improvements, and the proposed alternatives.

Display 2. Issues

- The three main issues (hydrologic, seismic and static) that need to be addressed in order to maintain the long term safety of Folsom Dam.

- Associated structures explained in detail with graphics.

Display 3. Impacts
- Potential impacts to both the reservoir and the Folsom area during construction and after modifications are complete.

Display 4. Roles & Responsibilities
- The collaborative relationship of Reclamation with the Corps to improve the structural integrity of Folsom Dam and protect the region from floods.

Display 5. EIR/EIS Process
- A timeline and explanation of the complete environmental review process from developing the purpose and need, to adopting the Record of Decision, with information describing continued public involvement.

4.4 Verbal Comments

During each of the scoping meetings, the public was encouraged to voice questions or comments. The following is an overview of the verbal comments and questions received during the scoping meetings.

Construction
- What is the procedure for notifying residents who live uphill from Mormon Island about the construction process?

Dam Releases
- There is some confusion regarding statements that existing dam spillways could release 650,000 cfs, but that the downstream levees can only handle about 130,000 cfs. The relationship between dam releases and downstream flows needs to be better explained.

Flood Scenarios
- There is confusion about what scenarios the recent flood inundation maps reflect. One assumes the worst case scenario (i.e. full lake and a monsoon type of rain) and 250 percent of the Sierra snow packs melting and releasing downstream. A second and third map show seven and fifteen feet more capacity respectively.

Responsible Agency
- Which federal agency is responsible for approaching landowners regarding the potential of building a floodwall along a dike on (residential) property?

- Which agency is ultimately in charge of this project since there are two agencies (or more) whose purposes are not the same? The joint effort is another reason for delays in the project, while citizens experience a traffic nightmare.

- It is very important that Reclamation's responsibility and costs are clearly defined in any combined Corps/Reclamation/SAFCA projects.

Public Meetings and Information

- Future public hearings should be held at times that facilitate public participation (avoid the summer).

- Requests were made for copies of the meeting displays to be posted on a website.

- Requests were made for website addresses of the Folsom Dam and Bridge Crossing projects.

- Many participants expressed a wish to continue to be informed of future EIR/EIS activities.

Alternatives

- Why are the agencies designing concrete flood walls to sit on top of earthen Folsom Dam? This appears to be a cheap fix and is strikingly similar to the floodwalls that failed in New Orleans.

- There is concern that flood level flows will stress downstream levees for twice as long if gates and spillways are enlarged without adding upstream storage. This solution does not appear to be good flood protection.

- Won't the structural integrity of the dam be even more vulnerable to attack if five new gates are added below the existing gates?

- We need to raise the level of Folsom Dam, make any necessary upgrades, and still consider Auburn Dam. As population continues to grow, we must save our water and have more stringent flood control.

- Comments were submitted for and against building Auburn Dam for flood protection, recreation, and water storage.

- Reclamation should pursue the course which provides the highest, most cost effective level of flood control. What is the best option in the long run? Spend less and raise Folsom Dam to get 200 year flood protection, or spend more and build Auburn Dam for the best flood protection?

Borrow Sites

- Will Reclamation be looking into the possible presence of asbestos in the soil to be removed from the borrow areas on Reclamation property surrounding the lake? Have the soils been tested for the presence of asbestos? What are the findings? How will the results (if asbestos is present) be addressed?

Recreation

- The lake should be kept full in the summer for recreation, and should be dredged, much like they do in the Bay and the Delta.

- Can bike trails be included on the new dikes?

Cultural Resources/Indian Trust Assets (ITA's)

- Will there be an evaluation of the historic and Native American artifacts located at the site? Is there mitigation needed? If so, what is it and how will it be done?

Air Quality

- How will construction impact air quality? Will dirt be blown into nearby homes?

Traffic

- Traffic is a major concern. Questions were directed to the Corps about the proposed bridge project.

- Why is travel blocked over Folsom Dam when there is nothing done to prevent a boat owner from filling his boat with explosives?

Other

- There is opposition to San Juan Water and Roseville Water District's construction of a new tap (emergency or permanent) into any of the penstocks for the Folsom Power Plant. Any such tap will have major impacts to the maintenance and operations of the power plant and the penstocks, including annual generator/runners/wicketgate OSM.

- CVP Water and Power Users/Customers should not be responsible to reimburse their SOD costs obligation under Reclamation Law, which is not CVP Projects.

5.0 Public Scoping Written Comments

In addition to verbal comments received at the public scoping meetings, agencies also accepted several forms of written comments including e-mails and letters. Copies of all written comments are available in Appendix C of this scoping report. The following bullets present a summary of the written comments received during the comment period.

Public Notification

- How will the project effect the Tacana Drive residential area? Will the modifications be announced to homeowners? All information regarding this important matter will be greatly appreciated.

Process

- What are the processes, next steps, and timeline?

- Has an EIS/EIR been completed? If so, where can the public access it?

- It is unclear if constituents are being asked to comment on the scoping of the EIS/EIR, which has not yet been completed, or on a completed document, which is not provided or referenced.

Funding

- Are there sufficient funds and are the project sponsors willing to mitigate the impacts of the project?

Alternatives

- Referring to the Corp's Folsom Dam Modification and increasing flow in the American River, this solution is very risky and should not be taken above a large metropolitan area like Sacramento. Although authorized, the Corps didn't even have time to conduct a feasibility study to determine adequately the design and construction problems nor the true cost. Don't continue the nonsense of modifying a 50 year old concrete dam.

- Property in a subdivision which adjoins Folsom Lake State Park, near the launch ramps in Granite Bay is not now protected from Folsom Lake flooding by existing dikes and levees, but instead is protected by the natural rise of the land in the park and in the subdivision. The proposal to raise the lake level (and dam) by seven feet, however, will require raising the dikes and extending them, so that property in the area will then be behind the extended levee and dependent on the integrity of the levee for flood protection. Residents do not want to be dependent on a levee for flood protection.

- There are too many people living behind levees and dependent on them for flood protection. Your proposal to raise the lake level will make matters worse, not better. Don't put more people behind potentially vulnerable levees.

General Project Impacts

- Have the impacts of the project been disclosed? If so, where? If not, when and how can the public access/comment on them?

- There is concern about the project sponsor's ability to effectively mitigate additional impacts (noise, light, changes to the landscape, deterioration of water, etc.). For example, the noise level of roads around the Folsom Dam already exceeds state/local standards.

- Pinebrook Village residents are concerned about the proposed additional seven feet on the Dam. Many residents are directly downhill from the wing dam and currently have an extremely high water table. Additional groundwater would materially impact 336 homes that do not have a typical cement foundation. The customary foundation system is a series of piers. This puts a tremendous amount of weight on a very limited ground area. Additional moisture could materially impact maintaining a level structure. This, of course, is a vital necessity for every home.

- Pinebrook Village residents are fully aware of the continuing problems with the wing dams on the south side of the lake, specifically Dike 8. Wetlands such as those created across the Empire Ranch area would be a disaster for their fully developed area of affordable homes for seniors.

Transportation Impacts

- There is concern about what the primary purpose and need of the project is. Is it to correct and improve public safety at the Folsom Dam and all associated structures and increase flood protection for the Sacramento region? If so, what is the relationship of the Dam/public safety and flood protection to transportation? Why is the Bureau of Reclamation and the Corps of Engineers deciding the future of local and regional transportation issues? Residents of the City of Folsom are concerned that the Bureau of Reclamation and Corps of Engineers' priorities and funding limitations will drive the decision of how to approach transportation solutions for the City and region.

- Our biggest concern is the mess created by closing of the dam road as it has significantly changed our lives. Going through Folsom is a nightmare. I strongly feel the Bureau of Reclamation is totally responsible for the dam road and is totally responsible for the mess created by closing the dam road. Not knowing when the bridge will be done or even started gives us a feeling of total despair. The dam project, whatever it turns out to be, will also have impacts on the bridge.

Biological Impacts

- In the Corps Long Term Study, the lead agencies did not propose purchase of any lands upstream of the dams and dikes to mitigate impacts and losses resulting from project construction and operation. Areas upstream of the dams and dikes will incur most of the project impacts through construction and operation and so lead agencies should find restoration and mitigation actions that will benefit upstream areas.

- Periodic inundation of existing upland areas could result in a ring of dead or impacted vegetation which will have adverse visual impacts. Acquiring additional land adjacent to the reservoir could be a means to mitigate this.

- Increasing the footprint of the dams and dikes could result in permanent loss of upland habitat. Additional land with the lost habitat types, preferably contiguous to Folsom Lake State Recreation Area, should be acquired as a mitigation measure.

- Lead agencies need to avoid or minimize impacts to natural resources where possible and fully mitigate any unavoidable impacts.

Recreation Impacts

- All recreational facilities need to be made whole when construction is complete and alternate trail and road routes will be developed for public use during construction.

- Recreation facilities have been planned around a maximum pool level of 466′ and the operation of the reservoir at higher levels would have impacts to these facilities. This may result in the need to move selected facilities and to develop a plan for funding source for clean-up and repair of facilities following an inundation.

- With construction of a new spillway, lead agencies should recognize that other potential uses of this unique location (Observation Point, the parking area, and vista point) will be forgone.

- Lead agencies should coordinate with California Department of Parks and Recreation to replace any recreation facilities displaced or impacted as a result of improvements to the dikes and dams.

Fiscal Impacts

- Construction will result in lower revenues from user fees and will impact the amount of funding the District receives to operate and maintain Folsom Lake SRA.

- Construction will impact concessionaires that operate around Folsom Lake, and will result in reduced revenue to State Parks from the fees paid by these concessionaires. Project lead agencies need to fully compensate DPR and concessionaires for losses in revenues resulting from project construction.

Cultural Impacts

- Lead agencies should conduct a thorough study of cultural resources and minimize impacts to potentially significant cultural sites and mitigate unavoidable impacts.

- Any impacts to natural and cultural resources from operation of the dam utilizing the additional surcharge space need to be fully mitigated.

Borrow Sites

- There is support for the approach to obtain borrow materials from areas primarily below the high pool level (466′) on the upstream side of Folsom Dam because this approach will have less impacts than taking materials from upland areas (either upstream or downstream of dams and dikes).

- The potential exists to create benefits for aquatic recreation if borrow excavation is accomplished in specific locations and in a manner that enhances water access.

- Lead agencies should include construction of recreational improvements such as extending boat ramps, constructing a new breakwater at the marina and completing development of swim beaches as part of the project.

- If borrow site excavations occur in upland areas, lead agencies should fully restore these areas as part of this project.

Auburn Dam

- The review (recent request from Congress to review Auburn Dam) should spend 99% of the time on Auburn Dam and Reservoir. There is no time for much field work so the Auburn review will be mainly reviewing existing studies dating from 1955 when the Auburn Dam Committee was formed, to 1980 when the Secretary of the Interior announced that a safe dam could be built at Auburn. Since the Corps only reviewed Reclamation stacks of studies to formulate their "dry dam" proposals of early 1990's, the majority of the information to be reviewed is in Reclamation's archives. It will take a lot of research of all the material to see what is pertinent. There are still Reclamation retirees available to help the present staff in this review.

- Residents of Pinebrook Village always have and continue to believe that the best solution to provide flood protection for the Sacramento area is the construction of the originally planned Auburn Dam. Both flood protection and additional water storage is sorely needed throughout the area. If additional power production is planned, this too would be a big plus in these days of blackouts.

6.0 Public Comment Summary

The following bullets provide a summary of major issues from public comments received including verbal comments made during the public scoping meetings, and all written comments submitted during the comment period.

- What is the role of each of the agencies and how will the two Federal agencies interact in completing the project?

- What are the major impacts from this project and how will they be mitigated?

- How will traffic be affected?

- What level of safety will the new dam features provide?

- What downstream affects will the new facilities have?

- How will agencies keep the public informed about future meetings and other project updates?

- What will the impacts be on local homeowners during construction?

- What are the recreational, cultural, and natural resource impacts and how will they be mitigated?

Appendix A

NOI, NOP, Public Notice, and News Release

Dated: September 19, 2005.

Edwin L. Roberson,

District Manager, Las Cruces.

[FR Doc. 05–20086 Filed 10–5–05; 8:45 am]

BILLING CODE 4310–VC–P

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[WO–300–1330–EO]

Notice of a 120-Day Public Comment Period To Affirm the Policy for the Standards To Establish the Potash Enclave as Used To Administer the Secretarial Order of 1986 Entitled ''Oil and Gas and Potash Leasing and Development Within the Designated Potash Area of Eddy and Lea Counties, New Mexico''

AGENCY: Bureau of Land Management, Interior.

ACTION: Notice.

SUMMARY: The Bureau of Land Management (BLM) originally published this notice on Tuesday, August 30, 2005 [70 FR 51364] and solicited public comments on the report which affirms the existing policy on the criteria used to establish the potash enclave. The BLM gave the public 30 days to comment on these Policy Standards. The public comment period ended on Thursday, September 29, 2005. The BLM received numerous requests to lengthen the comment period. The BLM will re-issue a comment period for 120 days.

DATES: Comments should be submitted to the address below no later than February 3, 2006.

ADDRESSES: Written comments should be addressed to Group Manager, Solid Minerals, 1620 L, Street, NW., Mail Stop 501 LS, Washington, DC 20036.

FOR FURTHER INFORMATION CONTACT: Charlie Beecham, Mining Engineer, 1620 L, St., NW., Mail Stop 501 LS, Washington, DC 20036, telephone (202) 785–6570.

Thomas Lonnie,

Assistant Director, Minerals, Realty and Resource Protection.

[FR Doc. 05–20087 Filed 10–5–05; 8:45 am]

BILLING CODE 4310–FB–P

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[ES–960–1420–BJ–TRST] ES–053597, Group No. 161, Wisconsin

Eastern States: Filing of Plat of Survey

AGENCY: Bureau of Land Management, Interior.

ACTION: Notice of Filing of Plat of Survey; Wisconsin.

SUMMARY: The Bureau of Land Management (BLM) will file the plat of survey of the lands described below in the BLM-Eastern States, Springfield, Virginia, 30 calendar days from the date of publication in the **Federal Register**.

FOR FURTHER INFORMATION CONTACT: Bureau of Land Management, 7450 Boston Boulevard, Springfield, Virginia 22153. Attn: Cadastral Survey.

SUPPLEMENTARY INFORMATION: This survey was requested by the Bureau of Indian Affairs.

The lands we surveyed are:

Fourth Principal Meridian, Wisconsin

T. 40 N., R. 6 W.

The plat of survey represents the dependent resurvey of the Fourth Standard Parallel North in Range 6 West, a portion of the Fourth Standard Parallel North in Range 7 West, a portion of the south and west boundaries, a portion of the subdivisional lines; and the subdivision of certain sections, the reestablishment of a portion of the record meander line and a survey of a portion of the present shore line of James Lake, and the apportionment of the shore line frontage to the original lots 2 and 3 in section 20, Township 40 North, Range 6 West, Fourth Principal Meridian, Wisconsin, and was accepted September 29, 2005. We will place a copy of the plat we described in the open files. It will be available to the public as a matter of information.

If BLM receives a protest against this survey, as shown on the plat, prior to the date of the official filing, we will stay the filing pending our consideration of the protest. We will not officially file the plat until the day after we have accepted or dismissed all protests and they have become final, including decisions on appeals.

Dated: September 29, 2005.

Stephen D. Douglas,

Chief Cadastral Surveyor.

[FR Doc. 05–20052 Filed 10–5–05; 8:45 am]

BILLING CODE 4310–GJ–P

DEPARTMENT OF THE INTERIOR

Bureau of Reclamation

Safety Modifications for Folsom Dam and Appurtenant Structures (Folsom Safety of Dams Project)— Sacramento, El Dorado, and Placer Counties, CA

AGENCY: Bureau of Reclamation, Interior.

ACTION: Notice of intent to prepare an Environmental Impact Statement (EIS) and notice of public scoping meetings.

SUMMARY: Pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA), the Bureau of Reclamation (Reclamation) intends to prepare an EIS for the implementation of the safety modifications for Folsom Dam and Appurtenant Structures (Folsom Safety of Dams Project). Reclamation seeks to improve public safety by modifying Folsom Facilities and its appurtenant structures (Folsom Facilities) to mitigate issues identified in previous and ongoing safety evaluations. Studies are being conducted by Reclamation to identify alternatives (modifications) to address these conditions.

Engineering, Economic, and Environmental studies are being conducted to help determine reasonable design alternatives. Information gathered from the EIS process will be used in conjunction with engineering and economic principles to determine preferred alternatives.

DATES: Reclamation will seek public input on alternatives, concerns, and issues to be addressed in the EIS through scoping meetings on Tuesday, November 1 and Thursday, November 3, 2005, from 6:30 to 9 p.m. in Folsom, California.

ADDRESSES: The public scoping meetings will be held at the Folsom Community Center, 52 Natoma Street in Folsom, California 95630.

Send written comments on the scope of alternatives and impacts to be considered to Mr. Shawn Oliver at the address below, no later than 2 weeks after the second scheduled public scoping meeting.

FOR FURTHER INFORMATION CONTACT: Mr. Shawn Oliver, Bureau of Reclamation, 7794 Folsom Dam Road, Folsom, California 95630; telephone number (916) 989–7256; e-mail *soliver@mp.usbr.gov.*

SUPPLEMENTARY INFORMATION: Reclamation seeks to mitigate potential safety issues identified in previous and ongoing studies for the Folsom Dam complex, including Main Folsom Dam, the two wing dams, Mormon Island Auxiliary Dam, and the eight dikes. Retrofitting and increasing the flood control capacity of the Folsom Dam and its appurtenant structures are currently being studied. Locating and extracting adequate borrow materials for embankment modifications will be a major component of the project. Reclamation has determined that an EIS is warranted to examine the potential impacts for implementation of the Folsom CAS Project on the natural and human environment.

Potential Modification Alternatives to the Folsom Dam and appurtenant structures are being identified to reduce risks associated with:

1. Major Flood Events
2. Earthquakes
3. Seepage and Piping through Embankments

Folsom Dam and Embankment Hydrologic Alternatives include, but are not limited to:

1. Embankment Raise Options
2. Auxiliary Spillway on the Left Abutment Options

Folsom Dam and Embankment Seismic and Static Alternatives include, but are not limited to:

1. Mormon Island Auxiliary Dam Seismic Alternatives
2. Concrete Dam Seismic Options
3. Folsom Dam and Embankment Static Alternatives

If special assistance is required at the scoping meetings, please contact Mr. Shawn Oliver, Bureau of Reclamation, at (916) 989–7256. Please notify Mr. Oliver as far in advance of the meetings as possible to enable Reclamation to secure the needed services. If a request cannot be honored, the requestor will be notified.

Reclamation's policy is to make comments, including names and home addresses of respondents, available for public review. Individual respondents may request that we withhold their name and/or home address from public disclosure, which Reclamation will honor to the extent allowable by law. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment. Reclamation will make all submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public disclosure in their entirety.

Dated: August 25, 2005.

Michael Nepstad,

Deputy Regional Environmental Officer, Mid-Pacific Region.

[FR Doc. 05–20051 Filed 10–5–05; 8:45 am]

BILLING CODE 4310–MW–P

DEPARTMENT OF JUSTICE

Notice of Lodging of Consent Decree Under the Comprehensive Environmental Response, Compensation, and Liability Act

Notice is hereby given that on September 19, 2005, a proposed Consent Decree (''Consent Decree'') in *United States* v. *Eliskim, Inc. et al.,* Civil Action No. 1:05CV2196 was lodged with the United States District Court for the Northern District of Ohio, Eastern Division.

In this action, the United States, on behalf of the United States Environmental Protection Agency (''EPA''), sought to recover response costs from Eliskim, Inc. (''Eliskim'') and the City of Geneva, Ohio (''City'') pursuant to Section 107 of the Comprehensive Environmental Response, Compensation, and Liability Act (''CERCLA''), 42 U.S.C. 107. The response costs were incurred in response to releases and threatened releases of hazardous substances from the True Temper Sports Superfund Site located in the City of Geneva, Ohio (the ''Site''). The Consent Decree would require Eliskim and the City to pay respectively $56,500 and $12,500 toward the response costs incurred by EPA, which are presently estimated to be $118,000. The Consent Decree would resolve Eliskim's liability for: (1) Past response costs at the Site; and (2) costs, penalties, and fees pursuant to an Administrative Order by Consent at the Site. To the extent provided by the Consent Decree, certain specified benefits of the settlement would also extend to Eliskim's parent corporation, American Household, Inc. Finally, the Consent Decree would grant the City a *de minimis* covenant not to sue pursuant to Section 122(g) of CERCLA, 42 U.S.C. 9622(g).

The Department of Justice will receive for a period of thirty (30) days from the date of this publication comments relating to the Consent Decree. Comments should be addressed to the Assistant Attorney General, Environment and Natural Resources Division, P.O. Box 7611, U.S. Department of Justice, Washington, DC 20044–7611, and should refer to *United States* v. *Eliskim, Inc., et al.,* No. 1:05CV2196 (N.D. Ohio), D.J. Ref. 90–11–2–1310/1.

The Consent Decree may be examined at the Office of the United States Attorney, 801 West Superior Avenue, Suite 400, Cleveland, Ohio 44113–1852, and at U.S. EPA Region 5, 77 West Jackson Boulevard, 14th Floor, Chicago, Illinois. During the public comment period, the Consent Decree may also be examined on the following Department of Justice Web site, *http://www.usdoj.gov/enrd/open.html.* A copy of the Consent Decree may also be obtained by mail from the Consent Decree Library, P.O. Box 7611, U.S. Department of Justice, Washington, DC 20044–7611 or by faxing or e-mailing a request to Tonia Fleetwood (*tonia.fleetwood@usdoj.gov*), fax no. (202) 514–0097, phone confirmation number (202) 514–1547. In requesting a copy from the Consent Decree Library, please enclose a check in the amount of $17.25 (25 cents per page reproduction cost) payable to the U.S. Treasury.

William D. Brighton,

Assistant Chief, Environmental Enforcement Section, Environment and Natural Resources Division.

[FR Doc. 05–20041 Filed 10–5–05; 8:45 am]

BILLING CODE 4410–15–M

DEPARTMENT OF JUSTICE

Amended Notice of Lodging of Settlement Agreement Pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act and the Comprehensive Environmental Response, Compensation, and Liability Act

In accordance with 28 CFR 50.7 and 42 U.S.C. 9622(i), notice is hereby given that on September 13, 2005, a Settlement Agreement was lodged with the United States District Court for the District of Puerto Rico in *United States* v. *Tropical Fruit, S.E., et al.,* Civil Action No. 97–1442–DRD. On October 25, 2001, the Court entered a Consent Decree between the United States, on behalf of the U.S. Environmental Protection Agency (''EPA''), and Defendants pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act (''FIFRA''), 7 U.S.C. 136 *et seq.*, and the Comprehensive Environmental Response, Compensation, and Liability Act (''CERCLA''), 42 U.S.C. 9601 *et seq.*, with respect to a Farm located in Rural Zone Boca, Guayanilla, Puerto Rico. The Consent Decree required Defendants to pay $35,000 in penalties and CERCLA response costs and to comply with extensive injunctive relief measures, including the creation of a no-spray buffer zone on the northern and a portion of the western perimeter of the Farm which will vary in width up to 173 feet. In December 2004, the United States filed a Motion to Enforce the Consent Decree and for stipulated penalties in that the United States alleged that Defendants violated certain provisions of the Consent Decree

MP-05-140

Media Contacts: **Bureau of Reclamation**
Jeffrey McCracken 916-978-5100
jmccracken@mp.usbr.gov

mailto:jmccracken@mp.usbr.gov **U.S. Army Corps of Engineers**
Jennifer Gonzalez 916-557-5103
jennifer.l.gonzalez@usace.army.mil

California Dept. of Water Resources/Reclamation Board
Don Strickland 916-653-9515
donalds@water.ca.gov

Sacramento Area Flood Control Agency
Maggie Franklin 916-874-4582
franklinma@saccounty.net

For Release On: December 1, 2005

Public Scoping Meetings Scheduled on Folsom Dam Corrective Action and Flood Damage Reduction Studies

The Bureau of Reclamation (Reclamation), the U.S. Army Corps of Engineers (Corps), California's Reclamation Board, and the Sacramento Area Flood Control Agency are combining efforts on three Federal projects: Reclamation's Folsom Corrective Action Study, and the Corps' Folsom Dam Modifications and Folsom Dam Raise Projects. The Combined Federal Effort will address Reclamation's Dam Safety Program objectives of improving public safety at Folsom Dam and all associated structures, and the Corps' flood damage reduction project which is designed to provide increased flood protection for the Sacramento area.

As part of the Combined Federal Effort, an Environmental Impact Statement/Environmental Impact Report (EIS/EIR) is being prepared, and three public scoping meetings are being held to provide information about a series of possible structural modifications to Folsom Dam, Mormon Island Auxiliary Dam, and Dikes 1 through 8 and to elicit public input. Reclamation and the Corps are currently investigating alternatives to improve public safety related to possible seepage, overtopping, earthquake events and flood damage reduction measures that were identified in previous and ongoing studies.

Engineering, environmental, and economic studies are also being conducted to determine which modifications are the most feasible to improve the structure of the facilities and provide an increased level of flood protection with minimal impacts to the environment. A Notice of Intent was published in the Federal Register on October 6, 2005.

-MORE-

At the public scoping meetings, the public will be provided with information on the series of alternatives currently being studied and will be given the opportunity to provide written comments. Staff from Reclamation, the Corps, and other members of the project team will be on hand to address questions regarding the facility, proposed alternatives, and the impacts of individual alternatives on surrounding areas.

The public meetings will be held on the following dates and locations:

Granite Bay	**Folsom**	**Sacramento**
Monday, December 12, 4 to 6 p.m. Granite Bay Activity Center Granite Bay, CA Enter the Granite Bay Day Use Area off Douglas Blvd. and pick up a map at the entrance booth.	Wednesday, December 14, 5:30 to 8 p.m. Folsom Community Center 52 Natoma Street Folsom, CA 95630	Thursday December 15, 5 to 7 p.m. County Administration Center Board Chamber Foyer 700 H Street Sacramento, CA 95814

Written comments on the scope of the EIS/EIR are due by close of business on Friday, January 13, 2006, to Mr. Shawn Oliver, Natural Resource Specialist, Bureau of Reclamation, Central California Area Office, 7794 Folsom Dam Road, Folsom, CA 95630, fax to 916-989-7208, or e-mail soliver@mp.usbr.gov.

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Public Scoping Meetings Scheduled

Folsom Dam Corrective Action and Flood Damage Reduction Studies

The Bureau of Reclamation (Reclamation), the U.S. Army Corps of Engineers (Corps), California's Reclamation Board, and the Sacramento Area Flood Control Agency are combining efforts on three Federal projects: Reclamation's Folsom Corrective Action Study, and the Corps' Folsom Dam Modifications and Folsom Dam Raise Projects. The Combined Federal Effort will address Reclamation's Dam Safety Program objectives of improving public safety at Folsom Dam and all associated structures, and the Corps' flood damage reduction project that are designed to provide increased flood protection for the Sacramento area.

As part of the Combined Federal Effort, an Environmental Impact Statement/Environmental Impact Report (EIS/EIR) is being prepared, and three public scoping meetings are being held to provide information about a series of possible structural modifications to Folsom Dam, Mormon Island Auxiliary Dam, the left and right wing dams, and Dikes 1 through 8 and to elicit public input. Reclamation and the Corps are currently investigating alternatives to improve public safety related to possible seepage, overtopping, earthquake events and flood damage reduction measures that were identified in previous and ongoing studies.

Engineering, environmental, and economic studies are also being conducted to determine which modifications are the most feasible to improve the structure of the facilities and provide an increased level of flood protection with minimal impacts to the environment. A Notice of Intent was published in the Federal Register on October 6, 2005.

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The public meetings will be held at the following three locations:

Granite Bay

Monday, December 12, 2005
4:00 to 6:00 p.m.
Granite Bay Activity Center
Granite Bay, CA
Coming from Douglas Blvd.
enter at the Granite Bay Day
Use Area entrance booth, and
pick up a map to the Activity Center.

Folsom

Wednesday, December 14, 2005
5:30 to 8:00 p.m.
Folsom Community Center
52 Natoma Street
Folsom CA 95630

Sacramento

Thursday, December 15
5 to 7 p.m.
Board Chamber Foyer
County Administration Center
700 H Street
Sacramento, CA 95814

Can't Attend the Meeting? We welcome your comments by mail. Please send comments by January 13, 2006, to Mr. Shawn Oliver, Natural Resource Specialist, Bureau of Reclamation, Central California Area Office, 7794 Folsom Dam Road, Folsom, CA 95630, fax to 916 989-7208, or e-mail to soliver@mp.usbr.gov.

Appendix B

Meeting Handout and Information Displays

WELCOME

Combined Federal Effort
Environmental Impact Statement/Environmental Impact Report

Welcome to the Scoping Open House for the Folsom Dam Combined Federal Effort Environmental Impact Statement/Environmental Impact Report (EIS/EIR). Representatives from the Bureau of Reclamation, U.S. Army Corps of Engineers, California State Reclamation Board, and Sacramento Area Flood Control Agency are here to listen to your concerns, answer your questions and explain modifications being proposed to Folsom Dam and its related facilities.

The six "Information Stations" are:

- Overview Station
  - ✓ Background of Folsom Dam and the Combined Federal Effort
  - ✓ How Reclamation, U.S. Army Corps of Engineers, California Reclamation Board/Department of Water Resources, and Sacramento Area Flood Control Agency are working to develop a long-term solution

- Roles and Responsibilities Station
  - ✓ Two federal missions, one goal
  - ✓ Other projects happening at Folsom Dam

- EIS/EIR Process Station
  - ✓ Steps during the EIS/EIR process
  - ✓ Timeline for completion
  - ✓ The public's role

- Issues Station
  - ✓ Three issues the Folsom Combined Federal Effort will address
  - ✓ Draft alternatives being suggested for further study

- Impacts Station
  - ✓ Potential impacts in the Folsom area
  - ✓ Impacts at the Reservoir

- Feedback Station
  - ✓ Provide your written comments, questions and concerns
  - ✓ Place in comment boxes at the meeting
  - ✓ Mail comments to Shawn Oliver, Bureau of Reclamation, Central California Area Office, 7794 Folsom Dam Road, Folsom, Ca 95630
  - ✓ E-mail comments to: soliver@mp.usbr.gov
  - ✓ Fax comments to: (916) 989-7208
  - ✓ All comments are due by close of business, **January 13, 2006**

Thank you for joining us this evening. We appreciate your input.

Monday	Wednesday	Thursday
December 12, 2005	December 14, 2005	December 15, 2005

US Army Corps of Engineers®
Sacramento District

SAFCA

WELCOME

TO THE COMBINED FEDERAL EFFORT
TO IMPROVE FLOOD CONTROL AND SAFETY OF THE FOLSOM FACILITIES

Environmental Impact Statement/Environmental Impact Report (EIS/EIR)

US Army Corps of Engineers®
Sacramento District

The Reclamation Board — State of California

SAFCA

U.S. Department of the Interior — Bureau of Reclamation

ISSUES

Combined Federal Effort
Environmental Impact Statement/Environmental Impact Report

To insure the highest levels of public safety protection, Folsom Dam and associated structures must be strong enough to withstand the various types of forces and stresses created by a significant earthquake, storm or seepage event. The forces which may act upon the Dam are described in technical terms. As Californians, we are familiar with the SEISMIC forces which can impact the dam during an earthquake. From a HYDROLOGIC standpoint, dams must be able to safely pass the largest inflow considered probable, without the water eroding or otherwise failing the dam. STATIC refers to the very remote possibility of water slowly seeping through the earthen embankments. If undetected this seepage could weaken the structure.

The combined Federal effort is the investigating action to address these issues. The Study Team will evaluate various remedies for each concern in the Draft EIS/EIR and group the preferred solutions into one package for review in the Final EIS/EIR.

HYDROLOGIC

A number of design combination options are under consideration to address hydrologic issues including a dam raise, an auxiliary spillway, modifications of the existing outlets or a tunnel. Examples of design options include:

CONSTRUCT AUXILIARY SPILLWAY. An Auxiliary Spillway is proposed to be constructed on the left abutment of the Main Folsom Dam. Construction would require the excavation and removal of significant quantities of earthen material and placement of concrete erosion protection surfaces and retaining walls.

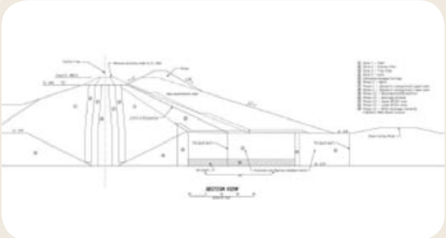
RAISE DESIGN. This alternative option would raise all retention facilities including earthen and concrete structures. Earthen structures would be raised to a yet to be determined additional height. Options include, but are not limited to, structure walls placed along the crest, retention walls along the crest, raise of entire embankments from downstream toe to new crest height, and concrete parapet type walls atop concrete structure.

SEISMIC

A number of design combination options are under consideration to address seismic issues including a downstream overlay, jet grouting and/or replace the foundation at MIAD and installation of tendons and/or shear keys at the concrete dam. Examples of design options include:

REINFORCEMENT OF THE MAIN FOLSOM DAM (Concrete Section of Folsom Dam) Modifications may be made to increase the stability of the main dam. Alternatives include, but are not limited to, reinforcement of pier and gate structures as well as increasing shear resistance of foundation and lift lines by caissons or cable tie down alternatives and/or additional concrete placement.

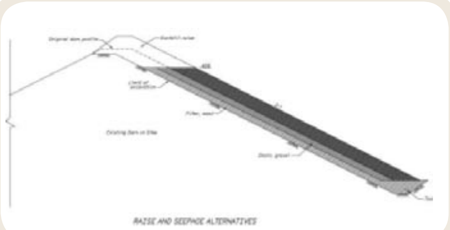
STABILIZATION OF MORMON ISLAND AUXILIARY DAM (MIAD). MIAD is founded upon potentially liquefiable materials. Modification alternatives may include, but are not limited to, excavation and replacement of the foundation materials in question or stabilization of materials with jet grouting, shear walls, dewatering and overlay alternatives.



STATIC

A number of design combination options are under consideration to address static issues including installation of filter and drain elements to prevent material movement should a internal leak develop and go undetected

FILTERS AND DRAINS. Modifications may include the installation of additional filter(s), drains and protection zone(s) on multiple earthen structures including the dikes, wing dams, and MIAD. This alternative may require placement of earthen or human-made materials within or on the upstream or downstream face of embankments.



IMPACTS

Combined Federal Effort
Environmental Impact Statement/Environmental Impact Report

POTENTIAL IMPACTS IN THE FOLSOM AREA

- Biological Resources
- Traffic Congestion
- Air Quality, including dust
- Noise
- Visual aesthetics
- Impacts to the local community
- Recreation
- Cultural Resources
- Other potential issues identified during scoping

IMPACTS AT THE RESERVOIR

- Cultural Resources
- Biological Resources
- Air Quality
- Traffic (Haul Trucks)
- Aesthetics
- Socioeconomic
- Recreation
- Noise

The EIS/EIR will analyze local, downstream and cumulative impacts of the alternatives under review. This will include impacts related to any construction activities around Reclamation facilities, which include the Folsom Dam and all of the associated structures.

OVERVIEW

Combined Federal Effort
Environmental Impact Statement/Environmental Impact Report

Built in 1955, Folsom Dam is one of the principal reservoirs of the Bureau of Reclamation's (Reclamation) Central Valley Project, and is an integral part of California's water delivery, power and flood control system. Folsom Dam provides drinking water for more than 200,000 people, irrigation water for more than 7,000 acres of farmlands, flood control for the growing Sacramento metropolitan area, and a recreation resource for millions of Californians.

COMBINED FEDERAL EFFORT – PROVIDING FOR THE LONG-TERM SAFETY OF FOLSOM DAM

The combined Federal effort will address Reclamation's Dam Safety Program objectives of improving public safety at Folsom Dam and all associated structures, and the US Army Corps of Engineers (Corps), SAFCA, and The Reclamation Board's flood damage reduction projects that are designed to provide increased flood protection for the Sacramento area.

Reclamation and the Corps are committed to the safe design and operation of their facilities. Folsom Dam was built using the best engineering of the mid 20th century. Since then, the understanding of dam construction has progressed, and it is clear that while still safe, Folsom Dam and the associated structures are in need of a thorough assessment and rehabilitation.

This is due in part to the large increase in population immediately below the dam, since it was constructed.

ASSESSING THE IMPACTS

An Environmental Impact Statement/Environmental Impact Report (EIS/EIR) will be prepared to assess the potential impacts of any modifications made to the structures or to how Folsom Dam is operated as a result of the alternatives identified by the CAS and various Corps environmental documents. In the EIS/EIR, the issues and alternatives will include:

Proposed modifications to Folsom Dam will address issues associated with:

- **Hydrologic - Major Flood Events**
- **Seismic - Earthquakes**
- **Static - Seepage and Piping through embankments**

Modifications associated with flood control operations, seismic and static alternatives include, but are not limited to:

- **Embankment Raise Options**
- **Auxiliary Spillway Options**
- **Tunnel Options**
- **Mormon Island Auxiliary Dam Seismic Alternatives**
- **Concrete Dam Seismic Options**
- **Folsom Dam and Embankment Static Alternatives**
- **Enlarge / Add outlets to the Dam**

ROLES & RESPONSIBILITIES

Combined Federal Effort
Environmental Impact Statement/Environmental Impact Report

Since 1955, the Bureau of Reclamation (Reclamation) and the U.S. Army Corps of Engineers (Corps) have been working together to ensure the safe maintenance and operation of Folsom Dam. This collaboration has provided 50 years of protection for people and businesses downstream, in addition to providing power and a reliable water supply.

Both agencies are also continuously seeking to improve the structural integrity of the facility, and operate the dam more efficiently to accomplish the missions of both Reclamation and the Corps.

PROJECTS AT FOLSOM DAM AND DOWNSTREAM

Reclamation and the Corps, other agencies and regional stakeholders, are also working together to insure consideration of other projects in the vicinity of Folsom Dam. Current projects include:

- Folsom Bridge Project
- Levee Improvements on the American River downstream of Folsom Dam
- Forecast Based Operations Feasibility Study – to release water earlier, in advance of incoming storms

PROTECTING THE REGION FROM FLOODS

The Corps, partnering with the State Reclamation Board and the Sacramento Area Flood Control Agency (SAFCA), has a mission to increase flood protection to the Sacramento region. The Corps coordinates flood storage at Folsom Dam in combination with levees along the American River, as well as flood management on the Sacramento River system to reduce the risk of flooding.

IMPROVING THE STRUCTURAL INTEGRITY OF FOLSOM DAM

Reclamation is responsible for the safety and structural integrity of Folsom Dam. Reclamation knows the potential structural hazards that can impact a large concrete dam in a seismically active region of California. Reclamation is actively assessing structural improvements for the three safety issues in its Corrective Action Study (CAS): hydrologic, static, and seismic issues present challenges for Folsom Dam and its associated facilities.

Both Reclamation and the Corps are now pooling their resources to make the Corrective Action Study a reality. They will be working closely with other regional stakeholders and the public to identify the best remedy for each of the three safety issues in the CAS.

EIS/EIR PROCESS

Combined Federal Effort
Environmental Impact Statement/Environmental Impact Report

The National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) processes both provide an opportunity for the public and concerned agencies to help clearly identify and define environmental issues and alternatives to be examined for a proposed action. The NEPA/CEQA process is intended to help public officials make decisions and take corrective actions based on an understanding of the environmental consequences.

October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January
	Purpose & Need	Scoping Meeting	Alternatives	Impact Analysis						Draft EIS/EIR			Final EIS/EIR	Public Review	Record of Decision
Notice of Intent		Notice of Preparation								Public Review Hearing					Notice of Decision
05			06												07

HOW IS THE PUBLIC INVOLVED?

The Combined Federal Effort is seeking public comment early in the EIS/EIR process and at critical milestones throughout the EIS/EIR process.

SCOPING

This is one of three open houses by the Corps, Reclamation, The Reclamation Board and SAFCA to present their combined efforts: Reclamation's Folsom Dam Corrective Action Study, Corps Folsom Dam Modifications and Folsom Dam Raise Projects.

The purpose of the scoping phase is to define the issues that will be studied during the EIS/EIR process. You are invited to provide input on issues relevant to defining the range of alternatives and analyzing environmental impacts. Scoping comments can be provided in person, by mail, or by e-mail or fax, and are due by close of business, January 13, 2006.

PUBLIC REVIEW AND COMMENT ON THE DRAFT EIS/EIR

The general public and state and federal agencies will have an opportunity to review and comment on the Draft EIS/EIR, which will be distributed at the beginning of a 60-day comment period when the Draft EIS/EIR is finished in late 2006. A public hearing will also be held during the review phase to officially record oral comments regarding the Draft EIS/EIR. Public comments received during this phase will be addressed in the Final EIS/EIR.

PUBLIC REVIEW OF FINAL EIS/EIR

Once the Final EIS/EIR is prepared, it is released to the public for a final 30-day review before Reclamation prepares and adopts the decision. The Record of Decision (ROD) will summarize and address any outstanding comments that are relevant to the Final EIS/EIR.

WHAT IS THE ROD?

The ROD will document the alternative selected by the Corps, Reclamation, The Reclamation Board and SAFCA.

The ROD will identify all of the alternatives considered and the environmental, economic, and any essential considerations of national security in reaching the decision.

The ROD will include the consideration of measures made to avoid or minimize effects from the selected alternative.

A Notice of Determination (NOD) will complete the CEQA process for California.

The ROD is the final step in the EIS/EIR process.

Appendix C

Written Comments

USBR CCAO (FOLSOM)
OFFICIAL FILE COPY
RECEIVED
DEC 14 2005

CODE	ACTION	INITIALS & DATE
400		
411		

Dec. 13, 2005

Dear Mr. Oliver,

In regard to the Environmental Impact Statement/Environmental Impact Report:

We would like to have some knowledge on how this will effect the TACANA DRive residential area? Will the Modifications be announced to the home owners?

All information regarding this important matter will greatly be appreciated.

Thank You,

Sincerely,

[signature]

208 TACANA DR.
Folsom, Ca. 95630

Pinebrook
VILLAGE

7900 Folsom-Auburn Road
Folsom, California 95630
(916) 988-6636

USBR-CCAO (FOLSOM)
OFFICIAL FILE COPY
RECEIVED
DEC 14 2005

CODE	ACTION	INITIALS & DATE
400		
411		

December 9, 2005

Shawn Oliver, Natural Resources Specialist
Bureau of Reclamation
7794 Folsom-Auburn Road
Folsom, CA 95630

Dear Mr. Oliver,

As you perhaps know Pinebrook Village is the manufactured home park that is just north of the Bureau office. Unfortunately, it will be impossible to attend the scheduled meetings relating to raising the height of the Folsom Dam.

We would appreciate having you forward the prepared material that you may have on this proposal to us. It could be mailed to 8022 Folsom-Auburn Road or a packet dropped off, whichever is easier for you.

We do have a concern relating to the proposed additional seven feet on the Dam. Because we are directly downhill from the wing dam we currently have an extremely high water table. Additional ground water would materially impact the 336 homes that do not have a typical cement foundation. The customary foundation system is a series of piers. This puts a tremendous amount of weight on a very limited ground area. Additional moisture could materially impact maintaining a level structure. This, of course, is a vital necessity for every home.

We are fully aware of the continuing problems with the wing dams on the south side of the lake, specifically Dyke 8, I believe. Wetlands such as those created across the Empire Ranch area would be a disaster for our fully developed area of affordable homes for seniors.

We always have and continue to believe that the best solution to provide flood protection for the Sacramento area is the construction of the originally planned Auburn Dam. Both flood protection and the additional water storage is sorely needed throughout the area. I don't recall whether additional power production was planned, but this, too, would a big plus in these days of blackouts.

Please give the potential moisture production the attention it merits.

Sincerely,

Neva J. Cimaroli

Neva J. Cimaroli
General Partner

COMMENT CARD

Combined Federal Effort
Environmental Impact Statement/Environmental Impact Report

The public is invited to provide comment on the combined Federal effort: Reclamation's Folsom Dam Corrective Action Study, and The Army Corp of Engineers Folsom Dam modifications and Folsom Dam Raise Projects. (See (2) below)

Mail your comment to:

Shawn Oliver,
Bureau of Reclamation
7794 Folsom Dam Road
Folsom, CA 95630
Email: soliver@mp.usbr.gov

Comment period ends on January 13, 2006.

DATE: 12/12/2005

NAME: Mike Schaefer

ADDRESS: 7050 Walnut Ave
Orangevale, CA 95662

TELEPHONE:

E-MAIL: (1) Note: This refers to the recent request from Congress to review Auburn Dam.

COMMENT: From discussions with the BR staff, it appears the study authorizes review of the "Auburn - Folsom So Unit" which includes Sugar Pine Res & Folsom - South Canal. I hope the review will spend 99% of $ & time on Auburn Dam & Reservoir. There is no time for much field work so the Auburn review will be mainly reviewing the existing studies dating from 1955 when the Auburn Dam Committee was formed to 1980 when the sec of Interior announced that a safe dam could be built at Auburn. Since the USCE only reviewed USBR stack of studies to formulate their "dry dam" proposals of early 1990s, which were turned down by Congress because of lack of consensus & support from the Sacramento Regional area, the majority of information to be reviewed is in the BR's archives. And it will take a lot of research of all the material to see what is pertinent. There are still BR retirees available to help ~~direct~~ the present BR staff to the most important studies etc. to help in this review. I suggest you contact: John Turner, Rod Somerday, Wendel Carlson, Larry Boll, Mike Catino & Jim Talley and search their minds for the best places to start your "Review" of existing studies.

(2) Referring to the USCE's Folsom Dam modification and increasing flow in the Am R, this solution is very risky and should not be taken above a large metropolitan area like Sacramento. Although authorized, the Corps didn't even have time to conduct a feasibility study to determine adequately the design & construction problems nor the true cost. Don't continue the nonsense of modifying a 50 year old concrete dam.

THANK YOU FOR YOUR PARTICIPATION

US Army Corps of Engineers®
Sacramento District

SAFCA

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

COMMENT CARD

Combined Federal Effort
Environmental Impact Statement/Environmental Impact Report

The public is invited to provide comment on the combined Federal effort: Reclamation's Folsom Dam Corrective Action Study, and The Army Corp of Engineers Folsom Dam modifications and Folsom Dam Raise Projects.

Mail your comment to:

Shawn Oliver,
Bureau of Reclamation
7794 Folsom Dam Road
Folsom, CA 95630
Email: soliver@mp.usbr.gov

Comment period ends on January 13, 2006.

DATE: JAN 3, 2006

NAME: DAVID E. SANDERS

ADDRESS: 7620 HALEY DR.
GRANITE BAY, CA 95746

TELEPHONE: 916-791-1095

E-MAIL: dsanders@surewest.net

COMMENT: I LIVE IN HIDDEN CREEK ESTATES, A SUBDIVISION WHICH ADJOINS FOLSOM LAKE STATE PARK, NEAR THE LAUNCH RAMPS IN GRANITE BAY. I BELIEVE THAT MY PROPERTY IS NOT NOW PROTECTED FROM FLOODING FROM FOLSOM LAKE BY THE EXISTING DYKES AND LEVEES, BUT INSTEAD IS PROTECTED BY THE NATURAL RISE OF THE LAND IN THE PARK AND IN OUR SUBDIVISION. THE PROPOSAL TO RAISE THE LAKE LEVEL (AND DAM) BY 7 FEET, HOWEVER, WILL REQUIRE RAISING THE DYKES AND EXTENDING THEM, SO THAT MY PROPERTY WILL THEN BY BEHIND THE EXTENDED LEVEE AND DEPENDENT ON THE INTEGRITY OF THE LEVEE FOR FLOOD PROTECTION. I BOUGHT MY PROPERTY IN GRANITE BAY IN 1985 IN PART BECAUSE I DID NOT WANT TO BE DEPENDENT ON A LEVEE FOR FLOOD PROTECTION.

I BELIEVE WE ALREADY HAVE TOO MANY PEOPLE LIVING BEHIND LEVEES AND DEPENDENT ON THEM FOR FLOOD PROTECTION. YOUR PROPOSAL TO RAISE THE LAKE LEVEL WILL MAKE MATTERS WORSE NOT BETTER. DON'T PUT MORE OF US BEHIND POTENTIALLY VULNERABLE LEVEES!

THANK YOU FOR YOUR PARTICIPATION

US Army Corps of Engineers ®
Sacramento District

SAFCA

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Gold Fields District
7806 Folsom Auburn Road
Folsom, CA 95630

January 19, 2006

Michael Finnegan, Area Manager
U.S. Bureau of Reclamation
Central California Area Office
7794 Folsom Dam Road
Folsom, CA 95630

Re: Folsom Dam Corrective Action Study

This letter is to express the concerns and recommendations of the California Department of Parks and Recreation (DPR) regarding the new combined federal Folsom Corrective Action Study that will look at options to improve dam safety and flood protection at Folsom Dam and Reservoir. It is our understanding that the flood protection elements of this new study are essentially a continuation of the work that the Army Corps of Engineers and other agency partners completed in the American River Watershed Long Term Study. The Long Term Study led to a decision to raise Folsom Dam and the associated dikes seven feet to provide additional flood protection for the Sacramento region. DPR understands that this new study will take another look at various dam raise options in addition to looking at the creation of a new spillway and other means to pass water downstream in flood events and alternatives to strengthen the dams and dikes from seismic events and seepage.

DPR is supportive of the twin goals of this project, improving public safety relative to the dams and dikes and providing additional flood protection for the region. DPR is also supportive of the two lead federal agencies, the Bureau of Reclamation and the Army Corps of Engineers, working together on a single project as there are many areas of overlap in the two primary project goals. A combined effort will be more efficient for the lead agencies and for agencies such as DPR which will necessarily be involved and affected by the project. This combined approach will also avoid unnecessary redundant and cumulative impacts.

As this new study is in the scoping phase and specific alternatives have not yet been presented to DPR or the public, our comments are general in nature regarding the range of concerns we might have with the project given the information currently available. Please see the enclosed Attachment 1 to this letter which provides specific information on our concerns regarding the new combined Corrective Action Study.

If you have any further questions regarding this matter, please contact either myself or Folsom Sector Superintendent Michael Gross at (916) 988-0205 or the Gold Fields District Planner Jim Micheaels at (916) 988-0513. Thank you.

Sincerely,

Scott Nakaji
Gold Fields District Superintendent

CC Colonel Ronald N. Light, District Engineer, U.S. Army Corps of Engineers, Sacramento District
Stein Buer, Sacramento Area Flood Control Agency
Shawn Oliver, U.S. Bureau of Reclamation, Central CA Area Office

Attachment 1

Department of Parks and Recreation Comments on Scoping for the Folsom Dam Corrective Action Study

It is the understanding of DPR that the new dam safety modifications and flood protection measures study will look at alternatives that would create a new spillway on the south side of the main dam, options to re-build or strengthen all of the earthen dikes and dams (adding material and increasing the effective width of these structures) and various options to raise the height of all of the dams and dikes.

Ecosystem Restoration

The flood protection elements of this new Folsom Dam Corrective Actions Study are a continuation of the American River Watershed Long Term Study, which resulted in a decision to raise Folsom Dam seven feet. DPR understands that the dam raise will be looked at again as part of this new study and options for no raise or a lower raise will also be considered. Portions of the Long Term Study are moving ahead of the dam raise. This includes the new Folsom Dam Bridge and the ecosystem restoration alternatives. These ecosystem restoration alternatives included the purchase and restoration of riparian and floodplain lands in the Lower American River downstream of Nimbus Dam. Specific areas include Urrutia (251 acres), Woodlake (283 acres), Bushy Lake (337 acres) and Arden Bar (280 acres). It is our understanding that in the Long Term Study more than $8 million were committed to several of these ecosystem restoration alternatives. It should be noted that in the long term study, the lead agencies did not propose purchase of any lands upstream of the dams and dikes to mitigate impacts and loses resulting from project construction and operation.

These ecosystem restoration alternatives in the Long Term Study, while perhaps worthy projects in their own right, are located downstream in areas that will also benefit from the primary purpose of the project, flood control. Whereas the areas upstream of the dams and dikes, which do not benefit directly from the flood control measures, will incur most of the project impacts, through construction and operation. These upstream areas include much of Folsom Lake SRA and the 1.5 million visitors that use the area annually.

In this new study, DPR hopes the lead agencies find ways to rectify this inequity in the Long Term Study and include restoration and mitigation actions that will benefit the areas upstream of the dams and dikes which will incur most of the project impacts.

Temporary Construction Impacts to Existing Facilities

Recreation Facilities and Visitor Use

Construction of the various alternatives including dam safety actions and dam raise options have the potential to substantially impact visitor use and recreation facilities at the largest and most heavily used recreation facilities at Folsom Lake including Granite Bay, Beal's Point and Folsom Point. These use areas include campgrounds, picnic areas, boat launching facilities (ramps and parking) and swim beaches. These three areas alone attract about half of all the visitors to Folsom Lake SRA annually or approximately 750,000 users annually and are typically filled to capacity on peak use summer weekends.

Impacts would result from adding huge amounts of rock, sand and soil to strengthen and raise the dams and dikes. The need for staging areas and circulation for large numbers of heavy equipment and construction supplies and material could significantly disrupt or close substantial portions of these use areas during construction.

The trail system around Folsom Lake utilizes the top of most of the dikes, including dikes 2, 4, 5, 6 and Mormon Island Dam. These trails are heavily used by a variety of trail users. The construction work would prevent use of these trails and displace trails users including pedestrians, equestrians and bicyclists. Additionally, improvements to Dikes 1 and 3 would impact the main access road into the north Granite Bay area.

Folsom Lake SRA is a popular venue for a wide variety of special events. Special events occur on the Lake, trails and use areas at Granite Bay, Beal's Point and Folsom Point nearly every weekend. These events include fishing tournaments, water skiing/wake boarding events, sailing events, aquatic craft demonstration days, running/walking races, equestrian events, mountain bike races, family and company/organization picnics and gatherings.

DPR expectation is that our facilities will be made whole when construction is complete and that alternate trail and road routes will be developed for public use during construction periods.

Fiscal Impacts: User Fees and Concessionaires

The construction impacts will negatively impact visitor use at major recreation use areas and as a result lower the revenues that DPR collects from user fees which ultimately impacts the amount of funding the District receives to operate and maintain Folsom Lake SRA. Each year State Park units are given revenue goals they are to meet through collection of user fees. If annual revenues goals are met, a portion of these revenues can be returned to the unit for maintenance and operation purposes. During the recent State fiscal crisis user fees have been raised, as have revenue goals and the importance of users fees to the fiscal health of the State Park System has increased. The construction of the dam safety and dam raise features of the Corrective Actions Project have the potential to significantly impact the revenues the State receives from user fees and potentially the amount of funding the District receives for managing Folsom Lake SRA. The impact on user fees collected could be many millions of dollars over the length of the project.

The construction activities will also likely impact the concessionaires that operate at Granite Bay and Beal's Point including boat rental operators, beach equipment rentals and food concessions. The adverse impacts on the concession operators will also result in reduced revenue to State Parks from the fees paid by these concessionaires. DPR expects that the project lead agencies will fully compensate DPR and our concessionaires for losses in revenues resulting from the project construction.

Folsom Lake SRA is an important amenity and attraction for the region. The visitor use and special events that occur within the SRA generate substantial economic activity for the City of Folsom and the region.

Borrow Site Locations and Impacts

The dam safety/flood control work will require large amounts (millions of cubic yards potentially) of rock, sand and other material. Over the course of the Corp's American River Watershed Long Term Study and Reclamation's Dam Safety studies many potential borrow site locations have been identified and assessed. DPR's understanding is that currently both agencies are focusing on obtaining borrow material from areas primarily below the high pool level (466') of Folsom reservoir on the upstream side of the Folsom Dam and dikes. DPR supports this approach, which will have much less impact than taking borrow material from upland areas (either upstream or downstream of the dams and dikes).

In fact taking borrow material from areas below the high pool level has the potential to enhance aquatic recreation at Folsom Lake SRA. Reclamation and DPR are currently completing a joint General Plan/Resource Management Plan for Folsom Lake State Recreation Area. Two of the key findings of this planning effort are the demand for additional marina capacity and the need to enhance boating access at Lake levels below 420' elevation. Borrow material excavation at Browns Ravine could lower the basin of the marina and preclude the need to remove boats moored at the slips during periods of low water. Excavation of areas near the Folsom Point boat ramp could extend and lower this ramp providing boating access at lower Lake levels. On the east side of Folsom Point, borrow material excavation could help create a new swim beach area if accomplished appropriately. At Beal's Point excavation of borrow material on the north side of the Point could increase the grade of the beach area and improve access to the water during periods of low water. Excavation on the south side of Beal's Point could improve water access for personal water craft and other small craft that access the Lake from this location during certain times of the year. Borrow excavations in the Granite Bay area, if in the correct locations and accomplished appropriately, could enhance beach access at Granite Bay Beach and improve boat launching facilities by extending ramps and deepening channels.

DPR is interested in continuing to work closely with staff from Reclamation and the Corps as more information is developed regarding potential borrow site locations. As indicated above, there is the potential to create benefits for aquatic recreation if this borrow excavation is accomplished in specific locations and in a manner that enhances water access. Designing borrow operations to achieve multiple benefits will require coordination and planning and DPR believes the potential benefits to recreation are too great not to make this effort.

DPR requests the lead agencies include the construction of recreation improvements, such as extending boat ramps, constructing a new breakwater at the marina and completing the development of swim beaches as part of the project. DPR would like to work with the lead agencies in identifying specific improvements that would be part of the mitigation for impacts to recreation facilities and use within Folsom Lake SRA. If borrow site excavations occur in upland areas DPR expects that the lead agencies will fully restore these areas as part of this project.

Natural and Cultural Resource Impacts

The construction activities associated with the various options to provide for dam safety and flood control have the potential to impact natural resources including native plant communities, native habitat and wildlife. DPR is particularly concerned about communities and species which are particularly sensitive or under protected, such as riparian areas, wetlands (vernal pools) and blue oak woodlands. DPR expects the lead agencies will seek to avoid or minimize impacts to natural resources where possible and to fully mitigate any unavoidable impacts to these resources.

The excavation of borrow material and other construction activities have the potential to impact cultural resources. There are many cultural sites, both historic and pre-historic above and below the high water mark of Folsom Reservoir. While sites below the high pool level are inundated at high water they still have the potential to yield valuable information during periods of low water. DPR requests that the lead agencies conduct a thorough study of cultural resources and minimize impacts that may result in impacts to potentially significant cultural sites and mitigate any unavoidable impacts.

Permanent Construction Impacts

Recreation Facilities and Visitor Use

It is DPR's understanding that the dam safety and dam raise modifications of the dams and dikes will increase the width of these structures, perhaps as much as 100 feet at the toe of the slope of some of the dikes. This increased footprint for these structures may permanently displace or impact recreation facilities and use at some locations around Folsom Lake. This could include the paved bike path to Beal's Point and other trails, the family and RV campgrounds at Beal's Point, and perhaps picnic areas at Folsom Point.

DPR expectation is that the lead agencies for this project will replace any recreation facilities displaced or impacted as a result of improvements to the dikes and dams. DPR would like to work with Reclamation and the Corps in identifying which facilities may be impacted and planning the location of replacement facilities if needed

Natural and Cultural Resources
Increasing the footprint of the dams and dikes for dam safety or flood control purposes may result in the permanent loss of upland habitat within Folsom Lake SRA. To the extent that the project permanently impacts upland habitats and plant communities, DPR requests that the lead agencies purchase additional land with the lost habitat types, preferably contiguous to Folsom Lake SRA, as a mitigation measure for the lost acreage. Generally DPR does not support converting one habitat type (e.g. upland areas) to another (e.g. wetlands) as a mitigation measure. Such a strategy presumes there is no value in the existing upland habitat. If necessary, DPR can assist the lead agencies in identifying appropriate parcels for mitigation of permanently lost habitat within the SRA.

Observation Point – Future Use
Observation Point, the parking area and vista point on the southeastern side of the main dam has been closed since the Dam Road closure. It is our understanding that this area is the proposed location of the spillway. This point has the most commanding view of the Lake and surrounding landscape of any within the SRA. Many options regarding the use of this location have been suggested in the past, including some which would take advantage of the spectacular view, such as a visitor center or multi-purpose activity center. DPR is supportive of increasing the flood protection for the Sacramento region, including construction of a new spillway if that is a cost effective means, however the lead agencies should recognize that other potential uses of this unique location will be foregone with the creation of the spillway.

Operational Impacts to Existing Facilities

Dam Raise and Potential Inundation of Recreation Facilities
Any raise of Folsom Dam for flood control purposes and subsequent reservoir operations utilizing the additional surcharge space, have the potential to impact recreation facilities at Folsom Lake SRA. The recreation facilities around Folsom Lake have been developed by DPR with the full knowledge and consent of Reclamation over the course of fifty years. Presumably recreation planners assumed that 466' was the effective high pool for the reservoir and developed

facilities accordingly. As a result many of the recreation facilities around Folsom Lake are located between elevations 466' and 474' elevation.

To the extent that the operation of the reservoir at higher Lake levels (above 466') results in impacts to recreational facilities, DPR expects the lead agencies will fully mitigate thee impacts to these facilities. This may include the need to move selected facilities, to "flood proof" other facilities and to develop a plan and funding source for the clean-up and repair of facilities following an inundation.

Natural and Cultural Resources

A raise of Folsom Dam for flood control purposes and subsequent reservoir operations utilizing the additional surcharge space, also have the potential to impact natural and cultural resources within Folsom Lake SRA. Periodic flooding of existing upland areas and plant communities could adversely impact these resources. DPR expects that the impacts to natural and cultural resources from the operation of the dam safety/flood protection project will be fully mitigated.

Visual Resources

The periodic inundation of existing upland areas could also result in a ring of dead or impacted vegetation that will result in a visual impact to the SRA and park visitors. Acquiring additional land adjacent to the reservoir could be one means to mitigate for the visual impacts and losses to vegetation and habitat as a result of project operations.

>>> <cbriseno@comcast.net> 1/10/2006 8:18:50 PM >>>
Dear Mr. Shawn Oliver:

I phoned the Bureau of Reclamation the week of December 27, 2005. I was told someone with knowledge about the scope/process of the FolsomDam Corrective Action and Floor Damage Reduction Studies would return my phone call on January 3, 2006. As of today, January 11, 2006, no one from your organization returned my call.

In fact, over a year ago, I attended a public workshop and added my name and email address to the mailing list. I believe The Hoyt Consulting Group was the consultant hired by your organization, the City or the Army Corps of Engineers. I don't know what happened to that mailing list, but I've never received any emails about the project.

I did receive your mailing about the Public Scoping Meeting. Unfortunately, I was unable to attend the December Public Scoping Meetings to obtain information on which to more appropriately comment on. However, to meet the January 13, 2006 deadline, I've compiled my questions as well as comments below. Please provide me with additional information answering my questions and addressing my comments.

1. What are the processes, next steps and timeline? Has an EIS/EIR been completed? If so, where could I access it? I am unclear if constituents are being asked to comment on the scoping of the EIS/EIR, which has not yet been completed, or on a completed document, which is not provided or referenced.

2. I am concerned what the primary purpose and need of the project is. Is it to correct and improve public safety at the Folsom Dam and all associated structures and increase flood protection for the Sacramento region? If so, what is the relationship of the Dam/public safety and flood protection to transportation. Why is the Bureau of Reclamation and the Corps of Engineers deciding the future of local and regional transportation issues. As a resident of the City of Folsom, I am concerned that the Bureau of Reclamation and Corps of Engineers' priorities and funding limitations will drive the decision of how to approach transportation solutions for the City and region.

3. Are there sufficient funds and are the project sponsors willing to mitigate the impacts of the project? Have the impacts of the project been disclosed? If so, where? If not, when and how can the public access/comment on them? I am concerned about the project sponsor's ability to effectively mitigate additional impacts (noise, light, changes to the landscape, deterioration of water, etc.). For example, the noise level of roads around the Folsom Dam already exceed state/local standards.

Please confirm receipt of this email and acknowledge when you will answer my questions. I'd also like to know in what format you accept comments because I need information in order to provide written comments by January 13, 2006.

Thank you in advance. I look forward to additional information.

Coco Briseno

(916) 985-4732 home
cbriseno@comcast.net email

-----Original Message-----
From: Shawn Oliver [mailto:SOLIVER@mp.usbr.gov]
Sent: Monday, February 06, 2006 3:59 PM
To: Wondolleck, John
Subject: Public Meeting Comments

Shawn E. Oliver
Natural Resource Specialist
Bureau of Reclamation
Central California Area Office (Folsom)
Email soliver@mp.usbr.gov
Office (916) 989-7256
Fax (916) 989-7208

>>> "Stan Trumbull" <strum@medsoftware.com> 12/15/2005 8:55:45 AM >>>
Thank you for hosting the meeting held at the Folsom Community Center, December 14.

My wife and I attended. We were pleased with the format of the meeting. I feel we gain a much better understanding of the issues and the confusing nature of this project. The staff members present were very helpful and seemed happy to answer questions.

We like this format much better than a solo speaker trying to cover the
subject.

Now as to our impression. We are very disappointed in the overall status of the project. We are concerned about safety and flood issues.
But our biggest concern is the mess created by closing of the dam road.
It has significantly changed our lives. Going through Folsom is a nightmare. We typically have to go through Folsom 1-3 times per day. But that is something I am sure you have heard before.

When we asked about opening the dam road the only response we got from a
BR person was that it was Folsom's problem or responsibility. That shows a disregard for the real decision maker, BR. It is obvious to us
that BR wanted to close the dam road for years and the security thing was a convienient excuse. I believe other dams roads have been reopened
and I don't understand why the Folsom road has not.

Putting the entire burden on Folsom is not only unfair but it almost assures that the dam road won't be opened. It is a classic case of pointing the finger of responsibility at someone else. I strongly feel
the BR is totally responsible for the dam road and is totally

responsible for the mess created by closing the dam road.

That coupled with no idea when the bridge will be done or even started for that matter, gives us a feeling of total dispair. This is because of the tie in to what ever the dam project will turn out to be has an impact on the bridge.

So we see no hope. Only more delays.

STAN Trumbull
Granite Bay 916.797.2353

Appendix B
Federal Biological Compliance

USFWS Coordination Act Report

United States Department of the Interior

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

In reply refer to:
Folsom Dam Safety and Flood Damage Reduction Project

NOV 2 2006

Memorandum

To: Regional Director, U.S. Bureau of Reclamation, Sacramento, California

Michael B. Hoover

From: Acting Field Supervisor, Sacramento Fish and Wildlife Office, Sacramento, California

Subject: Draft Fish and Wildlife Coordination Act Report for the Folsom Dam Safety and Flood Damage Reduction Project

This memorandum transmits the Fish and Wildlife Service's Draft Fish and Wildlife Coordination Act Report for the Folsom Dam Safety and Flood Damage Reduction project. This report is prepared under the authority of, and in accordance with, the provisions of section 2(b) of the Fish and Wildlife Coordination Act (48 stat. 401, as amended: 16 U.S. C. 661 et seq.).

The report assesses potential project effects on fish and wildlife resources and provides our preliminary recommendations to avoid, minimize, rectify or compensate for potential adverse effects. The report is primarily based on the Service's review of the September 2006, Folsom Dam Safety and Flood Damage Reduction Draft III- Environmental Impact Statement /Environmental Impact Report. This report is being submitted to the California Department of Fish and Game, National Marine Fisheries Service and the U.S. Army Corps of Engineers for review and comment. Details of the project's effects on federally listed species, pursuant to section 7 of the Endangered Species Act of 1973, as amended, are being addressed separately.

If you have any questions regarding this report, please contact Stephanie Rickabaugh at (916) 414-6724.

Attachments

cc:
Mike Finnegan, USBR, Folsom, California
Rosemary Stefani, USBR, Sacramento, California
Shawn Oliver, USBR, Folsom, California
Becky Victorine, USCOE, Sacramento, California (without attachments)
Bruce Oppenheim, NOAA Fisheries, Sacramento, California (without attachments)
Kent Smith, CDFG, Region 2, Rancho Cordova, California (without attachments)

DRAFT

FISH AND WILDLIFE COORDINATION ACT REPORT

FOLSOM DAM SAFETY AND FLOOD DAMAGE REDUCTION PROJECT

PREPARED BY:
SACRAMENTO FISH AND WILDLIFE OFFICE
FISH & WILDLIFE SERVICE
SACRAMENTO, CALIFORNIA

NOVEMBER 2006

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FOLSOM DAM SAFETY AND FLOOD DAMAGE REDUCTION PROJECT

EXECUTIVE SUMMARY

The U.S. Bureau of Reclamation (Reclamation) and the U.S. Army Corps of Engineers (Corps) are currently evaluating alternatives for the Folsom Dam Safety and Flood Damage Reduction (Folsom DS/FDR) project. This is one of many projects being pursued by the Corps under the authority of the American River Watershed Investigation. Reclamation is evaluating dam safety at the Folsom Facilities through their Safety of Dams Program. Reclamation recognizes the need to expeditiously implement engineering measures for the Folsom Facilities in order to reduce potential failure due to seismic, static, and hydrologic conditions. The Corps recognizes the need to incrementally increase minimum flood protection thru increasing flood storage capacity and/or reservoir pool release mechanisms. Therefore, Congress modified the existing authorities under 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. The project objectives are:

- Expeditiously reduce hydrologic risk of overtopping-related failure of any impoundment structure during a probable maximum flood (PMF) event in accordance with Reclamation's Public Protection Guidelines; and

- Expeditiously reduce the risk of structural failure of any impoundment structure during a potential seismic event in accordance with Reclamation's Public Protection Guidelines; and

- Expeditiously reduce the risk of structural failure of any impoundment structure during a potential static event in accordance with Reclamation's Public Protection Guidelines; and

- Expeditiously improve the flood damage reduction capacity of the facilities in a manner consistent with existing Corps authorities.

The project area encompasses primarily Federal lands in and around Folsom Reservoir and Folsom Dam, including parts of both the north and south forks of the American River.
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 was built 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.

This project identifies unique opportunities to expedite Federal funds for planning, design and implementation of a flood control and dam safety risk reduction action. Reclamation and the

Corps are analyzing five action alternatives along with the no action alternative that considers the current hydrologic, seismic, static, and flood damage risks posed by the Folsom Facilities.

The five action alternatives include designs for an auxiliary spillway, enlargement of the reservoir (a raise) as well as several construction zones, and borrow and stockpile areas. The four auxiliary spillway designs being evaluated are a fuseplug, fuseplug with a tunnel, a four-submerged tainter gate and a six-submerged tainter gate spillway. The five reservoir enlargement designs being evaluated include: minimal to 4-foot embankment raise, 3.5-foot parapet wall raise, 4-foot embankment raise, 7-foot embankment raise and a 17-foot embankment raise.

The U.S. Fish and Wildlife Service (Service) has evaluated the alternatives proposed under the Folsom DS/FDR project. This draft Fish and Wildlife Coordination Act report contains a preliminary evaluation of the adverse impacts to important fish and wildlife resources of the various alternatives outlined in the *Folsom Dam Safety and Flood Damage Reduction, Draft III Environmental Impact Statement/ Environmental Impact Report September 2006*.

The recommendations in this report 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. The outcome of any consultations, as required under section 7 of the Endangered Species Act or the Fish and Wildlife Coordination Act, could also affect the recommendations herein.

The Service recommends that Reclamation and the Corps:

- Select a flood control alternative which avoids, to the extent possible, unmitigable impacts and minimizes other impacts to fish and wildlife resources.

- Consult with the Service pursuant to section 7 of the Endangered Species Act, to minimize adverse affects to federally listed species and their habitats.

- Consult with the California Department of Fish and Game regarding potential impacts to State listed threatened and endangered species.

- Avoid impacts to oak-grey pine woodland, riparian and seasonal wetlands, adjacent to, but outside of, construction easement areas with construction fencing.

- Avoid impacts to woody vegetation at all staging areas, borrow sites, and haul routes by enclosing them with fencing.

- Avoid impacts to water quality at Lake Natoma and Folsom Reservoir when loading, unloading, and potentially barging borrow material to be used for dam raising by taking appropriate measures to prevent soil, fuel, oil, lubricants, etc. from entering into these waters.

- Minimize impacts to annual grassland habitat and other disturbed areas, by re-seeding all disturbed areas with appropriate native grass species as construction elements are completed.

- Minimize impacts to fish and phytoplankton during spillway construction (dredging and blasting) by implementing conservation and minimization measures (such as a curtain) during in reservoir activities and minimize sedimentation from being released downstream.

- Compensate for any vegetation losses associated with developing access to loading and unloading barges to be used for moving borrow material. Specific routes and other details have not been determined.

- Compensate for unavoidable impacts to oak-grey pine woodland habitat by acquiring suitable lands and developing oak woodland habitat using the assumptions contained in Appendix A. For this draft report compensation acreages by alternative are summarized in Appendix C.

- Compensate for unavoidable impacts to riparian habitat by acquiring suitable lands and developing riparian habitat using the assumptions contained in Appendix A. For this draft report, the compensation acreage by alternative is summarized are Appendix C.

- Compensate for unavoidable impacts to seasonal wetland habitat by acquiring suitable lands and developing seasonal wetland habitat using the assumptions contained in Appendix A. For this draft report, the compensation acreage by alternative are summarized in Appendix C.

- Compensate for unavoidable impacts to chaparral habitat by acquiring suitable lands and developing the needed mitigation of chaparral habitat using the assumptions contained in Appendix A. For this draft report, the compensation acreages by alternative are summarized in Appendix C.

- Develop a monitoring and adaptive management program with the other agencies, 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 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 (replanting on-site would be the first priority). Budget in advance for this monitoring and adaptive management program.

- Develop a monitoring and adaptive management plan with the other agencies, to monitor the hydrology and vegetation at Mormon Island Preserve. Baseline conditions would be established before construction begins in the area and continue for 4 years after construction has been completed. Post-construction surveys would monitor for potential changes in wetland hydrology, water quality, and vegetation. If changes in wetland hydrologic function are detected from the baseline condition, implement adaptive management mitigation to return affected systems to baseline conditions considering the long-term conservation of the Mormon Island Preserve.

- Develop a mitigation monitoring and adaptive management plan for all mitigation sites developed for the project.

- Monitor methylmercury levels in water and suspended sediment of water being released from Folsom Dam during in reservoir construction activities until levels return to baseline.

- Complete a more thorough assessment of freshwater sediment effect levels for contaminants of concern, in particular mercury and nickel. Many of the references used in Reclamations' Sediment Characterization document to identify effect levels were inappropriate for fish and wildlife assessment needs. Other references such as MacDonald et al. (2000) and EPA (2004) provide good assessment guidelines for freshwater sediment.

INTRODUCTION

The United States Army Corps of Engineers (Corps) and the United States 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.

This report provides: (1) the Fish and Wildlife Service's (Service) analysis of impacts to fish and wildlife that would result from construction and operation of the various Folsom DS/FDR project alternatives; (2) recommendations to avoid, minimize, rectify or, as a last resort, compensate these impacts; and (3) the Service's assessment of project alternatives based on a fish and wildlife conservation perspective. The analysis herein is based on the September 25, 2006, project description provided by the Reclamation and Corps as well as site visits, literature review, discussions with experts, and an amended project footprint provided the week of October 22, 2006.

The current study was implemented under several existing authorizations. The Corps project authorities are the: Folsom Dam Modification, authorized under section 101(a) (6) of the Water Resources Development Act (WRDA) of 1999 (Public Law (PL) 106-53) and the Folsom Dam Raise, authorized in the Energy and Water Resources Development Act of 2004, dated December 1, 2003 (PL 108-137) both of which are to enhance flood protection. Reclamation has also been pursing dam safety risk reduction improvements separately through its existing Dam Safety Program. Investigations by Reclamation have identified dam safety risk reduction needs at Folsom Dam and appurtenant facilities. Reclamation has commenced a Corrective Action Study (CAS) to identify possible, probable, and preferable design modification alternatives to address identified risk reduction needs for submittal to Congress for approval.

However, recent 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 enhanced flood protection improvements and address dam safety risk reduction needs at Folsom Dam and Reservoir as one Joint Federal Project. The text of this most recent authorization follows:

SEC. 128. American River Watershed, California (Folsom Dam and Permanent Bridge)

(a) COORDINATION OF FLOOD DAMAGE REDUCTION AND DAM SAFETY- 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 modification s to existing authorized activities, including a potential auxiliary spillway. In conducting such activities, the Secretaries are authorized to expend funds for coordinated technical review and joint planning, and preliminary design activities.

DESCRIPTION OF THE PROJECT AREA

The Folsom Facility is located about 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 DS/FDR project is located around Folsom Reservoir which is within Sacramento, Placer and El Dorado counties (Figure 1). Figure 2 shows several of the project components in relation to the Folsom Reservoir. The Folsom Facility is made up of 12 dams and dikes that impound about 977,000 acre-feet at a reservoir water surface elevation of 466 feet.

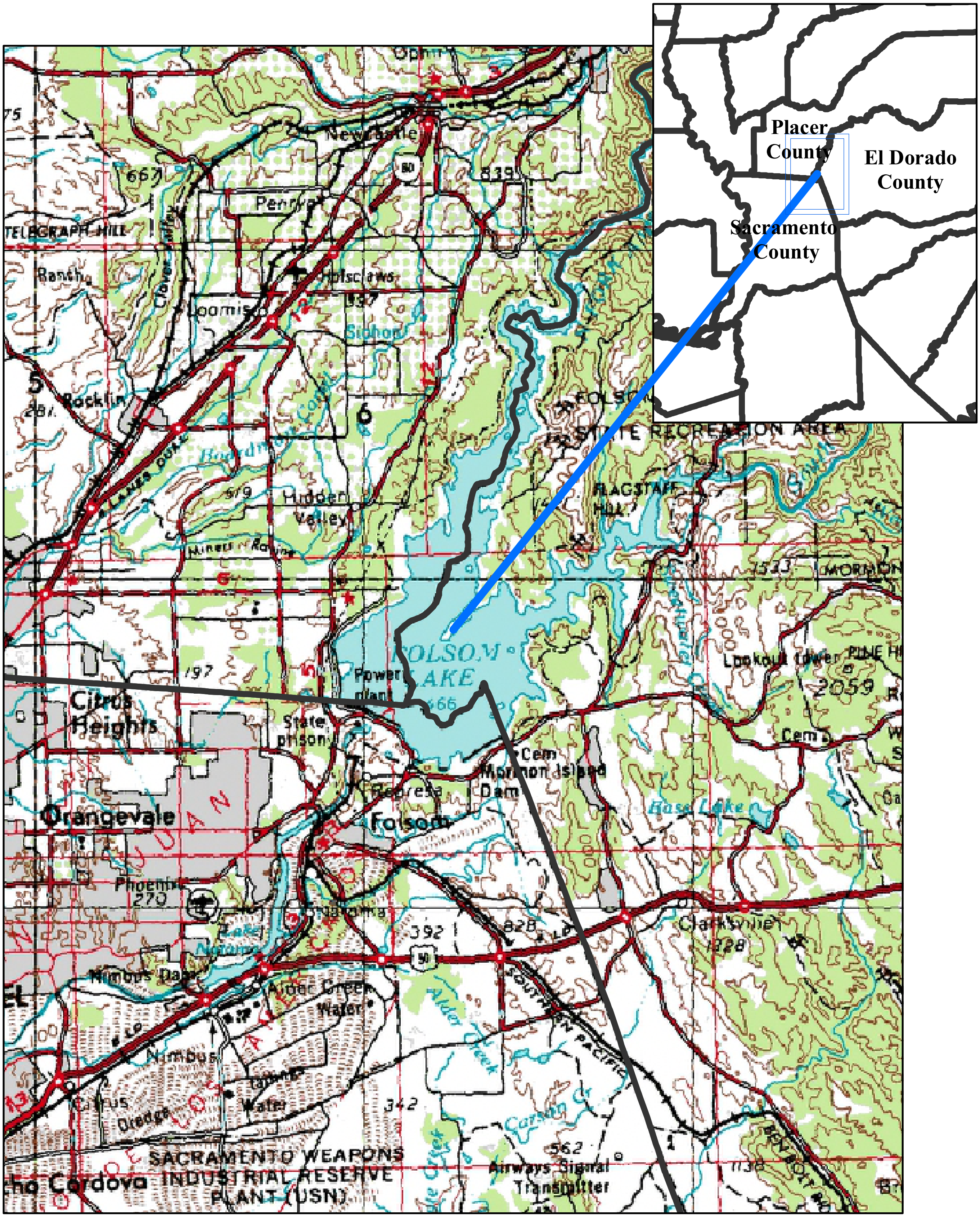
The Folsom Dam Safety and Flood Damage Reduction (Folsom DS/FDR) project includes measures to remedy dam safety issues associated with seismic, static, and hydrologic concerns, and to provide increased flood damage protection. These measures include several different options to remedy the various issues 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 was built 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.

DESCRIPTION OF THE PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE

The No Action/No project Alternative describes the reasonably foreseeable future without the Folsom DS/FDR project. Without the project the hydrologic, seismic, static, and flood damage risks currently posed by the Folsom Facilities would continue into the future.

Action Alternatives
In addition to the No Action/No project Alternative, the Folsom DS/FDR project evaluates five action alternatives. The basic features of the five alternatives are outlined below.

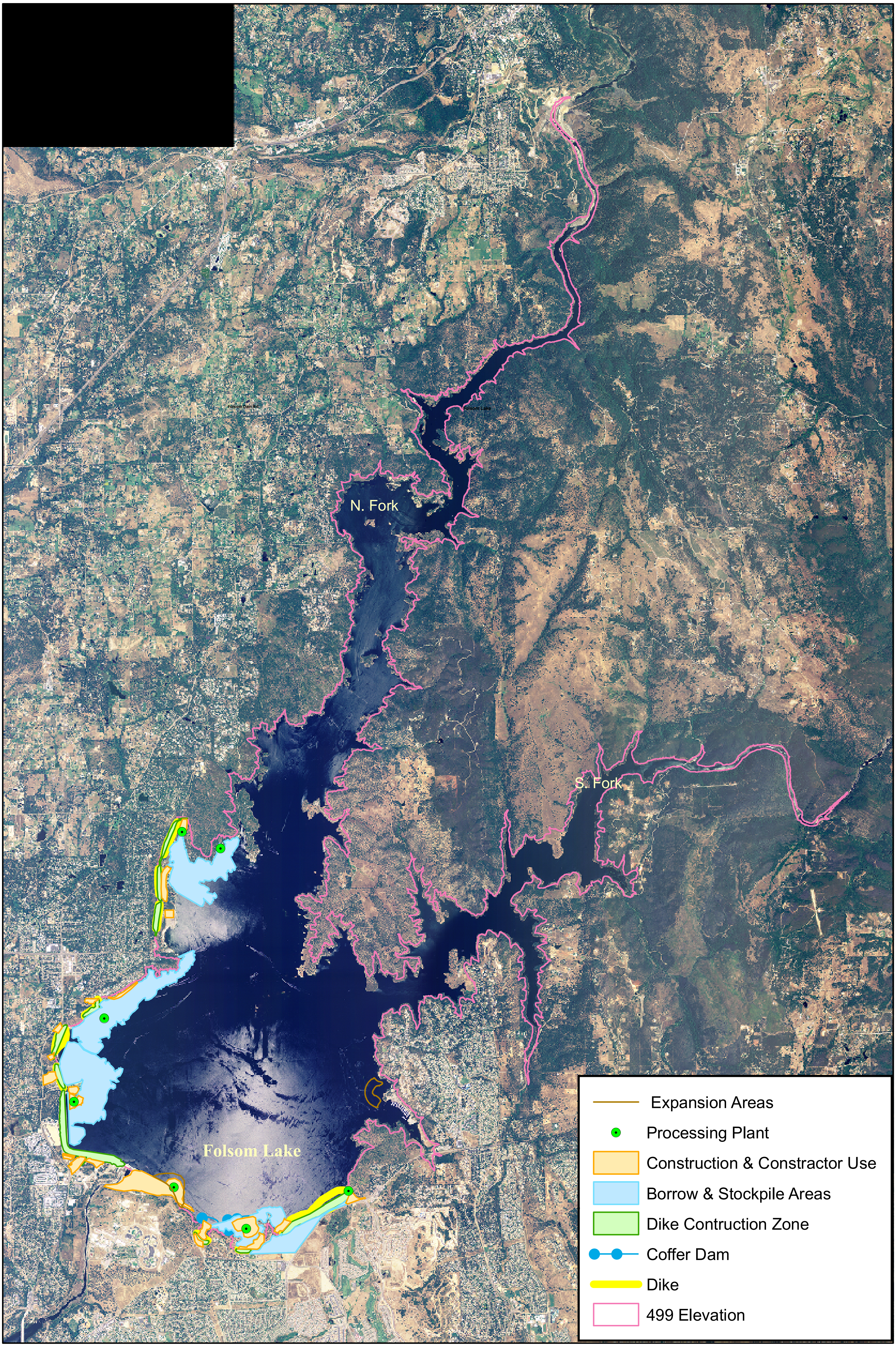


Project Vicinity- Folsom Reservoir

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.



Project Location Figure 2

Prepared by the US Fish and Wildlife Service, Sacramento Fish andWildlife Office, Flood and Waterway Planning Branch; Sept. 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.

Draft- Subject to Change

CONSTRUCTION ALTERNATIVES

1. Auxiliary Spillway

The auxiliary spillway would consist of an approach channel on the water side of the control section, a control structure section consisting of either a segmented earthen fuseplug control structure or a four or six-submerged tainter gate control structure. The discharge chute linings would be either a short lined-chute, constructed in the upper portion of the spillway, or a fully-lined chute constructed completely to the river discharge point. The spillway chute would be lined either with roller compacted concrete, or structural, formed, and poured concrete. The auxiliary spillway would be constructed by excavating an elongated trench in the area adjacent to and below the left wing dam. The excavation of the approach and discharge channels would be done in at least two stages. The first stage would include removing common material and some excavation of the rock. The underlying competent bedrock would be excavated using standard drill and blast techniques. The channel would convey the discharge to the American River channel without impact to the left wing dam. A rock plug and/or coffer dam would be used to close off the partially excavated approach channel. The second stage would involve excavating the approach and discharge channel to the final grade as the auxiliary spillway is being completed. Material would be removed by a clamshell dredge and placed on barges. Some material would have to be removed through blasting as the primary means of excavation. The spillway would be controlled by either an earthen fuseplug control section that would meet the dam safety objectives of passing the probable maximum flood (PMF) or submerged tainter gates that would meet both dam safety and flood control objectives. Features of the fuseplug spillway and tainter gate spillway are provided in the following sections.

A. Fuseplug Spillway

A control structure with fuseplug embankment sections would serve as the auxiliary spillway control on an interim basis, addressing Reclamation's Dam Safety objective while flood damage reduction elements are being designed and constructed. The fuseplug control could also serve on a permanent basis if it were to be determined through future analysis that it would also meet flood control objectives. The spillway would be excavated and constructed as described above. The fuseplug section would consist of a zoned embankment with an impervious core, an internal coarse shell zone, and erosion protection on the upstream face. The fuseplug embankment sections would be designed to erode in a controlled manner when the reservoir elevation exceeds the elevation of a pilot channel (by about 1 foot) and would be 2 feet below the fuseplug embankment crest. The fuseplug spillway would have a 520-foot-wide control structure at the upstream end of a 1,100-foot-long, 300- to 520-foot-wide roller-compacted concrete-lined channel. This channel would lead to a 1,700-foot unlined channel discharging into the American River. The fuseplug control structure would be designed with multiple segments to allow progressive passage of smaller floods up to the PMF flow without affecting the complete fuseplug control structure. The fuseplug alternatives would require placement of material in the reservoir at the Folsom Lake Observation Point on the left wing dam to increase the efficiency of the auxiliary spillway.

B. Gated Spillway

Another option for the auxiliary spillway control section would be the use of mechanical gate (submerged tainter gates) housed in a concrete structure to meet both dam safety and flood damage reduction objectives. Because a gated spillway would take longer to design and construct as opposed to the fuseplug described above, a fuseplug control structure is being considered to expeditiously meet dam safety requirements in the interim. Construction of the spillway would be in phases by excavating an elongated trench in the area adjacent to and below the left wing dam to a profile to safely pass the PMF. The gated auxiliary spillway would consist of an approach channel on the waterside of the gate, a control structure consisting of four or six submerged tainter gates, and a concrete-line chute leading to an energy dissipating structure and exit channel. The discharge chute would be fully lined with formed concrete and is inclusive of an energy-dissipating unit (stilling basin) at the river. The gated spillway would have a 190-foot wide control structure at the head of a 1,700-foot-long channel and would have a discharge capacity of about 280,000 cubic feet per second (cfs) at pool elevation 477 feet. The gated sections would be designed to allow safe passage of more frequent, smaller flood events and maintain the capability to safely pass the PMF without overtopping the other retention structures.

2. Concrete Dam Spillway Gates

A. Gate Improvements
Minor to moderate modifications are being considered to reduce seismic risks. These modifications range from reinforcing the existing gate wings to replacing the existing gate arms.

B. Gate Replacement
The existing concrete dam spillway gates are proposed for replacement under a dam raise option because structural members for the existing gates would be impacted during passage of large flood releases. The proposed gates would be higher, and the new trunion would be outside of the flow stream for large flood releases.

3. Main Dam Seismic Improvement
The main dam was constructed of concrete monoliths that may have the potential to slide on horizontal lift lines within the dam during a large earthquake event. Engineering options being considered to reduce the probability of main dam movement include upper and lower tendons, shear keys, and a toe-block.

4. Existing Stilling Basin
The existing stilling basin was designed so that it could contain hydraulic jump action for flows up to 200,000 cfs and prevent major damage during the existing spillway design flood. Flows above 200,000 cfs would result in hydraulic jump further downstream. Because releases from the main dam with an auxiliary spillway could be increased from the current 567,000 cfs maximum to 920,000 cfs with this project, an increase in spillway design flood capacity is warranted. To address this concern, the existing stilling basin would be extended 50 to 70 feet downstream.

5. Embankment Raises (Dikes and Wing Dams)
All earthen structures could be raised through the placement of additional earthen material, construction of concrete walls, or a combination of the two measures, along the crest of the

facilities. The purpose of the minimal embankment raises, as in alternative 1 and 2, would be to provide additional (up to 3 feet) freeboard to the existing facilities for dam safety concerns. Higher raise options would serve to provide additional flood damage reduction during low frequency storm events. Several options exist for the raising of existing dikes and wing dams. Embankment raise options are conventional earth fill raise, reinforced earth wall raise, reinforced concrete retaining wall raise, and combination earthen raise and concrete wall raise.

6. Filters

To better control seepage and piping (movement of water through the core that carries soil material), on the existing earthen structures (wing dams, dikes and MIAD) sand filters are proposed to be constructed within the downstream part of the earthen structures. Two alternatives for types of filters are being considered for the downstream face. The full-height filter would extend upward from the downstream toe of the facility to the crest of the dam or dike. The half-height filter would extend from the downstream toe to half the vertical distance to elevation 466 feet. Due to concerns about piping along the embankment interface with the concrete dam, filter zones are required along these contacts. This would be constructed by excavating a portion of the outer zones of the left wing dam and right wing dam so that filter material could be placed against the core materials of these dams. The filter zones would provide protection against both static and seismic loading conditions.

At the left and right wing dams, filter zones are required only in the upper portion of the dams. Sand filter zones would be constructed from the crest to an elevation about 40 feet below the dam crest. This filter zone would be constructed by excavating a 40-foot 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 face of the embankment.

7. MIAD Seismic Alternatives

Part of MIAD is constructed over an historic river channel, Blue Ravine. This portion of the dam, towards the left end of the dam, is at risk of significant deformations should the foundation of the dam liquefy during a severe earthquake event. Two design alternatives are being considered to prevent these deformations from occurring. These alternatives are jet grouting the lower zones of liquefiable material of the downstream foundation material and excavate and replace of material.

A component of the MIAD project would be increasing the mass of MIAD by placing an overlay over the downstream side. Although the upstream toe of MIAD was treated with dynamic compaction in the 1990s, the lower portion of MIAD was too deep to have been effectively treated by that procedure. Therefore, there still is some risk for large sliding or deformation to occur due to upstream liquefaction. Because the presence of the reservoir makes it difficult to treat the upstream toe, a downstream overlay is being proposed. The downstream overlay would not prevent upstream sliding and deformation, but it would afford MIAD with adequate mass to withstand a seismic event. The overlay would be accomplished following either jet grouting or replacement of the downstream foundation by widening the crest and downstream portion of the dam with large quantities of soil material. Construction of the overlay would facilitate rising of the height of MIAD in conjunction with a dam raise. The overlay would also incorporate the installation of a filter zone. Installation of the overlay could result in raising the height of MIAD up to 4 feet. The purpose of the overlay would be strictly for seismic and static concerns, and would not necessarily provide additional hydrologic control (temporarily increase flood storage), unless all other Folsom Facilities were also raised.

8. New Embankment Construction
Any of the alternatives involving a raise of Folsom Facility structures could result in a temporary increase in the reservoir water elevation during periods of maximum flood flows into the reservoir. Increasing the reservoir water elevation would result in the potential to flood property beyond the boundaries of Folsom Reservoir at locations with lower land elevations. Therefore, a new embankment or other containment alternative may be necessary in order to protect adjacent properties from flooding.

9. Borrow and Stockpile Sites
Borrow sites would be on Federal property within and immediately outside of the reservoir. The number and extent of borrow dikes development would be dependent on the amount of earthen material required to accomplish the various raise alternatives. Potential borrow sites include: north of the Granite Bay recreation area along the low waterline; along the low water shoreline opposite the Beale's Point recreation area and to the north along Mooney Ridge; excavation material from the auxiliary spillway; MIAD right abutment (Folsom Point), MIAD left abutment (Browns Ravine), D1 site, and D2 site. Borrow sites would also be used for temporary stockpiling of material. However depending on the alternative chosen disposal of excess material maybe permanently disposed of at Dike 7, Beale's Point, Folsom Point, D1 and D2 or MIAD as additional overlay.

10. Staging Areas and Haul Roads
The Corps would stage its project activities using the staging site developed under the American River Watershed Investigation Folsom Dam Modification project authorization. This would include contractor's offices, parking, and staging of materials. Folsom Point would be the main staging area along the reservoirs southern edge. Folsom Point would include contractor's offices, parking, staging of material, and processing and stockpiling of borrow materials, as well as other staging area-related activities. The majority of the Folsom Point recreation area would most likely be used to support activities related to improvements planned for the left wing dam,

Dikes 7 and 8, and MIAD. Depending on alternative and sand quantities needed for filters, the Granite Bay staging area would be occupied at a minimum during the period of work on Dikes 1, 2, and 3.

Main Dam Overlook Parking Lot – The main dam staging area would include contractor offices and parking, materials storage, and a concrete mixing plant. This would be the longest occupied staging area given that the dam seismic work would be scheduled last.

Equipment, materials and supplies, and hauling of materials from the west to east side construction sites would be conducted on city streets or internal haul roads. Typical materials to be hauled on city streets include concrete, reinforcement steel, and general supplies and if needed aggregate and sand.

Internal haul roads would also be developed to reduce construction traffic on city streets and to allow the use of oversized construction equipment. The internal haul roads would be graded into the weathered granite and have an earthen road base installed. The internal roadways would be sized to allow passage of oversized equipment. Internal haul roads include those constructed in reservoir as well as the crests of the wing dams and MIAD and the Dam Road. Given the space limitations of the crests, only conventional sized equipment would use the wing dams or MIAD.

11. Security Upgrades
To provide the required level of security for the dam the following would be installed: access controls, intrusion detection, supplemental lighting and closed circuit television throughout the power plant, pump plant, elevator tower, industrial area, administration area, recreational areas, Dikes 4-7, MIAD, the wing dams, Folsom Dam itself and Folsom Dam Road.

12. Exploratory Work
A certain amount of exploratory geologic and geotechnical work would be needed to better characterize the subsurface conditions within the proposed auxiliary spillway location and around MIAD.

The Corps exploration program for the auxiliary spillway consists of drilling about 20 rock core borings and conducting down-hole seismic surveys, optical televiewer logging, and in-situ testing within the proposed footprint of the auxiliary spillway and it appurtenances, with a future option of 10 additional borings. This exploratory work would require initial earthwork to construct drill pads and access roads to the drill sites.

It is anticipated that the earthwork and drilling would begin in late-November or early December 2006, and is anticipated to take about 11 weeks to complete. If the optional borings are completed under this contract, it is anticipated that the total of 30 borings would take about 4 to 6 months to complete.

Reclamation also has an exploration program for the auxiliary spillway, which includes excavating up to four trenches; each 200 feet long by 25 feet wide, and drilling six core holes. Additionally, Reclamation is in the early stages of planning exploratory work around MIAD that includes jet grouting.

Action Alternatives

Alternative 1– No Dam Raise/Minimal Embankment Raise/Fusplug Auxiliary 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. Table 1 summarizes the features of Alternative 1.

Alternative 2– Four-Foot Dam/Embankment Raise/Fuseplug Auxiliary Spillway with Tunnel
Under Alternative 2, there would 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 would be raised to address hydrologic concerns and to provide additional flood storage capacity. A 3.5-foot parapet concrete wall with a 0.5-foot earthen raise would be constructed on both wing dams. Table 1 summarizes the features of Alternative 2.

Alternative 3– Three and a Half Foot Dam/Embankment Raise/Six-Submerged Tainter Gate Spillway
Under Alternative 3 all Folsom Facilities would be raised 3.5 feet. A smaller auxiliary spillway would be constructed to address hydrologic and flood control concerns. All of the earthen structures would be raised to address hydrologic concerns and to increase the temporary flood storage capacity of the reservoir. A 3.5-foot parapet concrete wall would be constructed on both wing dams in place of an earthen raise. Table 1 summarizes the features of Alternative 3.

Alternative 4– Seven-Foot Dam/Embankment Raise/Four-Submerged Tainter Gate Spillway
Under Alternative 4 all Folsom Facilities would be raised 7 feet. A smaller auxiliary spillway would be constructed to address hydrologic and flood control concerns. All of the earthen structures would be raised using earthen material, to address hydrologic concerns and to increase the temporary flood storage capacity of the reservoir. Table 1 summarizes the features of Alternative 4.

Alternative 5– Seventeen-Foot Dam/Embankment Raise/No Spillway
Under Alternative 5 all Folsom Facilities would be raised 17 feet. A dam/embankment raise of this size would safely accommodate the PMF event by using the main dam spillways, including some overtopping of the center portion of the concrete dam, and increasing the flood surcharge without the need for an auxiliary spillway. Table 1 summarizes the features of Alternative 5.

***Table* 1**

Summary of Folsom DS/FDR Project Features by Alternative

Main Project Feature		***Alternative 1 No Dam Raise/Minimum Embankment Raise Fuseplug Spillway***	***Alternative 2 4-ft Dam/Embankment Raise, Fuseplug Spillway with Tunnel***	***Alternative 3 3.5-ft Dam/Embankment Raise, JFP Spillway***	***Alternative 4 7-ft Dam/Embankment Raise, JFP Spillway***	***Alternative 5 17-ft Dam/Embankment Raise No Spillway***
Main Concrete Dam	Concrete Monoliths	No Dam raise	Parapet wall dam raise of non-overflow sections (4 ft)	Dam raise - non-overflow sections of dam (3.5 ft)	Dam monolith raise - non-overflow sections of dam (7 ft)	Dam monolith raise – non-overflow sections of dam (17 ft)
		Post-tensioned tendons, shear key elements, and/or toe blocks	Post-tensioned tendons, shear key elements, and/or toe blocks s	Post-tensioned tendons, shear key elements, and/or toe blocks	Post-tensioned tendons, shear key elements, and/or toe blocks	Post-tensioned tendons, shear key elements, and/or toe blocks
		Foundation drain enhancements	Foundation drain enhancements	Foundation drain enhancements	Foundation drain enhancements	Foundation drain enhancements
	Existing Spillway	Minor to moderate spillway pier modification	Minor to moderate spillway pier modification	Minor to moderate spillway pier reinforcement	Replace all spillway gates	Replace all spillway gate
		Minor to moderate spillway bridge improvements	Minor to moderate spillway bridge improvement	Modify/replace existing spillway bridge	Replace existing spillway bridge	Replace existing spillway bridge
		Minor to moderate spillway gate modifications	Minor to moderate spillway gate modifications	Modify/replace 3 emergency gates; main spillway gate reinforcement	Moderate spillway pier reinforcement	Moderate spillway pier reinforcement
	Existing Stilling Basin	No modifications	No modifications	Extend the Stilling Basin 50-75 ft	Extend the Stilling Basin 50-75 ft	No modifications
Auxiliary Spillway	Spillway	PMF fuseplug partially-lined spillway	PMF fuseplug partially- or completely-lined spillway	Joint (PMF/Flood control) fully-lined auxiliary spillway, chute and approach channel	Fully-lined auxiliary spillway, chute and approach channel	None
	Control Structure	520-ft wide fuseplug	350- to 400-ft wide fuseplug	6 submerged tainter gates, plus redundant water supply outlet	4 submerged tainter gates, plus redundant water supply outlet	None
	Tunnel	No Tunnel	Tunnel w/3 submerged tainter gates	No Tunnel	No Tunnel	No Tunnel
Left Wing Dam		$\leq$4 ft earthen raise for crest protection	0.5-ft earthen, 3.5-ft parapet concrete wall	3.5-ft parapet concrete wall	3.5-ft earthen raise and 3.5 ft earthen raise	17-ft earthen raise
		None	Toe drains	None	Toe drains	Toe drains
		None	None	Training wall between LWD and spillway	Training wall between LWD and spillway	None
		Crest filters in upper portion of dam and along contact with concrete dam	Half-height filters	Crest filters in upper portion of dam and along contact with concrete dam	Full-height filters	Full-height filters

Table 1 (continued) *Summary of Folsom DS/FDR Project Features by Alternative*					
Main Project Feature	***Alternative 1 No Dam Raise/Minimum Embankment Raise, Fuseplug Spillway***	***Alternative 2 4-ft Dam/Embankment Raise, Fuseplug Spillway with Tunnel***	***Alternative 3 3.5-ft Dam/Embankment Raise JFP Spillway***	***Alternative 4 7-ft Dam/Embankment Raise JFP Spillway***	***Alternative 5 17-ft Dam/Embankment Raise No Spillway***
Right Wing Dam	≤4 ft earthen raise for crest protection	0.5-ft earthen, 3.5-ft parapet concrete wall	3.5-ft parapet concrete wall	3.5-ft earthen raise and 3.5-ft parapet wall	17-ft earthen raise
	None	Toe drains	None	Toe drains	Toe drains
	Crest filters in upper portion of dam and along contact with concrete dam	Half-height filters	None	Full-height filters	Full-height filters
Mormon Island Auxiliary Dam	≤4-ft earthen raise for crest protection	4-ft earthen raise	3.5-ft parapet concrete wall	7-ft earthen raise	17-ft earthen raise
	Toe drains	Toe drains	Toe drains	Toe drains	Toe drains
	Full-height filters	Full-height filters	Full-height filters	Full-height filters	Full-height filters
	Jet grouting downstream foundation	Excavation & replacement of downstream foundation	Jet grouting downstream foundation	Jet grouting downstream foundation	Excavation & replacement of downstream foundation
	Downstream overlay	Downstream overlay	Downstream overlay	Downstream overlay	Downstream overlay
Dikes 1,2 3,7, & 8	No activity	4-ft earthen raise	3.5-ft parapet concrete wall	7-ft earthen raise	17-ft earthen raise
		Toe drains	None	Toe drains	Toe drains
		No Filter	Full-height filter at Dike 7. Replace filter material removed at Dike 1-3 and 8 for parapet wall construction	Full-height filters	Full-height filters
Dikes 4, 5 & 6	≤4 ft earthen raise for crest protection	4-ft earthen raise	3.5-ft parapet concrete wall	7-ft earthen raise	17-ft earthen raise
	Toe drains	Toe drains	Toe drains	Toe drains	Toe drains
	Full-height filters	Half-height filters	Full-height filters	Full-height filters	Full-height filters

Table 1 (continued) ***Summary of Folsom DS/FDR Project Features by Alternative***					
Main Project Feature	***Alternative 1*** ***No Dam Raise/Minimum Embankment Raise*** ***Fuseplug Spillway***	***Alternative 2*** ***4-ft*** ***Dam/Embankment Raise*** ***Fuseplug Spillway with Tunnel***	***Alternative 3*** ***3.5-ft*** ***Dam/Embankment Raise*** ***JFP Spillway***	***Alternative 4*** ***7-ft*** ***Dam/Embankment Raise*** ***JFP Spillway***	***Alternative 5*** ***17-ft Dam/Embankment Raise*** ***No Spillway***
Non-Government Property Protection	No Activity	Flood easements	Flood easements	Flood easements	Flood easements
		New embankment protection	New embankment protection	New embankment protection	New embankment protection
		Property acquisition	Property acquisition	Property acquisition	Property acquisition
Borrow Sites	Auxiliary Spillway Beal's Point	Auxiliary Spillway Tunnel excavation Beal's Point	Auxiliary Spillway Beal's Point	Auxiliary Spillway Beal's Point Granite Bay	Beal's Point Folsom Point D1/D2 R1/R2 L1/L2 Granite Bay
Contractor Use Area – Staging, Material Processing, Concrete Batch Plant	Main Dam - Concrete Folsom Point - Processing Beal's Point - Processing MIAD - Jet Grout Plant	Main Dam - Concrete Folsom Point - Processing Beal's Point - Processing MIAD - Staging	Main Dam - Concrete Folsom Point - Processing Beal's Point - Processing MIAD - Jet Grout Plant	Main Dam - Concrete Folsom Point - Processing Beal's Point - Processing Granite Bay - Processing MIAD - Jet Grout Plant	Main Dam - Concrete Folsom Point - Processing Beal's Point - Processing Mooney Ridge - Processing Granite Bay - Processing MIAD – Staging
Disposal Sites	Dike 7 MIAD D1/D2 Beal's Point	Dike 7 MIAD D1/D2 Beal's Point	Dike 7 MIAD D1/D2 Beal's Point	Dike 7 MIAD D1/D2 Beal's Point	Dike 7 MIAD Beal's Point Granite Bay
Other Project Features	Utility relocations	Utility relocations	Utility relocations	Utility relocations	Utility relocations
	Road relocations	Road relocations	Road relocations	Road relocations	Road relocations
	Haul road construction	Haul road construction	Haul road construction	Haul road construction	Haul road construction
			Underwater blasting and dredging	Underwater blasting and dredging	

EXISTING CONDITIONS

Existing conditions are those conditions which exist in the project area at the time of the impact analysis.

FOLSOM DAM ENLARGEMENT

<u>Vegetation</u>

Around Folsom Reservoir and Upstream

The area surrounding Folsom Reservoir 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 oaks and interior live oaks. Small areas of chaparral extend to the reservoir's upper edge particularly along the South Fork arm. Annual grassland areas are interspersed throughout the area, and human-disturbed habitats occur around boat-launch facilities. Relatively small areas of riparian habitats can found along tributaries to the reservoir and in seep areas. Willow stands and individual trees have become established within some areas of the reservoir pool.

MIAD serves to dam water within an historic river channel thus creating several perennial wetlands on the landside in addition to a wetland preserve (Mormon Island Preserve) run by California Department of Parks and Recreation on the east side of Green Valley Road. No studies have been completed to date that definitively show where the water for these wetlands originates. It is possible that during wet weather the hills to the east funnel the runoff into the Preserve and using the old riverbed water travels into the remaining wetland across the Green Valley Road. Another possibility is that water seeps from MIAD into the wetland and the Preserve. Any construction in and around MIAD may have direct impacts to these wetlands and will need to be monitored during and after construction of the Folsom DS/FDR project. The wetland acreage within Mormon Island Preserve has not been included in this impact analysis.

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 encompasses about 4,000 acres, the majority of which are in State designated floodway and contain large areas of grasslands and pasture, riparian cottonwood and oak woodlands, herbaceous plants and riparian scrub-shrub, bare sand and gravel, and surface waters of the river and associated sloughs and dredge ponds (USFWS 2003). Most of the area is high floodplain dominated by upland species, including oak woodland and grasslands (per. com. T. Burwell).

Fish

Folsom Reservoir and Upstream

When full (i.e., around 1 million ac-ft), Folsom Reservoir 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: warmwater species such as bass (largemouth, smallmouth, and spotted) and panfish (crappie, bluegill, and sunfish) in the upper waters, and trout and landlocked salmon (kokanee and Chinook) in the deeper waters. Various common catfish can also be found near the bottom of shallower waters. Fish habitat is present within the inundation zone in the forms of young willow riparian which grows during extended periods of drought, as well as brush piles placed there by the California Department of Fish and Game (CDFG) and sportsmen groups. Both warmwater and coldwater fisheries tend to benefit from increased peak spring water storage as this results in better coldwater reserves for the salmonid fishes as well as increased spawning and rearing area for warmwater fish (USFWS 2001). Sport fishing is an important and popular recreational activity at Folsom Reservoir.

Sediment associated with the Folsom DS/FDR project area in the Folsom Reservoir may contain mercury from historic mining operations and metals from historic activities or geology in the American River drainage (Reclamation 2006a). 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 (USFWS 1986). In recognition of its "outstanding and remarkable" fishery resources, the entire lower American River was included in the Wild and Scenic Rivers System in 1981, which provides some protection for these resources (USFWS 1991). Four anadromous species are important from a commercial and recreational perspective. The lower river supports a large run of fall-run chinook salmon, a species with both commercial and recreational values. The salmon run is sustained by natural reproduction in the river, and by hatchery production at the Nimbus Salmon and Steelhead Hatchery, operated by CDFG; fall-run Chinook salmon raised at the Nimbus Hatchery provide roughly 40% of the salmon production of the American River (USFWS 1986). The average annual run of salmon in the American River is 25,948 with 72.5% (or 18,869) of these fish historically spawning in the river upstream of where Nimbus Dam is now located (CDFG 2006).

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

Wildlife

Around Folsom Reservoir and Upstream

The area around Folsom Reservoir 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 (USFWS 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 raccoon, wood duck, common merganser, mallard, black phoebe, great blue heron, greater yellowlegs, belted kingfisher, and common yellowthroat. The Mormon Island Preserve also provides a perennial wetland for many species including pond turtles.

Mammals likely found in the study area include California vole, ringtail, black-tailed jackrabbit, coyote, striped skunk, and mule deer; the typical mix of species found in riparian and woodland habitats with a herbaceous understory.

Reptile and amphibian species likely found in the study area include western fence lizard, gopher snake, western rattlesnake, common kingsnake, Pacific treefrog, and western toad.

Wildlife species that forage or breed in oak woodlands also include dusky-footed woodrat, western bluebird, and southern alligator lizard.

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, as wintering and/or breeding birds.

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 Reservoir, 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 (USFWS 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 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

Future without-project conditions are those conditions expected to occur over the life of the project if the project were not implemented.

<u>Vegetation</u>

Around Folsom Reservoir and Upstream

Without-project conditions for this project area are not expected to change significantly from the baseline condition over the life of the project. Refer to the baseline condition described under the no action alternative.

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, will 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 (USFWS 1991).

Sediment deposition needed for the establishment of these riparian species will continue to be limited by upstream impoundments. Forest complexes would be dominated by species adapted to relatively low water needs. Riparian species will gradually mature then die out, giving way to more drought-tolerant plant species such as ash, box elder, and valley and live oaks. Vegetation will 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 exists under baseline conditions will continue to develop over time into mature riparian woodland habitat. Habitat abundance and diversity is not expected to change significantly over time in the hydraulic mitigation areas.

Fish

Around Folsom Reservoir and Upstream

Without-project conditions for this project area are not expected to change significantly from the baseline condition over the life of the project. Refer to the baseline condition described under the no action alternative.

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 it will change is difficult to predict. With implementation of the Anadromous Fish Restoration Program (AFRP) of the Central Valley Project Improvement Act (USFWS 1995), conditions in the lower American River would continue to improve for fishery resources.

Other variables will determine the way in which flows are managed on the lower American River; including Bay-Delta water quality standards, Reclamation water contract renewals, and new contracts.

Wildlife

Around Folsom Reservoir and Upstream

Without-project conditions for this project area are not expected to change significantly from the baseline condition over the life of the project. Refer to the baseline condition described under the no action alternative.

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 (USFWS 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 habitats, 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

A) Folsom Reservoir

Vegetation

Four cover-types: oak/grey pine woodland, riparian woodland, chaparral and seasonal wetland, would be directly impacted by construction of the Folsom DS/FDR project. The compensation acreage is summarized by alternative for these cover-types in Table 2.

Table 2. Summary of Cover-Types, Acres Impacted, and Compensation Needed by Alternative Proposed for the Folsom DS/FDR Project, California.

Folsom DS/FDR Project					
Alternative	**1**	**2**	**3**	**4**	**5**
Cover-Type	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed
Oak/grey pine woodland	80.51 : 380.26	81.16 : 383.33	80.36 : 379.55	80.66 : 380.97	80.66 : 380.97
Riparian woodland	40.93 : 56.57	39.83 : 54.78	40.99 : 56.83	40.65 : 55.37	40.65 : 55.56
Chaparral	1.55 : 3.82	1.52 : 3.96	1.26 : 3.09	1.55 : 3.57	1.54 : 3.60
Seasonal wetland	4.29 : 17.16	4.29 : 17.16	4.29 : 17.16	4.29 : 17.16	4.29 : 17.16
Total	**127.28 : 457.81**	**126.80 : 459.23**	**126.90 : 459.23**	**127.15 : 457.07**	**127.14 : 457.29**

The Habitat Evaluation Procedures (HEP) used to develop the compensatory mitigation acreage is included in Appendix A.

B) Auxiliary Spillway

Three cover-types: oak/grey pine woodland, riparian woodland and chaparral would be directly impacted from the construction of the auxiliary spillway. Depending on the alternative chosen, the total impacts from the auxiliary spillway would be between 8.32 acres and 9.83 acres. Table 3 summarizes the cover-types impacted by the three spillway alternatives and their compensation needs based on the HEP results.

Table 3. Summary of Cover-Types, Acres Impacted, and Compensation Needed for the Construction of the Auxiliary Spillway Alternatives of the Folsom DS/FDR Project, California.

Folsom Dam Auxiliary Spillway Alternatives	**Tunnel**	**Fuseplug**	**Four-gate**	**Six-gate**
Cover Type	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed
Oak/Grey Pine woodland	7.72 : 9.40	7.57 : 9.22	7.51 : 35.47	7.22 : 8.79
Riparian woodland	1.44 : 1.78	1.72 : 2.14	0.67 : 0.92	2.26 : 2.81
Chaparral	0.33 : 0.70	0.34 : 0.97	0.14 : 0.33	0.35 : 0.74
Total	**9.49 : 11.88**	**9.63 : 12.33**	**8.32 : 36.72**	**9.83 : 12.34**

The spillway site would be developed by excavating about 3.4 million cubic yards of material. The material would be placed in haul trucks and taken to a processing plant site at the dam overlook parking lot or Folsom Point. Some of the material may be utilized as rip rap where needed. At the processing plant site, the material would be screened and crushed to size required to reinforce MIAD (MIAD overlay), the wing dams, and Dikes 4, 5 & 6. Following processing, the material would be hauled to a given structure for immediate use, or the material would be stored at Folsom Point, Dike 7, or near MIAD including D2. At Dike 7 and Dike 8/Folsom Point, some of the material may be placed permanently in the reservoir to create staging areas upstream of the structure. These areas would remain once construction is complete.

In order to construct the control structure, a rock plug may be left in place, and/or a coffer dam would be placed within the reservoir downstream of the approach channel to preclude reservoir water from flooding the work site during periods of maximum reservoir storage.

A 900-foot-long waterside approach channel would be constructed through dredging and blasting of materials. The approach channel invert and vertical sides would be concrete lined for about 50 feet upstream from the face of the control structure. The invert elevation for this concrete lining would be at the 368-foot sill elevation for the gates. Most of the approach channel would be excavated in rock to be resistant to erosion. Construction of the approach channel would require underwater blasting, dredging and excavating about 250,000 cubic yards of material.

Additional embankment construction and/or acquiring flood easements are proposed in Alternatives 2 thru 5. The construction details pertaining to these embankments or easements, along with exact locations and type of dike have not been determined and therefore can not be evaluated at this time.

Fill would need to be placed in reservoir around the Folsom Lake Observation Point to increase the efficiency of the auxiliary spillway fuseplug alternative.

C) Dike Zones, Borrow and Stockpile Sites
For this analysis all earthen dike zones include a 150-foot-wide construction area from the landside toe of the dike. All proposed borrow and stockpile sites were also included for each alternative. Table 4 summarizes the cover-types affected and the compensation need for the dike zones, borrow and stockpile sites of the Folsom DS/FDR project.

Table 4. Summary of Cover-Types, Acres Impacted and Compensation Needed for the 150-Foot Construction Zone around the Dikes (1-8), Mormon Island Dam, Left Wing Dam, Right Wing Dam and the Borrow and Stockpile Sites of the Folsom DS/FDR Project, California.

Folsom Reservoir Dike, Borrow and Stockpile Sites	**Dike Zone**	**Borrow and Stockpile**
Cover-Type	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed
Oak/Grey Pine woodland	44.46 : 209.99	8.81 : 41.61
Riparian woodland	3.57 : 4.88	32.41 : 4.30
Chaparral	0.71 : 1.66	n/a
Seasonal wetland	0.38 : 1.52	0.9 : 0.36
Total	**49.12 : 218.02**	**41.31 : 86.27**

Construction of cofferdams at Dike 7 and Dike 8 would facilitate stockpiling of borrow material and expansion of staging areas is being considered. Construction details such as the type of dam, construction of the dam and restoration of the site after construction has not been developed; therefore impact analyses can not be completed at this time.

D) Construction and Contractor Use Sites
For this analysis all proposed construction and contractor use sites are the same for all the alternatives except below the left wing dam, where the proposed spillway would be located. Table 5 summarizes the cover-types affected and compensation need for the construction and contractor use areas.

Impacts to annual grassland would be minimized by seeding all disturbed areas with native grasses as soon as construction activities are complete in the disturbed area. It was anticipated that the work would be phased, so the entire annual grassland area would probably not be disturbed at the same time. Similarly, the impacts to other disturbed lands (these areas are roads, parking lots, riprap, etc, that do not currently provide significant values for fish and wildlife species) can be minimized by replanting with native annual grasses, when possible.

E) Stilling Basin
The impact to riparian vegetation from the proposed extension of the stilling basin by 50 to 75 feet has not been evaluated in this draft report.

Table 5. Summary of Cover-Types, Acres Impacted and Compensation Needed for the Construction and Contractor Sites Folsom DS/FDR Project, California.

Proposed Construction Sites	Tunnel	Fuseplug	Four-gate	Six-gate
Cover-Type	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed
Oak/Grey Pine woodland	19.67 : 92.91	20.17 : 95.27	19.88 : 93.90	19.87 : 93.85
Riparian woodland	3.23 : 4.64	2.41 : 3.29	4.00 : 5.27	2.75 : 4.03
Chaparral	0.50 : 1.23	0.48 : 1.40	0.70 : 1.58	0.20 : 0.47
Seasonal wetland	3.82 : 15.28	3.82 : 15.28	3.82 : 15.28	3.82 : 15.28
Total	**27.22 : 114.06**	**26.88 : 115.24**	**28.40 : 116.03**	**26.64 : 113.64**

Fish

Impacts from blasting and dredging are expected to directly and indirectly affect plankton in the surrounding water column and fish in the reservoir. Blasting could increase the amount of sediment in the water column, thus decreasing the amount of light available. It is anticipated that these impacts would be temporary and could be minimized with the use of curtains or other technology available. Dredging would release mercury and methylmercury into the water column which could bioaccumulate in individual fish. These alternatives are still under evaluation.

Although total mercury levels in the sediment are at or below toxicity guidelines, those guidelines are based only upon direct sediment mercury toxicity to benthic organisms and do not address mercury methylation and bioaccumulation in the food chain.

Wildlife

About 60 acres of existing habitat for wildlife species (does not include the "other" or annual grassland cover-types) would be temporarily lost with implementation of the project. The compensatory mitigation is intended to offset this loss of habitat value over the life of the project.

Impacts from dredging and blasting are expected to temporarily increase the amount of mercury and methylmercury in the water column and in fish, around the work area. Any birds that may feed on those fish (with higher than typical levels of mercury) could be adversely affected through impaired reproduction. This issue will continue to be reviewed as the project is more fully developed.

Lower American River

Vegetation
No change in the existing conditions for vegetation in the Lower American River is anticipated; because the construction impacts of any Folsom Dam raise is centered to the flood control space within the reservoir and lands adjacent the existing reservoir.

Fish
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 during the blasting and dredging operations, monitor suspended sediment transport out of the reservoir during those operations, and monitor methylmercury in unfiltered water and suspended sediment that does move out of the reservoir to assess methylmercury loading into the Lower American River during the blasting and dredging operations.

Wildlife
No change in wildlife species numbers or species composition is expected to occur along the Lower American River as a result of the proposed work at the Folsom Facilities.

OPERATIONAL IMPACTS

A) Folsom Reservoir

Vegetation
The enlargement of Folsom Reservoir 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. Between 805.30 and 1,389.44 acres would 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 that provide little or no value for wildlife species, and some support vegetation that is tolerant of flooding. Table 6 summarizes the acreage of each cover-type which provides value for wildlife that is expected to receive inundation over the life of the project (the "Other" cover-type is not included in Table 6). Inundation effects around Folsom Reservoir would occur in large part by the frequency, timing, and duration of flooding.

Table 6. Summary of Cover-Types, Impacted Acres and Compensation Needed for the Inundated at 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	**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	773.08 : 941.60	811.74 : 988.68	926.66 : 1,128.65	1,323.35 : 1,611.81
Chaparral	32.22 : 87.37	34.32 : 94.60	40.80 : 112.46	66.09 : 179.22
Total	**805.30 : 1,028.97**	**846.06 : 1,083.28**	**967.46 : 1,241.11**	**1,389.44 : 1,791.03**

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* 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 be expected to fill during spring flood event, when oaks are actively growing. The absence of blue oaks within the inundation zone of Folsom Reservoir and other foothill impoundments indicates 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 (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 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 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 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 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 (replanting on site would be the first priority).

Fish
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 borrow areas and roads are not properly re-contoured to allow complete drainage as reservoir levels fall.

Wildlife
No operational effects for wildlife species are anticipated provided there is no accelerated erosion associated with the new inundation zone.

Lower American River
The raise plans 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 plan would maintain outflows at no more than 115,000 cfs, while the without-project conditions could be uncontrolled, resulting in very high outflows of 180,000-315,000 cfs.

Vegetation
Folsom Dam would be raised 3.5, 4.0, 7.0, or 17 feet with the project, and the additional space used to detain flood flows while outflows remain to the extent possible within the 115,000 cfs objective capacity of the downstream channel. This detention would reduce peak flows, while increasing the duration of flows, relative to existing conditions. The moderated flows may reduce erosive energy compared to existing conditions, and could have a cumulative or indirect effect on carryover storage.

Fish
No long-term operational effects for fish species are anticipated.

Wildlife
No long-term operational effects for wildlife species are anticipated.

THREATENED AND ENDANGERED SPECIES

Appendix B provides a list of the federally listed species for the Folsom DS/FDR project (Sacramento, Placer, and El Dorado counties), dated September 15, 2006, and a summary of a Federal agency's responsibilities under section 7(a) and (c) of the Endangered Species Act (Act) of 1973, as amended. Reclamation and the Corps should get an official list of all federally listed and proposed threatened and endangered species and their designated critical habitat within the project area, or an update of any list more than 90 days old at the time preparation of any additional or updated Biological Assessment for this project is undertaken by accessing the Service's Sacramento Fish and Wildlife Office's website. The National Oceanic and Atmospheric Administration (NOAA) has responsibility for federally listed marine fish and wildlife species, including all anadromous salmonids. They should be contacted if any of these species may be impacted by project activities. The CDFG has responsibility for State listed species and species of concern. Species accounts for most of the species discussed below may be obtained from the Service's Sacramento Fish and Wildlife Office.

Based on the county lists there are 13 federally listed threatened species which may occur in the project area. These are: bald eagle, giant garter snake, California red-legged frog and its critical habitat, delta smelt and its critical habitat, Lahontan cutthroat trout, Central Valley steelhead, Central Valley spring-run Chinook salmon and its critical habitat, valley elderberry longhorn beetle and its critical habitat, vernal pool fairy shrimp, Layne's butterweed, California tiger salamander and its critical habitat, slender Orcutt grass (and critical habitat for vernal pool plants), and delta green ground beetle.

There are nine federally listed endangered species which may occur in the project area. These are: vernal pool tadpole shrimp, Conservancy fairy shrimp (and critical habitat for vernal pool invertebrates), winter-run Chinook salmon and its critical habitat, Stebbin's morning glory, Pine Hill ceanothus, Pine Hill flannelbush, El Dorado bedstraw, Antioch Dune evening-primrose, and Sacramento Orcutt grass (and critical habitat for vernal pool plants).

DISCUSSION

Mitigation Planning Goals

The recommendations provided herein for mitigation and the protection of fish and wildlife are in conformance with the Fish and Wildlife 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, conserve, and enhance fish and wildlife and their habitats. 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 important and valuable fish and wildlife 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 habitat 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. In applying the Mitigation Policy during an impact assessment, each specific habitat or cover-type that may be impacted by the project is identified. Evaluation species which utilize each habitat or cover-type are then selected for Resource Category determination. Selection of evaluation species can be based on several rationales, including: (1) species known to be sensitive to specific land and water use actions, (2) species that play a key role in nutrient cycling or energy flow, (3) species that utilize a common environmental resource, or (4) species that are associated with important resource problems, such as anadromous fish and migratory birds, as designated by the Director or Regional Directors of the Service. Evaluation species used for Resource Category determinations may or may not be the same evaluation elements used in an application of HEP. Finally, 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 goals are: (1) no loss of existing habitat value (Resource Category 1); no net loss of in-kind habitat value (Resource Category 2); no net loss of habitat value while minimizing loss of in-kind habitat value (Resource Category 3); and minimize loss of habitat value (Resource Category 4). As defined in the Service's Mitigation Policy, "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.

Under Pacific Region Service guidance, we are also pursuing a goal of no net loss of wetland acreage, while seeking a net overall gain in the quality and quantity of wetlands through restoration, development and enhancement. Furthermore, the Service believes that wetlands mitigation, which is the creation of wetlands to offset losses, should only be deemed acceptable when losses are determined to be unavoidable and mitigation is known or believed to be technically feasible. Restoration of former or degraded wetlands is the preferred form of compensatory mitigation, followed by wetlands creation.

In recommending mitigation for adverse impacts to any of these habitats, 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, reduction or elimination of impacts over time, and compensation.

Impacts to four habitat types were evaluated for the Folsom DS/FDR project. These habitats, and their corresponding evaluation species, designated Resource Categories and associated mitigation planning goals are discussed below, and summarized in Table 7.

a. Oak-grey pine woodland

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, 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 (including oak savanna) 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.

Table 7. Evaluation Species, Resource Categories, and Compensation Planning Goals selected for cover-types impacted by the Folsom DS/FDR Project, California.

Cover-Types	Evaluation Species	Resource Category	Mitigation Planning Goals
Oak - grey pine woodland & Oak savannah	breeding birds	2	No net loss of in-kind habitat value
Riparian woodland	belted kingfisher, raptor guild	2	No net loss of in-kind habitat value
Chaparral	breeding birds	3	No net loss of habitat value while minimizing loss of in-kind habitat value
Seasonal wetlands	marsh wren, red-winged blackbird, great blue heron	2	No net loss of in-kind habitat value
Annual grasslands	raptor guild, ground-foraging birds	4	Minimize loss of habitat value
Other[1]	none	4	Minimize loss of habitat value

[1]No evaluation species were chosen because use by wildlife is minimal to none.

The canopy of blue oaks is typically 30 to 50 feet tall, and varies from about 30 to 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 Resource Category determination are breeding birds. These species were selected because: (1) their ecological roles (prey, predator, scavenger, etc.); (2) the Service has responsibilities to protect and manage many of these species under the Migratory Bird Treaty Act; (3) their high nonconsumptive value for bird watching; and (4) this habitat provides required nesting, foraging, and cover habitat for many breeding bird species. Blue oak-grey pine woodland habitat is still relatively common in the project area and region, but is increasingly being degraded in value and in general not exhibiting regeneration (blue oaks). Therefore, the Service has placed this habitat in Resource Category 2 with its mitigation planning goal of no net loss of in-kind habitat value.

c. Riparian woodland

Riparian woodlands occur extensively along the lower American River, and in patches along perennial and intermittent streams and rivers flowing into Folsom Reservoir. 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 shrub-scrub), 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 reasonably be expected to 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 today is one of the larger and better-protected remnants of this habitat, and has been recognized as a "natural area of special significance" in the county general plan (County of Sacramento 1993).

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 for 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 riparian habitat because: (1) as predators, they play a key role in community ecology of the study area; (2) they have important human nonconsumptive benefits (e.g., bird watching); and (3) the Service has responsibility for protection and management of many of these species under the Migratory Bird Treaty Act. Riparian habitat is of generally high value to the evaluation species, and is today very scarce in the project area and general ecoregion. Therefore, the Service finds that any riparian habitats that would be impacted by the project should have a mitigation goal of "no net loss of in-kind habitat value or acreage"--i.e., Resource Category 2.

d. Chaparral

Chaparral occurs in patches around Folsom Reservoir as well as along the south arm of Folsom Reservoir, and along the North and South Forks. Chaparral has a dense overstory of woody evergreen shrubs, and usually is 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 (USFWS 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).

Breeding birds were chosen to evaluate chaparral habitat because: (1) they play multiple roles in chaparral ecology, as predators, prey, and as seed dispersal agents; (2) they provide nonconsumptive recreational and other values to humans (e.g., bird watching, bird song); and (3) the Service is responsible for protection and management of many of these species under the Migratory Bird Treaty Act. Chaparral habitat is a native habitat of generally high value to the evaluation species, and is today moderately scarce in the project area, but fairly abundant in the eco-region. Therefore, the Service finds that any chaparral habitats that would be impacted by the project should have a mitigation planning goal of "no net loss of habitat value while minimizing loss of in-kind habitat value"--i.e., Resource Category 3.

e. Seasonal wetlands

Seasonal wetlands occur in small patches near seeps and springs, and in drainages entering Folsom Reservoir. Seasonal wetlands in the project vicinity 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 great blue heron were chosen to evaluate emergent wetland. 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; these herons are a highly visible species, which many people take great pleasure in observing. All of the evaluation species are also migratory birds for which the Service has management responsibility under the Migratory Bird Treaty Act.

In the project vicinity, and the eco-region (Central Valley) in general, emergent wetlands are relatively scarce, and would be of high value to the evaluation species. Emergent wetland in the project area is therefore designated as Resource Category 2, with a mitigation planning goal of "no net loss of in-kind acreage or habitat values, whichever is greater."

f. Annual grasslands
Annual grasslands differ from woodland by lacking dominant tree cover; it appears that much of the treeless grassland found on 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 western meadowlark, California quail, and sparrows and finches, and for California voles and pocket gophers. These areas provide important foraging habitat for breeding raptors, including red-tailed hawks, American kestrels, and great horned owls, and for wintering raptors. Lastly, waterfowl, notably Canada geese, graze on green vegetation in the grasslands adjacent to Folsom Reservoir.

The evaluation species selected for annual grasslands in the area near Folsom Reservoir are the raptor guild, and passerine ground-foraging birds (including western meadowlark, white-crowned sparrow. We have chosen these as evaluation species because: (1) raptors, as predators, play a key role in community ecology of the study area; (2) they have important human nonconsumptive benefits (e.g., bird watching); and (3) the Service's responsibilities for many of these species protection and management under the Migratory Bird Treaty Act. While the values of these habitats vary according with season and grazing intensity, much of the grassland habitat in the study 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, ponds, which provide nest and shelter sites. Grassland habitat has medium-to-high value, and is relatively abundant in the project area. Therefore, the Service finds that grasslands in the project should have a mitigation planning goal of no net loss of habitat value while minimizing loss of in-kind habitat value (i.e., Resource Category 3).

g. Other habitats
Disturbed habitats such as parking lots and boat ramps are highly degraded habitats. Evaluation species were not chosen, because use by wildlife is so minimal. In view of the extremely low value to most wildlife of much of these habitats in the project area, the Service finds that any highly disturbed habitats that would be impacted by the project should have a mitigation planning goal of "minimize loss of habitat value" (Resource Category 4).

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 our HEP analyses (Appendix A) 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 outlined 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 which are currently unknown, such as groundwater depth, surface hydrology, and presence of soil contaminants, also can affect a site's suitability for restoration or creation. Therefore, mitigation site selection should be considered preliminary until such time as complete evaluation of suitability of a site is completed (i.e., evaluations of soil condition, surface hydrology, groundwater depth, and conditions in regard to salinity, alkalinity or toxic substances).

The HEP evaluation of mitigation sites are 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 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 HEP analysis would need to be reviewed.

Construction Impact Mitigation Sites (Folsom Reservoir)
The following tables (Tables 8-11) summarize the actions proposed at each hypothetical mitigation site used to complete the HEP analyses. Additional information is contained in the HEP report (Appendix A).

Operation Impact Mitigation Sites (Folsom Reservoir)
Since there are uncertainties on effects of 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 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 (replanting on site would be the first priority).

Table 8. Oak Woodland - Grey Pine Woodland Mitigation Site Development Criteria, Folsom DS/FDR Project, California.

OAK WOODLAND-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 pots. ·Plant 90% oak tree species (blue and live oak); 10% grey pine. ·Provide watering, weeding, pest control as needed and monitoring reports for 3 years. ·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. ·Develop O&M Manual.

Table 9. Riparian Mitigation Site Development Criteria, Folsom DS/FDR Project, 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, pest control as needed and monitoring reports for 3 years. ·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 ·Develop O&M Manual.

Table 10. Seasonal Wetland Mitigation Site Development Criteria, Folsom DS/FDR Project, 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 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 O&M Manual.

Table 11. Chaparral Mitigation Site Development Criteria, Folsom DS/FDR Project, 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, pest control as needed and monitoring reports for 3 years. ·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 ·Develop O&M Manual.

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. The outcomes of any new or renewed consultations, as required under section 7 of the Endangered Species Act or the Fish and Wildlife Coordination Act, could also affect the recommendations herein. Rationale for most of the recommendations was discussed earlier within this report.

The Service recommends that Reclamation and the Corps implement the following preliminary recommendations if a Folsom DS/FDR project is pursued. As additional project information is developed these basic recommendations will be further refined.

GENERAL

- Select a flood control alternative which avoids, to the extent possible, unmitigable impacts and minimizes other impacts to fish and wildlife resources.

- Consult with the Service pursuant to section 7 of the ESA, to minimize adverse affects to federally listed species and their habitats.

- Consult with the CDFG regarding potential impacts to State listed threatened and endangered species.

- Avoid impacts to oak-grey pine woodland, riparian and seasonal wetlands, adjacent to, but outside of, construction easement areas with construction fencing.

- Avoid impacts to woody vegetation at all staging areas, borrow sites, and haul routes by enclosing them with fencing.

- Avoid impacts to water quality at Lake Natoma and Folsom Reservoir when loading, unloading, and potentially barging borrow material to be used for dam raising by taking appropriate measures to prevent soil, fuel, oil, lubricants, etc. from entering into these waters.

- Minimize impacts to annual grassland habitat and other disturbed areas, by re-seeding all disturbed areas with appropriate native grass species as construction elements are completed.

- Minimize impacts to fish and phytoplankton during spillway construction (dredging and blasting) by implementing conservation and minimization measures (such as a curtain) during in reservoir activities and minimize sedimentation from being released downstream.

- Compensate for any vegetation losses associated with developing access to loading and unloading barges to be used for moving borrow material. Specific routes and other details have not been determined.

- Compensate for unavoidable impacts to oak-grey pine woodland habitat by acquiring suitable lands and developing oak woodland habitat using the assumptions contained in Appendix A. For this preliminary draft report compensation acreages by alternative are summarized in Appendix C.

- Compensate for unavoidable impacts to riparian habitat by acquiring suitable lands and developing riparian habitat using the assumptions contained in Appendix A. For this preliminary draft report, the compensation acreage by alternative is summarized in Appendix C.

- Compensate for unavoidable impacts to seasonal wetland habitat by acquiring suitable lands and developing seasonal wetland habitat using the assumptions contained in Appendix A. For this preliminary draft report, the compensation acreage by alternative is summarized in Appendix C.

- Compensate for unavoidable impacts to chaparral habitat by acquiring suitable lands and developing chaparral habitat using the assumptions contained in Appendix A. For this preliminary draft report, the compensation acreages by alternative is summarized in Appendix C.

- Develop a monitoring and adaptive management program with the other agencies, 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 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 (replanting on-site would be the first priority). Budget in advance for this monitoring and adaptive management program.

- Develop a monitoring and adaptive management plan with the other agencies, to monitor the hydrology and vegetation at Mormon Island Preserve. Baseline conditions would be established before construction begins in the area and continue for 4 years after construction has been completed. Post-construction surveys would monitor for potential changes in wetland hydrology, water quality, and vegetation. If changes in wetland hydrologic function are detected from the baseline condition, implement adaptive management mitigation to return affected systems to baseline conditions considering the long-term conservation of the Mormon Island Preserve.

- Develop a mitigation monitoring and adaptive management plan for all mitigation sites developed for the project.

- Monitor methylmercury levels in water and suspended sediment of water being released from Folsom Dam during in reservoir construction activities until levels return to baseline.

- Complete a more thorough assessment of freshwater sediment effect levels for contaminants of concern, in particular mercury and nickel. Many of the references used in Reclamations' Sediment Characterization document to identify effect levels were inappropriate for fish and wildlife assessment needs. Other references such as MacDonald et al. (2000) and EPA (2004) provide good assessment guidelines for freshwater sediment.

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APPENDIX A

FOLSOM DAM SAFETY AND FLOOD DAMAGE REDUCTION PROJECT

HABITAT EVALUATION PROCEDURES

OCTOBER 2006

INTRODUCTION

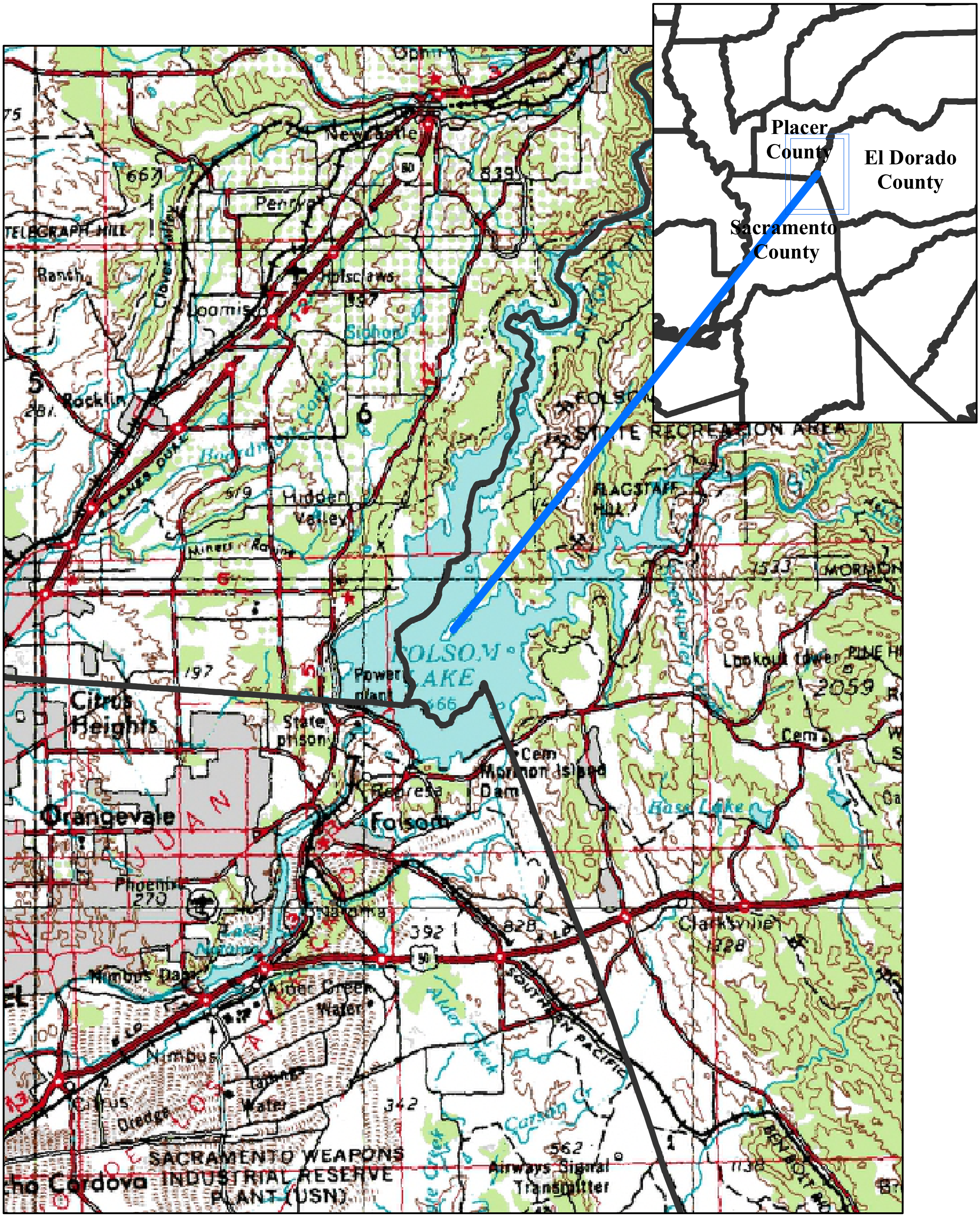
The United States Army Corps of Engineers (Corps) and the United States Bureau of Reclamation (Reclamation) seek to significantly reduce the risk of flooding along the main stem of the American River in the Sacramento area while meeting dam safety and public safety objectives. The project is authorized by the American River Watershed Investigation, Folsom Dam Modification project under section 101 (a) (6) of the Water Resources Development Act (WRDA) of 1999 and the Bureaus' 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 preliminary 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.

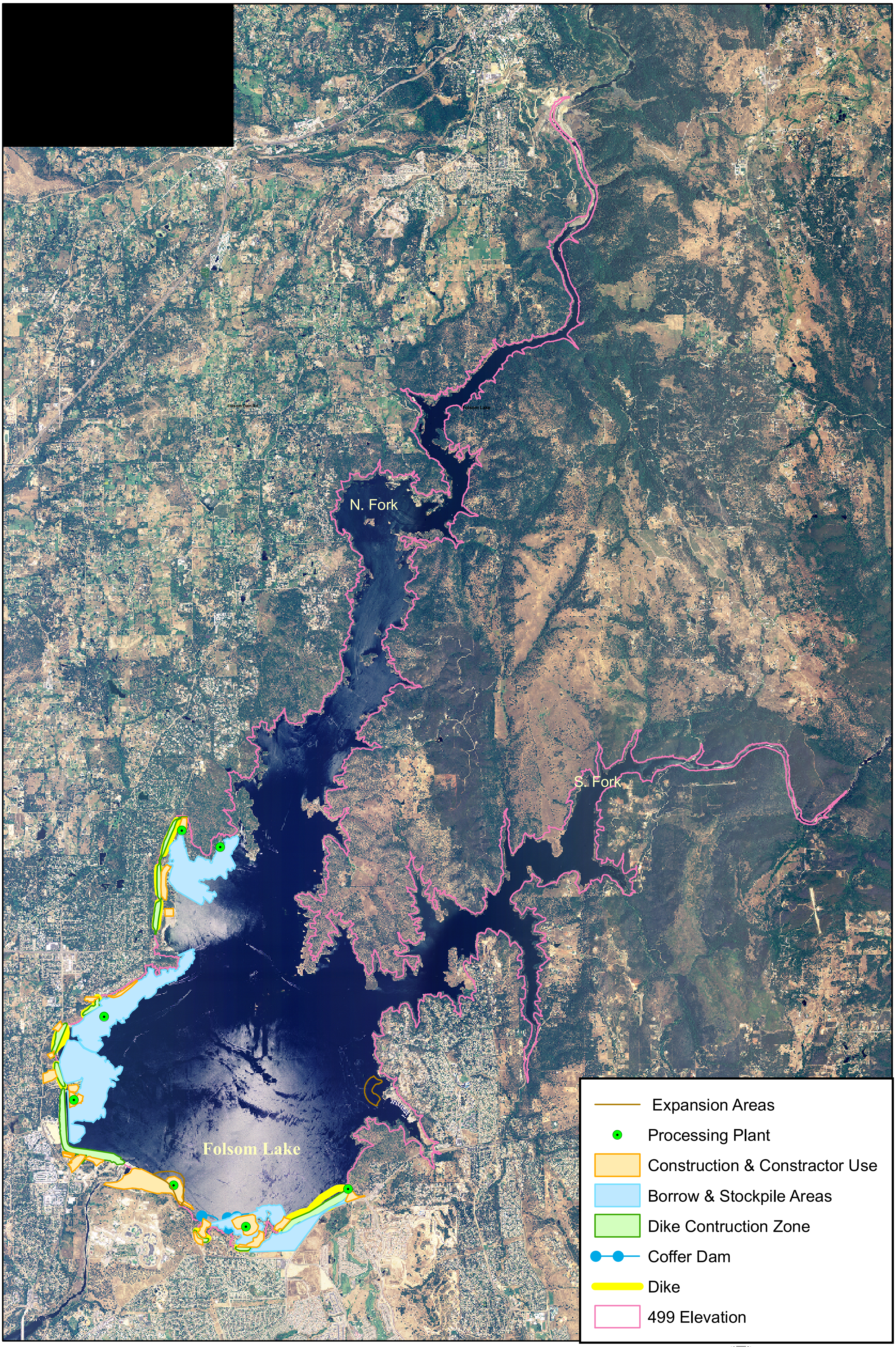


Project Vicinity- Folsom Reservoir

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.



Project Location Figure 2

Prepared by the US Fish and Wildlife Service, Sacreamento Fish andWildlife Office, Flood and Waterway Planning Branch; Sept. 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.

Mormon Island Auxiliary Dam and Morman Island Preserve Figure 3

Prepared by the US Fish and Wildlife Service, Sacreamento Fish andWildlife Office, Flood and Waterway Planning Branch; Sept. 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.

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.

Alternative 1 – No Dam Raise/Minimal Embankment Raise, Fuseplug Spillway

Alternative 1 would have a partially-lined fuseplug auxiliary spillway and have no raise to the main concrete dam. The wing dams, MIAD, and some dikes may be subject to an increase in height as part of reinforcing and protecting the structures. The height increase relates to the need to protect the structural integrity of the facilities during the PMF event, and not to increase temporary flood storage capacity, as would be accomplished by the other alternatives. Security features include installation of access controls, intrusion detection, supplemental lighting and closed circuit television components throughout the entire Folsom Facility.

Alternative 1 includes the features summarized in Table 1. Table 2 provides the estimated quantities of materials required for construction.

Table 1
Alternative 1 – No Dam Raise/Minimal Embankment Raise, Fuseplug Spillway

Feature	Project Component
Main Concrete Dam	• No Dam raise • Post-tensioned tendons, shear key elements, and or toe blocks • Foundation drain enhancements • Minor to moderate pier reinforcement • Minor to moderate spillway bridge improvements • Minor to moderate spillway gate improvements
Auxiliary Spillway	• PMF -520-ft wide fuseplug, partially-lined spillway
Left and Right Wing Dams	• ≤4-ft earthen raise crest protection • Crest filters in upper portion of dam and along contact with concrete dam
Mormon Island Auxiliary Dam	• ≤ 4-ft earthen raise for crest protection • Toe drains • Full-height filters • Jet grouting downstream foundation • Downstream overlay
Dikes 1, 2, 3, 7, & 8	• No activity

Table 1 (continued) Alternative 1 – No Dam Raise/Minimal Embankment Raise, Fuseplug Spillway	
Feature	**Project Component**
Dikes 4, 5 & 6	• ≤ 4-ft earthen raise for crest protection • Toe drains • Full-height filters
New Embankments	• No activity
Staging and Site Development	• Utility and road relocations • Haul road construction • Borrow site and staging area development • Stockpiling and borrow material processing • Concrete batch plant and jet grout processing

Table 2
Estimated Quantities – Alternative 1

Embankment Feature	Estimated Quantities (cy)					
	Excavation	Shell Material	Slope Protection	Filter	Asphalt Pavement	Concrete
Main Concrete Dam	50,000	0	0	0	0	25,000
Auxiliary Spillway	3,152,000	55,000	1400	14,700	1,100	124,809
Right Wing Dam	306,640	227,259	0	65,495	2,000	0
Left Wing Dam	97,075	66,128	0	20,662	600	0
MIAD	235,300	905,000	0	333,000	1,520	0
Dike 1	0	0	0	0	0	0
Dike 2	0	0	0	0	0	0
Dike 3	0	0	0	0	0	0
Dike 4	11,757	3,719	0	15,311	460	0
Dike 5	70,984	99,332	0	31,202	600	0
Dike 6	26,311	14,520	0	18,340	430	0
Dike 7	0	0	0	0	0	0
Dike 8	0	0	0	0	0	0
TOTALS	**3,950,067**	**1,370,958**	**1,400**	**498,710**	**6,710**	**149,809**

Alternative 2 – 4-foot Dam and Embankment Raise

Alternative 2 would have a partially or completely lined fuseplug auxiliary spillway with a tunnel and there would be a 4-foot raise to all facilities except the existing dam spillway elevation crest. The raise would allow for additional flood surge storage capacity, on a temporary as-needed basis, and not for increasing water storage capacity of the reservoir. Alternative 2 includes the majority of the security upgrade features from Alternative 1 and features provided in Table 3. Table 4 provides the estimated quantities for construction of this alternative.

Table 3 Alternative 2 – 4-foot Dam and Embankment Raise	
Feature	**Project Component**
Main Concrete Dam	• Parapet wall raise to non-overflow section • Post-tensioned tendons, shear key, and toe block elements • Foundation drain enhancements • Minor to moderate spillway pier reinforcements • Minor to moderate spillway bridge improvements • Minor to moderate spillway gate modifications
Auxiliary Spillway	• PMF fuseplug with partially- or fully-lined chute • Control structure – 350 to 400-ft wide fuseplug • Tunnel with 3 submerged tainter gates and fully-lined discharge channel
Left and Right Wing Dams	• 0.5-ft earthen, 3.5-ft parapet concrete wall • Toe drains • ½ height filters
Mormon Island Auxiliary Dam	• 4-ft earthen raise • Toe drains • Full-height filters • Excavation and replacement of downstream foundation • Downstream overlay
Dikes 1, 2, 3, and 8	• 4-ft earthen raise • Toe Drains
Dikes 4, 5 & 6	• 4-ft earthen raise • Toe drains • Full-height filters
Dikes 4 & 7	• 0.5-ft earthen, 3.5-ft parapet concrete wall raise • Toe drains • ½-height filters
Mooney Ridge	• New dike protection
Auxiliary Dikes	• Mini dikes • Flood easements
Staging and Site Development	• Utility and road relocations • Haul road construction • Borrow site and staging area development • Stockpiling and borrow material processing • Concrete batch plant

Table 4 Estimated Quantities – Alternative 2						
Embankment Feature	**Estimated Quantities (cy)**					
	Excavation	Shell Material	Slope Protection	Filter	Asphalt Pavement	Concrete
Main Concrete Dam	50,000	0	0	0	0	25,000
Auxiliary Spillway	3,190,000	55,000	0	14,700	1,100	124,650
Spillway Tunnel	1,656,330		0	0		134,570
Right Wing Dam	268,500	189,500	5,712	94,615	2,550	1,173
Left Wing Dam	371,800	254,400	1,734	90,808	816	367

Table 4-continued Estimated Quantities – Alternative 2						
Embankment Feature	**Estimated Quantities (cy)**					
	Excavation	Shell Material	Slope Protection	Filter	Asphalt Pavement	Concrete
MIAD	3,815,715	905,000	5,600	333,852	1,520	46,960
Dike 1	10,890	30,000	1,785	870	673	0
Dike 2	8,525	21,000	1,734	840	500	0
Dike 3	6,830	13,500	1,479	730	439	0
Dike 4	8,580	23,000	1,428	1,380	510	0
Dike 5	26,400	94,000	1,887	5,554	551	0
Dike 6	13,750	44,000	1,428	1,673	520	0
Dike 7	7,150	23,000	847	1,451	255	0
Dike 8	4,070	10,500	734	360	224	0
Mooney Ridge	15,730	55,000	5,712	3,100	520	
TOTALS	**9,454,270**	**2,008,900**	**30,080**	**549,933**	**10,178**	**332,450**

Alternative 3- Joint Auxiliary Spillway, 3.5-foot Parapet Wall Raise

Alternative 3 combines four distinct groupings of alternatives for the purpose of analyzing the cumulative effects of the project features, that when combined, meet all of Reclamation's Dam Safety needs, as well as the Corp's Flood Damage Reduction needs. Specifically, Alternative 3 includes: the joint auxiliary spillway which is strictly defined as a 900-foot-long waterside approach channel, a control structure with six submerged tainter gates, and a fully lined spillway channel. Alternative 3 also include the Dam Safety features from Alternative 1, the Corp's Flood Damage Reduction features, and the majority of the Security Upgrade features.

The stand alone Flood Damage Reduction Feature of the alternative is a 3.5-foot parapet concrete wall raise to all facilities, except for the concrete monoliths of the main dam where the existing 3.5-foot parapet wall would require minor modification to serve as a water impoundment structure. The raise would allow for additional flood surge storage capacity, on a temporary basis, and not for increasing the storage capacity of the reservoir. Alternative 3 serves as the functionally equivalent project to the Corps' authorized Folsom Dam Modification and Folsom Dam Raise projects and includes the features outlined in Table 5.

Table 5 Alternative 3- Joint Auxiliary Spillway and 3.5-foot Parapet Wall Raise	
Feature	**Project Component**
Main Concrete Dam	• No dam raise – minor modification to existing parapet wall (3.5 ft) • Modify/replace existing spillway bridge • Modify/replace 3 emergency gates; main spillway/service gate reinforcement • Minor to moderate spillway pier modification • Post-tensioned tendons • Shear key elements • Toe blocks • Foundation drain enhancements • Stilling basin extension (50-75 ft)
Auxiliary Spillway	• Joint (PMF/flood control) auxiliary spillway w/ fully-lined chute and approach channel • Control structure – 6 submerged tainter gates plus redundant water supply outlet • The control structure incorporates a bridge over the structure • Fully-lined stilling basin
Left and Right Wing Dams	• 3.5-ft parapet concrete wall • Training wall between left wing dam and auxiliary spillway • Crest filters in upper portion of dam and along contact with concrete dam
Mormon Island Auxiliary Dam	• 3.5-ft parapet concrete wall • Toe drains • Full-height filters • Jet grouting downstream foundation • Downstream overlay
Dikes 1, 2, 3, 7 & 8	• 3.5-ft parapet concrete wall • Replace filter material removed at dikes 1-3, 7 & 8 for parapet wall construction
Dikes 4, 5 & 6	• 3.5-ft parapet concrete wall • Toe drains • Full-height filters
New embankments/easements	• New embankments • Flood easements • Property acquisitions
Miscellaneous	• Utility and road relocations • Security provisions option • Haul road construction • Borrow site and disposal site development • Staging, borrow material processing, concrete batch plant and jet grout processing • Excavation blasting; underwater blasting and dredging

Alternative 4 – 7-foot Dam and Embankment Raise

Alternative 4, would have a four submerged tainter gate auxiliary spillway which is strictly defined as a 900-foot-long waterside approach channel, a control structure with four submerged tainter gates, and a fully lined spillway channel. Alternative 4 would provide additional freeboard to all Folsom facilities, providing an additional margin of safety during a PMF event and would provide additional flood storage capacity, temporarily on an as-needed basis. Alternative 4 includes the majority of the security upgrade features from Alternative 1 and the features presented in Table 6. The estimated quantities of materials required for construction of Alternative 4 are provided in Table 7.

A 7-foot raise could be accomplished two different ways. First, the raise of the embankments could be accomplished using earthen material. Secondly, the raise could be accomplished through a combination of parapet walls and earthen material (essentially combining Alternatives 2 and 3). However, Alternative 4 in this analysis is described as a 7-foot earthen raise.

Table 6
Alternative 4 – 7-foot Dam and Embankment Raise

Feature	Project Component
Main Concrete Dam	• 7-ft raise to non-overflow sections • Post-tensioned tendons, shear key elements, toe blocks • Foundation drain enhancements • Moderate spillway pier reinforcement • Replace existing spillway bridge • Spillway gate replacements • Stilling basin extension (50-75 ft)
Auxiliary Spillway	• 4 gate fully-lined spillway • Control structure – 4 submerged tainter gates
Left and Right Wing Dams	• 7-ft earthen raise • Toe drains • Full-height filters
Mormon Island Auxiliary Dam	• 7-ft earthen raise • Toe drains • Full-height Filters • Jet grouting downstream foundation • Downstream overlay
Dikes 1, 2, 3, 7 and 8	• 7-ft earthen raise • Toe drains
Dikes 4, 5 and 6	• 7-ft earthen raise • Toe drain • Full height filters
New Embankments	• New embankment construction • Flood easements • Property acquisition
Miscellaneous	• Utility and road relocations • Haul road construction • Borrow site and staging area development • Stockpiling and borrow material processing • Concrete batch plant and jet grout processing • Underwater blasting and dredging of material

Table 7
Estimated Quantities – Alternative 4

Embankment Feature	Estimated Quantities (cy)					
	Excavation	Shell Material	Slope Protection	Filter	Asphalt Pavement	Concrete
Main Concrete Dam	50,000	0	0	0	0	25,000
Auxiliary Spillway	3,425,057	58,135	0	14,700	1,100	124,650
Right Wing Dam	268,500	23,000	0	69,200	2,000	7,200
Left Wing Dam	370,200	13,500	0	22,260	600	4,200

Table 7-continued Estimated Quantities – Alternative 4						
Embankment Feature	**Estimated Quantities (cy)**					
	Excavation	Shell Material	Slope Protection	Filter	Asphalt Pavement	Concrete
MIAD	235,300	905,000	0	246,450	1,520	0
Dike 1	23,000	75,900	0	0	900	0
Dike 2	20,400	56,300	0	0	960	0
Dike 3	11,800	37,500	0	0	660	0
Dike 4	14,200	48,000	0	3,060	380	0
Dike 5	40,500	140,700	0	53,420	510	0
Dike 6	35,700	98,300	0	16,140	450	0
Dike 7	2,400	64,500	0	11,520	440	0
Dike 8	4,700	21,500	0	6,100	210	0
TOTALS	**4,501,757**	**1,542,235**	**1,400**	**444,650**	**11,030**	**161,050**

Alternative 5 – 17-foot Dam and Embankment Raise

Alternative 5 – the 17-foot Dam and Embankment Raise – would safely accommodate the PMF event by using the main dam spillways, including some overtopping of the center portion of the concrete dam, and increasing the flood surcharge without the need for an auxiliary spillway. The increased capacity would only be used to address flood control/dam safety considerations and not to increase the permanent storage capacity of Folsom Reservoir. Alternative 5 includes the majority of the security upgrade features from Alternative 1 and the features presented in Table 8. Quantities for Alternative 5 are provided in Table 9.

Table 8 Alternative 5 – 17-foot Dam and Embankment Raise	
Feature	**Project Component**
Main Concrete Dam	• 17-ft raise to non-overflow section • Post-tensioned tendon, shear key elements and toe blocks • Foundation drain enhancements • Replace existing spillway bridge • Spillway gate replacements • Gate and pier reinforcement • No change to stilling basin
Auxiliary Spillway	• None
Left and Right Wing Dams	• 17-ft earthen raise • Toe drains • Full-height filters
Mormon Island Auxiliary Dam	• 17-ft earthen raise • Toe drains • Full-height filters • Excavation and replacement of downstream foundation • Downstream overlay
Dikes 1, 2, 3, 7 and 8	• 17-ft earthen raise • Toe drains

Table 8-continued Alternative 5 – 17-foot Dam and Embankment Raise	
Feature	**Project Component**
Dikes 4, 5 and 6	• 17-ft earthen raise • Toe drains • Full-height filters
New Embankment/Easements	• New embankment • Flood easements • Property acquisition
Other Project Features	• Utility and road relocations • Haul road construction • Borrow site and staging area development • Stockpiling and borrow material processing • Concrete batch plant

Table 9 Estimated Quantities – Alternative 5						
Embankment Feature	**Estimated Quantities (cy)**					
	Excavation	Shell Material	Slope Protection	Filter	Asphalt Pavement	Concrete
Main Concrete Dam	50,000	0	0	0	0	25,000
Auxiliary Spillway	0	0	0	0	0	0
Right Wing Dam	268,500+	23,000+	0	69,200	2,000	7,200
Left Wing Dam	370,200+	13,500+	0	22,260	600	4,200
MIAD	235,300+	905,000+	0	246,450	1,520	0
Dike 1	23,000+	75,900+	0	0	900	0
Dike 2	20,400+	56,300+	0	0	960	0
Dike 3	11,800+	37,500+	0	0	660	0
Dike 4	14,200+	48,000+	0	3,060	380	0
Dike 5	40,500+	140,700+	0	53,420	510	0
Dike 6	35,700+	98,300+	0	16,140	450	0
Dike 7	2,400+	64,500+	0	11,520	440	0
Dike 8	4,700+	21,500+	0	6,100	210	0
TOTALS	**4,501,757**	**1,542,235**	**0**	**444,650**	**11,030**	**161,050**

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 (PA3 and PA4) and the direct impacts (PA1 and PA2) 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:

<u>Use of HEP:</u>

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.

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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 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 supplies by Reclamation and the Corps acreages were quantified using GIS. The cover-types and acreage affected by the proposed work is summarized in Table 10 and Table 11.

Table 10. Summary of Cover-Types, Acres Impacted, and Compensation Needed by Alternative Proposed for the Construction of Folsom DS/FRD Project, California.

Folsom DS/FRD Project					
Alternative	1	2	3	4	5
Cover-Type	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed	Impacted Acres: Compensation Needed
Oak/grey pine woodland	80.51 : 380.26	81.16 : 383.33	80.36 : 379.55	80.66 : 380.97	80.66 : 380.97
Riparian woodland	40.93 : 56.57	39.83 : 54.78	40.99 : 56.83	40.65 : 55.37	40.65 : 55.56
Chaparral	1.55 : 3.82	1.52 : 3.96	1.26 : 3.09	1.55 : 3.57	1.54 : 3.60
Seasonal wetland	4.29 : 17.16	4.29 : 17.16	4.29 : 17.16	4.29 : 17.16	4.29 : 17.16
Total	**127.28 : 457.81**	**126.80 : 429.23**	**126.90 : 459.23**	**127.15 : 457.07**	**127.14 : 457.29**

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 11. Summary of Cover-Types, Impacted Acres and Compensation Needed for the Inundation at 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	**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	773.08 : 3,651.42	811.74 : 3,834.02	926.66 : 4,376.81	1,323.35 : 6,250.47
Riparian woodland*	n/a	n/a	n/a	n/a
Chaparral	32.22 : 101.71	34.32 : 112.31	40.80 : 133.51	66.09 : 216.27
Seasonal wetland*	n/a	n/a	n/a	n/a
Total	**805.30 : 3,753.13**	**846.06 : 3,946.33**	**967.46 : 4,510.32**	**1,389.44 : 6,466.74**

*No permanent impacts to riparian woodland and seasonal wetland are expected from the short inundation that would occur with the Folsom DS/FDR project.

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 12. 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 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.

Table 12. HEP Cover-types, proposed HIS models, and HSI model variables for the Folsom DS/FDR Project, California.

COVER-TYPE	PROPOSED HSI MODELS	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.	

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 four 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 construction associated with the dikes and wing dams (150-foot zone on the landside); (3) impacts from borrow and stockpile; and (4) 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 direct impacts and mitigation needed for the Folsom DS/FDR project are summarized in Tables 13 thru 17. 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.

Table 13. **Alternative 1**- Summary of Cover-Types, Acres Impacted, Net Change in Average Annual Habitat Units With- and Without-Project, and Compensation Need 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	Oak - grey pine woodland	19.67	4.86	0.04	-4.82	92.91
	Riparian woodland	3.23	1.34	0.01	-1.32	4.64
	Seasonal wetland	0.50	0.41	0.00	-0.41	15.28
	Chaparral	3.82	0.15	0.04	-0.11	1.23
Dikes	Oak - grey pine woodland	44.46	10.98	0.09	-10.89	209.99
	Riparian woodland	3.57	1.48	0.01	-1.46	4.88
	Seasonal wetland	0.38	0.04	0.00	-0.04	1.52
	Chaparral	0.71	0.21	0.06	-0.15	1.66
Borrow & Stockpile	Oak - grey pine woodland	8.81	2.18	0.02	-2.16	41.61
	Riparian woodland	32.41	13.40	0.12	-13.29	44.30
	Seasonal wetland	0.91	0.10	0.00	-0.10	3.64
	Chaparral	n/a	n/a	n/a	n/a	n/a
Spillway	Oak - grey pine woodland	7.57	1.87	0.02	-1.85	35.75
	Riparian woodland	1.72	0.71	0.01	-0.71	2.75
	Seasonal wetland	n/a	n/a	n/a	n/a	n/a
	Chaparral	0.34	0.10	0.03	-0.07	0.93
Raise (Inundation)	Oak - grey pine woodland	n/a	n/a	n/a	n/a	n/a
	Riparian woodland	n/a	n/a	n/a	n/a	n/a
	Seasonal wetland	n/a	n/a	n/a	n/a	n/a
	Chaparral	n/a	n/a	n/a	n/a	n/a

Table 14. **Alternative 2**- Summary of Cover-Types, Acres Impacted, Net Change in Average Annual Habitat Units With- and Without-Project, and Compensation Need for the Direct Impacts and Inundation Impacts of Construction and Raise of the Federal 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	Oak - grey pine woodland	20.17	4.98	0.04	-4.94	95.27
	Riparian woodland	2.41	1.00	0.01	-0.99	3.29
	Seasonal wetland	3.82	0.41	0.00	-0.41	15.28
	Chaparral	0.48	0.14	0.02	-0.13	1.40
Dikes	Oak - grey pine woodland	44.46	10.98	0.09	-10.89	209.99
	Riparian woodland	3.57	1.48	0.01	-1.46	4.88
	Seasonal wetland	0.38	0.04	0.00	-0.04	1.52
	Chaparral	0.71	0.21	0.06	-0.15	1.66
Borrow & Stockpile	Oak - grey pine woodland	8.81	2.18	0.02	-2.16	41.61
	Riparian woodland	32.41	13.40	0.12	-13.29	44.30
	Seasonal wetland	0.91	0.10	0.00	-0.10	3.64
	Chaparral	n/a	n/a	n/a	n/a	n/a
Spillway	Oak - grey pine woodland	7.72	1.91	0.02	-1.89	36.46
	Riparian woodland	1.44	0.60	0.01	-0.59	2.31
	Seasonal wetland	n/a	n/a	n/a	n/a	n/a
	Chaparral	0.33	0.10	0.03	-0.07	0.90
Raise (Inundation)	Oak - grey pine woodland	811.74	200.53	1.73	-198.80	3,834.02
	Riparian woodland	48.66	20.12	20.12	0.00	0.00
	Seasonal wetland	0.58	0.06	0.06	0.00	0.00
	Chaparral	34.32	13.27	3.04	-10.23	112.31

Table 15. **Alternative 3**- Summary of Cover-Types, Acres Impacted, Net Change in Average Annual Habitat Units With- and Without-Project, and Compensation Need 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	Oak - grey pine woodland	19.87	4.91	0.04	-4.87	93.85
	Riparian woodland	2.75	1.22	0.01	-1.21	4.03
	Seasonal wetland	3.82	0.41	0.00	-0.41	15.28
	Chaparral	0.20	0.06	0.02	-0.04	0.47
Dikes	Oak – grey pine woodland	44.46	10.98	0.09	-10.89	209.99
	Riparian woodland	3.57	1.48	0.01	-1.46	4.88
	Seasonal wetland	0.38	0.04	0.00	-0.04	1.52
	Chaparral	0.71	0.21	0.06	-0.15	1.66
Borrow & Stockpile	Oak - grey pine woodland	8.81	2.18	0.02	-2.16	41.61
	Riparian woodland	32.41	13.40	0.12	-13.29	44.30
	Seasonal wetland	0.91	0.10	0.00	-0.10	3.64
	Chaparral	n/a	n/a	n/a	n/a	n/a
Spillway	Oak - grey pine woodland	7.22	1.78	0.02	-1.77	34.10
	Riparian woodland	2.26	0.93	0.01	-0.93	3.62
	Seasonal wetland	n/a	n/a	n/a	n/a	n/a
	Chaparral	0.35	0.11	0.03	-0.07	0.96
Raise (Inundation)	Oak - grey pine woodland	773.08	190.98	1.65	-189.33	3,651.43
	Riparian woodland	45.54	n/a	n/a	n/a	0.00
	Seasonal wetland	0.58	n/a	n/a	n/a	0.00
	Chaparral	32.22	12.46	2.85	-9.61	101.71

Table 16. **Alternative 4**- Summary of Cover-Types, Acres Impacted, Net Change in Average Annual Habitat Units With- and Without-Project, and Compensation Need 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	Oak - grey pine woodland	19.88	9.14	0.08	-9.07	93.90
	Riparian woodland	4.00	3.08	0.03	-3.05	5.27
	Seasonal wetland	3.82	0.41	0.00	-0.41	15.28
	Chaparral	0.70	0.39	0.11	-0.28	1.58
Dikes	Oak - grey pine woodland	44.46	10.98	0.09	-10.89	209.99
	Riparian woodland	3.57	1.48	0.01	-1.46	4.88
	Seasonal wetland	0.38	0.04	0.00	-0.04	1.52
	Chaparral	0.71	0.21	0.06	-0.15	1.66
Borrow & Stockpile	Oak - grey pine woodland	8.81	2.18	0.02	-2.16	41.61
	Riparian woodland	32.41	13.40	0.12	-13.29	44.30
	Seasonal wetland	0.91	0.10	0.00	-0.10	3.64
	Chaparral	n/a	n/a	n/a	n/a	n/a
Spillway	Oak - grey pine woodland	7.51	3.45	0.03	-3.42	35.47
	Riparian woodland	0.67	0.52	0.00	-0.51	0.92
	Seasonal wetland	n/a	n/a	n/a	n/a	n/a
	Chaparral	0.41	0.08	0.02	-0.06	0.33
Raise (Inundation)	Oak - grey pine woodland	926.66	228.92	1.97	-226.95	4,376.81
	Riparian woodland	56.48	23.36	23.36	0.00	n/a
	Seasonal wetland	0.58	0.06	0.06	0.00	n/a
	Chaparral	40.80	15.78	3.61	-12.16	133.51

Table 17. **Alternative 5**- Summary of Cover-Types, Acres Impacted, Net Change in Average Annual Habitat Units With- and Without-Project, and Compensation Need 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	Oak - grey pine woodland	27.39	12.60	0.11	-12.49	129.37
	Riparian woodland	4.67	3.60	0.03	-3.56	6.38
	Seasonal wetland	3.82	0.76	0.01	-0.76	15.28
	Chaparral	0.83	0.46	0.14	-0.33	1.94
Dikes	Oak - grey pine woodland	44.46	10.98	0.09	-10.89	209.99
	Riparian woodland	3.57	1.48	0.01	-1.46	4.88
	Seasonal wetland	0.38	0.04	0.00	-0.04	1.52
	Chaparral	0.71	0.21	0.06	-0.15	1.66
Borrow & Stockpile	Oak - grey pine woodland	8.81	2.18	0.02	-2.16	41.61
	Riparian woodland	32.41	13.40	0.12	-13.29	44.30
	Seasonal wetland	0.91	0.10	0.00	-0.10	3.64
	Chaparral	n/a	n/a	n/a	n/a	n/a
Spillway	Oak - grey pine woodland	n/a	n/a	n/a	n/a	n/a
	Riparian woodland	n/a	n/a	n/a	n/a	n/a
	Seasonal wetland	n/a	n/a	n/a	n/a	n/a
	Chaparral	n/a	n/a	n/a	n/a	n/a
Raise (Inundation)	Oak - grey pine woodland	1,323.35	326.92	2.82	-324.10	6,250.47
	Riparian woodland	64.69	26.75	26.75	0.00	n/a
	Seasonal wetland	0.58	0.06	0.06	0.00	n/a
	Chaparral	66.09	25.55	5.85	-19.70	216.27

<u>Folsom Reservoir Inundation</u>
Between 811.74 and 1,323.35 acres would 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. Tables 13 through 17 summarize the acreage 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 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 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).

Lastly, preliminary work conducted by the Reclamation indicates that several mini dikes (as many as 45) would need to be constructed depending on the raise alternative to accommodate the higher water elevations and to prevent inundation of roads and private lands. These impacts have not been addressed to date.

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 58
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 58 V1 - no change from TY 0
V2 - no change from TY 0
V3 - no change from TY 0

HSI = 0.65

<u>PA 2 - Future With Project (Impact Area)</u>

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 58- 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

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 58 - V1 - no change from TY 1
V2 - no change from TY 1
V3 - no change from TY 1

HSI = .06

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 58 - no change from TY 15 HSI = 0

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 58 - no change from TY 15 HSI = .06

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

TY 58	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

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 58 -	V1 - 13 dbh	SI = 0.6
	V2 - $\geq$ 100 tree/ac	SI = 1.0
	V3 - 100%	SI = 1.0

$$HSI = \frac{0.6 + 1.0 + 1.0}{3} = 0\ .86$$

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 58 – no change from baseline HSI = 0.23

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 58 – no change from baseline HSI = 0.2

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 58 – no change from baseline HSI = 0.76

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 58 – no change from TY 1 HSI = 0.05

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 58 – no change from baseline TY 1 HSI = 0

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 58 – no change from TY 1 HSI = 0.06

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 58 no change from TY 4

CALIFORNIA VOLE

TY 0 - Baseline (estimated)

V1 - Height of herbaceous vegetation ($\geq$ 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 58 - V1 - no change from TY 4

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 58 - no change from TY 4

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 58 - no change from TY 4 HSI = .70

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 - $\geq$ 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 58- V1 - no change from TY 4
V2 - no change from TY 4
V3 - no change from TY 4

HSI = .78

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

$$HSI = (V1 + V2 + V3 + V4 + V5)^{½} = (0.1 \times 1.0 \times 1.0 \times 1.0 \times 0.1)^{½} = 0.1$$

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

$$HSI = (1.0 \times 1.0 \times 1.0 \times 1.0 \times 1.0)^{½} = 1.0$$

TY 58 - no change from TY 4 HSI = 1.0

AMERICAN RIVER WATERSHED INVESTIGATION
FOLSOM BRIDGE PROJECT

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 58 – no change from baseline HSI = 0.22

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

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 58 – no change from baseline HSI = 0.63

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 58 –	V1 – no shrubs	SI = 0
	V2 – no shrubs	SI = 0
	V3 - no shrubs	SI = 0

HSI = $(V1 \times V2 \times V3)^{1/3} = 0$

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 58 –	V1 – no trees	SI = 0
	V2 – no trees	SI = 0
	V3 – no trees	SI = 0

HSI = $(V1 \times V2 \times V3)^{1/3} = 0$

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 58 – No change from TY 1

<u>MP 1 – Management Area – Future Without the Project (Compensation Site)</u>

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 51 – no change from baseline HSI = 0

TY 58 – no change from baseline HSI = 0

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 58 – no change from baseline HSI = 0

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 58 – no change from baseline HSI = 0

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 = $(0.15 \times 0.17 \times 0.80)^{1/2} = 0.14$

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 = $(1.0 \times 0.82 \times 0.80)^{1/2} = 0.81$

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 = $(1.0 \times 0.82 \times 0.80)^{1/2} = 0.81$

TY 58 – no change from TY 30

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 58 - 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 = $(1.0 \times 0.9 \times 0.5)^{1/3} = 0.77$

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 58 –	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

$CI = (2V1 \times V2 \times V3)^{1/3} = 1.16\ (1.0)$

$TI = (V1 \times V4)^{1/2} = 0.57$

$HSI = (CI \times TI)^{1/2} = 0.75$

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 58 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

WRENTIT

TY 0 – Baseline (measured)

V1 - % shrub cover
V2 - % shrub cover ≤ 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 58 V1 – no change from TY 1
V2 - no change from TY 1

HSI = $(V1 \times V2)^{1/2} = 0.34$

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 58- V1 – no change from TY 1
V2 - no change from TY 1

<u>PA 2 - Future With Project (Impact Area)</u>

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 58 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

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 58 V1 – no change from TY 1
V2 - no change from TY 1

HSI = 0

CALIFORNIA THRASHER

TY 0 – Baseline (measured)

V1 – Presence of low shrub openings
V2 - Shrub/seedling cover

HSI = $(V1 \times V2^2)^{1/3}$ = 0.34

TY 1 -	V1 – no shrubs	SI = 0
	V2 - no shrubs/seedlings	SI = 0

HSI = $(0 \times 0^2)^{1/3} = 0$

TY 58- V1 – no change from TY 1
V2 - no change from TY 1

<u>PA 3 - Future Without Project (Inundation Area)</u>

<u>CHAPARRAL</u>

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 58 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

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 58 V1 – no change from TY 1
V2 - no change from TY 1

$HSI = (V1 \times V2)^{1/2} = 0.19$

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 58- V1 – no change from TY 1
V2 - no change from TY 1

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 58 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

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 58 V1 – no change from TY 1
V2 - no change from TY 1

HSI = 0

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 58- V1 – no change from TY 1
V2 - no change from TY 1

MP 1 - Management Area - Future Without Project (Compensation Site)

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 = $(V1 \times V2)^{½} = (0 \times 0)^{½} = 0$

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

<u>MP 2 - Management Area - Future With Project (Compensation Site)</u>

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

$$HSI = \frac{1.0 + 0.8 + 0.6 + 0.2}{5} = 0.52$$

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 = 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 HABITAT VARIABLES

Average height of deciduous tree canopy (V_1)

Valley Woodland (W)

Reproduction/ Cover Percent deciduous tree

Riparian (R)

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 COVER TYPE EQUATION

Reproduction R, W

$(V_1 \times V_2 \times V_3)^{1/3}$

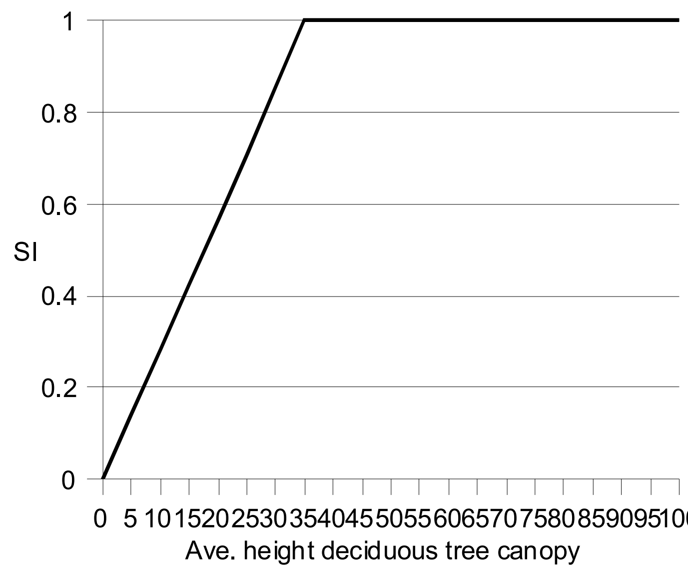
The HSI value for the northern oriole is equal to the reproduction/cover value.

Model Applicability

The model applies to breeding habitat of the northern oriole in the Central Valley of California up to 500 feet in elevation.

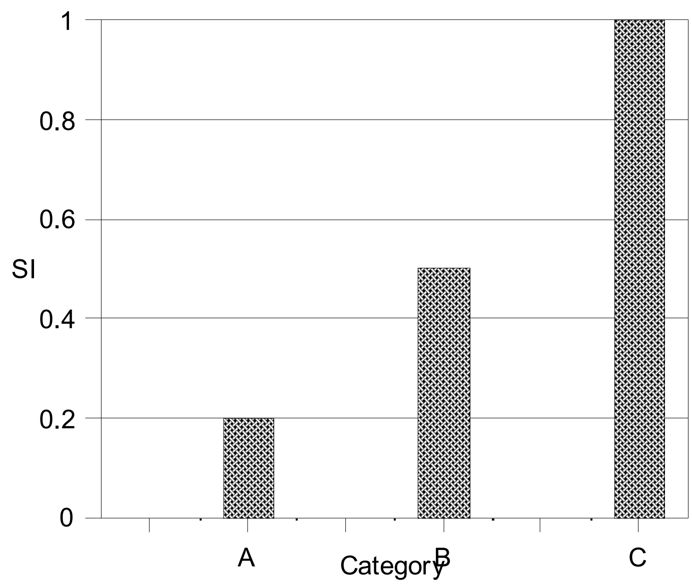
1. Average height of deciduous tree canopy.

   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.

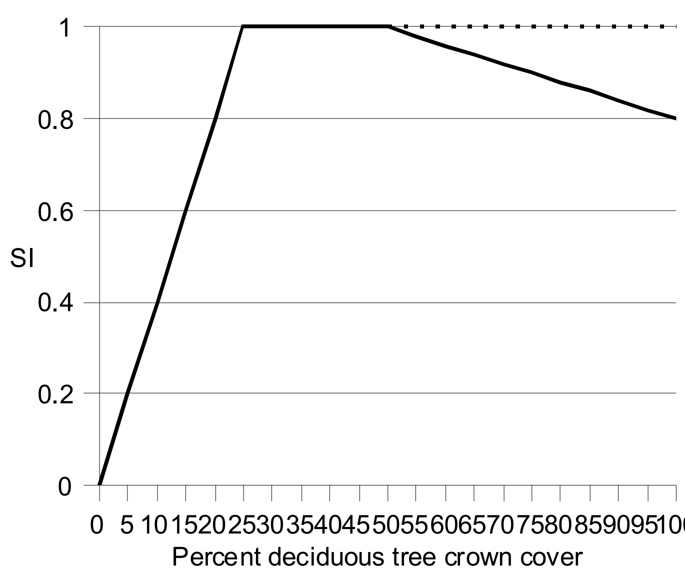


2. Percent deciduous tree crown cover.

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
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Division of Ecological Services
Sacramento, California

March 1989

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
Riparian (R) Oak savannah (O) Oak woodland (W) Scrub (S) Annual Grassland (G)	Cover/Reproduction	Percent ground cover (V_1) Average size of ground cover objects (V_2) 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

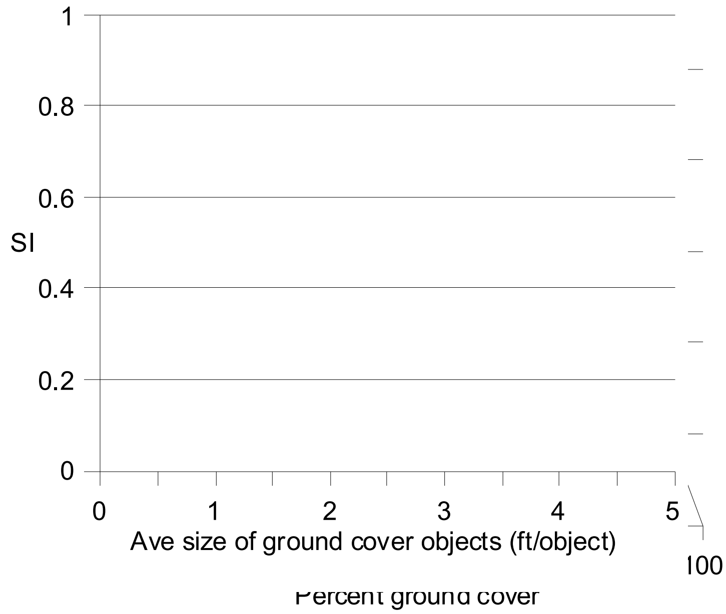
Assumes:

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.

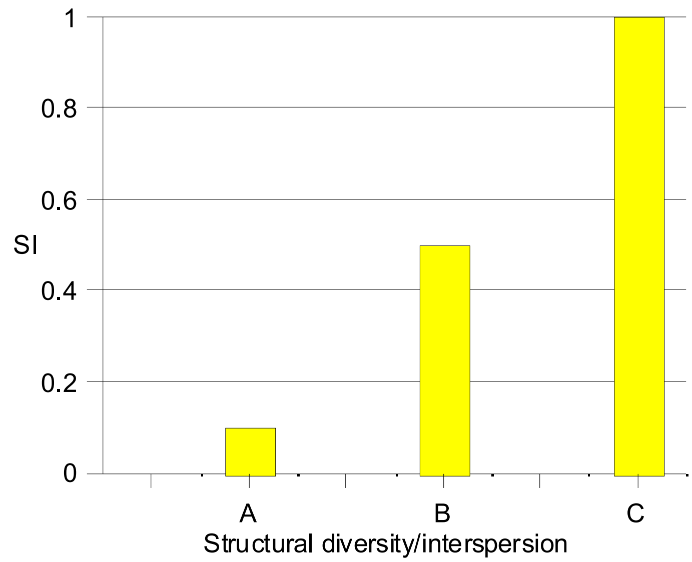
Assumes:

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.

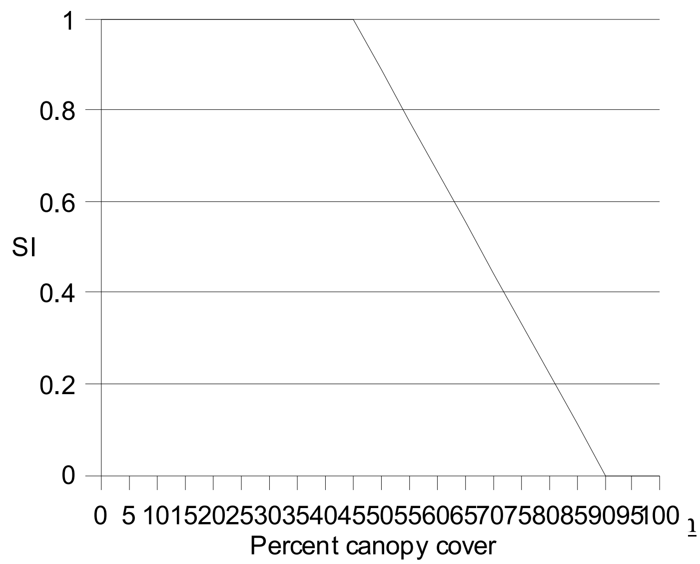
Variable 4. Percent canopy cover

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 $\quad\quad\quad 3)^{1/3}$

Thermoregulation R.O.W.S,G $TI = (V_1 \times V_4)^{½}$

HSI Determination $HSI = (CI \times TI)^{½}$

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).

ACKNOWLEDGMENTS

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HABITAT SUITABILITY INDEX MODELS: YELLOW WARBLER

by

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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:

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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.

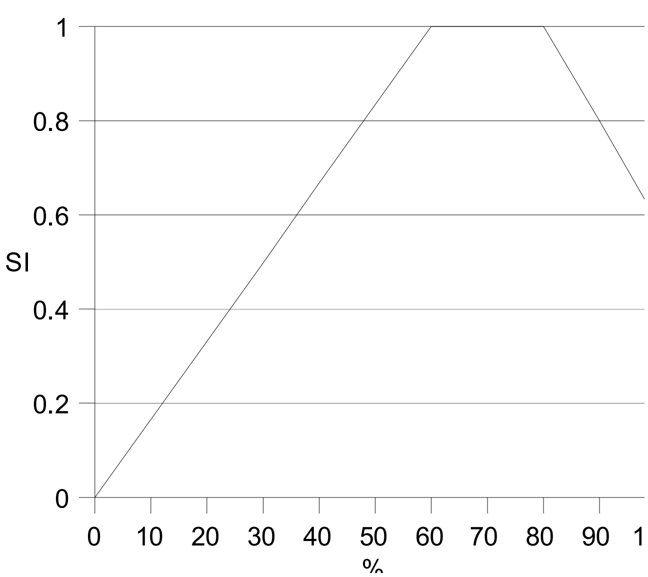
Habitat variable	Life requisite	Cover types	
Percent deciduous shrub crown cover			
Average height of deciduous shrub canopy	Reproduction	Deciduous Shrubland Deciduous Scrub/ Shrub Wetland	HSI
Percent of shrub canopy comprised of hydrophytic shrubs			

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.

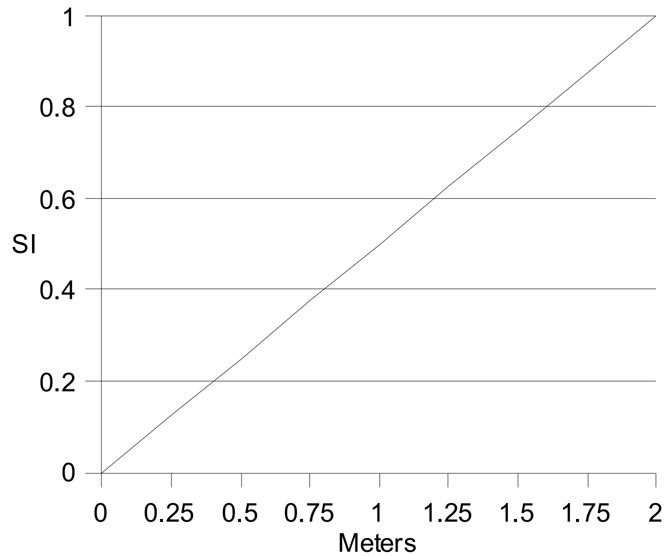
Each of these habitat variables exert a major influence in determining overall habitat quality for the yellow warbler. A habitat must contain optimal levels of all variables to have maximum suitability. Low values of any one variable may be partially offset by higher values of the remaining variables. 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.

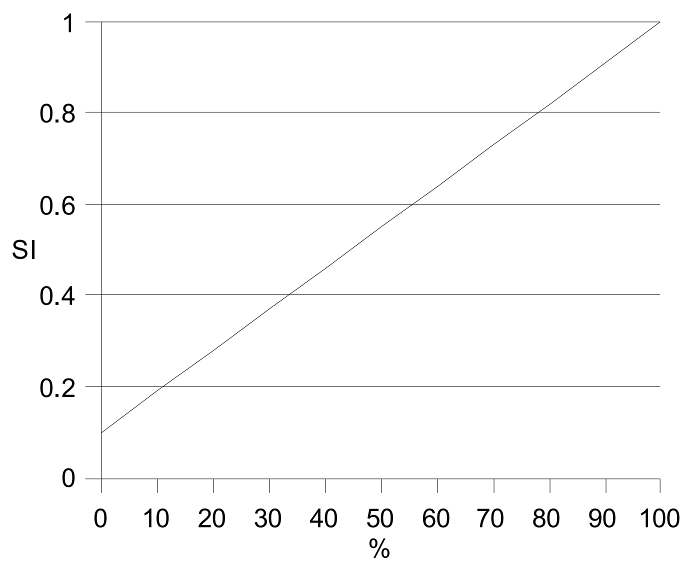


Cover-type Variable
DS,DSW V_1
Percent deciduous shrub crown cover.



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

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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.

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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

Geoqraphic 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 qua1ity 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.

<u>HSI determination</u>. 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:

$$HSI = (V1 \text{ x } V2 \text{ x } V3 \text{ x } V4 \text{ x } V5)$$

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:

$$HSI = (0.1 \text{ x } V6)^{1/2}$$

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:

$$HSI = (V7 \text{ x } V8)^{1/2}$$

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 $\geq$ 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

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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.

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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.

<u>Water</u>
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).

<u>Interspersion</u>
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

<u>Model Applicability</u>

<u>Geographic</u> 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.

<u>Season</u>. 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

Feedinq 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.	

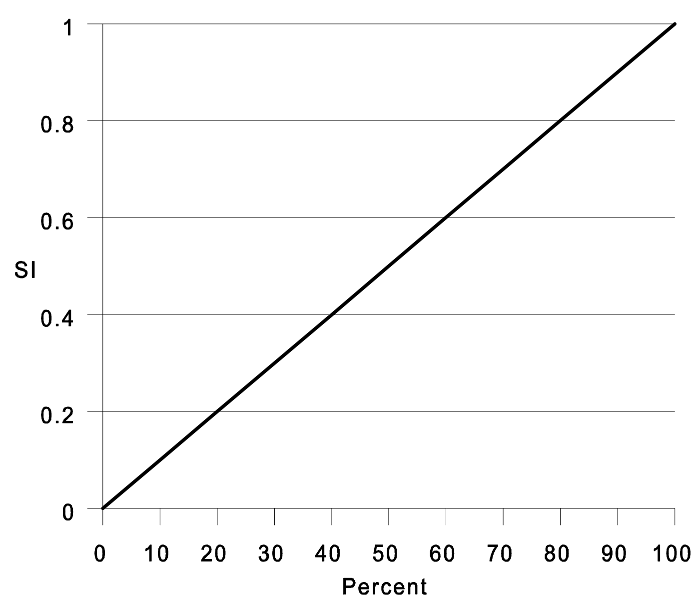
Food HSI (Feeding)

V_2 Percentage of submerged or emergent vegetation cover in zone 10-23 cm deep.

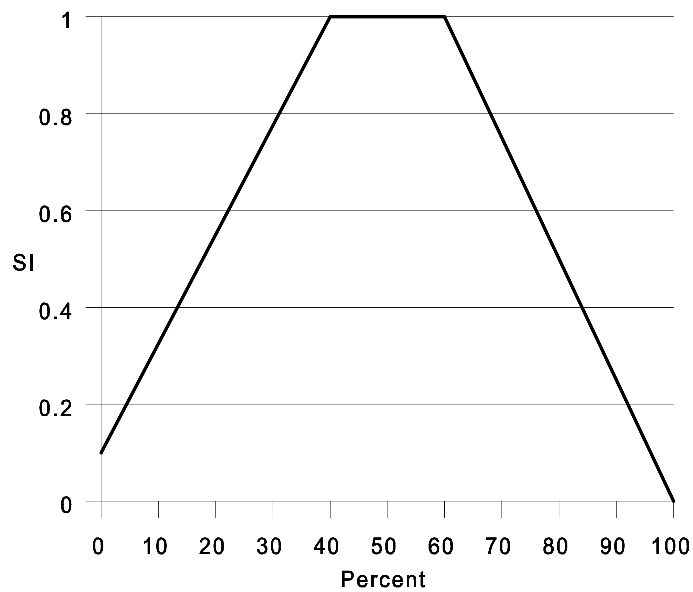
<u>Suitability Index (SI) Graphs for Model Variables</u>
This section provides graphic representation of the relationship between habitat variables and habitat suitability for the great egret in wetland (see Table 2 for abbreviations) and upland (U) cover types. The SI values are read directly from the 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*)

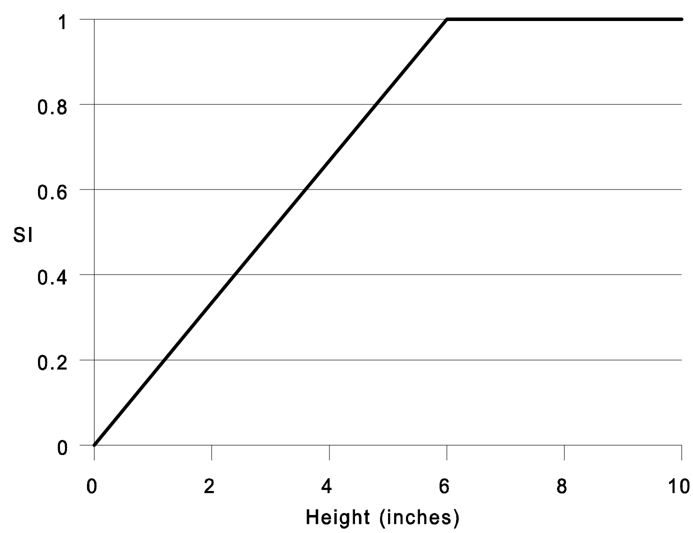
U.S. Fish and Wildlife Service
Division of Ecological Services
Sacramento, California

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

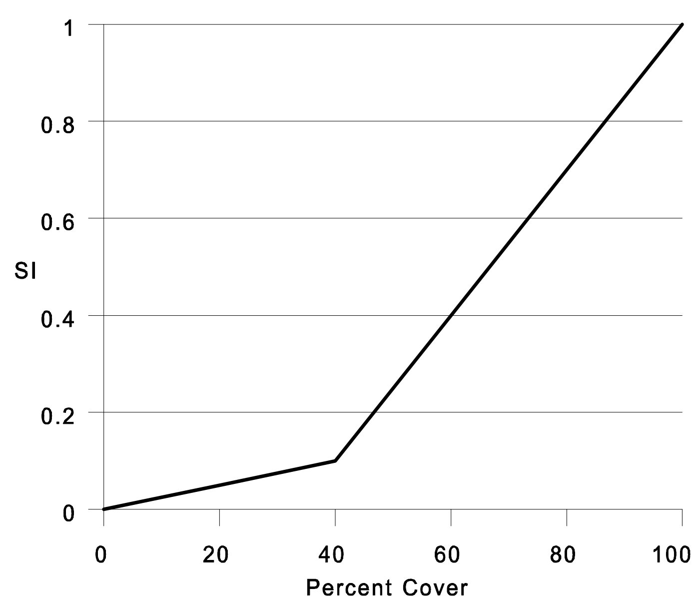
Variable 1: Height of herbaceous vegetation.

Assumes: California voles require relatively tall herbaceous vegetation for both food (Gill 1977. Batzil 1986) and cover (Ingles 1965). Herbaceous vegetation $\geq$ 6 in tall is considered optimum.



Variable 2: Percent cover of herbaceous vegetation.

Assumes: Relatively dense herbaceous vegetation is needed for cover percent cover $\geq$ 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.

HSI Determination

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.

Model Applicability

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

<u>General</u>
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.

<u>Food</u>
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).

<u>Reproduction</u>
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).

<u>Cover</u>
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).

<u>Interspersion</u>
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.

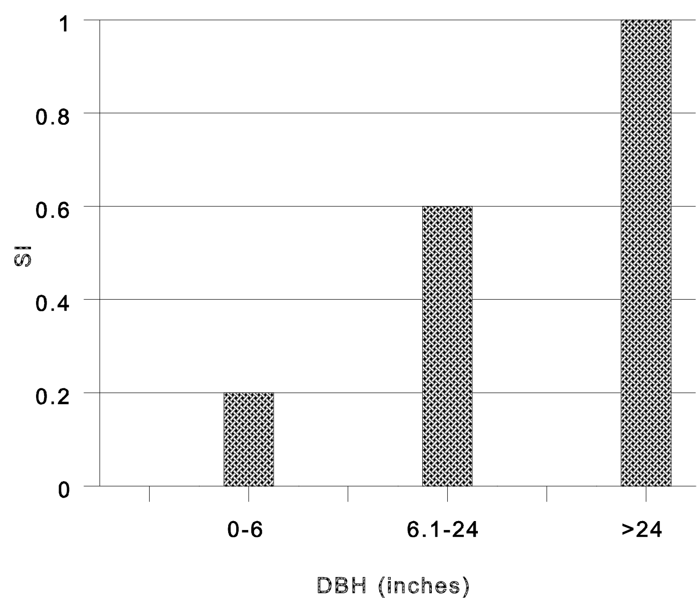
<u>Water Requirements</u>
In a study by Williams and Koenig (1980), the plain titmouse was classified as an occasional drinker.

<u>Model Applicability</u>
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.

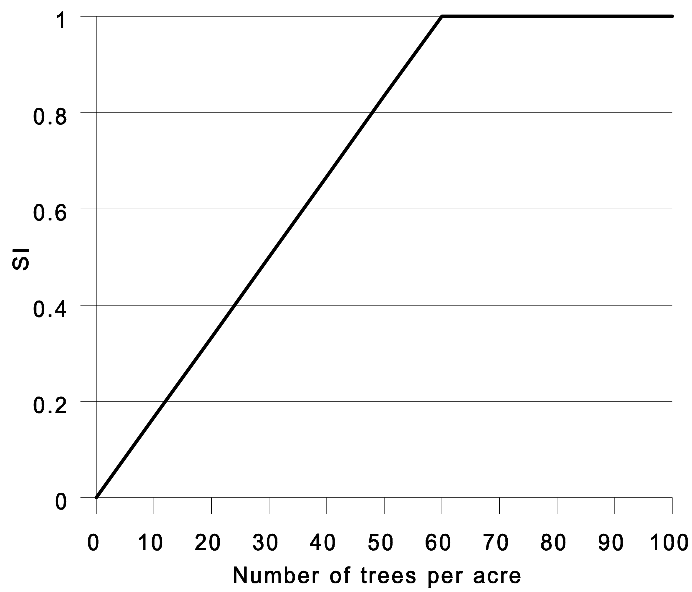
Variable 1. Tree diameter. (A tree is defined as a woody plant species 16 feet high or greater)

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.



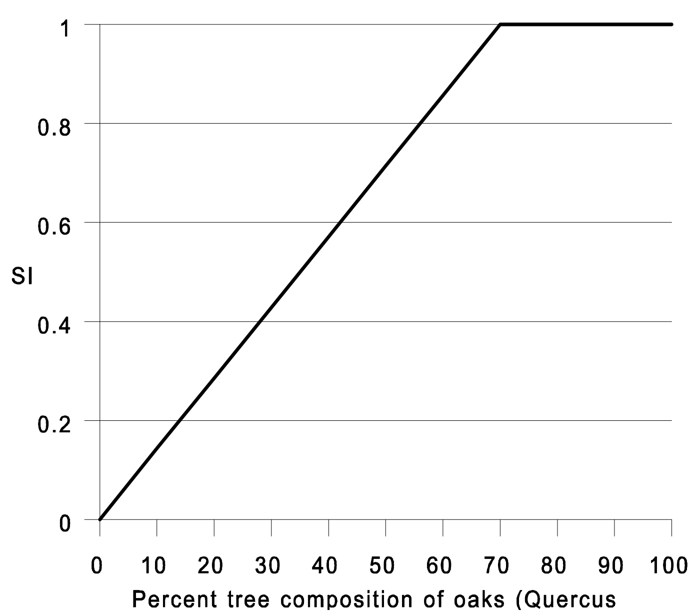
Variable 2. Trees per acre.

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.



HSI Determination

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.

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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.

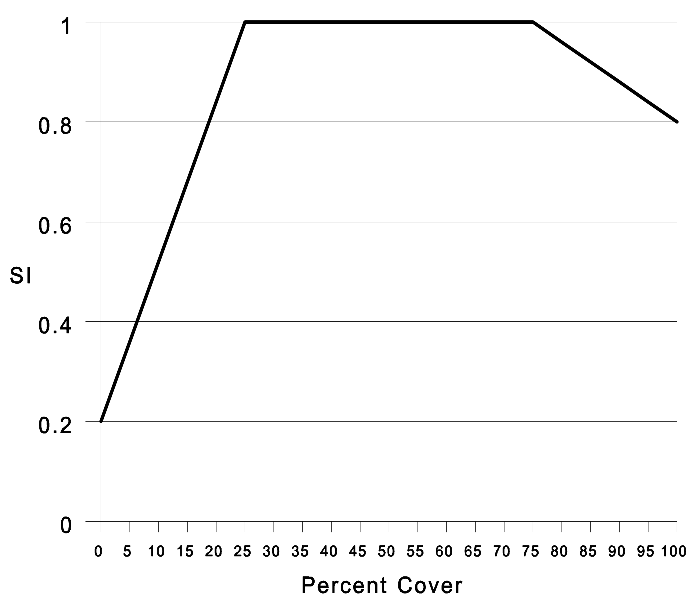
Season: This model was developed to evaluate year-round habitat suitability for the bobcat *(Felis rufus)*.

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).

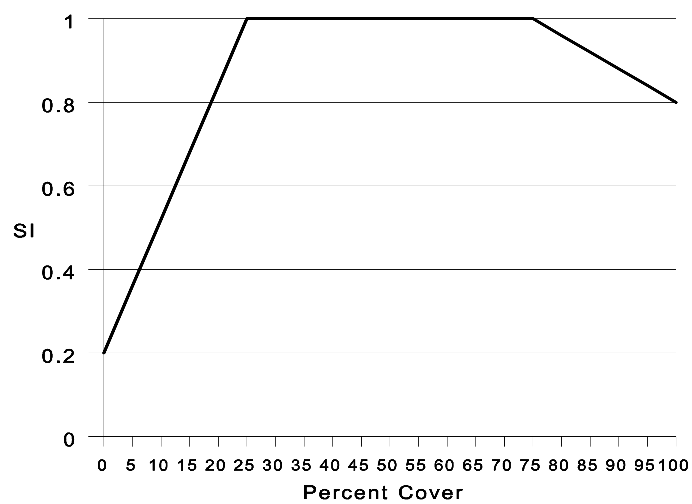
Guild:	Feeding	Breedinq
	Surface	Subsurface

Equation: $$HSI = \frac{(V_1 + V_2 + V_3 + V_4)}{5}$$

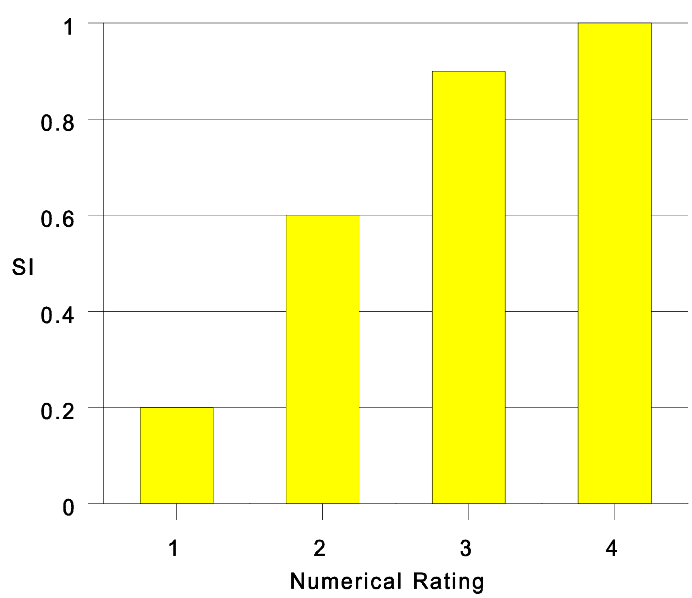
V1 - Percent Shrub Cover



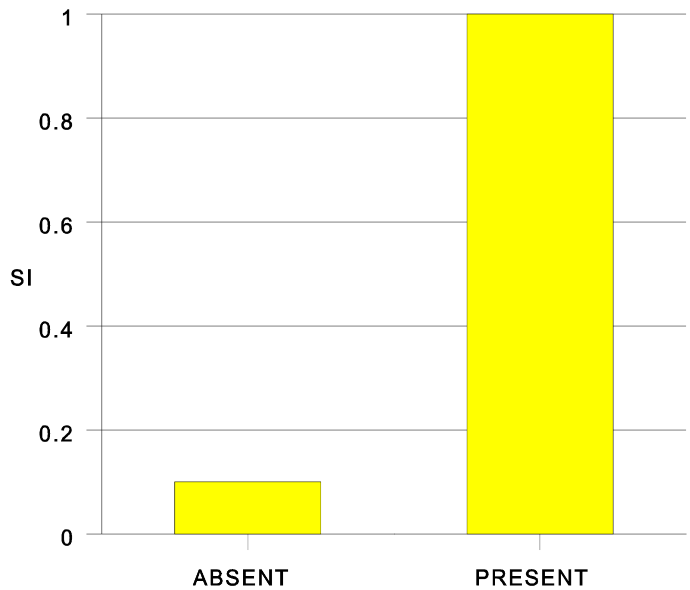
V2 - Herbaceous Cover



V3 - Degree of Patchiness



V4 - Rock Outcroppings



FISH AND WILDLIFE HABITAT CAPABILITY MODELS

AND

SPECIAL HABITAT CRITERIA

FOR THE NORTHEAST ZONE NATIONAL FORESTS

LASSEN NATIONAL FOREST
MENDOCINO NATIONAL FOREST
MODOC NATIONAL FOREST
PLUMAS NATIONAL FOREST

Karen 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 <u>Habitat Capability Models (HCM)</u>.

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 Stanislaus National Forest as an extension of the HCM concept (Hurley et al 1981). 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, separate 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

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 denote 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 judgement.

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. M. 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.

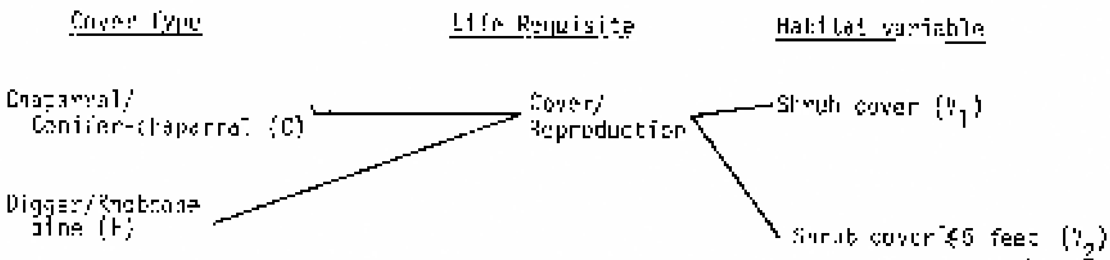
Verner, J. and A. A. Boss (Technical Coordinators). 1980. California wildlife and their habitats: western Sierra Nevada. USDA Forest Service. Gen. Tech. Rep., PSW-37, 439p.

DRAFT
HABITAT SUITABILITY INDEX MODEL
WRENTIT (*Chamaea fasciata*)

U.S. Fish and Wildlife Service
Division of Ecological Services
Sacramento, California

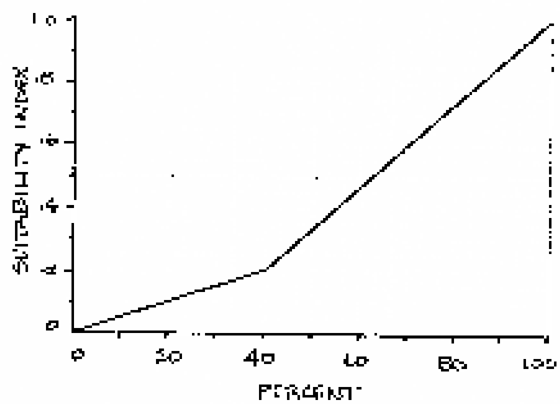
September 1984

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)
Cover/
Reproduction
Shrub cover (V_1)
Digger/Knobcone
pine (P)
Shrub cover ≤5 feet (V_2)

3

Variable 1. Shrub cover - % of ground shaded by a vertical projection of the shrub canopy

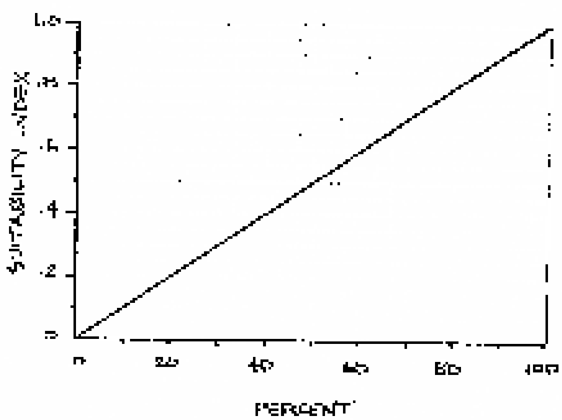


Assumes: 1) Dense stands of chaparral needed for optimum conditions.

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 1939). Most of the wrentit's existence is spent beneath the crown foliage of brush not more than 5 feet from the ground (Bent 1939). 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 1962, 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. 1979. 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.

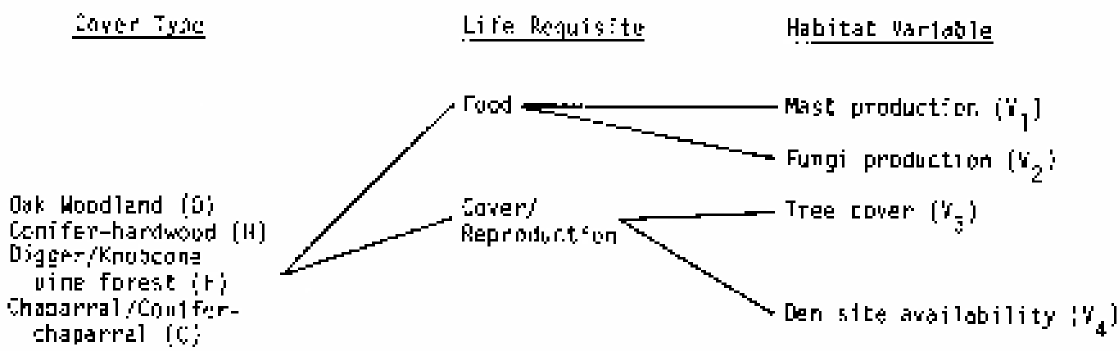
DRAFT HABITAT SUITABILITY INDEX MODEL
WESTERN GRAY SQUIRREL (*Sciurus griseus*)

U.S. Fish and Wildlife Service
Division of Ecological Services
Sacramento, CA

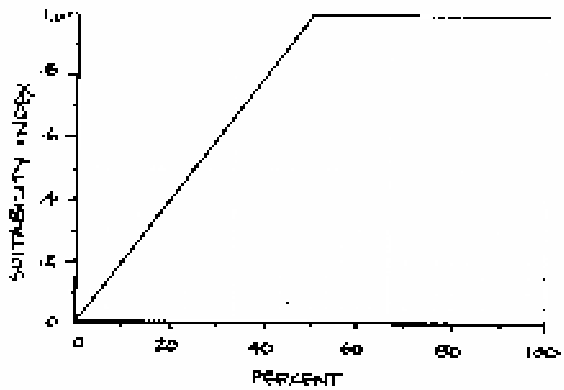
September 1984

Squirrel

VARIABLE	COVER TYPES	SUGGESTED TECHNIQUES
(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



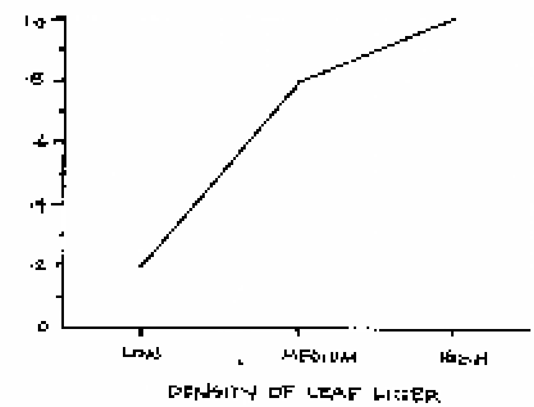
Variable 1. Hard mast production = % canopy closure of trees ≥ 5 m (16.5 ft) tall and shrubs that produce hard mast (e.g. oaks and conifers).



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):

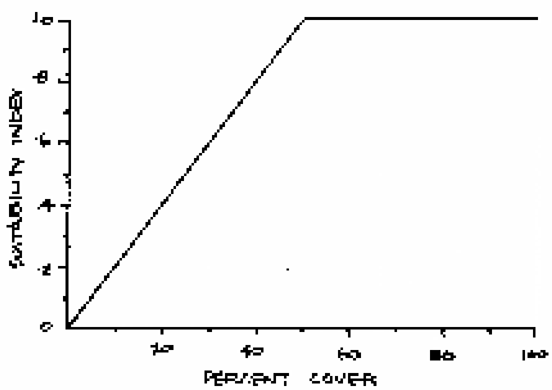
High - leaf litter is abundant with thick identifiable layers of leaves over mulch.

Medium - leaf litter is moderately abundant with low to moderate separation of leaf-mulch layers.

Low - leaf litter scarce with very thin leaf - mulch layer; little or no separation.

Squirrel

Variable 3. Tree cover - % of ground surface shaded by vertical projection of canopies of all woody vegetation ≥ 5 m (16 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 squirrels 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

Equations Used to Calculate Suitability Indices

a) Food:

Cover Type	Equation
O,H,F,C	$(V_1 \times V_2)^{1/2}$

b) Cover/Reproduction:

Cover Type	Equation
O,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 2610 - 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 B

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in Placer, Sacramento, and El Dorado Counties

Document Number: 060915114416; Database Last Updated: September 15, 2006

Red-Legged Frog Critical Habitat - The Service has designated final critical habitat for the California red-legged frog. The designation became final on May 15, 2006.

County Lists

Listed Species
Invertebrates
Branchinecta conservatio
Conservancy fairy shrimp (E)

Branchinecta lynchi
Critical habitat, vernal pool fairy shrimp (X)
vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus
Critical habitat, valley elderberry longhorn beetle (X)
valley elderberry longhorn beetle (T)

Elaphrus viridis
delta green ground beetle (T)

Lepidurus packardi
Critical habitat, vernal pool tadpole shrimp (X)
vernal pool tadpole shrimp (E)

Fish
Hypomesus transpacificus
Critical habitat, delta smelt (X)
delta smelt (T)

Oncorhynchus (=Salmo) *clarki henshawi*
Lahontan cutthroat trout (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)
Critical Habitat, Central Valley spring-run Chinook (X) (NMFS)
Critical habitat, winter-run Chinook salmon (X) (NMFS)
winter-run Chinook salmon, Sacramento River (E) (NMFS)

Amphibians
Ambystoma californiense
California tiger salamander, central population (T)
Critical habitat, CA tiger salamander, central population (X)

Rana aurora draytonii
California red-legged frog (T)
Critical habitat, California red-legged frog (X)

Reptiles
Thamnophis gigas
giant garter snake (T)

Birds
Haliaeetus leucocephalus
bald eagle (T)

Plants
Calystegia stebbinsii
Stebbins's morning-glory (E)

Castilleja campestris ssp. succulenta
Critical habitat, succulent (=fleshy) owl's-clover (X)

Ceanothus roderickii
Pine Hill ceanothus (E)

Fremontodendron californicum ssp. decumbens
Pine Hill flannelbush (E)

Galium californicum ssp. sierrae
El Dorado bedstraw (E)

Oenothera deltoides ssp. howellii
Antioch Dunes evening-primrose (E)

Orcuttia tenuis
Critical habitat, slender Orcutt grass (X)
slender Orcutt grass (T)

Orcuttia viscida
Critical habitat, Sacramento Orcutt grass (X)
Sacramento Orcutt grass (E)

Senecio layneae
Layne's butterweed (=ragwort) (T)

Candidate Species
Fish
Oncorhynchus tshawytscha
Central Valley fall/late fall-run Chinook salmon (C) (NMFS)
Critical habitat, Central Valley fall/late fall-run Chinook (C) (NMFS)

Amphibians
Bufo canorus
Yosemite toad (C)

Rana muscosa
mountain yellow-legged frog (C)

Birds
Coccyzus americanus occidentalis
Western yellow-billed cuckoo (C)

Mammals
Martes pennanti
fisher (C)

Plants
Rorippa subumbellata
Tahoe yellow-cress (C)

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

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. See www.fws.gov/sacramento/es/spp_concern.htm for more information and links to these sensitive species lists.

Appendix C
Summary of Acreages Impacted and Compensation Needed by Alternative

	Dikes		Borrow		Spillway (fuseplug)		Construction		TOTAL	TOTAL	Raise None to Minimal(Inundation)	
Alternative1	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**
Oak	44.46	209.99	8.81	41.61	7.57	35.75	19.67	92.91	**80.51**	**380.26**	0	0
Rip	3.57	4.88	32.41	44.3	1.72	2.75	3.23	4.64	**40.93**	**56.57**	0	0
Chap	0.71	1.66	0	0	0.34	0.93	0.5	1.23	**1.55**	**3.82**	0	0
SeaWet	0.38	1.52	0.09	0.36	0	0	3.82	15.28	**4.29**	**17.16**	0	0
									127.28	**457.81**		

	Dikes		Borrow		Spillway (tunnel)		Construction		TOTAL	TOTAL	Raise 4-ft (Inundation)	
Alternative 2	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**
Oak	44.46	209.99	8.81	41.61	7.72	36.46	20.17	95.27	**81.16**	**383.33**	811.74	3834.02
Rip	3.57	4.88	32.41	44.3	1.44	2.31	2.41	3.29	**39.83**	**54.78**	0	0
Chap	0.71	1.66	0	0	0.33	0.9	0.48	1.4	**1.52**	**3.96**	34.32	112.31
SeaWet	0.38	1.52	0.09	0.36	0	0	3.82	15.28	**4.29**	**17.16**	0	0
									126.8	**459.23**		

	Dikes		Borrow		Spillway (6-gate)		Construction		TOTAL	TOTAL	Raise 3.5ft (Inundation)	
Alternative 3	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**
Oak	44.46	209.99	8.81	41.61	7.22	34.1	19.87	93.85	**80.36**	**379.55**	773.08	3651.43
Rip	3.57	4.88	32.41	44.3	2.26	3.62	2.75	4.03	**40.99**	**56.83**	0	0
Chap	0.71	1.66	0	0	0.35	0.96	0.2	0.47	**1.26**	**3.09**	32.22	101.71
SeaWet	0.38	1.52	0.09	0.36	0	0	3.82	15.28	**4.29**	**17.16**	0	0
									126.9	**459.23**		

	Dikes		Borrow		Spillway (4-gate)		Construction		TOTAL	TOTAL	Raise 7ft (Inundation)	
Alternative 4	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**
Oak	44.46	209.99	8.81	41.61	7.51	35.47	19.88	93.9	**80.66**	**380.97**	926.66	4376.81
Rip	3.57	4.88	32.41	44.3	0.67	0.92	4	5.27	**40.65**	**55.37**	0	0
Chap	0.71	1.66	0	0	0.14	0.33	0.7	1.58	**1.55**	**3.57**	40.8	133.51
SeaWet	0.38	1.52	0.09	0.36	0	0	3.82	15.28	**4.29**	**17.16**	0	0
									127.15	**457.07**		

	Dikes		Borrow		Spillway		Construction		TOTAL	TOTAL	Raise 17 ft (Inundation)	
Alternative 5	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**	**Impact**	**Compensation**
Oak	44.46	209.99	8.81	41.61	0	0	27.39	129.37	**80.66**	**380.97**	1323.35	6250.47
Rip	3.57	4.88	32.41	44.3	0	0	4.67	6.38	**40.65**	**55.56**	0	0
Chap	0.71	1.66	0	0	0	0	0.83	1.94	**1.54**	**3.6**	66.09	216.27
SeaWet	0.38	1.52	0.09	0.36	0	0	3.82	15.28	**4.29**	**17.16**	0	0
									127.14	**457.29**		

Based on:
50-year project life and In-kind Compensation

*acres include all construction areas including entire site below LWD and MODS staging areas. NO spillway ac subtracted.

Appendix C
Biological Field Report

Biological Field Report
Wetland Delineation

RECLAMATION
Managing Water in the West

Folsom Dam Safety and Flood Damage Reduction Action

Biological Field Report

U.S. Department of the Interior
Bureau of Reclamation

November 10, 2006

RECLAMATION

Managing Water in the West

Folsom Dam Safety and Flood Damage Reduction Action

Biological Field Report

prepared by:

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U.S. Department of the Interior

Bureau of Reclamation **November 10, 2006**

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1.0 INTRODUCTION

1.1 Action Background

The proposed Folsom Dam Safety/Flood Damage Reduction (DS/FDR) Action reflects a cooperative effort by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and the U.S. Army Corps of Engineers (Corps), as well as the Corps' non-federal sponsors, the State Reclamation Board (Reclamation Board)/Department of Water Resources (DWR) and the Sacramento Area Flood Control Agency (SAFCA). The Folsom DS/FDR Action is intended to implement Reclamation's dam safety and security obligations and the Corps' flood damage reduction structural modifications at Folsom Dam and appurtenant facilities. These facilities impound waters of the American River forming Folsom Reservoir and are collectively referred within this document as the Folsom Facility (Folsom Facility).

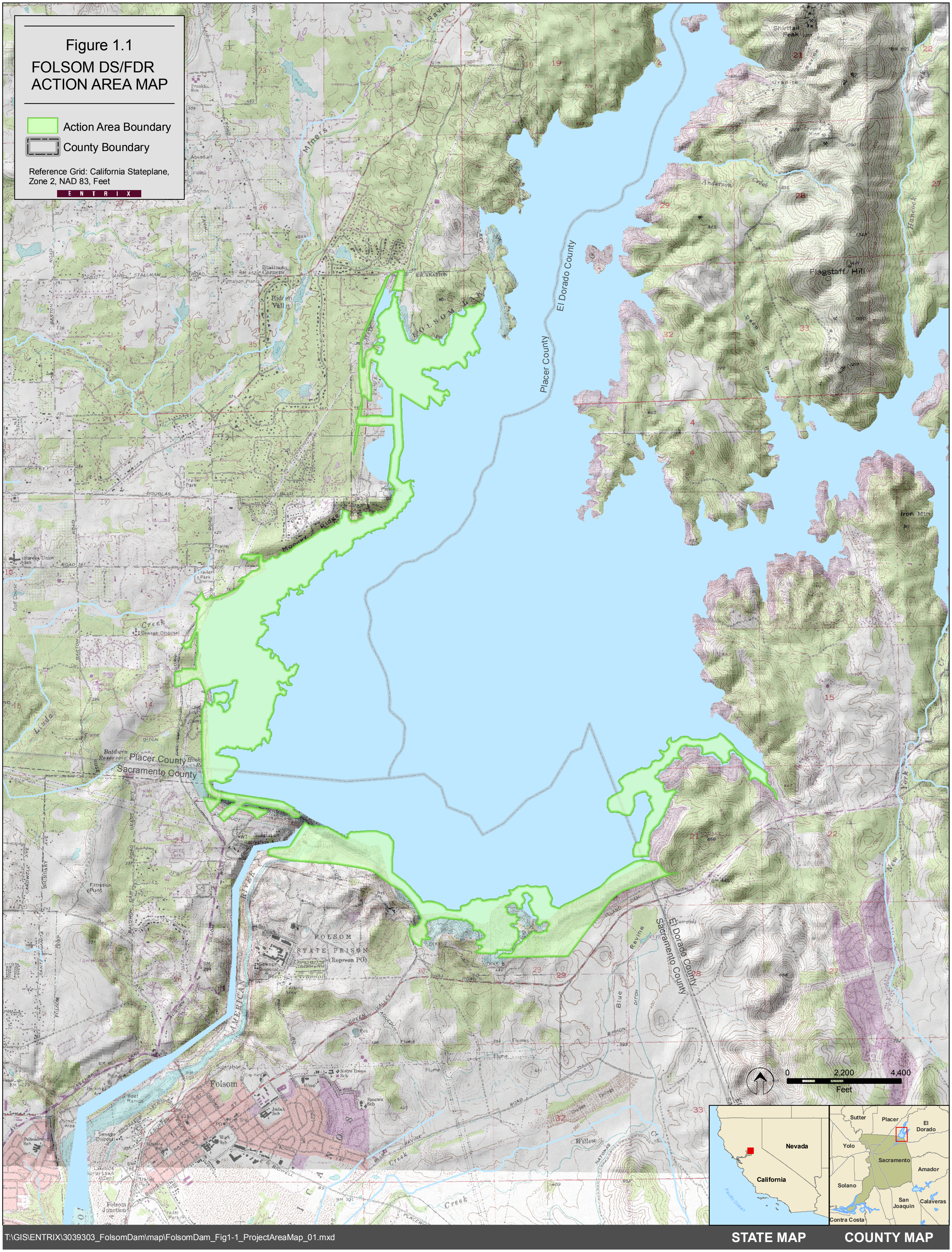
The Folsom DS/FDR Action responds to certain objectives of each of the aforementioned agencies. Reclamation's Safety of Dams Program objectives focus on reducing the risk of failure under hydrologic (flood), seismic (earthquake), and static (seepage) loads. Folsom Dam has been designated as a National Critical Infrastructure Facility and any compromise of the facility could result in grave property damage and loss of life. Reclamation's Security Program objectives are to protect public safety by securing Folsom Dam and its appurtenant structures and other Reclamation facilities, including the Folsom power plant, from attack or damage. The Corps' flood damage reduction objective is to improve the annual recurrence level of flood protection provided to the lower American River corridor. Similarly, SAFCA and DWR seek to improve the level of flood protection for the Sacramento region. Reclamation is the lead agency for this action.

The Folsom DS/FDR Action is located in Placer, El Dorado and Sacramento Counties, California. The various alternatives being evaluated for the Folsom DS/FDR Action involve construction in and around Folsom Reservoir. The study area is composed of areas that may be potentially affected by the Folsom DS/FDR Action in the vicinity of Folsom Reservoir including: potential dike construction zones, potential borrow areas, potential contractor use areas, existing haul roads and proposed haul roads. A depiction of the Folsom DS/FDR Action area and vicinity is provided in Figure 1-1.

The Folsom Dam and associated facilities were constructed by the Corps, with construction completed in 1956. Currently, the Bureau of Reclamation manages Folsom Reservoir, while surrounding lands are managed by the State of California's Parks and Recreation Department.

A study of biological resources within the Folsom DS/FDR Action area was initiated for the purpose of quantifying potential impacts of the various alternatives. The study included a combination of database and literature searches and on the ground field surveys. Field surveys included: mapping vegetation communities and potential wildlife habitat, a species-specific valley elderberry long-horned beetle survey, and an inventory of wetlands and other jurisdictional waters.

This report is organized in the following manner; Section 2 presents the methods employed, Section 3 provides the results and discussion and Section 4 is the literature cited.



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2.0 METHODS

The methods used for each resource study are presented below. The results of each study are provided in Section 3.

2.1 Vegetation Community Mapping

Vegetation maps developed for the Folsom Lake State Recreation Area (SRA) (LSA 2003) were reviewed. Additional observations were made in winter 2005-2006 by ENTRIX biologists (Keven Ann Colgate, Gretchen Lebednik, Dan Chase, and Jelica White) in conjunction with other survey work. The observations from the wetland delineation study were also included as part of the vegetation descriptions. The Folsom DS/FDR Action study area included the Folsom DS/FDR Action area and immediate vicinity to create a contiguous buffer around the Folsom DS/FDR Action area. Vegetation community boundaries were then incorporated into a GIS database and mapped on aerial photographs. Acreages of each vegetation community are reported in the results section (Section 3) for the Folsom DS/FDR Action area as defined in January 2006 by Reclamation.

Vegetation community types are consistent with those communities identified in the Draft Resource Inventory for the Folsom Lake State Recreation Area (LSA 2003). Community descriptions generally follow Holland (1986) and Sawyer and Keeler-Wolf (1995). The taxonomy of plants is consistent with Hickman (1993).

Because surveys were conducted outside of the growing season, a list of individual species observed is not included in this report. A list of observed plant species is provided in the Draft Resource Inventory for the SRA (LSA 2003). However it should be noted that the SRA study encompassed a considerably larger area and may include species that are not present in the Folsom DS/FDR Action area.

2.2 Special Status Species Literature Search

A list of special status species with potential to occur in the Folsom DS/FDR Action area was compiled through a series of literature, website and database sources. This search included a review of California Department of Fish and Game’s (CDFG) California Natural Diversity Database (CNDDB) (CDFG 2005a) and the U.S. Fish and Wildlife Service (USFWS) Sacramento District website (USFWS 2006). Both the CNDDB and the USFWS website were queried by 7.5-minute quadrangle. The list of Folsom DS/FDR Action quadrangles (quads) included Folsom, Clarksville, Rocklin, and Pilot Hill. Additional species were included in the analysis based on known distribution, habitat requirements, and/or incidental sightings. Other literature sources including Zeiner et al. (1988, 1990a, 1990b) the California Wildlife Habitat Relationship (CWHR) database (CDFG 2000), and others are referenced as appropriate.

2.3 Valley Elderberry Longhorn Beetle Survey

Surveys for the valley elderberry longhorn beetle (VELB [*Desmocerus californicus dimorphus*]) were conducted within the Folsom DS/FDR Action area during the winter of 2005. On November 16th and 17th, 2005, two ENTRIX biologists (Rob Schell and Gina Tarbill) conducted surveys for elderberry (*Sambucus* spp.) within the reservoir influence zone. The reservoir influence zone is between elevation 425 feet and elevation 466 feet (the ordinary high water mark). On December 29th and 30th, 2005 two ENTRIX biologists (Rob Schell and Gina Tarbill) surveyed the remainder of the Folsom DS/FDR Action area above the ordinary high water mark. Follow-up surveys were conducted on May 26 and June 2, 2006 (Rob Schell and Chris Hogue), when the elderberries were flowering. Additional sites were added to the Folsom DS/FDR Action area, and surveys were conducted at these sites on August 28, 2006 (Rob Schell and Chris Hogue).

In all surveys, the locations of elderberry shrubs were recorded using a handheld Garmin GPS unit. The diameter of each individual stem at ground level (~6 inches) and total height was recorded. All visible exit-holes (potentially used by emerging larvae) were counted and recorded. The location of each surveyed elderberry shrub was mapped on an aerial photograph of the Folsom DS/FDR Action area.

2.4 Wetland Delineation

In winter of 2005-2006 ENTRIX biologists (Keven Ann Colgate, Gretchen Lebednik, Dan Chase, and Jelica White, biologists) surveyed the entire Folsom DS/FDR Action area (as then defined) for potentially jurisdictional wetlands and other waters. Surveys of the reservoir influence zone (elevation 425-466 feet) were performed November 16-18, 2005. Surveys of most of the outside reservoir zone (elevation < 466 feet) were completed in January 11-13, 2006. Surveys of additional smaller areas were conducted on August 1 and 2, 2006 (Gretchen Lebednik, biologist and Coralie Dayde, ecologist) and on September 12, 2006 (Gretchen Lebednik and Sara Ebrahim, biologists).

The methods used in the delineation of potential jurisdictional wetland areas at the Folsom DS/FDR Action site are consistent with those 1) outlined in the Corps' Wetlands Delineation Manual (USACE 1987). Standard methods were employed to obtain data on the vegetation, soils and hydrology at the Folsom DS/FDR Action site.

All potentially jurisdictional sites were investigated, and soil pits were excavated where hydrology and vegetation indicators were inconclusive. Within the reservoir influence zone, a wetland study site was installed approximately every quarter mile along the shoreline, or more frequently if conditions were diverse. Wetland soil pits and wetland areas were mapped with a handheld Trimble GPS unit (sub-meter accuracy) or a Garmin III Plus unit and integrated into a GIS database. The results of these surveys will be provided in a separate wetland delineation report.

3.0 RESULTS AND DISCUSSION

3.1 Vegetation And Wildlife Habitat Mapping

The following communities are consistent with classification results in the Draft Resource Inventory for the Folsom Lake State Recreation Area (LSA 2003). However, because that report covered a more extensive area, not all communities reported are included here.

Upland communities within the Folsom DS/FDR Action area include, interior live oak woodland, blue oak woodland and savanna, and annual grassland. Riparian, aquatic and seasonally wet areas include cottonwood-willow riparian, freshwater marsh, willow stands within the reservoir fluctuation zone, and seasonal wetlands. Areas that are influenced by man are typed as developed areas, and areas devoid of vegetation are mapped as reservoir shoreline fluctuation zone/ruderal and barren areas. The distribution and extent of each community type is depicted on aerial maps of the Folsom DS/FDR Action area. A vegetation community map is provided in Appendix A. The acreages for each vegetation type are provided in Table 3-1.

3.1.1 Upland Plant Communities

Interior Live Oak Woodland

This upland vegetation community (classified as interior live oak series by Sawyer and Keeler-Wolf [1995]) was present above the ordinary high water mark (OHWM) of the reservoir (at elevation 466 feet), and is therefore not influenced by fluctuation of the reservoir water line. Dominant tree species are interior live oak (*Quercus wislizenii*), blue oak (*Quercus douglasii*), and foothill or gray pine (*Pinus sabiniana*). This community intergrades with blue oak woodland (Holland 1986). The shrub layer was relatively depauperate with an occasional elderberry (*Sambucus mexicana*), or ceanothus (*Ceanothus* sp.). The understory herb layer was occupied by exotic Mediterranean grasses (*Bromus* spp.) and other ruderal species including summer mustard (Hirschfeldia incana), telegraph weed (*Heterotheca grandiflora*), and yellow star thistle (*Centaurea solstitialis*). In areas of dense tree cover, bare ground or leaf litter was dominant. Approximately 81 acres of oak woodland, including interior live oak woodland, are present in the Folsom DS/FDR Action area.

Blue Oak Woodland and Savanna

Blue oak woodland is a highly variable climax woodland dominated by blue oak, but usually including other oak species (coast live oak [*Q. agrifolia*], and interior live oak) as well as foothill pine (Holland 1986). The community is described as blue oak series (Sawyer and Keeler-Wolf 1995) and blue oak woodland (Holland 1986) in the literature. Within the Folsom DS/FDR Action area, blue oak woodlands were present outside of the reservoir fluctuation zone on relatively xeric sites. Canopy cover ranges from continuous to fairly open. Understory species are mainly herbaceous and include Mediterranean grasses (*Bromus* spp.), dogtail grass (*Cynosurus echinatus*) and yellow star thistle (*Centaurea solstitialis*). Approximately 81 acres of oak woodland, including blue oak woodland and savanna, are present in the Folsom DS/FDR Action area.

Table 3-1. Vegetation Community Acreages in the Folsom DS/FDR Action Area

Vegetation Community	Acres
Oak Woodland (Interior Live Oak & Blue Oak)	81
Chaparral	1.5
Annual Grassland	180
Riparian Vegetation	41
Freshwater Marsh	0.9
Seasonal Wetlands, including Reservoir Fluctuation Zone Stands	5.3
Reservoir Fluctuation Zone: Ruderal and Barren Areas	733*
Developed Areas	35

- some of this area extends below the water line on the aerial images and is not included in this value. See discussion below

Chaparral

Chaparral consists of a dense cover of perennial, mostly evergreen shrubs, generally 1 to 3 meters in height. Chaparral is common around Folsom Reservoir, especially on steep, west or south facing slopes. The dominant species include chamise (*Adenostoma fasciculatum*) and whiteleaf manzanita (*Arctostaphylos viscida*). Other common species present include toyon (*Heteromeles arbutifolia*), California coffeeberry (*Rhamnus californica*), buck brush (*Ceanothus cuneatus* var. *cuneatus*), poison oak (*Toxicodendron diversilobum*), and redbud (*Cercis occidentalis*). Small stands of this community occur within the project construction area, sometimes as understory to interior live oak woodland. These small units are not shown on the vegetation map. Approximately 1.5 acres of chaparral are present in the maximum extent of the project construction area.

Annual Grassland

Annual grassland is a heterogeneous mix of non-native grasses, annual forbs and wildflowers. This community is classified as California annual grassland series (Sawyer and Keeler-Wolf 1995) and valley and foothill grassland or non-native grassland (Holland 1986). Dominant plant species in the annual grassland include introduced annual grasses such as wild oat (*Avena fatua*), ripgut brome (*Bromus diandrus*), barley (*Hordeum* spp.), dogtail grass and fescue (*Vulpia* spp.). Herbaceous forbs and wildflowers present in this vegetation include both native species such as fiddle neck (*Amsinckia* spp.), western ragweed (*Ambrosia psilostachya*), and popcornflower (*Plagiobothrys* spp.), and non-native species such as shortpod mustard (*Hirschfeldia incana*), yellow star thistle, and dove weed (*Eremocarpus setigerus*). Approximately 180 acres of annual grassland are present in the Folsom DS/FDR Action area.

3.1.2 Riparian and Wetland Plant Communities

Cottonwood-Willow Riparian

Vegetation communities dominated by Fremont cottonwood (*Populus fremontii* ssp. *fremontii*) and various species of willow (*Salix* spp.) are typically found on floodplains, riparian areas, and low-gradient depositions along the banks of rivers, seeps, and streams where soils are intermittently flooded. Cottonwood communities in the Folsom DS/FDR Action area contain elements of both great valley cottonwood riparian forests and willow scrub described by Holland (1986) and the Fremont cottonwood series and mixed willow series described by Sawyer and Keeler-Wolf (1995). Approximately 41 acres of woody riparian vegetation, including cottonwood-willow riparian, are present in the Folsom DS/FDR Action area.

Freshwater Marsh

Freshwater marsh communities within the Folsom DS/FDR Action area were wetland communities fed by seeps or springs and are permanently to semi-permanently flooded. The dominant species was cattail (*Typha latifolia*). The most applicable vegetation community described in the literature is coastal and valley freshwater marsh, a community dominated by perennial, emergent monocots including bulrush (*Scirpus* spp.) and cattail (*Typha* spp.) (Holland 1986). Approximately one acre of freshwater marsh is present in the Folsom DS/FDR Action area.

Riparian Vegetation within the Reservoir Fluctuation Zone

Scattered stands of willow and other woody vegetation are present within the reservoir fluctuation zone in the Folsom DS/FDR Action area. Several categories have been mapped within this general vegetation type. Approximately 41 acres of woody riparian vegetation, including these vegetation types, are present in the Folsom DS/FDR Action area.

Riparian Reservoir Fluctuation Zone: Gooding's Willow

This seasonally wet community is created by mature Gooding's willow (*Salix goodingii*) trees that reached an average height of 30 feet. These communities were generally present within 100-200 feet below the OHWM within the vegetated portion of the shore. Understory species were common herbaceous species including Bermuda grass (*Cynodon dactylon*), spiny cocklebur (*Xanthium strumarium*) and rushes (*Juncus* spp.).

Riparian Reservoir Fluctuation Zone: Mixed Riparian Areas

Areas occupied by this community were generally associated with depressions, or riparian areas within the reservoir fluctuation zone. These areas appeared to be frequently inundated and also likely received overland flow from upland areas. Species present include rushes, buttonwillow (*Cephalanthus occidentalis*), seep monkey flower (*Mimulus guttatus*) and other common species.

Riparian Reservoir Fluctuation Zone: Shrub Willow

Willow shrubs (*Salix* sp.) dominated certain areas at the very lowest elevations of the shore. These areas are frequently inundated and had saturated soil conditions.

Seasonal Wetlands

Seasonal wetland communities were observed both inside and outside of the reservoir-influenced zone. The majority of wetland areas within the Folsom DS/FDR Action area were considered seasonal. These communities are exposed to wetland hydrology for a limited period of time, though it may be for a long enough duration to show indicators of wetland soil and hydrology and to seasonally host hydric vegetation. Much of this area, however, does not meet all three wetland criteria. Approximately five acres of seasonal wetlands are present in the Folsom DS/FDR Action area. Following is a breakdown of the various types of seasonal wetland communities observed in the Folsom DS/FDR Action area.

Seasonal Depressions within the Reservoir Fluctuation Zone

Areas occupied by this community were generally associated with depressions, or riparian areas within the area influenced by the reservoir. These areas appeared to be frequently inundated and also likely received overland flow from upland areas. Species present include rushes, seep monkey flower and other common species.

Seasonal Wetland Slope Areas within the Reservoir Fluctuation Zone

This seasonal wetland community was by far the most common vegetation community below the OHWM of the reservoir. Dominant species included Bermuda grass, sand spurrey (*Spergularia* spp.), rough cocklebur, and rushes, with each species alternating in dominance, depending on the site conditions. Rushes and rough cocklebur appeared to dominate the more mesic sites and depressions while Bermuda grass and sand spurrey were more common in the drier areas.

Seasonal Depressions and Riparian Areas Outside the Reservoir Fluctuation Zone

Seasonally wet areas in the Folsom DS/FDR Action area outside the reservoir fluctuation zone were also surveyed. These communities receive water from seeps, drainages and from direct precipitation. Some areas were confined to a distinct channel, but one area with uneven terrain and a partly-exposed bedrock outcrop had what appeared to be seasonal ponding. Dominant species included pointed rush (*Juncus oxymeris*), Baltic rush (*Juncus balticus*), and often scattered willow and cottonwood. During the dry season, these areas support annual upland vegetation such as non-native brome grasses (*Bromus* spp.) and other forbs.

3.1.3 Disturbed Areas

Reservoir Shoreline Fluctuation Zone: Barren Areas

The reservoir shoreline fluctuation zone occurred between the 425-foot and 466-foot elevations, which corresponded with the minimum and maximum pool volumes for the reservoir. Barren areas within this zone were generally devoid of vegetation, or hosted less than 10 percent cover. Areas of deep sand and rock were prevalent in this zone. This zone extended below the water line on the aerial images.

Developed Areas

Developed land is intensively used with much of the land paved or covered by structures. The urban community includes residential, commercial and industrial development. Vegetation in urban areas generally consists of non-native landscape species (lawns, flowerbeds, shrubs or ornamental trees) or cleared areas that are generally devoid of vegetation.

Developed communities within the Folsom DS/FDR Action area included rip-rap slopes of dams and dikes, roads, trails, or parking lots. These communities were generally located outside of the OHWM except in the case of a dam or dike in which the toe of the structure would be within the OHWM. Dikes and dams were generally devoid of vegetation but sometimes hosted ruderal species such as Mediterranean grasses, summer mustard, telegraph weed, yellow star thistle and tree tobacco (*Nicotiana glauca*). Parks and other developed areas were located outside of the reservoir influence and were dominated by horticultural or ruderal species. Approximately 35 acres of developed land are present in the Folsom DS/FDR Action area.

3.2 Special Status Species

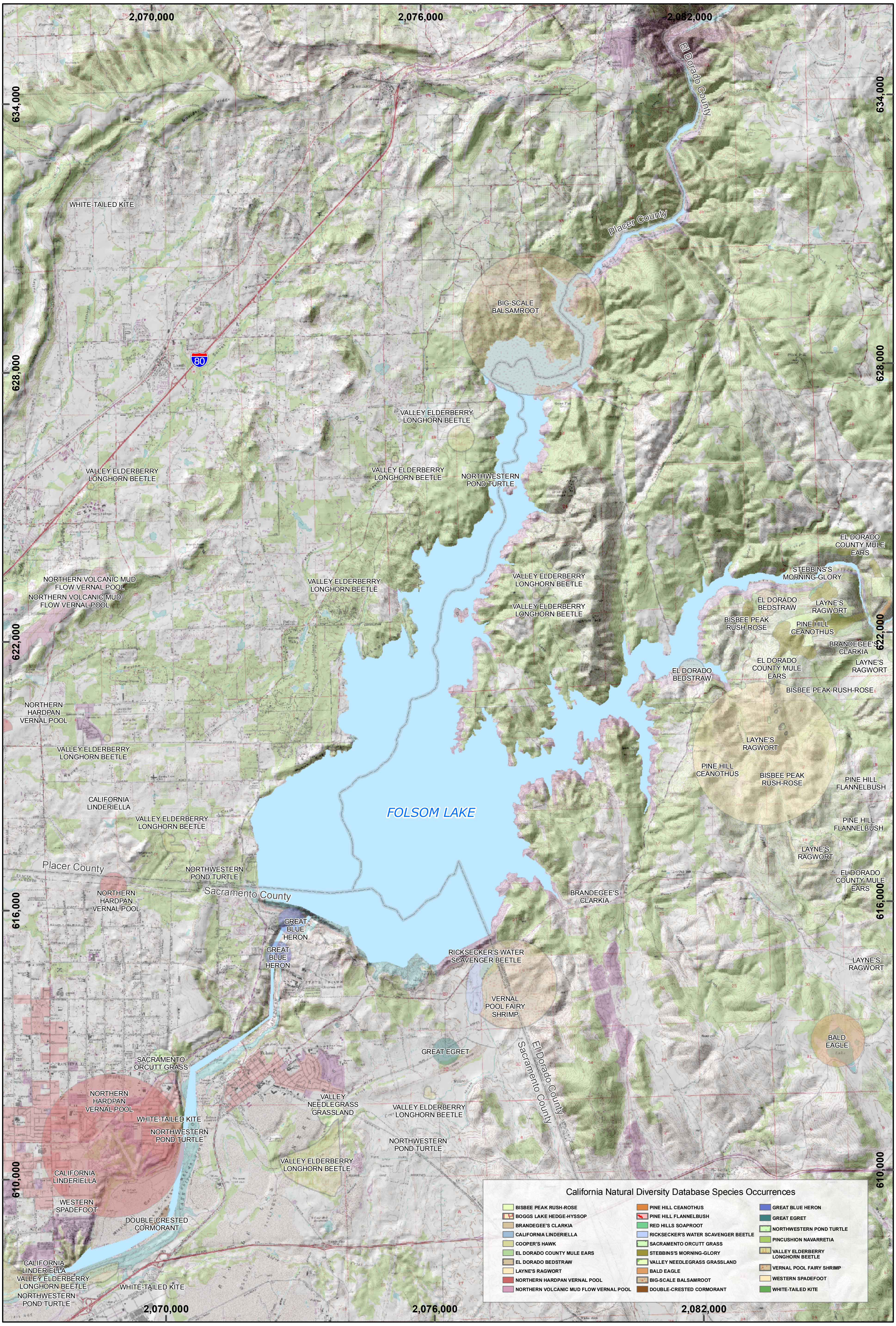
3.2.1 Results of Literature Search

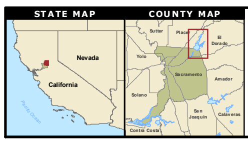
Based on a review of the existing literature, 45 special status plant and animal species could occur in the Folsom DS/FDR Action vicinity. A list of these species and an evaluation of their potential to occur is provided in Appendix B. Figure 3-1 depicts special status plant and animal occurrences recorded by the CNDDB within the Folsom, Clarksville, Rocklin, and Pilot Hill quadrangles.

The following section addresses species that have been afforded special status designations by federal or state resource agencies and organizations that could potentially occur in the Folsom DS/FDR Action vicinity. This includes species that are federally listed as endangered

(FE) or threatened (FT), candidate species for federal listing (FC) and species proposed for listing (FPE, FPT) under the Federal Endangered Species Act (ESA). Species protected by California statues or California Department of Fish and Game (CDFG) regulations, including State of California endangered (CE), threatened (CT), Rare (CR), California species of concern (CSC) and California Fully Protected species (CFP) are discussed. And lastly, species recognized by the California Native Plant Society (CNPS) in CNPS List 1a (presumed extinct in California), List 1b (rare, threatened or endangered in California and elsewhere) and List 2 (rare in California but more common elsewhere) are also included.

Based on data in the California Natural Diversity Database (CNDDB) and other literature sources, there were 45 special-status species initially identified as potentially occurring in the Folsom DS/FDR Action vicinity (CDFG 2005a, USFWS 2006). An analysis of distribution, known occurrences and habitat requirements resulted in a list of 34 species for which appropriate





Reference Grid:
California Stateplane,
Zone 2, NAD83,
Feet

0 0.5 1 2
Miles
1:78,000

FOLSOM DS/FDR
BIOLOGICAL FIELD REPORT

FIGURE 3 -1

California Natural Diversity Database
Species Occurrences in the Project Vicinity

ENTRIX

habitat exists within the Folsom DS/FDR Action area or vicinity. Section 3.2.2 provides a description of each of the 34 species for which suitable habitat exists in the Folsom DS/FDR Action vicinity, as well as an evaluation of their potential to occur within the Folsom DS/FDR Action area. A list of wildlife species observed in the Folsom DS/FDR Action area during the field surveys is provided in Appendix C.

3.2.2 Special-status Species with Potential to Occur in the Folsom DS/FDR Action Area

Based on known occurrences and quality of existing habitat, a total of 34 special status terrestrial species have the potential to occur in the Folsom DS/FDR Action area (Table 3-2). This includes five plant species, three invertebrates, three amphibians, three reptiles, 1sixteen birds and four mammals. The five plant species are San Joaquin spearscale (*Atriplex joaquiniana*), big-scale balsamroot (*Balsamorhiza macrolepis* var. *macrolepis*), El Dorado bedstraw (*Galium californicum* ssp. *sierrae*), Boggs Lake hedge-hyssop (*Gratiola heterosepala*), and Layne’s butterweed (*Senecio layneae*). Special-status invertebrate species with potential to occur are vernal pool fairy shrimp (*Branchinecta lynchi*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and California vernal pool tadpole shrimp (*Lepidurus packardi*).

Special-status amphibian and reptile species that may occur are California red-legged frog (*Rana aurora draytonii*), foothill yellow-legged frog (*Rana boylii*), western spadefoot toad (*Spea* [*Scaphiopus*] *hammondii*), western pond turtle (*Emys* [*Clemmys*] *marmorata marmorata*), California horned lizard (*Phrynosoma coronatum frontale*), and giant garter snake (*Thamnophis gigas*).

Special-status bird species with potential to occur are Cooper’s hawk (*Accipiter cooperii*), tricolored blackbird (*Agelaius tricolor*), western burrowing owl (*Athene cunicularia hypugaea*), Aleutian Canada goose (*Branta canadensis leucopareia*), ferruginous hawk (*Buteo regalis*), Swainson’s hawk (*Buteo swainsoni*), Vaux’s swift (*Chaetura vauxi*), mountain plover (*Charadrius montanus*), white-tailed kite (*Elanus leucurus*), American peregrine falcon (*Falco peregrinus anatum*), bald eagle (*Haliaeetus leucocephalus*), loggerhead shrike (*Lanius ludovicianus*), long-billed curlew (*Numenius americanus*), osprey (*Pandion haliaetus*), white-faced ibis (*Plegadis chihi*), and bank swallow (*Riparia riparia*).

Special-status mammals that may occur are pallid bat (*Antrozous pallidus*), Pacific western big-eared bat (*Corynorhinus* [*Plecotus*] *townsendii townsendii*), spotted bat (*Euderma maculatum*), and greater western mastiff bat (*Eumops perotis californicus*). The following section provides a brief description of each species followed by their potential to occur in the Folsom DS/FDR Action area.

Table 3-2. Special Status Species Potentially Occurring in the Folsom DS/FDR Action Area

Plants	**Invertebrates**
San Joaquin spearscale	Vernal pool fairy shrimp
Big-scale balsamroot	Valley elderberry longhorn beetle
El Dorado bedstraw	Vernal pool tadpole shrimp
Boggs Lake hedge-hyssop	
Layne's butterweed	
Amphibians	**Reptiles**
California red-legged frog	Northwestern pond turtle
Foothill yellow-legged frog	California horned lizard
Western spadefoot toad	Giant garter snake
Birds	
Cooper’s hawk	White-tailed (=black shouldered) kite
Tricolored blackbird	American peregrine falcon
Western burrowing owl	Bald eagle
Aleutian Canada goose	Loggerhead shrike
Ferruginous hawk	Long-billed curlew
Swainson's hawk	Osprey
Vaux’s swift	White-faced ibis
Mountain plover	Bank swallow
Mammals	
Pallid bat	Pacific western big-eared bat
Spotted bat	Greater western mastiff-bat

Special Status Plant Species

San Joaquin spearscale (*Atriplex joaquiniana*) – CNPS List 1B

A member of the Chenopodiaceae family, the San Joaquin spearscale is an annual herb that blooms from April to October. The San Joaquin spearscale is found in chenopod scrub, meadows, playas, valley and foothill grassland habitats or alkaline soils within the elevation range of 1 to 1,050 feet. This species has been found in Alameda, Contra Costa, Colusa, Glenn, Merced, Monterey, Napa, Sacramento, San Benito, Santa Clara [extirpated], San Joaquin [extirpated], Solano, Tulare [extirpated], and Yolo Counties (CNPS 2001).

It is unlikely that the San Joaquin spearscale would occur within the Folsom DS/FDR Action area because there are no chenopod scrubs, playas, or alkaline areas within the Folsom DS/FDR Action vicinity.

Big-scale balsamroot (*Balsamorhiza macrolepis* var. *macrolepis*) – CNPS List 1B

The big-scale balsamroot is a perennial herb that blooms from March to June. A member of the Asteraceae family, the big-scale balsamroot is found in chaparral, cismontane woodland, valley and foothill grassland habitats and sometime serpentinite soils within an elevation range of 295 to 4,600 feet. The big-scale balsamroot has been located within Alameda, Butte, Colusa, Lake, Mariposa, Napa, Placer, Santa Clara, Solano, Sonoma, and Tehama Counties (CNPS 2001).

Although there is no serpentinite within the Folsom DS/FDR Action area, there is a possibility of finding the big-scale balsamroot on other substrates within woodland and grassland communities in the Folsom DS/FDR Action area.

El Dorado bedstraw (*Galium californicum* ssp. *sierrae*) – FE, CR, CNPS List 1B

The El Dorado bedstraw is a perennial herb that blooms from May to June. A member of the Rubiaceae family, this species is only found in El Dorado County. The El Dorado bedstraw is found within chaparral, cismontane woodland, lower montane and coniferous forest habitats and gabbroic soils in an elevation range from 100 to 585 meters (CNPS 2001).

It is unlikely that El Dorado bedstraw occurs in the Folsom DS/FDR Action area based on the lack of chaparral and coniferous forest. However, the Folsom DS/FDR Action area is in the lower extent of the elevation range for this species, and cismontane woodland is present. Therefore there is a small possibility that this species could be present.

Boggs Lake hedge-hyssop (*Gratiola heterosepala*) – CE, CNPS List 1B

Boggs lake hedge-hyssop is an annual herb and a member of the Scrophulariaceae family. This species can be found in marshes, swamps (lake margins), and vernal pool habitats on clay soils ranging from 10 to 2,375 meters in elevation. Boggs lake hedge-hyssops bloom from April to August and has been 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 (CNPS 2001).

The Folsom DS/FDR Action area is within the known range Boggs lake hedge-hyssop. Small areas of seasonal wetland and marshy habitat are present within the Folsom DS/FDR Action area, but are not on clay soils. This species is not expected to occur in the Folsom DS/FDR Action area.

Layne's butterweed (*Senecio layneae*) – FT, CR, CNPS List 1B

The Layne's butterweed is a perennial herb that blooms from April to May in chaparral and cismontane woodland habitats on serpentinite, gabbroic and/or rocky soils. A member of the

Asteraceae family, the Layne's butterweed is found in El Dorado, Tuolumne and Yuba Counties. Habitat areas fall within 200 to 1,000 meters in elevation (CNPS 2001).

Layne's butterweed is not likely to occur in the Folsom DS/FDR Action area based on the lack of chaparral and serpentinite soils.

Special Status Invertebrates

Vernal pool fairy shrimp (*Branchinecta lynchi*) - FT

Vernal pool fairy shrimp are restricted to seasonal vernal pools (Eng, et al. 1990; Federal Register 1994). The vernal pool fairy shrimp prefers cool-water pools that have low to moderate dissolved solids (Eriksen and Belk 1999). This fairy shrimp is found primarily in the Central Valley and the foothills of the Sierra Nevada in northern California from 10 to 290 meters in elevation (Eng et al. 1990, Eriksen and Belk 1999, Federal Register 1994).

Fairy shrimp are adapted for survival in water bodies that are transient and their cysts (protected eggs) can withstand long dry periods. They require cool waters early in the rainy season for hatching and are highly susceptible to contaminants. Dispersal of cysts to other ponds is thought to occur by animal vectors, including grazing animals or waterfowl.

Evidence of seasonal ponding was observed in August surveys in the vicinity of Dike 2 and east of MIAD, at locations that may be included in the Folsom DS/FDR as contractor use areas. Vernal pool fairy shrimp have been observed less than one mile away from the Folsom DS/FDR area (David Murth pers. obs., as cited in LSA 2003). Although the seasonal pools within the study area contain less water than is typical for this species' habitat, the close proximity of the Folsom DS/FDR area to a known occurrence provides at least a low potential for this species to occur.

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) - FT

The valley elderberry longhorn beetle (VELB) is associated with various species of elderberry (*Sambucus* spp.). This beetle generally occurs along waterways and in floodplains that support remnant stands of riparian vegetation. Both larvae and adult VELB feed on elderberry shrubs. Larvae feed internally on the pith of the trunk and larger branches, while adult beetles appear to feed externally on elderberry flowers and foliage. Prior to metamorphosing into the adult life stage, VELB larvae chew an exit hole in the elderberry trunk, through which the adult beetle later exits the plant (CDFG 2003).

The Folsom Folsom DS/FDR Action area contains blue elderberry (*Sambucus mexicana*), the host of the VELB. Exit holes have been observed in the elderberry shrubs in the Folsom DS/FDR Action area. Therefore this beetle must be assumed to occur within the Folsom DS/FDR Action area.

California Vernal Pool Tadpole Shrimp (*Lepidurus packardi*) - FE

The California vernal pool tadpole shrimp is a small crustacean found in ephemeral freshwater pools. This species inhabits vernal pools ranging in size from 5 square meters to

36 hectares. The water in the pools can be clear to turbid and often has low conductivity, total dissolved solids, and alkalinity (Federal Register 1994, Eng et al. 1990). Temperatures in pools where this tadpole shrimp have been found to vary from 3 to 23°C (Gallagher 1996). Vernal pool formations occur in grass-bottomed swales of grasslands, in old alluvial soils underlain by hardpan or in mud bottomed pools (Federal Register 1994). Pools with cobblely hardpan bottoms also serve as habitat (Gallagher 1996). Gallagher (1996) found that the depth, volume, and duration of inundation of a pool was important for the presence of this tadpole shrimp in vernal pools when compared to the needs of other branchiopods. He found that this species did not reappear in ponds that dried and rehydrated during the study period, while other branchiopod species did. California vernal pool tadpole shrimp needs deeper and longer-lasting pools if they are to persist over a rainy season in which both wet and dry periods occur.

Potential habitat for the vernal pool tadpole shrimp occurs within the Folsom DS/FDR area. Because this species requires pools of specific size and inundation duration, potential habitat within the Folsom DS/FDR area is limited. However, this species is known to occur in small pools in the Mather Air Force Base vicinity in eastern Sacramento County, and therefore even small pools may supply adequate habitat if inundation is of sufficient duration.

Special Status Amphibians

California red-legged frog (*Rana aurora draytonii*) - FT, CSC

The California red-legged frog is a federally threatened species (Federal Register 1996) and a California species of special concern. Critical habitat was designated in 2001 (Federal Register 2006). However, on November 6, 2002, the U.S. District Court for the District of Columbia entered a consent decree, vacating the critical habitat designation (except Units 5 and 31) and remanding the designation to the USFWS to conduct an economic analysis. The USFWS released a recovery plan in 2002 (USFWS 2002). Critical habitat was again designated on April 13, 2006 (Federal Register 2006). No proposed critical habitat is within the Folsom DS/FDR Action area.

Historically, the California red-legged frog occurred in coastal mountains from Marin County south to northern Baja California, and along the floor and foothills of the Central Valley from about Shasta County south to Kern County (Jennings et al. 1992). Currently, this subspecies generally only occurs in the coastal portions of its historic range; it is apparently extirpated from the valley and foothills and in most of southern California south of Ventura County. California red-legged frogs are usually associated with aquatic habitats, such as creeks, streams and ponds, and occur primarily in areas having pools approximately 3 feet deep, with adjacent dense emergent or riparian vegetation (Jennings and Hayes 1988). Adult frogs in general rarely move large distances from their aquatic habitat. California red-legged frogs breed from November to March. Egg masses are attached to emergent vegetation (Jennings and Hayes 1994) and hatch within fourteen days. Metamorphosis generally occurs between July and September.

Within the Folsom DS/FDR Action area perennial and intermittent creeks and Folsom Reservoir may provide marginally suitable habitat for this species. This frog has been reported from a location upstream of the construction Folsom DS/FDR Action area in a tributary to Folsom Reservoir (CDFG 2006c). The presence of centrarchids (including species of the warmwater fish community such as bass) and fluctuating reservoir levels that affect vegetation communities make Folsom Reservoir marginally suitable to unsuitable for this species. Perennial and intermittent creeks, seasonal wetlands, and ponds and may provide marginally suitable habitat for adult California red-legged frog, but the lack of vegetation and/or the presence of centrarchids substantially reduce the value of aquatic habitat for spawning and rearing frogs.

Foothill Yellow-Legged Frog (*Rana boylii*) – CSC

Foothill yellow-legged frogs inhabit foothill and mountain streams from sea level to about 6,000 feet in elevation. Their known range includes the Coast Ranges from the Oregon border south to the Transverse Mountains in Los Angeles County, most of northern California west of the Cascade crest, and along the western flank of the Sierra south to Kern County. Most records are below 3,500 feet. The foothill yellow-legged frog is found in a variety of habitats, including valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadow types (Zeiner et al. 1988).

Home ranges are small, but these frogs may move several hundred meters to spawning habitat. Adult frogs congregate at suitable spawning sites as spring runoff declines, when water temperatures reach 54 to 59ºF (12 to 15ºC), usually any time from mid-March to May, depending on local water conditions. The breeding season at any locality is usually about two weeks for most populations. Spawning frogs favor low to moderately steep gradient streams (0 to 8 degrees). Females deposit eggs in shallow edgewater areas with low water velocities (Seltenrich and Pool 2002). Egg masses are often attached to the downstream sides of cobbles and boulders, or to gravel, wood, or other materials. Eggs hatch in approximately five days. Tadpoles transform in three to four months and stay for a time in spawning habitat but eventually disperse. Tadpoles feed on diatoms or algae on the surface of the substrate (Stebbins 1951). Tadpoles favor calm, shallow water.

Juvenile and adult frogs bask on midstream boulders or in terrestrial sites along riffles, cascades, main channel pools, and plunge-pools, often in dappled sunlight near low overhanging vegetation. Adults generally avoid deep shade. Foothill yellow-legged frogs are relatively strong swimmers and prefer faster water habitat than do other frog species in the foothills such as the bullfrog (*Rana catesbeiana*) or the California red-legged frog.

Foothill yellow-legged frogs are not likely to occur in the Folsom DS/FDR Action area, although they may occur in upstream areas. Fluctuating reservoir levels and the presence of exotic species (bullfrogs, crayfish and introduced fish) probably preclude the establishment of a viable population. The perennial and intermittent creeks provide potential habitat, however they are likely too small and lack the appropriate substrate to sustain a viable population (LSA 2003).

Western Spadefoot Toad (*Spea* [*Scaphiopus*] *hammondii*) – CSC

This species ranges throughout the Central Valley and adjacent foothills from sea level to 4,500 feet, primarily in grasslands with shallow temporary pools, and occasionally in valley-foothill hardwood. The Western spadefoot toad typically lives underground in burrows up to three feet deep during most of the year, with the first rains of the year initiating movement to the surface. Terrestrial burrowing sites may be well removed from breeding sites.

Breeding occurs from late winter to late March. Western spadefoot toad utilizes shallow, temporary pools formed by heavy winter rains, with sand and gravel substrate, for breeding habitat and tadpole rearing. Sandy, gravelly washes or small streams (often temporary) may also be used. Egg masses, in clusters of 10 to 40, are attached to plant material, or the upper surfaces of small, submerged rocks, with eggs hatching within two weeks. During late spring, recently metamorphosed juveniles seek refuge in breeding ponds for several days after transformation (Zeiner et al. 1988, Stebbins 1972). However, aquatic breeding habitat is unsuitable in the presence of predators (bullfrogs, fish or crayfish) or in the presence of mosquitofish.

While most of the grassland/savanna communities in the Folsom DS/FDR Action area appear suitable for adult toads, there is little suitable aquatic habitat for reproduction. Most of the seasonal wetlands in the Folsom DS/FDR Action area are too small to hold water long enough for spadefoot larvae to reach metamorphosis (LSA 2003). There are few seasonal wetlands that may inundate long enough to sever as rearing habitat. Therefore the lack of breeding habitat may limit the population within the Folsom DS/FDR Action area.

Special Status Reptiles

Western pond turtle (*Emys* [*Clemmys*] *marmorata marmorata*) – CSC

This turtle occurs in suitable aquatic habitat throughout California, west of the Sierra-Cascade crest, from sea level to about 6,000 feet (Zeiner et al. 1988). It is absent from desert regions except in the Mojave Desert along the Mojave River and its tributaries. It is found in permanent or nearly permanent water in a wide variety of habitat types with basking sites such as partially submerged logs, rocks, mats of floating vegetation, or open mud banks. Individuals are active all year where climates are warm but hibernate during cold periods elsewhere. During the spring or early summer, females move overland for up to 325 feet to find suitable sites for egg-laying. Eggs are laid from March to August depending on local conditions and incubate from 73 to 80 days. Sexual maturity is reached at about eight years of age (Zeiner et al. 1988).

Most of the creeks, ponds, and reservoir backwater areas in the Folsom DS/FDR Action area are suitable for western pond turtles. They have been regularly observed in the vicinity of the Folsom DS/FDR Action area at Avery’s Pond since the 1970’s (David Murth pers. obs., as cited in LSA 2003). However, Holland (1994) and Jennings and Hayes (1994) suggest that turtles that are found occupying reservoirs, stock ponds and the like represent displaced individuals and therefore do not represent viable populations.

California Horned Lizard (*Phrynosoma coronatum frontale*) - CSC

The California horned lizard occurs in open country, especially gravelly or sandy areas, washes, flood plains and wind-blown deposits, sand dunes, alluvial fans, etc. Common habitats include valley foothill hardwood, conifer and riparian habitats, alkali flats, chaparral, as well as in pine-cypress, juniper and annual grass habitats. This lizard has a wide range in California occurring from Shasta County south, along the Sacramento Valley, east to the Sierra Nevada foothills (below 4,000 feet), west through much of the South Coast Ranges, and in the Southern California deserts and mountains below 6,000 feet. Horned lizards are generally active from April through October. The reproductive season for the California horned lizard varies from year to year and geographically depending on local conditions. Courtship generally occurs in the spring, and hatchlings first appear in mid-summer. Horned lizards prefer to eat ants, but they will also eat many other types of invertebrates, such as grasshoppers, beetles and spiders.

Suitable habitat is present for the California horned lizard within the Folsom DS/FDR Action area. In addition, recorded observations of this species have occurred within five miles of the Folsom DS/FDR Action site within the past 20 years (CDFG 2005a). It is likely that this species occurs within the Folsom DS/FDR Action area.

Giant garter snake (*Thamnophis gigas*) - FT, CT

The giant garter snake historically ranged in the Sacramento and San Joaquin valleys from Butte County in the north to Kern County in the south (Rossman et al. 1996). Its current range is much reduced, and it is apparently extirpated south of northern Fresno Co. (Bury 1971, Rossman et al. 1996).

The giant garter snake inhabits marshes, sloughs, ponds, small lakes, low-gradient streams, and other waterways and agricultural wetlands, such as irrigation and drainage canals and rice fields. Giant garter snakes feed on small fishes, tadpoles, and frogs (Fitch 1941, Hansen 1980, Hansen 1988). Habitat requirements consist of adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; emergent herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; grassy banks and openings in waterside vegetation for basking; and higher elevation uplands for cover and refuge from flood waters during the snake's dormant season in the winter (Federal Register 1993). Giant garter snakes are absent from larger rivers and other water bodies that support introduced populations of large, predatory fish, and from wetlands with sand, gravel, or rock substrates (Rossman and Stewart 1987, Brode 1988, Federal Register 1993).

The giant garter snake inhabits small mammal burrows and other soil crevices above prevailing flood elevations throughout its winter dormancy period (November to mid-

March). Giant garter snakes typically select burrows with sunny aspects along south and west facing slopes. Upon emergence, males immediately begin wandering in search of mates. The breeding season extends through March and April, and females give birth to live young from late July through early September (Hansen and Hansen 1990). Brood size is variable, ranging from 10 to 46 young (Hansen and Hansen 1990). Young immediately scatter into dense cover and absorb their yolk sacs, after which they begin feeding on their own. Sexual maturity averages 3 years of age in males and 5 years for females.

It is unlikely that the seasonal wetlands in the Folsom DS/FDR Action area hold water throughout the summer and into the fall. While potential habitat may exist within the vicinity of the Folsom DS/FDR Action area, it is unlikely that a viable population occurs within the boundaries of the Folsom DS/FDR Action. Previous surveys for giant garter snake in this area found no individuals of this species.

Special Status Birds

Cooper's Hawk (*Accipiter cooperii*) – CSC

The Cooper's hawk is a breeding resident through out most of the wooded portion of the state. The Cooper's hawk, which can be found in elevations ranging from sea level to 8,860 feet, requires dense stands of live oak, riparian, deciduous, or other forest habitats near water when nesting. The breeding season begins in March and continues through August, with average clutch sizes of 4-5 eggs. During this period, the female will incubate the eggs while the male provides food. The Cooper's hawk primary food source is small birds, supplemented by reptiles and amphibians. More of an ambush predator, the Cooper's hawk will take prey from the ground, on branches or in mid-flight (Johnsgard 1990). Hunting takes place in broken woodland and habitat edges. The Cooper's hawk is seldom found in areas without dense tree stands. Some individuals are yearlong residents of California, while others from the more northern areas winter in California. Commonly found in the southern Sierra Nevada foothills, New York Mountains, Owens Valley, and other local areas in southern California (Zeiner et al. 1990a).

There is a high potential for the Cooper's hawk to occur within the Folsom DS/FDR Action area because there is suitable nesting habitat and Folsom DS/FDR Action sites are within their known range. A wintering Cooper's Hawk was observed perched in an oak tree in the vicinity of Beal's Point behind Dike 6 on December 29th, 2005 (Schell pers. comm. 2005)

Tricolored blackbird (*Agelaius tricolor*) – CSC

The tricolored blackbird ranges throughout the Central Valley of California, typically nesting in colonies numbering several hundred. An adequate breeding ground for the tricolored blackbird requires open water, protected nesting substrate (emergent wetland vegetation) and a foraging area with insect prey within a few kilometers (miles) of the colony. Tricolored blackbird foraging habitats in all seasons include pastures, agricultural fields and dry seasonal pools. Occasionally, these birds will also forage in riparian scrub, marsh boarders and grassland habitats. Egg laying generally begins within 4 days of the colonies arrival, with one egg being laid per day and clutch size usually around 3 to 4 eggs. Tricolored blackbirds typically leave their wintering areas in late March and early April for breeding locations in Sacramento County and throughout the San Joaquin Valley (Beedy and Hamilton 1997).

There is potential for the tricolored blackbird to occur within the Folsom DS/FDR Action area due to the presence of suitable foraging sites (i.e. grasslands) in an around the Folsom DS/FDR Action area. No suitable nesting habitat is present due to the limited size of emergent marshland habitat .

Western burrowing owl (*Athene cunicularia hypugaea*) – CSC

The western burrowing owl was formerly a common permanent resident throughout much of California. However, a decline that became noticeable in the 1940's (Grinnell and Miller 1944) has continued through to the present time. The western burrowing owl is a year long resident of open, dry grassland and desert habitats often associated with burrowing animals. They have also been found to inhabit grass, forb, and shrub stages of pinyon and ponderosa pine habitats. Western burrowing owls commonly perch on fence posts or on top of mounds outside their burrows. Western burrowing owls are active both day and night, with a lessening in activity at the peak of the day. Western burrowing owls are opportunistic feeders and large arthropods comprise a majority of their diet. Small mammals, reptiles, birds, and carrion are also important components of the burrowing owl's diet (Zeiner, et al. 1990a). The nesting season of the burrowing owl occurs from February through August, with a peak in breeding occurring from April to May. Western burrowing owls nest in burrows in the ground and often utilize old ground squirrel or other small mammal nests (Zeiner, et al. 1990a). However, western burrowing owls may dig their own nests in areas of soft soil. Pipes, culverts, and nest boxes are also used in areas where burrows are scarce (Robertson 1929).

Portions of the Folsom DS/FDR Action area contain grassland habitat with small mammal burrows. Therefore there is potential for Western burrowing owl to occur.

Aleutian Canada goose (*Branta canadensis leucopareia*) - FD

The Aleutian Canada goose breeds in the Aleutian Island chain of Alaska and winters in California, Oregon and Washington. These geese are among the smaller of the Canada goose subspecies, and migrate south to wintering areas between August and December, with the greatest number leaving the Aleutian Island chain in September. Aleutian Canada geese are omnivores, having a steady diet of arthropods, evergreen shrubs, roots, tubers, leaves, and stems during the breeding season; with all their water taken from vegetation. During the non-breeding season they feed on crops such as corn, wheat, barley, oats, and lima beans. They can be found wintering on lakes, reservoirs, ponds and inland prairies, and will forage on natural pasture or fields cultivated in grain (Sibley 2001).

There is moderate potential for the Aleutian Canada goose to occur within the Folsom DS/FDR Action area because suitable wintering habitat is present, although the area is outside the reported wintering sites for this subspecies. A Canada goose (subspecies not identified) was observed in the vicinity of Beal's Point on November 17, 2005 (Colgate, pers. comm. 2005), and many Canada goose (subspecies not identified) were observed all around the reservoir on May 24 and 25, 2006 (Victorine, pers. comm. 2006).

Ferruginous hawk (*Buteo regalis*) - CSC

The ferruginous hawk is an uncommon winter resident and migrant in the lower elevations and open grasslands of the Central Valley and Coast Ranges. It is a fairly common resident in the Southern Californian grasslands and agricultural areas. Ferruginous hawks favor open grasslands, sagebrush flats, desert scrubs, low foothills surrounding valleys and fringes of pinyon-juniper habitats. Requiring open, treeless areas to hunt, the ferruginous hawk feeds on rabbits, jackrabbits, ground squirrels, and mice, but also takes birds, reptiles and amphibians. It is speculated that the hawk’s population trend follows the lagomorph population cycles. There are no records of the ferruginous hawk breeding in California. Ferruginous hawks prefer to roost in open areas, usually in a lone tree or other elevated structure. Migration to California usually occurs in September, where the ferruginous hawk will remain until mid-April (Zeiner et al. 1990a).

Roosting and foraging habitat for the ferruginous hawk is present in the vicinity of the Folsom DS/FDR Action. Based on their reported distribution, the species is not likely to breed within the Folsom DS/FDR Action area.

Swainson’s Hawk (*Buteo swainsoni*) –CT

Swainson's hawk is restricted to portions of the Central Valley and Great Basin regions where suitable nesting and foraging habitat is still available. Swainson's hawk requires large, open grasslands with abundant prey in association with suitable nest trees. Suitable foraging areas include native grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands. Central Valley populations are centered in Sacramento, San Joaquin, and Yolo Counties. Over 85 percent of Swainson's hawk territories in the Central Valley are associated with riparian systems adjacent to suitable foraging habitats. Swainson's hawk often nests peripherally to riparian systems, and is known to utilize lone trees or groves of trees in agricultural fields. Valley oak, Fremont cottonwood, walnut, and large willow 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 late May through July. Clutch size is two to four eggs (Zeiner et al. 1990a).

This species may use the riparian trees in the Folsom DS/FDR Action area as nest sites, and they may forage on the uplands.

Vaux’s swift (*Chaetura vauxi*) – CSC

Vaux’s swift is a summer resident of northern California, preferring redwood and Douglas-fir habitats. Between April and September, the Vaux’s swift is a fairly common migrant throughout the state. Nesting typically takes place in hollow redwood, Douglas-fir, and occasionally other coniferous trees, with the nest located near the bottom of the cavity. The

Vaux's swift show a preference to forage over rivers and lakes, but will forage over most terrain or habitat. They feed almost exclusively on flying insects taken in long continuous foraging flights. The Vaux's swift breeds from early May to mid-August, with a clutch size usually of 4-5 eggs (Zeiner et al. 1990a).

Although it is unlikely that the Vaux's swift nests within the Folsom DS/FDR Action area, there are adequate foraging sites in the Folsom DS/FDR Action area.

Mountain Plover (*Charadrius montanus*) – CSC

The mountain plover is known to winter in northern California, southern Arizona and New Mexico, and central Texas south into north-central Mexico, however it has not been known to nest in California. The mountain plover avoids high and dense cover, preferring prairie grasslands, shortgrass plains and plowed fields with little vegetation. The mountain plover forages for large insects, in particular grasshoppers. Breeding takes place from late April through June with a peak in late May. The average clutch is 3 eggs. In years of abundant food, the male may incubate the existing clutch to allow the female to lay an additional clutch, often attended by another male (Zeiner et al. 1990a).

The Folsom DS/FDR Action area provides only marginal foraging habitat for the mountain plover, therefore this species is not likely to occur there.

White-Tailed Kite (*Elanus leucurus*) –CFP

The white-tailed kite is a common to uncommon, yearlong resident in coastal and valley lowlands, and is rarely found away from agricultural areas. This species inhabits herbaceous and open stages of most habitats in cismontane California, and uses herbaceous lowlands with variable size trees, especially with dense populations of voles. Substantial groves of dense, broad-leaved deciduous trees are used for nesting and roosting. The white-tailed kite forages in undisturbed, open grasslands, meadows, farmlands, and emergent wetlands. White-tailed kite eats small rodents, especially the California vole as well as birds, snakes, lizards, frogs and large insects. Nests are built of twigs and sticks with an inner layer of grass or leaves in trees that are usually located on habitat edges. Nest-building occurs January through August (Dunk 1995). Egg laying begins in February and probably peaks in March and April. Peak fledging probably occurs in May and June with most fledging complete by October. Clutch size is most commonly four (Zeiner, et al. 1990a).

Suitable habitat for the white-tailed kite can be found within the Folsom DS/FDR Action vicinity. Therefore the white-tailed kite may occur within the Folsom DS/FDR Action area.

American Peregrine Falcon (*Falco peregrinus anatum*) – FD, CE

The American peregrine falcon is a medium sized-raptor breeding from non-Arctic portions of Alaska and Canada south to Baja California (except the coast of southern Alaska and in British Columbia), throughout Arizona and into Mexico (locally). Nesting American peregrine falcons usually winter in their breeding range, with the exception of the more northern residents, which move south. The primary nesting habitat for the American peregrine falcon tends to be cliffs or series of cliffs that dominate the surrounding landscape. However, river cutbanks, trees, and manmade structures including tall towers and the ledges of tall buildings can also serve as suitable nesting sites. American peregrine falcons hunt their prey in the air, usually over open habitat types such as waterways, fields, and wetland areas, diving at speeds of up to 200 miles per hour to strike their targets. Bluejays, flickers, meadowlarks, pigeons, starlings, shorebirds, waterfowl, and other readily available species make up the American peregrine falcon's diet. The raptor may travel 10 to 12 miles from their nests in search of prey. Breeding takes place in later March and April, with a usual clutch size of 3 to 4 eggs

There is potential for the American peregrine falcon to occur within the Folsom DS/FDR Action area. Adequate nesting sites and sufficient foraging habitat is available within the Folsom DS/FDR Action area and vicinity.

Bald Eagle (*Haliaeetus leucocephalus*) – FT, FPD, CE, CFP

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 at a few favored inland waters in southern California. Largest numbers 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. The eagle requires large bodies of water with abundant fish and adjacent snags or other perches for foraging. Bald eagle preys mainly on fish and occasionally on small mammals or birds, by swooping from a perch or from mid-flight. Nests are found in large, old growth, or dominant trees, especially ponderosa pine with an open branchwork, usually 50 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 could occur within the Folsom DS/FDR Action area based on the availability of adequate nesting sites and foraging habitat within the Folsom DS/FDR Action area and vicinity.

Loggerhead Shrike (*Lanius ludovicianus*) – CSC

The loggerhead shrike is a common resident and winter visitor in lowlands and foothills throughout California. It prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches. Its highest density occurs in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. It occurs only rarely in heavily urbanized areas, but is often found in open cropland. It builds its nest on stable branches in densely-foliaged shrub or tree, usually well-concealed. Nest height is 1 to 50 feet above ground. It lays eggs from March into May, and young become independent in July or August. The loggerhead shrike is a monogamous, solitary nester with a clutch size of four to eight. Incubation lasts 14 to 15 days. Altricial young are tended by both parents and leave the nest at 18 to 19 days (Zeiner et al. 1990a).

There is a high potential for the loggerhead shrike to be present within the Folsom DS/FDR Action area because of favorable riparian woodlands within the vicinity. A wintering loggerhead shrike was observed perched on barbed wire atop a chain-link fence behind the right-wing dam on December 29, 2005.

Long-Billed Curlew (*Numenius americanus*) – CSC

In California, the long-billed curlew is known to nest on elevated interior grasslands and wet meadows, usually adjacent to lakes or marshes, in northeastern California. Breeding long-billed curlew will be present in northeastern California from April to September. Generally a solitary nester, the long-billed curlew may be loosely colonial in favorable habitats. Both parents incubate a mean clutch size of 4 eggs for 27-28 days. The long-billed curlew prefers to winter in large coastal estuaries, upland herbaceous areas, and croplands. Some years, large numbers of nonbreeders remain in the Central Valley in the summer. The long-billed curlew uses its characteristic long bill to probe deep into the substrate, or to grab prey from mud surfaces. During its inland stay, the long-billed curlew takes insects (adults and larvae), worms, spiders, berries, crayfish, snails, and small crustaceans. Occasionally they will take nestling birds. In coastal estuaries and intertidal zones, the long-billed curlew will prey on mud crabs, ghost shrimp, mud shrimp, insect pupae, gem clams and small estuarine fish (Zeiner et al. 1990a).

The long-billed curlew has the potential to occur in the Folsom DS/FDR Action area based on the availability of grassland and lake habitat. However, this habitat is marginal at best.

Osprey (*Pandion haliaetus*) - CSC (Nesting)

The osprey occurs along seacoasts, lakes, and rivers, primarily in ponderosa pine and mixed conifer habitats. It preys mostly on fish at or below the water surface, but will also take small mammals, birds, reptiles, amphibians, and invertebrates. Large snags and open trees near large, clear, open waters are required for foraging. The osprey typically swoops from flight, hover, or perch to catch prey. In California, the osprey breeds primarily in the northern part of the state and typically builds its nest in large conifers, but may also use artificial platforms as nesting areas. The breeding season is from March to September. Nests are built on platforms of sticks at the top of large snags, dead-topped trees, on cliffs, or on human-made structures. A nest may be as much as 250 feet above ground and is usually within 1,000 feet of fish-producing water. Osprey need tall, open-branched "pilot trees" nearby for landing before approaching the nest and for use by young for flight practice. Typically, this species migrates in October south along the coast and the western slope of the Sierra Nevada to Central and South America (Zeiner et al. 1990a).

The osprey has high potential to occur within the Folsom DS/FDR Action area, because there is suitable foraging habitat in Folsom Reservoir and the nearby American River. Suitable nest trees (foothill pine) are also present. Osprey are frequently sighted at Folsom Reservoir.

White-faced ibis (*Plegadis chihi*) – CSC

The white-faced ibis is a rare visitor to the Central Valley, and is more widespread in migration. The white-faced ibis prefers to feed in fresh emergent wetland habitats, shallow lacustrine waters, the muddy ground of wet meadows and irrigated/flooded pastures or croplands. Within these habitats, the white-faced ibis feeds on earthworms, insects, crustaceans, amphibians, small fishes and miscellaneous invertebrates. The white-faced ibis uses its long bill to probe deep into mud. It feeds in shallow water or on the surface. Preferred nesting sites are in dense marsh vegetation near foraging areas in shallow water or muddy fields. The white-faced ibis no longer breeds regularly anywhere within California (Zeiner et al. 1990a).

It is unlikely that the white-faced ibis will occur within the Folsom DS/FDR Action area. There is suitable foraging habitat on the margins of Folsom Reservoir, however the fluctuating reservoir levels preclude the establishment of dense marsh vegetation, their preferred nesting habitat.

Bank swallow (*Riparia riparia*) – CT

The bank swallow arrives in California from South America in early March and remains until early August when colonies are abandoned and migration begins. The bank swallow is found primarily in riparian and other lowland habitats in California west of the desert during the spring-fall period. The bank swallow is a common migrant within the interior of the state during the spring-fall period, and less common along the coast. There are few records of the bank swallow in California during the winter months. During the summer, the bank swallow is restricted to riparian, lacustrine, and coastal areas with vertical banks, bluffs, and cliffs with fine-textured or sandy soils. A colonial breeder, about 75% of the current breeding population in California nest along the banks of the Sacramento and Feather River in the northern Central Valley. The bank swallow breeds from early May through July, digging horizontal nesting tunnels and burrows along the side of stream banks and cliffs. Most colonies have between 100 to 200 nesting pairs. The bank swallow feeds predominantly over open riparian areas, but will also forage over brushland, grassland, wetlands, water and cropland. A wide variety of aerial and terrestrial soft-bodied insects including flies, bees and beetles makes up the bank swallows diet (Zeiner et al. 1990a).

The bank swallow may occur within the Folsom DS/FDR Action area due to suitable foraging habitat. However, the Folsom DS/FDR Action area does not have vertical banks, bluffs or cliffs for nesting.

Special Status Mammals

Pallid Bat (*Antrozous pallidus*) – CSC

The pallid bat ranges from western Canada to central Mexico. This species is usually found in rocky, mountainous areas, near water, and in desert scrub. They are also found over more open, sparsely vegetated grasslands, and they seem to prefer to forage in the open. The pallid bat has three different roosts. The day roost is usually in a warm, horizontal opening such as in attics or rock cracks; the night roost is usually in the open, near foliage; and the hibernation roost, which is often in buildings, caves, or cracks in rocks (Miller 2002).

Although this species has not been recorded near the Folsom DS/FDR Action vicinity, pallid bats are known to occur throughout California where suitable habitat exists (CDFG 2005a). Since suitable habitat exists within the Folsom DS/FDR Action vicinity there is potential for the species to occur there.

Pacific Western Big-Eared Bat (*Corynorhinus* [*Plecotus*] *townsendii townsendii*) – CSC

The Pacific Western big-eared bat is known to occur in the coastal regions of north and central California to Washington. Townsend's big-eared bat can be found in a variety of habitats throughout California, from the moist coastal redwoods to the mid-elevation mixed conifers to the dry deserts, but are most commonly associated with desert scrub, mixed conifer, pinyon-juniper, and pine forest. Common roosting locations include limestone caves, lava tubes, mines, buildings and other structures. This species is extremely sensitive to disturbance in its roost. Townsend's big-eared bat feeds primarily on small moths, but also takes other insects including flies, lacewings, dung beetles, and sawflies (Kunz and Martin 1982).

This species could potentially utilize the Folsom DS/FDR Action area as foraging habitat while using nearby buildings or other man-made structures as roosting habitat.

Spotted Bat (*Euderma maculatum*) – CSC

Although spotted bats were once thought to be very rare (Zeiner, at al. 1990b), this species is now known to range widely in western North America from southern British Columbia to Mexico (Pierson & Rainey 1998). In California, these bats probably occur throughout the state in suitable habitat. Spotted bats have been found foraging in many different habitats, from arid deserts, to ponderosa pine forests, and marshlands.

Spotted bats have a patchy distribution that may be related to the distribution of suitable diurnal roosting sites (Pierson & Rainey 1998). Spotted bats roost in the small cracks found in steep cliffs and stony outcrops. They have been found as high as 3,000 meters above sea level, and even below sea level in the deserts of California (Pierson and Rainey 1998).

This species is usually found foraging in open areas (Pierson & Rainey 1998). In addition to the nightly migration to foraging sites, these bats might have a seasonal elevation migration from ponderosa pine high elevation habitats in June and July to lower elevations in August

(Barbour & Davis 1969), although they are known to hibernate in some colder portions of their range (Pierson & Rainey 1998).

Due to the proximity of the Folsom DS/FDR Action area to suitable roosting habitat and the recorded long-range nightly migrations of this species between roosting and foraging sites, this species may be found to forage in the Folsom DS/FDR Action vicinity, although spotted bats are unlikely to roost in the Folsom DS/FDR Action area.

Greater Western Mastiff Bat (*Eumops perotis californicus*) – CSC

The greater western mastiff bat occurs from central California to central Mexico. This bat is found in arid to semi-arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands and chaparral (Zeiner, at al. 1990b). Preferred roosting sites include cracks and crevices in cliffs, trees, tunnels and buildings. Day roosts in cliffs are usually located in large cracks in exfoliating slabs of granite or sandstone. Greater western mastiff bat feeds on both low-flying and high-flying insects and may forage as much as 195 feet above the ground (Zeiner, at al. 1990b).

This species has potential to occur in the Folsom DS/FDR Action area based on the availability of preferred habitat, and the availability of roosting sites in trees and other man-made structures.

3.3 Valley Elderberry Longhorn Beetle Survey

The ecology of the valley elderberry longhorn beetle was presented in Section 2. Because of the high probability of the occurrence of VELB in the Folsom DS/FDR Action area, a survey was conducted. Surveys for VELB record the number of elderberry shrubs, their stem diameters, and the presence and number of exit holes formed by VELB as they exit the branch. Additional surveys in parts of the study area have been conducted by USFWS, but are not reported here. The survey for VELB recorded 48 elderberry shrubs or shrub complexes within the Folsom DS/FDR Action area that were not included in the USFWS surveys. Stem diameters (recorded near ground level) ranged from less than one inch to over eight inches. Elderberry shrubs ranged in height from three to thirty-five feet, with an average height of approximately ten feet. The results of the survey are provided in Table 3-2 below. None of the shrubs were located in riparian vegetation. A map of the locations of elderberry shrubs is provided in Appendix D.

Table 3-2. Valley Elderberry Longhorn Beetle Survey Results

PLANT ID #	PLANT HT	STEMS PER SIZE CLASS				TOTAL	EXIT HOLES	COMMENTS
	(ft)	<1”	1-3”	>3- ≤ 5”	>5”	≥5”	(count)	
EB 1	7	1	3	0	0	0	0	Stem diameter: 0.7, 1.0, 1.5, 2.5
EB 2	9	1	3	0	0	0	0	Stem diameter: 0.8, 2.7, 1.9, 3.0
EB 3	10.5	3	3	1	0	0	0	Stem diameter: 0.5, 0.6, 0.8, 1.0, 1.1, 2.3, 4.8
EB 7	20	0	0	0	2	2	6	Stem diameter: 8.5, 5.2
EB 11	11	2	3	0	0	0	0	Stem diameter estimated. Bark around bottom of 3.0’’ stem is peeling
EB 12	4-6	12	6	0	0	0	1	Stem diameter: 0.5, 0.8, 0.8, 1.6, 0.7, 0.4, 0.4, 0.4, 0.7, 0.7, 0.4, 0.3, 0.5, 1.6, 1.2, 1.9, 1, 2.4. Last stem is dead
EB 13	11	0	0	0	2	2	5	Stem diameter: 6.0, 6.0
EB 14	15	0	0	1	2	2	30+	Stem diameter: 3.7, 7.5, 12.8. Burrowing under tree; parts of shrub are dead.
EB 15	12	0	0	0	4	4	11	Stem diameter: 7.2, 7.8, 7.9, 5.4. Large bottom branches are dead, but many smaller offshoots from these branches.
EB 16	15	21	4	5	4	4	22	Stem diameter: 0.9, 2.1, 2.5, 3.3, 3.3, 3.6, 6.1, 6.3, 8.7, 1.1, 4.8, 4.8, 5.0, 1.6, 15-20 single stem offshoots <1” in diameter.
EB 17	14	1	3	9	0	0	0	Stem diameter estimated.
EB 27	12	2	3	2	0	0	2	Stem diameter estimated
EB 28	8	0	0	2	0	0	1	Stem diameter: 3.7, 4.3
EB 29	12	0	0	0	1	1	13	Stem diameter estimated
EB 30	11	3	2	0	0	0	0	Stem diameter estimated
EB 31	9	3	2	0	0	0	0	Stem diameter estimated
EB 32	14	4	3	0	0	0	0	Stem diameter estimated

Table 3-2. Valley Elderberry Longhorn Beetle Survey Results (*continued*)

PLANT ID #	PLANT HT	STEMS PER SIZE CLASS				TOTAL	EXIT HOLES	COMMENTS
	(ft)	<1"	1-3"	>3- ≤ 5"	>5"	≥5"	(count)	
EB0526 -D1	9	6	3	2	0	0	2	
EB0526 -D2	7	~20	6	0	0	0	5	Mostly new shoots with a couple of larger stems
EB0526 -D3	16	2	0	0	1	1	3 old	7.3
EB0526 -D4		2	1	2	0	0	0	
EB0602 -02	10	0	0	1	0	0	1 new	Stem diameter estimated, flagged adjacent oak
EB0602 -06	8	5	1	0	0	0	0	1.6
EB0602 -07	4	1	0	0	0	0	0	
EB0602 -08	7	0	1	0	0	0	1 old 2 new	
EB0602 -09	10	1	0	0	0	0	11 new	
EB0602 -10	10	1	1	0	0	0	0	
EB0602 -11	5	11	0	0	0	0	0	Aggregation in a 3-foot radius
EB0602 -12	25		5	1	1	1	many	Main stem damaged but much new growth
EB0602 -13	12	3	8	4	3	3	many	
EB0602 -26	18	21	7	7	0	0	8 old, 3 new	
EB0602 -27	12	2	1	3	0	0	1 new	3.7, 2.8, 4.2, 3.1. Older branches cut
EB0602 -28		0	0	0	1	1	0	in rip-rap
EB0602 -45	10	53	4	0	1	1		
EB0602 -46	3	8	0	0	0	0	0	Larger stem now dead
EB0602 -47	2	16	0	0	0	0	0	
EB0602 -48	5	8	0	0	0	0	0	
EB0602 -49	8	0	1	0	0	0	2 new	
EB0602 -51	12	5	4	5	2	2	7 old	
EB0602 -53	3	0	2	0	0	0	0	Dried out

Table 3-2. Valley Elderberry Longhorn Beetle Survey Results (*continued*)

PLANT ID #	PLANT HT	STEMS PER SIZE CLASS				TOTAL	EXIT HOLES	COMMENTS
	(ft)	<1"	1-3"	>3- ≤ 5"	>5"	≥5"	(count)	
EB0602-54	10	5	5	2	0	0	4 old	
EB0602-55	15	0	0	0	1	1	6 new 5 old	
EB0825-01	12	15	5	0	1	1	11 new 14 old	Old, large branches broken, new growth out of existing stump
EB0825-02	10	8	3	3	2	2	4 new 3 old	
EB0825-03	12	63	19	2	1	1	7 new 22 old	
EB0825-04	10	2	4	3	0	0	0	
EB0825-05	17	54	6	1	2	2	3 old	
EB0825-06	10							Plant located in center of large elderberry thicket under large snag, no access

Numbers are not always sequential because shrubs that were measured but determined to be outside the final boundary for the Action, shrubs with all stems less than one inch in diameter, and shrubs that were also recorded in USFWS surveys are not included here.

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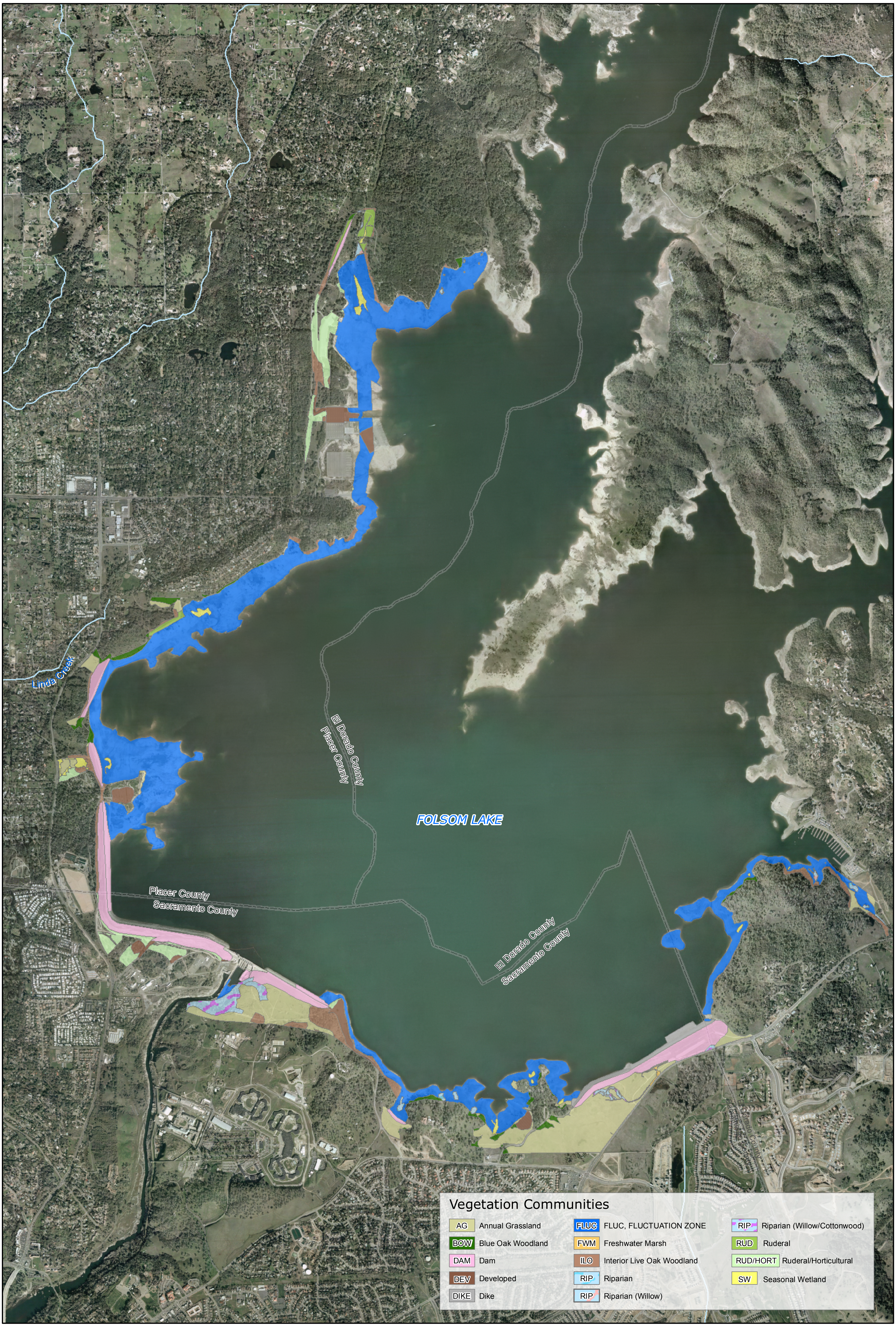
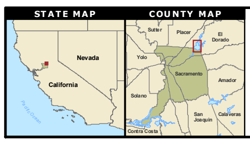
ATTACHMENT A. VEGETATION COMMUNITIES WITHIN THE FOLSOM DS/FDR ACTION STUDY AREA





Reference Grid:
California Stateplane,
Zone 2, NAD83,
Feet

0 0.25 0.5 1
Miles
1:30,000

FOLSOM DS/FDR
BIOLOGICAL FIELD REPORT
ATTACHMENT A
Vegetation Communities within
the Project Vicinity
ENTRIX

ATTACHMENT B. SPECIAL-STATUS PLANT AND WILDLIFE SPECIES WITH POTENTIAL TO OCCUR IN THE FOLSOM DS/FDR ACTION VICINITY

Table B-1.. Special-Status Plant and Wildlife Species with Potential to Occur in the DS/FDR Action Vicinity

Name	Status	Habitat	Potential to Occur
Plants			
San Joaquin spearscale *Atriplex joaquiniana*	CNPS 1B	Chenopod scrub, meadows, playas, valley and foothill grassland and alkaline soils. Elevation: 1-320 meters (m).	No. No chenopod scrub or playas or alkaline areas.
Big-scale balsamroot *Balsamorhiza macrolepis* var. *macrolepis*	CNPS 1B	Chaparral, cismontane woodland, valley and foothill grassland and sometimes serpentinite soil. Elevation: 90-1,400 m.	Possible. No serpentinite soil.
Pine Hill ceanothus *Ceanothus roderickii*	FE, CR CNPS 1B	Chaparral and cismontane woodland with serpentinite or gabbroic soils. Elevation: 260-630 m.	No. Action area below species elevation range.
Red Hills soaproot *Chlorogalum grandiflorum*	CNPS 1B	Chaparral, cismontane woodland, lower montane coniferous forest on serpentinite or gabbroic soils. Elevation: 245-1,005 m.	No. Action area below species elevation range.
Brandegee's clarkia *Clarkia biloba* ssp *brandegeae*	CNPS 1B	Chaparral, cismontane woodland, and often roadcuts. Elevation: 295-885 m.	No. Action area below species elevation range.
Pine Hill flannelbush *Fremontodendron californicum* ssp. *decumbens*	FE, CR CNPS 1B	Chaparral and cismontane woodland with gabbroic or serpentinite soil. Also rocky areas. Elevation: 425-760 m.	No. Action area below species elevation range.
El Dorado bedstraw *Galium californicum* ssp. *sierrae*	FE, CR CNPS 1B	Chaparral, cismontane woodland and lower montane coniferous forest with gabbroic soils. Elevations: 100-585 m.	Unlikely. No suitable soil or coniferous forest in Action area.
Boggs Lake hedge-hyssop *Gratiola heterosepala*	CE CNPS 1B	Marshes, swamps (lake margins) and vernal pools in clay. Elevation: 10-2,375 m.	Unlikely. No suitable soil is present in marshy areas at the Action site.

Table B-1. Special-Status Plant and Wildlife Species with Potential to Occur in the DS/FDR Action Vicinity (*continued*)

Name	Status	Habitat	Potential to Occur
Plants (*continued*)			
Amador (Bisbee Peak) rush-rose *Helianthemum suffrutescens*	CNPS 3	Chaparral; often serpentinite, gabbroic, or Ione soil. Elevation: 45-840 m.	No. Suitable habitat is not present at the Action site.
Pincushion navarretia *Naverretia myersii* ssp. *myersii*	CNPS 1B	Vernal pools on clay loam. Elevation: 355 m.	No. Suitable habitat is not present at the Action site, Action area below species elevation range.
Sacramento orcutt grass *Orcuttia viscida*	FE, CE CNPS 1B	Vernal pools. Elevation: 30-100 m.	No. Suitable habitat is not present at the Action site, no vernal pools.
Layne's butterweed *Senecio layneae*	FT, CR CNPS 1B	Chaparral and cismontane woodland on serpentinite or gabbroic soils and/or rocky areas. Elevation: 200-1,000 m.	Unlikely. No chaparral or serpentinite soil in Action area.
El Dorado mule-ears *Wyethia reticulata*	CNPS 1B	Chaparral, cismontane woodland and lower montane coniferous forest on clay or gabbroic soils. Elevation: 185-630 m.	No. Suitable habitat is not present at the Action site.
Invertebrates			
Vernal pool fairy shrimp *Branchinecta lynchi*	FT	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.	Possible. Have been recorded in close proximity to Action area, marginal habitat exists
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT	Occurs only in the Central Valley of California, in association with blue elderberry (*Sambucus mexicana*). Prefers to lay eggs in elderberries 2-8 inches in diameter; some preference shown for "stressed" elderberries.	Yes. Suitable habitat present within Action area. Obligate host also occurs within Action area

Table B-1. Special-Status Plant and Wildlife Species with Potential to Occur in the DS/FDR Action Vicinity (*continued*)

Name	Status	Habitat	Potential to Occur
Invertebrates (*continued*)			
vernal pool tadpole shrimp *Lepidurus packardi*	FE	Vernal pools in the Central Valley.	Unlikely. Potential habitat within Action area may not hold water long enough
Amphibians			
California tiger salamander *Ambystoma californiense*	FT CSC	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).	No. Outside the spawning range for the species.
California red-legged frog *Rana aurora draytonii*	FT CSC	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.	Possible. However, only marginal habitat exists within Action area.
Foothill yellow-legged frog *Rana boylii*	CSC	Partly shaded, shallow streams & riffles with a rocky substrate in a variety of habitats. Need at least some cobble-sized substrate for egg laying. Need at least 15 weeks to attain metamorphosis.	Unlikely. Action area lacking suitable substrate habitat.
Western spadefoot toad *Spea hammondii*	CSC	Occurs primarily in grassland habitats, but can be found in valley-foothill hardwood woodlands. Vernal pools are essential for breeding and egg laying.	Possible. Seasonal wetlands in Action area may be inundated for sufficient duration to allow for metamorphosis.
Reptiles			
Northwestern pond turtle *Emys* (=*Clemmys*) *marmorata marmorata*	CSC	Thoroughly aquatic: found in ponds, marshes, rivers, streams & irrigation ditches with aquatic vegetation. Need basking sites and suitable (sandy banks or grassy open fields) upland habitat for egg laying.	Yes. Suitable habitat is present at the Action site.

Table B-1. Special-Status Plant and Wildlife Species with Potential to Occur in the DS/FDR Action Vicinity (*continued*)

Name	Status	Habitat	Potential to Occur
Reptiles(*continued*)			
California horned lizard *Phrynosoma coronatum frontale*	CSC	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. Open areas for sunning, bushes for cover, patches of loose soil for burial, & abundant supply of ants & other insects.	Yes. Suitable habitat is present at the Action site. Been recorded from within 5 miles of Action site
Giant garter snake *Thamnophis gigas*	FT CT	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. Although suitable habitat is present at the Action site this species has not been found here in a previous study.
Birds			
Cooper's hawk *Accipiter cooperii*	CSC	(Breeding and Nesting) Through out most of the wooded portion of the state. Requires dense stands of live oak, deciduous riparian or other forest habitats near water.	Yes. Suitable nesting habitat is found within the Action area.
Tricolored blackbird *Agelaius tricolor*	CSC	(Nesting colony) 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.	Possible. No colonies found within Action area, potential foraging area's present.
Western burrowing owl *Athene cunicularia hypugaea*	CSC	Found in a wide variety of arid and semi-arid environments. Nesting habitat consists of open areas with mammal burrows, ranging from native prairie to urban habitats. Burrows need to be located in well-drained, level to gently sloping areas characterized by sparse vegetation and bare ground.	Yes. Small mammal burrows present in Action area.
Aleutian Canada goose *Branta canadensis leucopareia*	FD[1]	(Wintering) Winters on lakes and inland prairies. Forages on natural pasture or that cultivated to grain; loafs on lakes, reservoirs, and ponds.	Possible. Suitable habitat found within Action area, although it is outside the reported wintering areas.

Table B-1. Special-Status Plant and Wildlife Species with Potential to Occur in the DS/FDR Action Vicinity (*continued*)

Name	Status	Habitat	Potential to Occur
Birds (*continued*)			
Ferruginous hawk *Buteo regalis*	CSC	(Wintering) Open grasslands, sagebrush flats, desert scrub, low foothills & fringes of pinyon-juniper habitats with abundant small mammals.	Unlikely. Marginal foraging habitat present at Action site.
Swainson's hawk *Buteo swainsoni*	CT	(Nesting) Riparian systems adjacent to suitable foraging habitats. Often nest peripherally to riparian system in valley oak, Fremont cottonwood, walnut, and large willow trees. Require large, open grasslands or lightly grazed pastures; feeding on voles, a variety of birds and insects.	Yes. Suitable foraging habitat found within Action area.
Vaux's swift *Chaetura vauxi*	CSC	(Nesting) Redwood, Douglas fir, & other coniferous forests. Nests in large hollow trees & snags, often in flocks. Forages over most terrain & habitats but shows a preference for foraging over rivers and lakes.	Unlikely. Marginal nesting habitat, possible foraging habitat found within Action area.
Mountain plover *Charadrius montanus*	CSC	(Wintering) short grasslands, freshly plowed fields, newly sprouting grain fields, & sometimes sod farms: sites with short vegetation, bare ground & flat topography. Prefer grazed areas & areas with burrowing rodents.	Unlikely. Marginal habitat found within Action area.
Black swift *Cypseloides niger*	CSC	(Nesting) Coastal belt of Santa Cruz & Monterey Co; central & southern Sierra Nevada; San Bernardino & San Jacinto Mountains. Breeds in small colonies on cliffs behind or adjacent to waterfalls in deep canyons and sea-bluffs above surf; forages widely.	No. Suitable habitat not present at the Action site.
White-tailed (=black shouldered) kite *Elanus leucurus*	CFP	(Nesting) Rolling foothills and valley margins with scattered oaks & river bottomlands or marshes next to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	Yes. Suitable habitat present within Action area.
Little willow flycatcher *Empidonax traillii brewsteri*	CE	(Nesting) Inhabits extensive thickets of low, dense willows on edge of wet meadows, ponds, or backwaters; from 2000-8000 feet. Require dense willow thickets for nesting/roosting. Low, exposed branches are used for singing posts/hunting perches.	No. Action area below species elevation range.

Table B-1. Special-Status Plant and Wildlife Species with Potential to Occur in the DS/FDR Action Vicinity (*continued*)

Name	Status	Habitat	Potential to Occur
Birds (*continued*)			
American peregrine falcon *Falco peregrinus anatum*	FD[2] CE	(Nesting) Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures. Nest consists of a scrape on a depression or ledge in an open site.	Yes. Suitable nesting and foraging habitat present within Action area.
Bald eagle *Haliaeetus leucocephalus*	FT/FPD[3] CE/CFP	(Nesting & wintering) Ocean shore, lake margins, & rivers for both nesting & wintering. Most nests within 1 mile of water. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.	Yes. Suitable habitat within Action area.
Loggerhead shrike *Lanius ludovicianus*	CSC	(Nesting) Broken woodlands, savannah, pinyon-juniper, Joshua tree, & riparian woodlands, desert oases, scrub & washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting.	Yes. Suitable habitat within Action area.
long-billed curlew *Numenius americanus*	CSC	(Nesting) Breeds in upland shortgrass prairies & wet meadows in northeastern California. Habitats on gravelly soils and gently rolling terrain are favored over others.	Yes. Suitable habitat within Action area.
Osprey *Pandion haliaetus*	CSC (Nesting)	(Nesting) Ocean shore, bays, fresh-water lakes, and larger streams. Builds large nests in tree-tops within 15 miles of good fish-producing body of water.	Yes. Suitable habitat within Action area.
White-faced ibis *Plegadis chihi*	CSC	(Nesting) Dense, fresh emergent wetland. Prefers to feed in fresh emergent wetland, muddy ground of wet meadows, shallow lacustrine waters and irrigated, or flooded, pastures and croplands. Currently not know to breed anywhere in California.	Unlikely. Possible feeding ground within Action area.
Bank swallow *Riparia riparia*	CT	(Nesting) Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks or cliffs with fine-textured/sandy soils near streams, rivers, lakes, and ocean to dig nesting hole.	Possible. Marginal habitat, no colonies found within Action area.

Table B-1. Special-Status Plant and Wildlife Species with Potential to Occur in the DS/FDR Action Vicinity (*continued*)

Name	Status	Habitat	Potential to Occur
Mammals			
Pallid bat *Antrozous pallidus*	CSC	Found usually in rocky mountainous areas near water. Also found in sparsely vegetated grasslands, and prefer to forage in the open. Day roosts in attics or rock cracks, night roosts are usually open. Near foliage, hibernation roosts in buildings, caves, cracks in rocks.	Yes. Widespread range and suitable habitat within the Action area likely supports this species.
Pacific western big-eared bat *Corynorhinus* (=*Plecotus*) *townsendii townsendii*	CSC	Humid coastal regions of northern & central California. Roost in limestone caves, lava tubes, mines, buildings, etc. Roosting sites limiting. Extremely sensitive to disturbance.	Possible. May feed in Action area and roost in nearby buildings
Spotted bat *Euderma maculatum*	CSC	Found foraging in many different habitats, especially in arid or Ponderosa Pine forests, and marshlands. Because of the low frequency of their echolocation calls large open habitat is predicted to be preferred. Roost in the small cracks found in cliffs and stony outcrops. They have been found as high as 3000m above sea level, and even below sea level in the deserts of California.	Yes. Suitable foraging sites within Action area. However unlikely to roost within Action area. Long distance daily migrant.
Greater western mastiff-bat *Eumops perotis californicus*	CSC	Many open, semi-arid to arid habitats, including conifer & deciduous woodlands, coastal scrub, grasslands, chaparral, etc. Roosts in crevices in cliff faces, high buildings, trees & tunnels.	Yes. Suitable foraging sites and possible roosting sites within Action area.

Sources

CDFG 2005a, CDFG 2005b, CDFG 2006a, CDFG 2006b, USFWS 2006, Zeiner et al. 1988; 1990a; and 1990b.

Codes

[1] Delisted from federally threatened on 3/20/2001
[2] Delisted from federally endangered on 8/25/1999
[3] Proposed for federal delisting on 2/16/2006

FE: Federally Endangered
FT = federally listed as threatened

FC: Federal Candidate for listing
FPT: Federally Proposed Threatened
FD: Federal Delisted
FPD: Federal Proposed Delisted
CE: State of California Endangered
CT: State of California Threatened
CR: State of California Rare
CFP: California Fully Protected
CSC: California Species of Concern
CNPS = California Native Plant Society

2 = rare, threatened or endangered in California, but more common elsewhere
3 = need more information

APPENDIX C. INCIDENTAL WILDLIFE OBSERVATIONS

Appendix C. Incidental Wildlife Observations

Common Name	*Scientific Name*
AMPHIBIANS	
Pacific chorus frog	*Pseudacris regilla*
Western toad	*Bufo boreas*
REPTILES	
California red-sided garter snake	*Thamnophis sirtalis infernalis*
BIRDS	
Double-crested cormorant	*Phalacrocorax auritus*
Great blue heron	*Ardea herodias*
Canada goose	*Branta canadensis*
Turkey vulture	*Cathartes aura*
Cooper's hawk	*Accipiter gentilis*
Red-tailed hawk	*Buteo jamaicensis*
American kestrel	*Falco sparverius*
American coot	*Fulica americana*
Killdeer	*Charadrius vociferus*
Ring-billed gull	*Larus delawarensis*
California gull	*Larus californicus*
Herring gull	*Larus argentatus*
Mourning dove	*Zenaida macroura*
Rock dove	*Columba livia*
Barn owl	*Tyto alba*
Anna's hummingbird	*Calypte anna*
Acorn woodpecker	*Melanerpes formicivorus*
Nuttall’s woodpecker	*Picoides nuttallii*
Northern flicker	*Colaptes auratus*
Black phoebe	*Sayornis nigricans*
Loggerhead shrike	*Lanius ludovicianus*
Western scrub jay	*Aphelocoma californica*
American crow	*Corvus brachyrhynchos*
Oak titmouse	*Baeolophus inornatus*
Bushtit	*Psaltriparus minimus*
Ruby-crowned kinglet	*Regulus calendula*
American robin	*Turdus migratorius*
Northern mockingbird	*Mimus polyglottos*
European starling	*Sturnus vulgaris*
American pipit	*Anthus rubescens*
Cedar waxwing	*Bombycilla cedrorum*
Orange-crowned warbler	*Vermivora celata*
Yellow-rumped warbler	*Dendroica coronata*
Spotted towhee	*Pipilo maculatus*
California towhee	*Pipilo crissalis*
Rufous-crowned sparrow	*Aimophila ruficeps*
Savannah sparrow	*Passerculus sandwichensis*

Table C-1. Incidental Wildlife Observations (*continued*)

Common Name	*Scientific Name*
BIRDS (*continued*)	
Golden-crowned sparrow	*Zonotricha atricapilla*
White-crowned sparrow	*Zonotricha leucophrys*
Fox sparrow	*Passerella iliaca*
Song sparrow	*Melospiza melodia*
Lincoln's sparrow	*Melospiza lincolnii*
Dark-eyed junco	*Junco hyemalis*
Western meadowlark	*Sturnella neglecta*
Red-winged blackbird	*Agelaius phoeniceus*
Brewer's blackbird	*Euphagus cyanocephalus*
Purple finch	*Carpodacus purpureus*
House finch	*Carpodacus mexicanus*
American goldfinch	*Carduelis tristis*
MAMMALS	
White-tailed jack rabbit	*Lepus townsendii*

APPENDIX D. VALLEY ELDERBERRY LONGHORN BEETLE SURVEY MAP

LEGEND

County Boundary Streams Elderberry Locations

Reference Grid:
California Stateplane,
Zone 2, NAD83,
Feet

0 0.25 0.5 1
Miles
1:33,000

FOLSOM DS/FDR ACTION
BIOLOGICAL FIELD REPORT

ATTACHMENT D

ELDERBERRY LOCATIONS

ENTRIX

RECLAMATION

Managing Water in the West

Folsom Dam Safety and Flood Damage Reduction Action

Wetland Delineation

For Submittal to:

UNITED STATES ARMY CORPS OF ENGINEERS

U.S. Department of the Interior
Bureau of Reclamation **November 10, 2006**

RECLAMATION

Managing Water in the West

Folsom Dam Safety and Flood Damage Reduction Action

Wetland Delineation

Prepared by:

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1325 J Street
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U.S. Department of the Interior
Bureau of Reclamation **November 10, 2006**

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Folsom Dam Safety/Flood Damage Reduction Action Background

The proposed Folsom Dam Safety/Flood Damage Reduction (DS/FDR) Action reflects a cooperative effort by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and the U.S. Army Corps of Engineers (Corps), as well as the Corps' non-federal sponsors, the State Reclamation Board (Reclamation Board)/Department of Water Resources (DWR) and the Sacramento Area Flood Control Agency (SAFCA). The Folsom DS/FDR Action is intended to implement Reclamation's dam safety and security obligations and the Corps' flood damage reduction structural modifications at Folsom Dam and appurtenant facilities. These facilities impound waters of the American River forming Folsom Reservoir and are collectively referred within this document as the Folsom Facility (Folsom Facility).

The Folsom DS/FDR Action responds to certain objectives of each of the aforementioned agencies. Reclamation's Safety of Dams Program objectives focus on reducing the risk of failure under hydrologic (flood), seismic (earthquake), and static (seepage) loads. Folsom Dam has been designated as a National Critical Infrastructure Facility and any compromise of the facility could result in grave property damage and loss of life. Reclamation's Security Program objectives are to protect public safety by securing Folsom Dam and its appurtenant structures and other Reclamation facilities, including the Folsom power plant, from attack or damage. The Corps' flood damage reduction objective is to improve the annual recurrence level of flood protection provided to the lower American River corridor. Similarly, SAFCA and DWR seek to improve the level of flood protection for the Sacramento region. Reclamation is the lead agency for this action and is the responsible party for all mitigation.

The Folsom DS/FDR study area includes the area surrounding the Folsom Facility. The Folsom Facility falls within the borders of Placer, Sacramento, and El Dorado Counties, in the State of California. The study area mainly consists of federally-owned lands that are currently leased to and managed by the California Department of Parks and Recreation. The Folsom DS/FDR Action footprint associated with this assessment is composed of areas that may be potentially affected by the Folsom DS/FDR Action in the vicinity of Folsom Reservoir including: potential dike construction zones, potential borrow areas, potential contractor use areas, existing haul roads and proposed haul roads.

1.2 Folsom DS/FDR Action Location

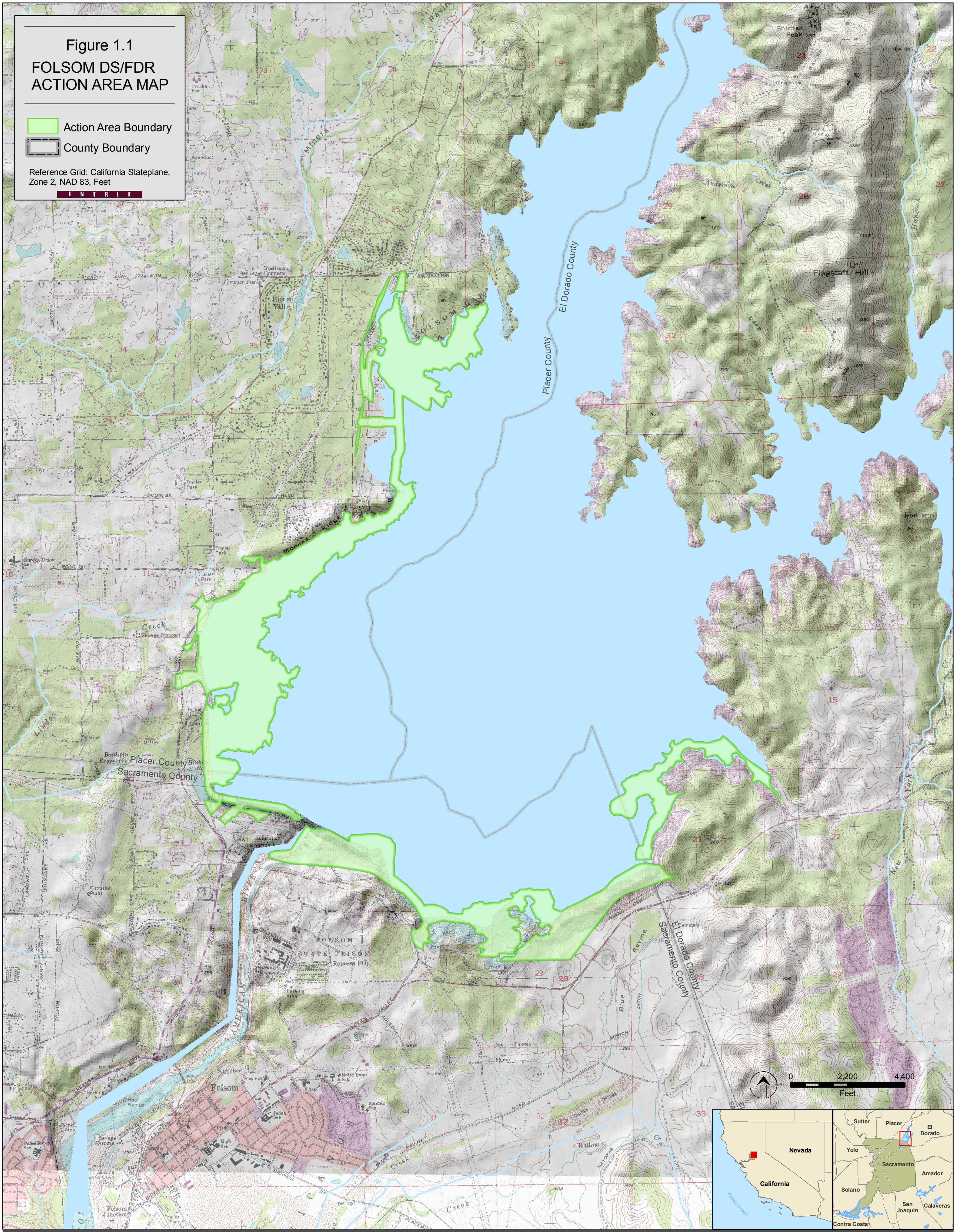
The Folsom DS/FDR Action area is located in Placer, El Dorado and Sacramento Counties, California. The various alternatives presented in the Folsom DS/FDR Action area involve construction in and around Folsom Reservoir. The locations evaluated in this study include potential use areas in the vicinity of Folsom Reservoir including: potential dike construction zones, potential borrow areas, potential contractor use areas, existing haul roads, and proposed haul roads. A depiction of the Folsom DS/FDR Action area and vicinity is provided in Figure 1-1, and a soil series map is provided in Figure 1-2.

1.3 Purpose of Report

Under Section 10 of the Rivers and Harbors Act, and Section 404 of the Clean Water Act, the United States Army Corps of Engineers (Corps) has authority over activities taking places in jurisdictional wetlands and other waters of the United States. The Folsom DS/FDR Action is located in Placer, El Dorado and Sacramento counties. Therefore, the Sacramento district of the Corps has jurisdiction in the Folsom DS/FDR Action area.

This report is intended to provide information to the Corps on potential jurisdictional areas within the Folsom DS/FDR Action area to facilitate a jurisdictional determination by the Corps. The purpose of this report is to present the following assessment results: 1) the potential occurrence of jurisdictional wetlands in the Folsom DS/FDR Action area, and 2) the extent of other waters of the United States in the Folsom DS/FDR Action area that may be under the jurisdiction of the Corps, pursuant to its authority under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. All wetlands and waters that meet the criteria for jurisdiction are described herein as potential jurisdictional waters, unless Corps staff has already determined that such waters are jurisdictional.

This document is organized as follows. Section 2 describes the proposed action. Section 3 describes the climate, soils, vegetation, topographic, and hydrologic character of the Folsom DS/FDR Action area. Section 4 outlines the methods used to delineate potential jurisdictional wetlands and other waters of the United States in the Folsom DS/FDR Action area. Section 5 provides the results of the wetland and waters delineation. Finally, Section 6 summarizes the findings of the study.



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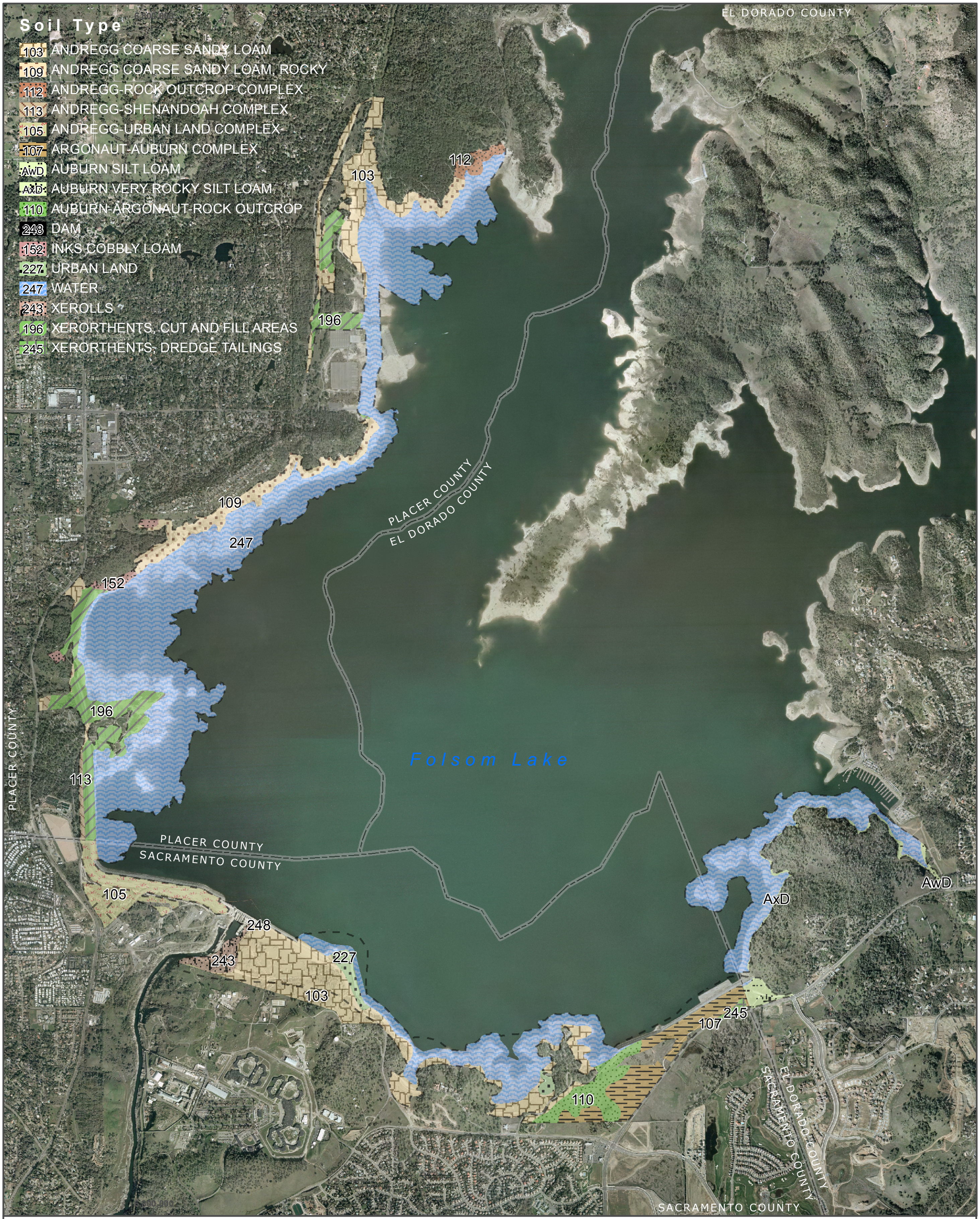
STATE MAP

COUNTY MAP



Folsom Lake

Action Area Boundary

County Boundary

0 0.25 0.5 1
Miles

E N T R I X

U.S. Department of the Interior
Bureau of Reclamation

Figure 1-2

Soils Map for the Folsom DS/FDR Action
in Placer, El Dorado and Sacramento Counties, California

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2.0 FOLSOM DS/FDR ACTION SETTING

Regional environmental factors influence the creation and maintenance of wetland sites. Following is a general description of the environmental setting surrounding the Folsom DS/FDR Action area, including a summary of climate, vegetation, soils and hydrology.

The Folsom DS/FDR Action area is located between the Sierra Nevada and the Great Valley geomorphic provinces on the far western edge of the Sierra Nevada foothills (USFS 1998, LSA Associates 2003). This area ranges in elevation from about 200-500 feet.

2.1 Climate

Climatological information was derived from the Soil Survey of Placer County, California, the Soil Survey of El Dorado County, California and the Soil Survey of Sacramento County, California (USDA 1980, USDA 1974, USDA 1993). Additional information was gathered from the Ecological Subregions of California (USFS 1998).

Climate within the Great Valley geographic province is characterized by hot, dry summers and mild, wet winters. Marine influence is negligible in this portion of the Valley. The mean annual precipitation for this area is between 18 and 25 inches and typically falls as rain during the winter months. Around 80 percent of the area's annual rainfall occurs from November to March. Mean annual temperature is about 60° to 62°Farenheit (F). The mean freeze-free period (i.e. the growing season) is approximately 150 to 300 days. (USFS 1998, USDA 1980, USDA 1993, USDA 1974).

2.2 Hydrology

The study area is within the American River Watershed, which spans approximately 2,100 square miles. In 1955, major alterations occurred to the natural drainage system when the Folsom Dam and 12 additional dams and dikes were constructed for the impoundment of the American River. A major function of the dam is to prevent flooding down stream during major winter storms and high spring runoffs. The man-made Folsom Reservoir extends approximately 15 miles up the North Fork and 10.5 miles up the South Fork of the American River. When operating at full capacity, Folsom Reservoir will hold 1,010,000 acre-feet of water with a surface area of 11,450 acres (USDI BR 2005). Reservoir level normally varies from 466 feet in early summer to a low of 426 feet in early winter. The ordinary high water line (OHWM) of Folsom Reservoir is considered the 466-foot elevation feet and is clearly indicated by the “bathtub rim” that borders the reservoir. The dam’s spillways, located at the southwest end of the reservoir, feed into the American River.

2.3 Soils

Soils within the Folsom DS/FDR Action vicinity belong to seventeen soil mapping units. Fourteen of the mapping units were composed of soil types or soil complexes and four additional areas were mapped as urban land, cut and fill areas, or dredge tailings. An additional, non-soil mapping unit is the reservoir's water. Soils found in the Folsom DS/FDR Action area are derived from five series, the Andregg, Argonaut, Auburn, Inks, and Shenandoah series (USDA 1974, 1980, 1993), or are classified as urban lands, Xerolls, or Xerorthents (Figure 1-2).

2.3.1 Andregg Series

The Andregg series consists of moderately deep, well-drained soils underlain by weathered granitic bedrock. Permeability is moderately rapid. Slopes range from 2 to 50 percent in an elevation range of 200 to 1,000 ft. The available water capacity is 2.5 to 5 inches, and roots may penetrate as deep as 40 inches (USDA 1980).

In a typical soil profile for the Andregg series (an Andregg course sandy loam) the surface layers (0 to 9 inches) are a dark gray (10 YR 4/1) clay, very dark grayish brown (10 YR 3/2) moist with common fine and medium strong brown (7.5 YR 5/8) mottles. From 9 to 27 inches, the profile is a dark gray clay (10YR 4/1) with very dark grayish brown moist loam (2.5Y 3/2) with few very fine roots and tubular pores (USDA 1980).

Andregg soils found within the survey area include: Andregg coarse sandy loam (2 to 8 or 9 percent slopes), Andregg coarse sandy loam (8 or 9 to 15 percent slope), Andregg coarse sandy loam, rocky (2 to 15 percent slopes), Andregg coarse sandy loam, rocky (15 to 30 percent slopes), Andregg-rock outcrop complex, the Andregg-Shenandoah complex (2 to 15 percent slopes), and the Andregg-urban land complex (2 to 8 percent slopes).

The Andregg coarse sandy loam, rocky (15 to 30 percent slopes) has around 5 percent of its area covered with scattered granitic rock outcrop. Depth to bedrock ranges from 40 to 60 inches (USDA 1980). The Andregg-urban land complex (2 to 8 percent slopes) is comprised of about 55 percent Andregg soil and 30 percent urban land. Depth to bedrock ranges from 20 to 40 inches (USDA 1993).

Small areas of Auburn, Argonaut, Fiddyment, Caperton, and Sierra soils, as well as urban land and rock outcrops, are included in Andregg coarse sandy loam units. Small areas of Caperton and Sierra soils, as well as Xerofluvents are included in the Andregg-Shenandoah complex (USDA 1980, 1993). None of these soils except Xerofluvents are considered hydric (USDA 1992a, 1992b).

2.3.2 Auburn Series

The Auburn series consists of well-drained soils that are underlain by hard metamorphic rocks at a depth of 12 to 26 inches. Permeability is moderate. Slopes range from 2 to 70 percent and elevation ranges from 500 to 1,800 ft. The available water holding capacity is 2 to 4 inches, and roots may penetrate as deep as 26 inches (USDA 1974).

In a typical soil profile for the Auburn series the surface layers (0 to 3 inches) are brown silt loam (dark reddish brown (5 YR 3/3) when moist). From 3 to 14 inches, the profile is reddish-yellow silt loam (dark reddish brown (5 YR 3/4) when moist). Both layers have many very fine roots and pores. Below 14 inches, the substrate consists of weathered metabasic rock (USDA 1993).

Auburn soils within the Project area include the Auburn very rocky silt loam (2 to 30 percent slopes), the Auburn silt loam (2 to 30 percent slopes), and the Auburn-Argonaut-rock outcrop complex (8 to 30 percent slopes). The Auburn very rocky silt loam is a typical Auburn soil. Soils included in this mapping unit have slopes that are usually between 5 and 15 percent. Auburn silt loam is similar to Auburn very rocky silt loam, except that less than 5 percent of the surface is bedrock. The Auburn-Argonaut-rock outcrop complex (8 to 30 percent slopes) is comprised of about 40 percent Auburn soil, 35 percent Argonaut soil and 10 percent Rock outcrop (USDA 1974, 1993).

Small areas of Argonaut very rocky loam, Boomer very rocky loam, and Sobrante very rocky silt loam are included in mapped units of Auburn very rocky silt loam. Small areas of Argonaut gravelly loam, Perkins gravelly loam, and Sobrante silt loam are included in mapped units of Auburn silt loam (USDA 1974). Small areas of Mokelumne soils are included in mapped units of Auburn-Argonaut-rock outcrop complex USDA 1993). None of these soils are considered hydric (USDA 1992b, 1998).

2.3.3 Argonaut Series

The Argonaut series consists of moderately deep, well-drained soils on foothills. This series is formed from material weathered from meta-andesite and metamorphic rocks. Permeability is very slow. Slopes range from 3 to 30 percent. Soils of this series are fine, mixed, thermic Mollic Haploxeralfs. Depth to the paralithic contact ranges from 20 to 40 inches (USDA 1993).

In a typical Argonaut series, the surface layer (0 to 1 inch) is a light yellowish brown loam (dark yellowish brown when moist, 7.5 YR 5/6) with common prominent string brown mottles (7.5 YR 4/6). From 1 to 8 inches, the profile is a reddish yellow loam (7.5 YR 6/6) with distinct pale brown mottles (10 YR6/3). From 8 to 14 inches, the profile is yellowish red gravelly loam (5 YR 4/6) with medium distinct light brown mottles (7.5 YR 6/4). From 14 to 21 inches, the profile is a variegated strong brown and yellowish brown clay (7.5 YR 5/6 and 10 YR 5/6), with yellowish red (5 YR 5/6) clay films on the faces of peds (USDA 1993).

One wetland investigation site within the Folsom DS/FDR Action area is situated in an Argonaut-Auburn complex (3-8 percent slopes) mapping unit. The Argonaut-Auburn complex (3 to 8 percent slopes) is comprised of about 45 percent Argonaut soil and 35 percent Auburn soil USDA 1993).

Small areas of Creviscreek, Hicksville, and Mokelumne soils, as well as xerorthents and rock outcrop, are included in mapped units of Argonaut- Auburn complex. None of these soils are considered hydric except for certain types of dredge-tailing xerorthents (USDA 1992b).

2.3.4 Ink Series

The Inks series consists of shallow soils underlain by andesitic conglomerate. These soils are well-drained and are found on side slopes of volcanic ridges.

In a typical Inks series, the surface layer (0 to 5 inches) is a yellowish-brown loam (dark brown when moist, 10YR 3/3). From 5 to 12 inches, the profile is a brown, very cobbly clay loam (dark brown when moist, 7.5YR 3/3). From 12 to 18 inches, the profile is a brown, very cobbly clay loam, (dark brown when moist, 10YR 3/3). Below 18 inches is partly weathered consolidated andesitic conglomerate (USDA 1980).

The only Inks soil mapped in the Folsom DS/FDR Action area is Inks cobbly loam, (2 to 30 percent slopes). The surface layer for this Inks soil differs from the typical description provided above. It is a cobbly loam, rather than a loam, but the color is the same. Small areas of Inks Variant and Exchequer soils are included in mapped units if Inks cobbly loam. None of these soils are considered hydric soils (USDA 1992a).

2.3.5 Shenandoah Series

The Shenandoah series consists of moderately deep, claypan soils underlain by weathered granite. These soils are somewhat poorly-drained and are found in upland areas of foothills.

In a typical Shenandoah series, the surface layer (0 to 10 inches) is a grayish brown, sandy loam (very dark grayish brown when moist, 10YR 3/2). From 10 to 16 inches, the profile is a dark grayish brown, sandy loam (dark brown when moist, 7.5YR 3/3), with common, medium, faint dark brown mottles (7.5YR 4/2 moist). From 16 to 23 inches, the profile is a grayish brown clay, (dark brown when moist, 10YR 4/3), with common, medium, faint brown mottles (7.5YR 4/4 moist). From 23 to 29 inches, the profile is a light olive brown clay (olive brown when moist, 2.5Y 4/4). From 29 to 34 inches, the profile is a light olive brown clay (olive brown when moist, 2.5YR 4/4) with common, medium, distinct, brown mottles (dark yellowish brown when moist, 10YR 4/4). Below 34 inches is weathered granodiorite (USDA 1980).

Shenandoah soils are found in the Folsom DS/FDR Action area as part of the Andregg-Shenandoah complex (2 to 15 percent slopes), described under the Andregg series.

2.3.6 Xerolls

Xerolls are shallow to very deep soils on terrace escarpments and steep hillsides along drainages near the American River, formed in colluvium derived from mixed granitic or metabasic rocks. These soils are well-drained or somewhat excessively drained. The texture, color, and thickness of these soils vary.

Small areas of Andregg, Auburn, Fiddyment, Kaseberg, and Red Bluff soils are included in mapped units of Xerolls. None or these soils are considered hydric (USDA 1992b).

2.3.7 Xerothents

Xerothents are typically deep, well drained soils derived from mixed rock sources. The soils are very well to excessively drained. Areas included in the mapping unit for Xerothents (cut and fill areas) consist of mechanically removed and mixed soil materials. Horizons are no longer discernable in these areas. Fill area can contain rocks, concrete, asphalt, and other debris. These areas are typically well drained and are used primarily for highways and urban development (USDA 1980). Xerorthents in this category are not considered hydric soils (USDA 1992a, 1992b).

2.4 Vegetation

Vegetation communities are a direct function of climate, soils, topography, and land use practices. The primary vegetation communities found within the Folsom DS/FDR Action area are identified below, followed by a short description of each vegetation community. Community descriptions were derived from the Draft Resource Inventory of the Folsom Reservoir State Recreation Area (LSA Associates 2003) with additional details provided for some wetland communities. These descriptions generally follow Holland (1986) and Sawyer and Keeler-Wolf (1995).

Currently, vegetation in the Folsom DS/FDR Action area is dominated by oak woodland and non-native annual grassland. The immediate shoreline of the reservoir is characterized by seasonally wet areas occupied by willows and herbaceous vegetation. Smaller areas of willow and cottonwood willow riparian and freshwater marsh and vegetation typical of seasonally wet areas are located within woodland and grassland communities. Non-vegetated habitats include open water within the reservoir, frequently flooded areas along the shoreline, small, isolated ponds on the floodplain, and developed areas including roads, parking lots and rip rap dikes and dams. These habitats are discussed in more detail below.

2.4.1 Upland Vegetation and Other Upland Habitats

Upland vegetation types in the Folsom DS/FDR Action area include Interior Live Oak Woodland (Interior Live Oak Series) dominated by interior live oak (*Quercus wislizenii*), blue oak (*Quercus douglasii*), and foothill or gray pine (*Pinus sabiniana*), Blue Oak Woodland and Savanna (Blue Oak Series) dominated by blue oak and other oaks, Non-Native Annual Grassland (California Annual Grassland Series) dominated by non-native annual grasses and native and non-native herbs.

Other upland habitat types include developed land that is intensively used with much of the land paved or covered by structures. The urban community includes residential, commercial, and industrial development. Vegetation in urban areas generally consists of non-native landscape species (lawns, flowerbeds, shrubs, or ornamental trees) or cleared areas that are generally devoid of vegetation. Developed areas within the Folsom DS/FDR Action area included rip-rap slopes of dams and dikes, roads, trails, or parking lots. These communities were generally located outside of the OHWM except in the case of a dam or dike in which the toe of the structure would be within the OHWM. Dikes and dams were generally devoid of vegetation but sometimes hosted ruderal species such as Mediterranean grasses, summer mustard, telegraph weed, yellow star thistle and tree tobacco (*Nicotiana glauca*). Parks and other developed areas were located outside of the reservoir influence and were dominated by horticultural or ruderal species.

2.4.2 Wetlands and Aquatic Habitats

Cottonwood-Willow Riparian

Vegetation communities dominated by Fremont cottonwood (*Populus fremontii* ssp. *fremontii*) and various species of willow (*Salix* spp.) are typically found on floodplains, riparian areas, and low-gradient depositions along the banks of rivers, seeps, and streams where soils are intermittently flooded. Cottonwood communities in the Folsom DS/FDR Action area contain elements of both great valley cottonwood riparian forests and willow scrub described by Holland (1986) and the Fremont cottonwood series and mixed willow series described by Sawyer and Keeler-Wolf (1995).

Freshwater Marsh

Freshwater marsh communities within the Folsom DS/FDR Action area were wetland communities fed by seeps or springs and are permanently to semi-permanently flooded. The dominant species was cattail (*Typha latifolia*). The most applicable vegetation community described in the literature is coastal and valley freshwater marsh, a community dominated by perennial, emergent monocots including bulrush (*Scirpus* spp.) and cattail (*Typha* spp.) (Holland 1986).

Riparian Vegetation within the Reservoir Fluctuation Zone

Scattered stands of willow and other woody vegetation are present within the reservoir fluctuation zone in the Folsom DS/FDR Action area. Several categories were observed within this general vegetation type, but were not mapped separately due to intergradation of types.

Gooding's Willow

This seasonal wetland community is created by mature Gooding's willow (*Salix goodingii*) trees that reached an average height of 30 feet. These communities were generally present within 100 to 200 feet from the OHWM within the heavily vegetated portion of the shore. Understory species were common herbaceous species including Bermuda grass (*Cynodon dactylon*), spiny cocklebur (*Xanthium strumarium*) and rushes (*Juncus* sp.).

Mixed Riparian Areas within the Reservoir Fluctuation Zone

Areas occupied by this community were generally associated with depressions, or riparian areas within the reservoir fluctuation zone. These areas appeared to be frequently inundated and also likely received overland flow from upland areas. Species present include rushes, buttonwillow (*Cephalanthus occidentalis*), seep monkey flower (*Mimulus guttatus*) and other common species.

Shrub Willow within the Reservoir Fluctuation Zone

Willow shrubs (*Salix* sp.) dominated certain areas at the very lowest elevations of the shore. These areas are frequently inundated and had saturated soil conditions. This depauperate shrub was generally the only species present in these areas.

Seasonal Wetlands

Seasonal wetland communities were observed both inside and outside of the reservoir-influenced zone. The majority of wetland areas within the Folsom DS/FDR Action area were considered seasonal. These communities are exposed to wetland hydrology for a limited period of time, though it may be for sufficient duration to show indicators of wetland soil and hydrology and to seasonally host hydric vegetation. Much of this area, however, does not meet all three wetland criteria. Following is a description of the various types of seasonal wetland communities observed in the Folsom DS/FDR Action area. However, because of overlap in the types, they are not mapped separately.

Seasonal Depressions within the Reservoir Fluctuation Zone

Areas occupied by this community were generally associated with depressions, or riparian areas within the area influenced by the reservoir. These areas appeared to be frequently inundated and also likely received overland flow from upland areas. Species present include rushes, seep monkey flower (*Mimulus guttatus*) and other common species. These areas are mapped as jurisdictional seasonal wetlands.

Seasonal Wetland Slope Areas within the Reservoir Fluctuation Zone

This seasonal wetland community was by far the most common vegetation community below the OHWM of the reservoir. Dominant species included Bermuda grass, sand spurrey (*Spergularia* spp.), rough cocklebur, and rushes, with each species alternating in dominance, depending on the site conditions. Rushes and rough cocklebur appeared to dominate the more mesic sites and depressions while Bermuda grass and sand spurrey were more common in the drier areas. However, areas with this type of vegetation below the OHWM frequently did not meet all three wetland criteria, and most have been mapped as jurisdictional other waters of the U.S. (fluctuation zone).

Seasonal Depressions and Seasonal Riparian Areas Outside the Reservoir Fluctuation Zone

Seasonally wet areas in the Folsom DS/FDR Action area outside the reservoir fluctuation zone were also surveyed. These communities receive water from seeps, drainages and from direct precipitation. Some areas were confined to a distinct channel, but one area with uneven terrain and a partly-exposed bedrock outcrop had what appeared to be seasonal ponding. Dominant species included pointed rush (*Juncus oxymeris*), Baltic rush (*Juncus balticus*), and often scattered willow and cottonwood. During the dry season, these areas support annual upland vegetation such as non-native brome grasses (*Bromus* spp.) and other forbs. If all three criteria were met, these areas were mapped as jurisdictional seasonal wetlands or jurisdictional riparian wetlands.

Reservoir Shoreline Fluctuation Zone: Barren Areas

The reservoir shoreline fluctuation zone occurred between the 425-foot and 466-foot elevations, which corresponded with the minimum and maximum pool volumes for the reservoir. Barren areas within this zone were generally devoid of vegetation, or hosted less than 10 percent cover. Areas of deep sand and rock were prevalent in this zone. This area was mapped as jurisdictional other waters of the U.S.

3.0 METHODS

This section describes the following: 1) the parameters used to determine potential jurisdictional wetlands and other waters of the United States based on the Corps' Wetland Delineation Manual (USACE 1987) and written guidance as provided in the 1997 (33 CFR 328) and, 2) the field methods used to apply these parameters.

3.1 Corps Parameters

Three parameters (vegetation, soils and hydrology) are used by the Corps to determine jurisdictional wetlands. A summary of these parameters is presented below.

3.1.1 Hydrophytic Vegetation

Hydrophytic vegetation is defined in the Corps' Wetland Delineation Manual (USACOE 1987) as "macrophytic plant life that occurs in areas where the frequency and duration of soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present." For a site to be defined as supporting hydrophytic vegetation, the dominant plant species must be species that, by virtue of physiological and reproductive adaptations, are adapted to wetland inundation or saturated soils. Table 3-1 provides a listing of plant categories and their indicator status (i.e., probability of occurrence in wetlands).

3.1.2 Hydric Soils

Hydric soils are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part (SSS 1997). These soils usually support hydrophytic vegetation.

3.1.3 Wetland Hydrology

The driving force creating wetlands is "wetland hydrology"; that is, permanent or periodic inundation, or soil saturation, for a significant period (usually a week or more) during the growing season. Wetland hydrology refers to the hydrologic regime of an area that is periodically inundated, or the soils of which are saturated to the surface, at some time during the growing season. Ponded or standing water for seven or more days indicates wetland hydrology.

Table 3-1. Indicator Codes for Plant Species

INDICATOR CATEGORY	CODE	DESCRIPTION
Obligate Wetland Plant	OBL	Occurs almost always (estimated probability >99%) under natural conditions in wetlands.
Facultative Wetland Plant	FACW	Usually occurs in wetlands (estimated probability 67% to 99%), but occasionally found in non-wetlands.
Facultative Plant	FAC	Equally likely to occur in wetlands or non-wetlands (estimated probability 34% to 66%).
Facultative Upland Plant	FACU	Usually occurs in non-wetlands (estimated probability 67% to 99%), but occasionally found in wetlands (estimated probability 1% to 33%).
Obligate Upland Plant	UPL	Occurs in wetlands in other regions, but almost always occurs (estimated probability >99%) under natural conditions in non-wetlands in the region specified.
No Indicator	NI	Insufficient information was available to determine an indicator status.

+ indicates increased probability of occurrence in wetlands
- indicates decreased probability of occurrence in wetlands

3.2 Field Methods

The methods used in the delineation of potential jurisdictional wetland areas at the Folsom DS/FDR Action site are consistent with those 1) outlined in the Corps' Wetlands Delineation Manual (1987) and subsequent comments and 2) outlined in the National Food Security Act Manual (1996) and its amendments. Standard methods were employed to obtain data on the vegetation, soils and hydrology at the Folsom DS/FDR Action site.

3.2.1 Initial Identification of Wetlands

Initial identification of potential wetlands was based on a review of an ortho-rectified photograph of the study area. Field observations confirmed the potential presence of potential wetlands and other waters of the United States in the study area

3.2.2 Selection of Sample Sites

On November 16, 17, and 18, 2005, a wetland delineation of the potential jurisdictional wetland areas within the OHWM of Folsom Reservoir was conducted by ENTRIX staff (Gretchen Lebednik, botanist, Keven Ann Colgate, biologist, Jelica White, biologist, and Dan Chase, biologist). Additional studies were conducted on January 11 and 12, 2006 (Keven Ann Colgate, biologist, Jelica White, biologist), August 1 and 2, 2006 (Gretchen Lebednik, botanist, Coralie Dayde, ecologist), and September 12, 2006 (Gretchen Lebednik, botanist, Sara Ebrahim, biologist). Twenty-three transects were spaced around the reservoir in the study area. Ten transects were located at potential wetland locations in the study area outside the reservoir. (see Attachment B). One exterior transect has been excluded as not part of the study area. The area below the Left Wing Dam had recently been delineated by USFWS. That portion of the Folsom DS/FDR Action area was not included in this study.

3.2.3 Hydrophytic Vegetation

At each site, the vegetation in five-foot radius was identified (all dominant vegetation was herbaceous). Hydrophytic vegetation was considered to be present if more than 50 percent of the dominant species had a wetland indicator status of FAC, FACW, or OBL. At locations that had more than one stratum, more than 50 percent of the dominant species in each stratum must have a wetland indicator status of FAC, FACW, or OBL for the vegetation at that site to be considered hydrophytic. The indicator status of each species was obtained from the National List of Plant Species that Occur in Wetlands: California (USFWS 1988), which is summarized in Table 3-2. The taxonomy of plants is based on Hickman (1993).

Table 3-2. Wetland Plant Species Observed within the Folsom DS/FDR Action Area.

GENUS SPECIES	COMMON NAME	INDICATOR STATUS (REGION 0)
Aesculus californica	California buckeye	NL
Baccharis pilularis	coyotebrush	NL
Bromus sp.	brome grass	NL
Cardamine hirsuta		NL
Carduus pycnocephalus	Italian plumeless thistle	NL
Centaurea solstitialis	yellow star thistle	NL
Cephalanthus occidentalis var. californicus	California buttonwillow	OBL
Cynodon dactylon	Bermuda grass	FAC
Cynosurus echinatus	bristly dogstailgrass	NL
Cyperus eragrostis	tall flatsedge	FACW
Eleocharis sp.	spikerush	OBL - FACW

GENUS SPECIES	COMMON NAME	INDICATOR STATUS (REGION 0)
Epilobium brachycarpum	autumn willowweed	NL

Table 3-2. Wetland Plant Species Observed within the Folsom DS/FDR Action Area. *(continued)*

GENUS SPECIES	COMMON NAME	INDICATOR STATUS (REGION 0)
Epilobium ciliatum	hairy willowherb	FACW
Eremocarpus setigerus	turkey mullein	NL
Erodium cicutarium	redstem stork's bill	NL
Eryngium aristulatum	coyote thistle	OBL
Euthamia occidentalis	western goldenrod	OBL
Festuca sp.	red fescue	FAC
Foeniculum vulgare	fennel, sweet fennel	FACU
Geranium molle	dovefoot geranium	NL
Gnaphalium palustre	western marsh cudweed	FACW
Heterotheca grandiflora	telegraphweed	NL
Hirschfeldia incana	shortpod mustard, summer mustard	NL
Hordeum murinum		NL
Hypericum perforatum	Klamath weed	NL
Juncus balticus	Baltic rush	OBL
Juncus oxymeris	pointed rush	FACW
Juncus sp.	rush	FAC to OBL
Lythrum hyssopifolium	loosestrife	FACW
Marrubium vulgare	horehound	FAC
Mimulus guttatus	seep monkeyflower	OBL
Nicotiana glauca	tree tobacco	FAC
Pinus sabiniana	foothill pine, grey pine	NL
Plantago lanceolata	narrowleaf plantain	FAC-
Poa annua	annual bluegrass	FACW-
Polypogon monspeliensis	annual rabbit's-foot grass	FACW+
Populus fremontii ssp. *fremontii*	Fremont's cottonwood	FACW

GENUS SPECIES	COMMON NAME	INDICATOR STATUS (REGION 0)
Quercus douglasii	blue oak	NL
Quercus lobata	California white oak	FAC+
Quercus wislizenii	interior live oak	NL

Table 3-2. Wetland Plant Species Observed within the Folsom DS/FDR Action Area. *(continued)*

GENUS SPECIES	COMMON NAME	INDICATOR STATUS (REGION 0)
Rorippa nasturtium-aquaticum	water cress	OBL
Rubus discolor	Himalayan blackberry	FACW*
Rumex crispus	curly dock	FACW-
Rumex pulcher	fiddle dock	FAC+
Salix gooddingii	Goodding's black willow	OBL
Salix sp.	willow	FAC to OBL
Spergularia sp.	sand-spurrey	FAC- to NL
Typha latifolia	broadleaf cattail	OBL
Xanthium strumarium	rough cocklebur	FAC +

Sources: USFWS 1988, Hickman 1993
Notes:
Obligate Wetland (OBL). Occur almost always (probability >99 percent) under natural conditions in wetlands.
Facultative Wetland (FACW). Usually occur in wetlands (probability 67 to 99 percent), but occasionally found in non wetlands.
Facultative (FAC). Equally likely to occur in wetlands or non wetlands (estimated probability 34 to 66 percent).
Obligate Upland (UPL). Occur in wetlands in another region, but occur almost always (probability >99 percent) under natural conditions in non wetlands in the region specified
No Indicator (NI). Insufficient information available to determine indicator.
Not Listed (NL). Not included in the National List of Plant Species. This generally denotes an upland species that was not considered during the formation of the National List.

3.2.4 Hydric Soils

Due to wetness during the growing season, hydric soils usually develop certain morphological properties that can be readily observed in the field. Prolonged anaerobic soil conditions typically lower the soil redox potential and cause a chemical reduction of some soil components, mainly iron oxides and manganese oxides. This reduction affects solubility, movement, and aggregation of these oxides. Reduction is reflected in the soil color and other physical characteristics that are usually indicative of hydric soils.

In order to examine the soil, a soil pit was excavated to a depth of 16 inches at most sample sites. Where the soil was extremely compacted, or some other impermeable material (i.e., rip-rap) was encountered, shallower pits were dug. The soil chroma for each soil pit was characterized by the appropriate Munsell soil color chart (Munsell Color 1994). Each soil sample was described by its Hue notation of color, which indicates its relation to red, yellow, green, blue, and purple; its Value notation, which indicates lightness; and its Chroma notation, which indicates its departure from a neutral color of the same lightness. Mottle color and abundance was also examined if mottles were present. Other soil parameters recorded were texture, structure and any indications of hydric conditions including odor, presence of organics, aquic moisture regime, and presence of concretions or other reducing conditions.

3.2.5 Wetland Hydrology

Numerous factors influence the wetness of an area including precipitation, stratigraphy, topography, soil permeability, and plant cover. The frequency and duration of inundation or soil saturation are important in separating wetlands from non-wetlands. Duration usually is the more important factor. Soil permeability, related to the texture of the soil, influences the duration of inundation and soil saturation. For example, clayey soils absorb water more slowly than sandy or loamy soils, and therefore have slower permeability, and remain saturated much longer. The type and amount of plant cover also affect both the degree of inundation and duration of saturated soil conditions. Excess water drains more slowly in areas of abundant plant cover, thereby increasing duration of inundation and soil saturation. Conversely, transpiration rates are higher in areas of abundant plant cover, which may reduce the duration of soil saturation.

At each sample site, the depth to saturated soil in the excavated pit was measured as well as depth to free water in pit and depth of surface water if the site was significantly wet. Primary indicators, such as inundation, water marks, drift lines, sediment deposits, and drainage patterns were documented, and any secondary indicators of hydrology were noted.

3.2.6 Wetland Determinations

Those sites meeting the vegetation, hydrology, and soil criteria described above were considered potential jurisdictional wetlands. Those sites located within the ordinary high water mark (OHWM) of Folsom Reservoir were determined to be potential jurisdictional wetlands if the area met the hydric soil criterion and had a “prevalence of vegetation typically adapted for life in saturated soil conditions” (USACE 1987), or met the hydrophytic vegetation criteria described above and met the hydric soil criterion. Similarly, sites located within seasonally wet areas outside of the reservoir were considered wetlands if indicators of wetland hydrology, vegetation and soil were evident.

The data collected were used to complete the data forms for normal and atypical wetland determinations, as specified in the Corps’ Wetlands Delineation Manual (1987). The completed data forms are included in Attachment C.

3.2.7 Other Waters of the United States

If the vegetation criterion was not met, but clear indications of hydrology were present, the site was considered a potentially jurisdictional other waters of the United States. Other waters of the United States were delineated by estimating the Ordinary High Water Mark (OHWM) for Folsom Reservoir within the Folsom DS/FDR Action boundaries and mapping the areas that lie below this elevation. The OHWM of Folsom Reservoir is considered to be at the 466-foot elevation, which corresponds to the elevation of the spillway and the maximum pool elevation of the reservoir. This elevation is marked by the “bathtub ring” at the upper edge of the reservoir shoreline. All areas below this elevation were considered jurisdictional, based on frequent inundation by the reservoir waters.

Hydrologic indicators observed in the field included scour lines, benching, bank undercutting and/or slumping, shelving, and the presence of drift and debris.

4.0 FINDINGS

This section describes the results of the wetland delineation and discusses the functions and values of the potential jurisdictional wetlands at the Folsom DS/FDR Action site.

4.3 Wetlands Delineation

The extent of possible jurisdictional waters of the United States, as defined under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, within the boundaries of the Folsom DS/FDR Action mapped in this study is approximately 10,452 acres (4,230 hectares), consisting of 11,058 acres (hectares) of other waters of the U.S. and 30.3 acres (hectares) of various types of wetlands. The results of the wetland delineation are shown in Table 4-1 and Attachment B.

Table 4-1. Potential Jurisdictional Waters of the U.S. in the Folsom DS/FDR Area.

Unit	**Category**	**Acres**
Folsom Reservoir	Riparian	15.7
	Seasonal Wetland	1.0
	Other Waters of the U.S. (Fluctuation zone)	734
	Other Waters of the U.S.	10,310
American River below Dam	Other Waters of the U.S.	9.3
OR1	Seasonal wetland	3.3
OR2	Seasonal wetland	0.9
	Riparian (willow)	7.3
OR3	Seasonal wetland	0.03
OR4	Seasonal wetland	0.1
	Other Waters of the U.S.	1.7
OR5	Riparian (willow/cottonwood)	2.0
	Other Waters of the U.S.	0.6
OR6	Freshwater Marsh	0.9
	Other Waters of the U.S.	2.0
Total Acres	Other Waters of the U.S.	11,058
	Riparian	25.0
	Seasonal Wetland	5.3
	Freshwater Marsh	0.9

4.3.1 Seasonal Wetlands

Seasonal wetlands cover much of the reservoir shoreline within the boundaries of the OHWM. However, most of this area does not meet all three criteria.

Vegetation in these wetlands is dominated by Bermuda grass (FAC), rush (FACW), and sand-spurrey, although numerous other species are also found in this area (Table 3-2).

Soils in these areas on the east side of the reservoir generally exhibit low chromas and mottles.

Hydrologic indicators vary, but include saturation in the upper twelve inches, oxidized root channels in the upper 12 inches, drift lines, drainage patterns in wetlands, and the FAC-neutral test.

A total of 1.0 acre (0.4 hectare) of seasonal wetlands was delineated as jurisdictional waters of the U.S.

4.3.2 Freshwater Marsh

Most freshwater marsh in the Folsom DS/FDR Action area was inundated at the time of the survey.

Freshwater marsh in the Folsom DS/FDR Action area is dominated by obligate wetland species such as cattails.

Because these areas were inundated, soil pits were not dug, and no soil data were recorded.

The primary hydrologic indicator was inundation.

The total area of freshwater marsh mapped within the Folsom DS.FDR Action Area was 0.9 acre (0.36 hectare).

4.3.3 Riparian Wetlands

Most of the riparian wetlands were mapped along the fluctuation zone of the reservoir shoreline and were generally dominated by willows. Riparian wetlands in the Folsom DS/FDR Action area outside the reservoir area represented by willow or cottonwood and willow stands.

Soils in these areas on the east side of the reservoir generally exhibit low chromas and mottles.

The primary hydrologic indicators were the OHWM of the reservoir and channel features.

The total area of riparian wetlands meeting mapped within the Folsom DS/FDR Action Area that met jurisdictional criteria was 25.0 acres (10.1 hectares).

4.4 Other Waters of the U.S.

Other Waters of the U.S. mapped by this study in the Folsom DS/FDR Action area include the portions of Folsom Reservoir that did not meet all three wetland criteria, as well as a few channels downstream from the dams and dikes. For the Folsom Reservoir, the boundary is the OHWM. Jurisdictional channels were identified where a defined bed and bank was present and a connection to jurisdictional water was evident.

10,310 acres (4,172 hectares) of other waters of the U.S. were mapped within the Folsom DS/FDR Action Area below the fluctuation zone for Folsom Reservoir, and 734 acres (297 hectares) of other waters of the U.S. were mapped as fluctuation zone. On the American River downstream from Folsom Dam, 9.3 acres (3.8 hectares) of other waters of the U.S. are part of the Action area. An additional 4.3 acres (1.7 hectares) of other waters of the U.S. were mapped outside of Folsom Reservoir.

5.0 DISCUSSION

5.1 Potential Impacts

In addition to the areas mapped by this study, USFWS has mapped 0.24 acre (0.10 hectare) of seasonal wetlands and 0.98 acre (0.39 hectare) of swale/drainage below the Left Wing Dam. Activities conducted as part of the Folsom DS/FDR Action could result in impacts to up to 5.54 acres (2.24 hectares) mapped as jurisdictional seasonal wetland, 0.9 acre (0.36 hectare) mapped as jurisdictional freshwater marsh, 0.98 acre (0.39 hectare) mapped as swale/drainage, and 13.0 acres (5.3) hectares) mapped as other waters of the U.S. that lie outside the reservoir. Because there are areas below the reservoir’s OHWM that meet all three criteria for jurisdictional wetlands, impacts within the reservoir could range from 16.8 acres (6.8 hectares) of jurisdictional wetlands and 11,044 acres (4,469 hectares) of other waters of the U.S. if all of these wetlands are jurisdictional wetlands, to 11,053 acres (4,473 hectares) of other waters of the U.S. if all of these vegetated areas are determined to be other waters of the U.S.

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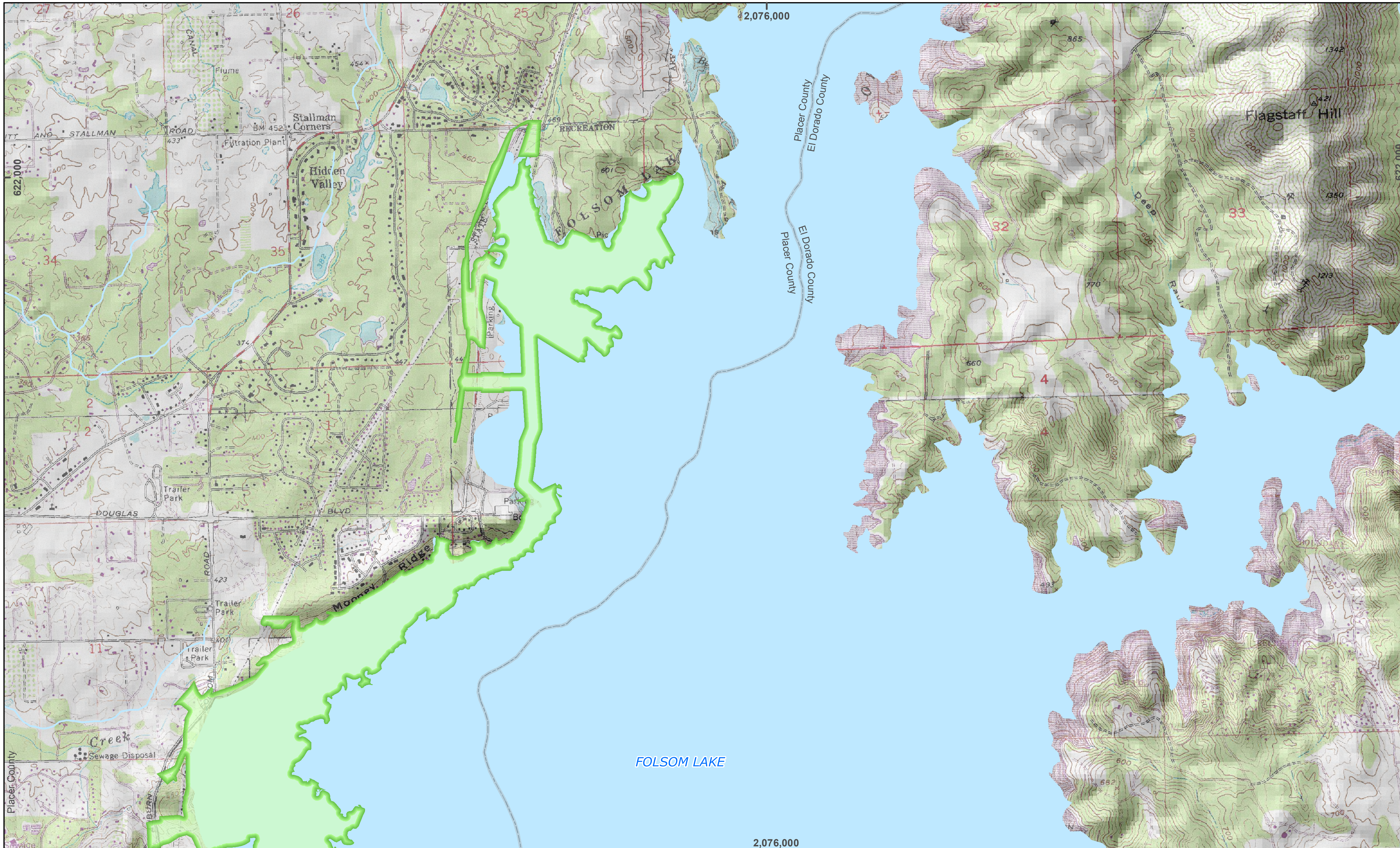
ATTACHMENT A. TOPOGRAPHIC MAPS OF THE FOLSOM DS/FDR ACTION AREA



LEGEND

Action Area Boundary

County Boundary

Reference Grid:
California Stateplane,
Zone 2, NAD83,
Feet

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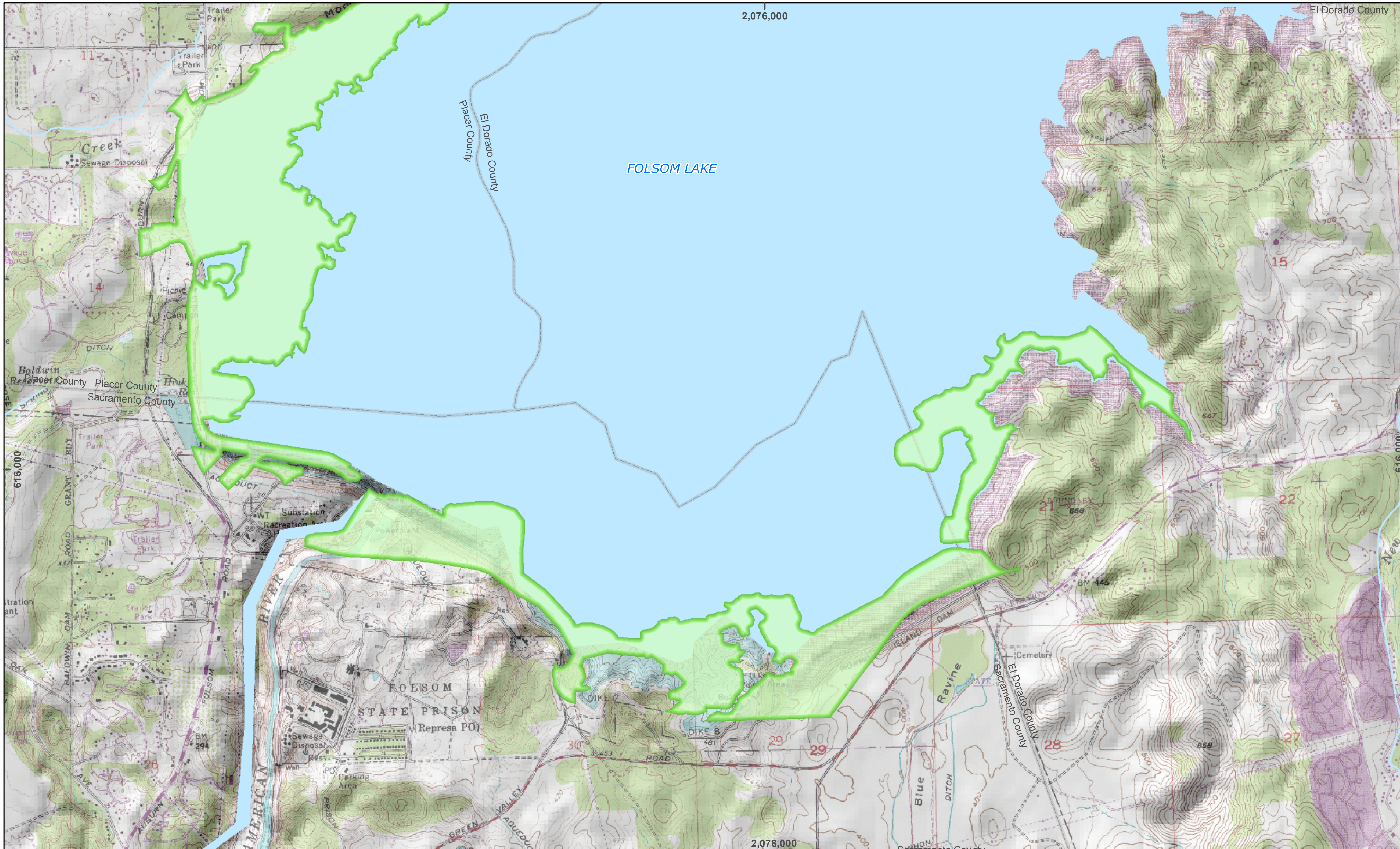
Miles

1:24,000

Attachment A (1 of 2)

Folsom DS/FDR
ACTION AREA MAP

ENTRIX



LEGEND

Action Area Boundary
County Boundary

Reference Grid:
California Stateplane,
Zone 2, NAD83,
Feet

0 0.25 0.5 1
Miles
1:24,000

Attachment A (2 of 2)

Folsom DS/FDR
ACTION AREA MAP

E N T R I X